EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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16. Abstract

This bibliography lists 616 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1974 and March 1974. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory, natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources, geodesy and cartography, geology and mineral resources, oceanography and marine resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economic analysis.

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NASA SP-7041 (01)

EARTH RESOURCES

A Continuing Bibliography
With Indexes
Issue 1

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between January 1974 and March 1974 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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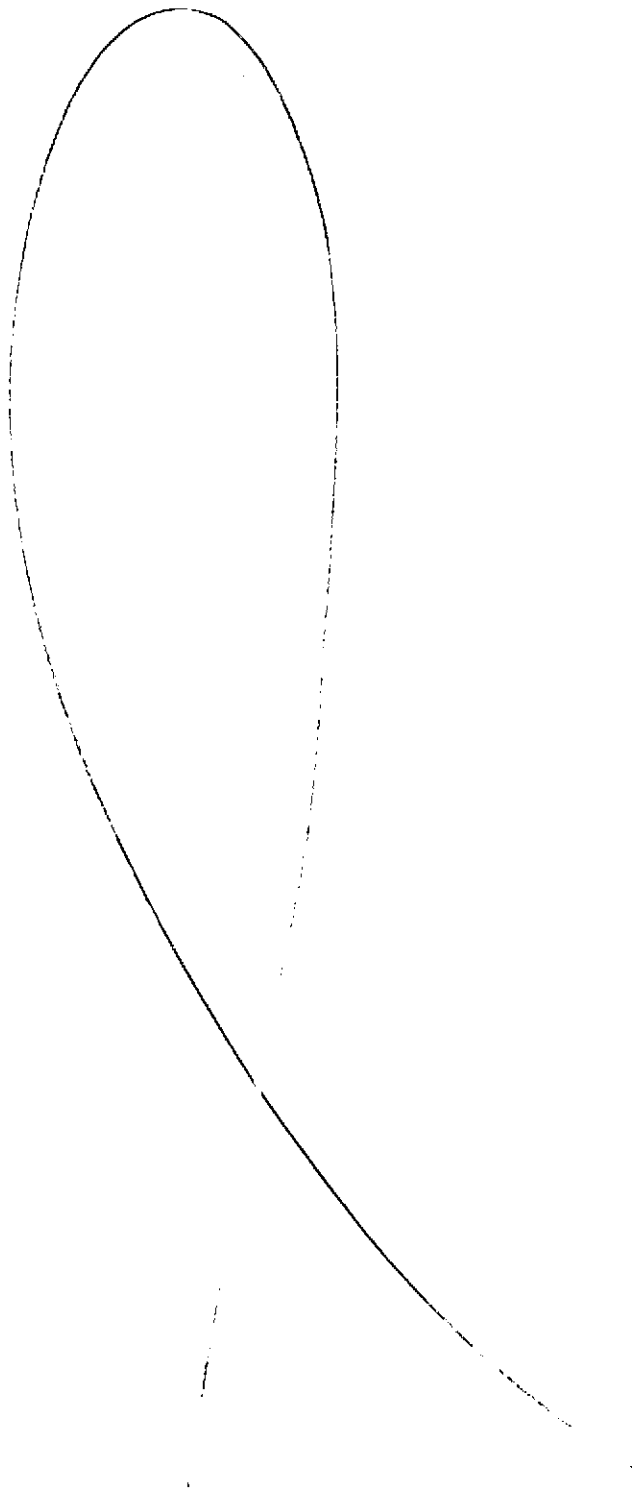

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INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 616 reports, articles, and other documents announced between January and March 1974 in *Scientific and Technical Aerospace Reports (STAR), and International Aerospace Abstracts (IAA).*

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

IAA entries identified by accession number series A74-10,000 in ascending accession number order.

STAR entries identified by accession number series N74-10,000 in ascending accession number order;

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All publications abstracted in this bibliography are available to the public through the sources as indicated in the *STAR Entries* and *IAA Entries* sections. It is suggested that the bibliography user contact his own library or other local libraries prior to ordering any publication inasmuch as many of the documents have been widely distributed by the issuing agencies, especially NASA. A listing of public collections of NASA documents is included on the inside back cover.

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Subject Categories

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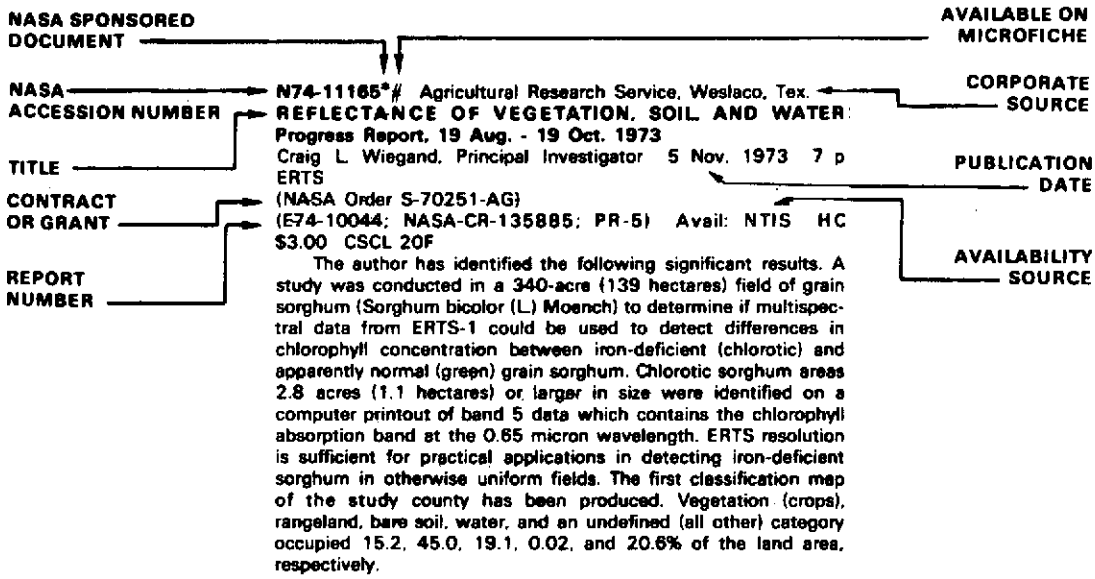
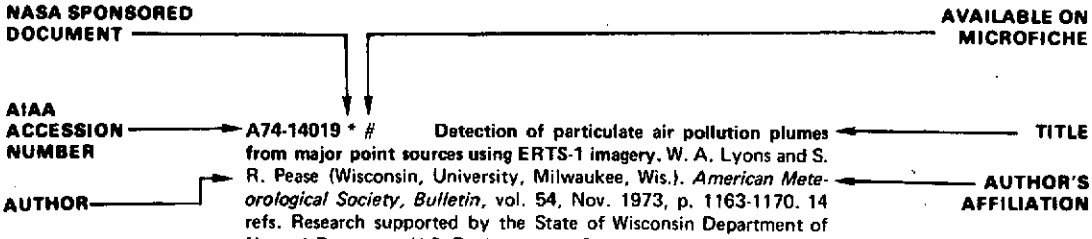


N74-11165*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER
Progress Report, 19 Aug. - 19 Oct. 1973
Craig L. Wiegand, Principal Investigator 5 Nov. 1973 7 p
ERTS
(NASA Order S-70251-AG)
(E74-10044; NASA-CR-135885; PR-5) Avail: NTIS HC $3.00 CSCL 20F

The author has identified the following significant results. A study was conducted in a 340-acre (139 hectares) field of grain sorghum (Sorghum bicolor (L) Moench) to determine if multispectral data from ERTS-1 could be used to detect differences in chlorophyll concentration between iron-deficient (chlorotic) and apparently normal (green) grain sorghum. Chlorotic sorghum areas 2.8 acres (1.1 hectares) or larger in size were identified on a computer printout of band 5 data which contains the chlorophyll absorption band at the 0.65 micron wavelength. ERTS resolution is sufficient for practical applications in detecting iron-deficient sorghum in otherwise uniform fields. The first classification map of the study county has been produced. Vegetation (crops), rangeland, bare soil, water, and an undefined (all other) category occupied 15.2, 45.0, 19.1, 0.02, and 20.6% of the land area, respectively.

TYPICAL CITATION AND ABSTRACT FROM *IAA*



A74-14019 * # **Detection of particulate air pollution plumes from major point sources using ERTS-1 imagery.** W. A. Lyons and S. R. Pease (Wisconsin, University, Milwaukee, Wis.). *American Meteorological Society, Bulletin*, vol. 54, Nov. 1973, p. 1163-1170. 14 refs. Research supported by the State of Wisconsin Department of Natural Resources. U.S. Environmental Protection Agency Grant No. R-800873; Contract No. NAS5-21736.

The Earth Resources Technology Satellite (ERTS-1) launched by NASA in July 1972 has been providing thousands of high resolution multispectral images of interest to geographers, cartographers, hydrologists, and agroculturists. It has been found possible to detect the long-range (over 50 km) transport of suspected particulate plumes from the Chicago-Gary steel mill complex over Lake Michigan. The observed plumes are readily related to known steel mills, a cement plant, refineries, and fossil-fuel power plants. This has important ramifications when discussing the interregional transport of atmospheric pollutants. Analysis reveals that the Multispectral Scanner Band 5 (0.6 to 0.7 micrometer) provides the best overall contrast between the smoke and the underlying water surface.

F.R.L.

EARTH RESOURCES

A Continuing Bibliography (Issue 1)

JUNE 1974

01
AGRICULTURE AND FORESTRY

Includes crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

A74-12784 **Hot spot determination.** G. R. Heath (Lockheed Electronics Co., Inc., Houston, Tex.). *Photogrammetric Engineering*, vol. 39, Nov. 1973, p. 1205-1214. 7 refs.

A procedure is proposed for determining hot spots in photographic surveys of forested areas. The procedure is applied to 30 deg latitude areas but can be modified easily for application at other latitudes. A table and graphs for hot-spot-free times are given to facilitate photographic mission planning. Directions are given for computing permissible amounts of hot spotting on photographs. V.Z.

A74-12957 **Traditional research and teledetection at the National Institute of Agronomic Research (Recherches traditionnelles et télédétection à l'Institut National de la Recherche Agronomique).** C. Goillot (Ministère de l'Agriculture et du Développement Rural, Paris, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 21-24. In French.

The basic objective of INRA (Institut National de la Recherche Agronomique) is to ensure the promotion of productivity within agricultural exploitations. The subject is divided into three perspectives: inventory, surveillance, and management. It is known that electromagnetic radiations, to which teledetection makes the greatest appeal, interact universally with matter as a function of its nature, texture, and structure. It is shown that traditional research and teledetection complement each other, but are not interchangeable. Conjointly, they should supply the overall information necessary to the good management of the environment up to the planetary scale, thanks to terrestrial resources satellites. F.R.L.

A74-14481 **Plant size, leaf structure, spectra, and chlorophyll content of normal and chlorotic sorghum plants and correlations with density readings from aerial, infrared color, positive film transparencies.** H. W. Gausman, R. Cardenas, and A. H. Gerbermann (U.S. Department of Agriculture, Agricultural Research Service, Weslaco, Tex.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 313-320. 14 refs.

A74-14482 **Color and color variation of a hardwood forest as imaged on color infrared film.** J. H. Hansen (Missouri, University, Columbia, Mo.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 321-334. 18 refs. Research supported by the U.S. Department of Agriculture. USDA Project 1670; USDA Project 1650.

Techniques for measuring and methods of describing color and color differences of imaged objects on color transparencies are explained. The measurement of the transmittance of imaged objects is done on a Leitz MPV microscope photometer equipped with an in-line monochromator. From these measurements the internal transmittance of the three dye layers is calculated at 10 nanometer intervals from 380 to 720 nanometers. CIE (Commission Internationale de l'Eclairage) approved methods are used to define the imaged object's color by three approved systems and the paired color differences between all objects are calculated. A multiple comparison test yielded predictions that are correct for 119 out of 120 pairs of comparisons possible for the 16 objects studied on the 1/3,000 scale infrared transparencies. (Author)

A74-14483 **A regional approach to wildland resource distributional analysis utilizing high altitude and earth orbital imagery.** P. F. Krumpe (California, University, Berkeley, Calif.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 336-371. 17 refs.

A regional description is given of the research area, taking into account location, physiography, geology, hydrology, and precipitation. The vegetation in the area is discussed together with the research objectives, questions of ground data and imagery acquisition, a preliminary imagery interpretation, an initial ERTS-1 regional imagery analysis, a quantitative analysis of ERTS-1 imagery, and a quantitative interpretation test of an ERTS-1 image. G.R.

A74-14876 **ERTS-1 analysis of wildland resources using manual and automatic techniques.** P. F. Krumpe, J. D. Nichols, and D. T. Lauer (California, University, Berkeley, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 50-66.

Review of research results pertaining to analyses of timber, forage, and water resources within the Feather Watershed region using ERTS-1 imagery data. Accuracies, timeliness and costs associated with extracting useful resource data from various types of color composite ERTS-1 imagery are reported. Present utility and limitations of ERTS-1 data are outlined. M.V.E.

A74-14888 * **Automatic information extraction for land use and agricultural applications.** A. D. Bond (Computer Sciences Corp., Huntsville, Ala.) and D. T. Thomas (NASA, Marshall Space Flight Center, Computation Laboratory, Huntsville, Ala.). In: Management

and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 257-267. 9 refs.

Description of some current work in interpretation technique development for automatic computer-aided image information extraction related to various application areas, including land use mapping and agricultural survey and monitoring. In particular, the application of a fast template matching algorithm, employing the sequential similarity detection principle, to image registration, linear feature detection, and the extraction and enumeration of scene objects is discussed and illustrated. M.V.E.

A74-14901 The development and implementation of orthophotography as a management tool by the Oregon State Forestry Department. L. W. Aggers (Oregon State, Forestry Dept., Salem, Ore.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 491-500. 8 refs.

A74-14905 Operational uses of satellite data in agriculture. W. C. Draeger and A. S. Benson (California, University, Berkeley, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 564-572.

If agricultural resource surveys utilizing satellite data are to become operational, increased consideration must be given to the development of data acquisition, analysis, and handling procedures which are specifically suited to large-scale, regional operations. In particular procedures must be developed with the information requirements of prospective user agencies in mind, and investigations must be designed such that a quantitative basis is provided for objective cost-accuracy comparisons of alternative information-gathering and processing systems. (Author)

A74-14906 * Critical land resources inventory using ERTS data. R. W. Kiefer, B. J. Niemann, Jr., D. L. Keyes, E. L. Kuhlmey (Wisconsin, University, Madison, Wis.), and A. H. Miller (Wisconsin State, Planning Office, Wis.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 573-592. 5 refs. Research supported by the Upper Great Lakes Regional Commission and Department of Administration of Wisconsin; Contract No. NAS5-21754.

The State of Wisconsin has embarked on a Critical Resources Information Program aimed at defining, establishing the units of measurement, inventorying, and monitoring natural and cultural spatial resource elements which are of statewide or regional significance. This paper presents the results of using ERTS data to inventory certain significant natural resources, such as agricultural land, forests, surface water and wetlands. Computer-generated spatial and statistical comparisons of resource data derived from conventional sources, RB-57 photographs, and ERTS images of Wisconsin suggest that certain resources can be inventoried and monitored on a statewide basis using ERTS images. Preliminary results of data extraction using ERTS digital tapes are also presented. The interpretation of certain natural and cultural resource information from ERTS images is anticipated to be an operational part of Wisconsin's Critical Resources Information Program. (Author)

A74-14908 * Identification of soil associations in South Dakota on ERTS 1 imagery. F. C. Westin (South Dakota State University, Brookings, S. Dak.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 610-629. 6 refs. Contract No. NAS5-21774.

Soil association maps show the spatial relationships of land units developed in unique climatic, geologic, and topographic environments, and having characteristic slopes, soil depths, textures, available water capacities, permeabilities, and the like. From these characteristics of the soil, broad interpretations can be made such as how the soil is suited for various agronomic and engineering uses. ERTS-1 imagery was found to be a useful tool in the identification of soil associations since it provides a synoptic view of an 8 million acre scene, which is large enough so that the effect can be seen on soils of climate, topography, and geology. A regional view also allows soil associations to be observed over most, if not all, of their extent. This aids in selecting typical sampling sites and provides a check on the homogeneity of the associations. (Author)

A74-16988 Survey of radio frequency techniques for teledetection of soil moisture. M. A. K. Hamid (Manitoba, University, Winnipeg, Manitoba, Canada). *Journal of Microwave Power*, vol. 8, Nov. 1973, p. 217-225. 35 refs. National Research Council of Canada Grant No. A-3326; Defence Research Board of Canada Grant No. 3801-42.

The paper outlines the principles of operation of contact and noncontact methods as well as recent development in radio frequency techniques for detection of soild moisture content. In the case of noncontact techniques, emphasis is placed on the interaction between measurement quantities which introduces ambiguities and limits the skin depth and overall progress in this area. Attention is also focussed on the effectiveness of contact methods employing immersion type sensors operating in the time or frequency domain, as well as the potential of hybrid techniques employing beacons interrogated by remote sensors during data reconnaissance missions. (Author)

A74-17488 Moisture dependency of radar backscatter from irrigated and non-irrigated fields at 400 MHz and 13.3 GHz. F. M. Dickey, C. King, J. C. Holtzman, and R. K. Moore (Center for Research, Inc., Lawrence, Kan.). *IEEE Transactions on Geoscience Electronics*, vol. GE-12, Jan. 1974, p. 19-22.

Scattered 2.25 cm radar signals from an agricultural area have been found to increase 5-7 dB at angles within 45 deg of vertical as the radar flies from dry to irrigated parts of the same field. Indications at 75 cm are that similar effects occur, but the results are less clear because of instrumental geometry. This result was the fortuitous consequence of an overflight by the NASA/MSC earth resources aircraft at a time when a group of fields was in the process of receiving irrigation water, so that the same field contained both dry and wet soil areas. Implications for use of radar as a sensor of agricultural areas are that determining soil moisture requires incidence under 45 deg and avoiding soil moisture effects requires incidence beyond 45 deg, at least for the low vegetation in the sample fields. (Author)

A74-17560 Mapping soil associations using ERTS MSS data. J. E. Cipra (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-1 to 3A-10. 10 refs.

Multispectral imagery from ERTS was compared to a soil association map of Tippecanoe County, Indiana, based on a conventional field survey. Three methods of processing single and multiple wavelength bands were applied to imagery collected on three dates. Correction of geometric distortions in computer-processed imagery was investigated. Four to six groupings of soil associations could be delineated on ERTS imagery. Some associations were more readily delineated using visible wavelengths, some

more readily delineated using infrared wavelengths. In general, MSS band 7 was found to give more soils information than MSS band 5. Imagery of single wavelength bands displayed on a television type display system gave greater contrast than photographically processed imagery. Computer processing and display of information from multiple bands is believed to be superior to using single ERTS bands. The present study failed to confirm this hypothesis, primarily because of the combinations of overpass dates, processing methods, and display methods. Computer compatible multispectral data which had geometric distortions removed was superior to distorted data. (Author)

A74-17561 * **Analysis of remotely sensed data for detecting soil limitations.** L. A. Benson, C. J. Frazee, and F. A. Waltz (South Dakota State University, Brookings, S.D.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-11 to 3A-19. 5 refs. Grant No. NGL-42-003-007.

During 1971 and 1972 a detailed study was conducted on a fallow field in the proposed Oahe Irrigation Project to determine the relationship between the tonal variation observed on aerial photographs and the properties of eroded soil. Correlation and regression analysis of digitized, multiemulsion, color infrared film (2443) data and detailed field data revealed a highly significant correlation between film transmittance and several soil properties indicative of the erosion limitation. Computer classification of the multiemulsion film data resulted in maps portraying the eroded soil and the normal soil. Both correlation and computer classification results were best using the reflectance data from the red spectral band. The results showed film transmittance was actually measuring the reflectivity of the soil surface which was increased by the incorporation of the light colored, calcareous parent material exposed by erosion or tillage on soils with thin surface horizons. (Author)

A74-17563 **Computerized interpretation of ERTS data for forest management.** L. Kirvida (Honeywell, Inc., Systems and Research Div., Minneapolis, Minn.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-35 to 3A-41.

Multispectral and spatial features are evaluated for automatic delineation of forest and associated land types. The principal components algorithm was used for determining the efficacy of multispectral bands in making class separations. Four spatial algorithms were evaluated for texture measurements. A thematic map was generated using four multispectral bands as features. Clusters were also used for generating a thematic map. (Author)

A74-17578 * **Machine boundary finding and sample classification of remotely sensed agricultural data.** J. N. Gupta, R. L. Kettig, D. A. Landgrebe, and P. A. Wintz (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-26 to 4B-35. 15 refs. Grants No. NGL-15-005-112; No. NGR-15-005-152.

A method based on the use of spectral variations in combination with spatial variations is developed for automatic boundary finding and sample classification of remotely sensed multispectral data. Preliminary applications of the method to agricultural data show significant improvements in accuracy as compared to the use of spectral data alone. V.P.

A74-18577 * **Plant size, etc., and aerial films.** H. Gausman, R. Cardenas, and A. H. Gerbermann (U.S. Department of Agriculture, Weslaco, Tex.). *Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 61-65, 67. 14 refs. NASA-supported research. NASA Order R-09-038-002.

Chlorophyll concentration of chlorotic leaves, expressed as milligrams of chlorophyll per cubic centimeter of leaf volume, was positively correlated to film density readings. Images on the film became darker as chlorophyll concentration increased. Plant size was not related to density readings. M.V.E.

A74-18578 **Are reforestation surveys with aerial photographs practical.** D. A. Bernstein (U.S. Forest Service, Portland, Ore.). *Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 69-73.

The possibilities of making tree counts in young forest plantations on large-scale aerial photos were tested. Interpretation was made on both color and black-and-white prints produced by the Aeronegative system. Photographs were taken with a 12-inch focal-length camera at scales of 1:1000 and 1:500. Results indicated, as far as the techniques and equipment of this test are concerned, that tree counts on aerial photos were not sufficiently accurate to be useful. Results did not improve with increased scale or the use of color instead of black-and-white. (Author)

A74-18581 **Interpretation of soils.** K. R. Piech and J. E. Walker (Calspan Corp., Buffalo, N.Y.). *(American Society of Photogrammetry, Annual Convention, Washington, D.C., Mar. 12-17, 1972.) Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 87-94. 10 refs. Research supported by the Calspan Corp. and U.S. Navy.

It is shown that conventional photointerpretation techniques, such as land-form analyses, can be usefully supplemented by photometric information extracted from color imagery through photometric ratio analyses. The aerial camera can be used as a photometer, and the resulting photometric data can be related to terrain physical properties. M.V.E.

A74-18660 # **Remote sensing and agricultural productivity.** R. A. Phelps (Anderson Clayton and Co., Houston, Tex.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 10th, Washington, D.C., Jan. 28-30, 1974, Paper 74-252.* 3 p. Members, $1.50; nonmembers, $2.00.

Review of a 1971 remote sensing project designed to cope with a severe insect and fungus infestation of cotton in the Western United States, whose encouraging results led to application of remote sensing to the improvement of the productivity of several types of large-acreage crops. Successes and failures of these ventures are summarized, and the practical application of aircraft, spacecraft, and satellite color infrared imagery to both unusual and routine agricultural operations is described. Encountered problems and future needs are pointed out. M.V.E.

A74-19022 * **Remote sensing of soil moisture with microwave radiometers.** T. Schmugge, P. Gloersen, T. Wilheit, and F. Geiger (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Journal of Geophysical Research*, vol. 79, Jan. 10, 1974, p. 317-323. 13 refs.

Microwave radiometry has been used for the remote sensing of soil moisture in a series of aircraft flights over an agricultural test area in the vicinity of Phoenix, Arizona. The radiometers covered the wavelength range 0.8-21 cm. Ground truth in the form of gravimetric measurements of the soil moisture in the top 15 cm were obtained for 200 fields at this site. The results indicate that it is possible to monitor moisture variations with airborne radiometers. The emission is a function of the radiometer wavelength and the distribution of the moisture in the soil. At a wavelength of 1.55 cm there is little or no variation in the emission for soil moisture values below 10 or 15% moisture content by weight. Above this value, there is a linear decrease in the emission with a slope of approximately 3 K for each percentage point increase in soil moisture. (Author)

N74-10347*# Alaska Univ., Fairbanks. Cooperative Wildlife Research Unit.
APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER Bimonthly Progress Report
Peter C. Lent, Principal Investigator 30 Sep. 1973 3 p ERTS
(Contract NAS5-21833)
(E73-11087; NASA-CR-135555) Avail: NTIS HC $3.00 CSCL 06C

N74-10349*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Monthly Progress Report, 16 Sep. - 15 Oct. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 16 Oct. 1973 9 p EREP
(NASA Order T-4106-B)
(E73-11166; NASA-CR-135767; MPR-6) Avail: NTIS HC $3.00 CSCL 02F

N74-10361*# Agricultural Research Service, Weslaco, Tex.
SPECTRAL SURVEY OF IRRIGATED REGION CORPS AND SOILS Annual Report, 1 Oct. 1970 - 30 Sep. 1971
30 Sep. 1971 262 p refs Original contains color illustrations
(NASA Order R-09-038-002)
(NASA-CR-125195) Avail: NTIS HC $15.25 CSCL 08G

The applications of remote sensing techniques to spectral surveys of irrigation, crops, and soils are reported. Topics discussed include: (1) canopy temperature as an indication of plant water stress, (2) temperature of soils and of crop canopies differing in water conditions, (3) ERTS project, (4) spectrum matching and pattern recognitation, (5) photographic procedures and interpretation, (6) interaction of light with plants, and (7) plant physiological and histological factors. F.O.S.

N74-11135 Pennsylvania State Univ., University Park.
APPLICATION OF MULTISPECTRAL REMOTE SENSING AND SPECTRAL REFLECTANCE PATTERNS TO SOIL SURVEY RESEARCH Ph.D. Thesis
Harold Lynn Mathews 1972 119 p
Avail: Univ. Microfilms Order No. 73-14022

Spectral reflectance curves of selected soil characterization samples and standard clay minerals were studied over the wavelength interval 0.5 to 2.6 microns. Results reported include reflectance data from three Hagerstown profiles and the Ap horizons of a Berks, Penn, and Ellery profile. Hagerstown soils are developed from limestone: while the Berks, Penn, and Ellery are developed from shale, sandstone, and glacial till respectively. Spectral curves for standard clay mineral samples of nontronite, kaolinite, and illite were also studied. Spectral reflectance data indicate that clay type and the amount of organic matter, Fe_2O_3, and silt influence the intensity of energy reflected by soils in the 0.5 to 2.6 micron range. High contents of organic matter and Fe_2O_3 reduced reflectance intensity in the 0.5 to 1.2 micron range, while clay type influenced curve shape and intensity over the entire range studied. For the Hagerstown profiles, silt is highly correlated with percent reflectance in the 0.8 to 2.5 micron range. Dissert. Abstr.

N74-11154*# Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
APPLICATION OF REMOTE SENSING IN THE STUDY OF VEGETATION AND SOILS IN IDAHO
E. W. Tisdale, Principal Investigator 5 Nov. 1973 1 p ref ERTS
(Contract NAS5-21850)
(E74-10016; NASA-CR-135857) Avail: NTIS HC $3.00 CSCL 08M

N74-11155*# Iowa State Univ. of Science and Technology, Ames. Iowa Agriculture Experimental Station.
REMOTE SENSING IN IOWA AGRICULTURE Progress Report, period ending 31 Oct. 1973
John P. Mahlstede, Principal Investigator and R. E. Carlson 9 Nov. 1973 3 p ERTS
(Contract NAS5-21839)
(E74-10020; NASA-CR-135861) Avail: NTIS HC $3.00 CSCL 02B

The author has identified the following significant results. Results include the estimation of forested and crop vegetation acreages using the ERTS-1 imagery. The methods used to achieve these estimates still require refinement, but the results appear promising. Practical applications would be directed toward achieving current land use inventories of these natural resources. This data is presently collected by sampling type surveys. If ERTS-1 can observe this and area estimates can be determined accurately, then a step forward has been achieved. Cost benefit relationship will have to be favorable. Problems still exist in these estimation techniques due to the diversity of the scene observed in the ERTS-1 imagery covering other part of Iowa. This is due to influence of topography and soils upon the adaptability of the vegetation to specific areas of the state. The state mosaic produced from ERTS-1 imagery shows these patterns very well. Research directed to acreage estimates is continuing.

N74-11164*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Sep. 1973
Allan Shapiro, Principal Investigator 26 Oct. 1973 1 p EREP
(NASA Order T-4716-B)
(E74-10043; NASA-CR-135884) Avail: NTIS HC $3.00 CSCL 08E

N74-11165*# Agricultural Research Service, Weslaco, Tex.
REFLECTANCE OF VEGETATION, SOIL, AND WATER Progress Report, 19 Aug. - 19 Oct. 1973
Craig L. Wiegand, Principal Investigator 5 Nov. 1973 7 p ERTS
(NASA Order S-70251-AG)
(E74-10044; NASA-CR-135885; PR-5) Avail: NTIS HC $3.00 CSCL 20F

The author has identified the following significant results. A study was conducted in a 340-acre (139 hectares) field of grain sorghum (Sorghum bicolor (L.) Moench) to determine if multispectral data from ERTS-1 could be used to detect differences in chlorophyll concentration between iron-deficient (chlorotic) and apparently normal (green) grain sorghum. Chlorotic sorghum areas 2.8 acres (1.1 hectares) or larger in size were identified on a computer printout of band 5 data which contains the chlorophyll absorption band at the 0.65 micron wavelength. ERTS resolution is sufficient for practical applications in detecting iron-deficient sorghum in otherwise uniform fields. The first classification map of the study county has been produced. Vegetation (crops), rangeland, bare soil, water, and an undefined (all other) category occupied 15.2, 45.0, 19.1, 0.02, and 20.6% of the land area, respectively.

N74-11173*# Agricultural Research Service, Weslaco, Tex.
IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Sep. - Oct. 1973
Craig L. Wiegand, Principal Investigator 5 Nov. 1973 2 p EREP
(NASA Order T-4105-B)
(E74-10052; NASA-CR-135893; MPR-4) Avail: NTIS HC $3.00 CSCL 08M

N74-11181*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Plans and Progress Report, Oct. 1973

Lester V. Manderscheid, Principal Investigator Oct. 1973 2 p EREP
(Contract NAS9-13332)
(E74-10060; NASA-CR-135960) Avail: NTIS HC $3.00 CSCL 05B

N74-11191*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Oct. 1973
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Oct. 1973 44 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13273)
(E74-10077; NASA-CR-135812) Avail: NTIS HC $4.25 CSCL 08H

The author has identified the following significant results. This is a preliminary report on the ability to detect soil moisture variation from the two different sensors on board Skylab. Initial investigations of S190A and SI94 Skylab data and ground truth has indicated the following significant results. (1) There was a decrease in SI94 antenna temperature from NW to SE across the Texas test site. (2) Soil moisture increases were measured from NW to SE across the test site. (3) There was a general increase in precipitation distribution and radar echoes from NW to SE across the site for the few days prior to measurements. This was consistent with the soil moisture measurements and gives more complete coverage of the site. (4) There are distinct variations in soil textures over the test site. This affects the moisture holding capacity of soils and must be considered. (5) Strong correlation coefficients were obtained between S194 antenna temperature and soil moisutre content. As the antenna temperature decreases soil moisture increases. (6) The SI94 antenna temperature correlated best with soil mositure content in the upper two inches of the soil. A correlation coefficient of .988 was obtained. (7) SI90A photographs in the red-infrared region were shown to be useful for identification of Abilene clay loam and for determining the distribution of this soil type.

N74-11200*# Arizona Univ., Tucson. Dept. of Biological Sciences.
DETERMINATION OF SPECIES Progress Report
C. H. Lowe, Principal Investigator and D. Slaymaker 7 Nov. 1973 1 p ERTS
(Contract NAS5-21819)
(E74-10089; NASA-CR-136001; PR-5) Avail: NTIS HC $3.00 CSCL 08F

N74-12112*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Nov. 1973
Harvey K. Nelson and Edgar A. Work, Jr., Principal Investigators (Environ. Res. Inst. of Mich.) 30 Nov. 1973 2 p EREP
(NASA Order T-4114-B)
(E74-10009; NASA-CR-135850) Avail: NTIS HC $3.00 CSCL 06C

N74-12117*# California Univ., Riverside. Citrus Research Center/Agricultural Experiment Station.
EVALUATION OF REMOTE SENSING IN CONTROL OF PINK BOLLWORM IN COTTON Final Draft Report, Jul. 1972 - Oct. 1973
Lowell N. Lewis, Principal Investigator and Virginia B. Coleman 30 Nov. 1973 25 p ERTS
(Contract NAS5-21771)
(E74-10026; NASA-CR-135867) Avail: NTIS HC $3.25 CSCL 06C

The author has identified the following significant results. The main objective is to evaluate the use of a satellite in monitoring the cotton production regulation program of the State of California as an aid in controlling pink bollworm infestation in the southern deserts of California. Color combined images of ERTS-1 multispectral images simulating color infrared are being used for crop identification. The status of each field (i.e., crop, bare, harvested, wet, plowed) is mapped from the imagery and is then compared to ground survey information taken at the time of ERTS-1 overflights. A computer analysis has been performed to compare field and satellite data to a crop calendar. Correlation to data has been 97% for field condition. Actual crop identification varies; cotton identification is only 63% due to lack of full season coverage.

N74-12121*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources (ORSER).
AGRICULTURAL LAND USE MAPPING Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, and A. D. Wilson May 1973 26 p ERTS
(Contract NAS5-23133)
(E74-10032; NASA-CR-135873; ORSER-SSEL-TR-25-73) Avail: NTIS HC $3.50 CSCL 08B

The author has identified the following significant results. Agricultural areas were selected or analysis in southeastern Pennsylvania, north central Montana, and southern Texas. These three sites represent a broad range of soils, soil parent materials, climate, modes of agricultural operation, crops, and field sizes. In each of these three sites, ERTS-1 digital data were processed to determine the feasibility of automatically mapping agricultural land use. In Pennsylvania, forest land, cultivated land, and water were separable within a 25,000 acre area. Four classes of water were also classified and identified, using ground truth. A less complex land use pattern was analyzed in Hill County, Montana. A land use map was prepared shown alternating patterns of summer fallow and stubble fields. The location of farmsteads could be inferred, along with that of a railroad line. A river and a creek flowing into the river were discernible. Six categories of water, related to sediment content and depth, were defined in the reservoir held by the Fresno dam. These classifications were completed on a 150 square mile area. Analysis of the data from Texas is in its formative stages. A test site has been selected and a brightness map has been produced.

N74-12122*# South Dakota State Univ., Brookings. Remote Sensing Inst.
[USE OF MULTISPECTRAL SYSTEMS TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL] Monthly Report, period ending 1 Oct. 1973
Victor I. Myers, Principal Investigator 1 Oct. 1973 2 p EREP
(Contract NAS9-13337)
(E74-10034; NASA-CR-135875) Avail: NTIS HC $3.00 CSCL 08M

N74-12127*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Progress Report, 1 Sep. - 31 Oct. 1973
Harvey K. Nelson, Principal Investigator 1 Nov. 1973 4 p ERTS
(NASA Order S-70243-AG-4)
(E74-10039; NASA-CR-135880) Avail: NTIS HC $3.00 CSCL 06C

N74-12130*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Oct. 1973
Harvey K. Nelson and Edgar A. Work, Jr., Principal Investigators (Environ. Res. Inst. of Mich.) 19 Oct. 1973 2 p EREP

(NASA Order T-4114-B)
(E74-10063; NASA-CR-135963) Avail: NTIS HC $3.00 CSCL 06C

N74-12134*# Department of Agriculture, Washington, D.C. Statistical Reporting Service.
CROP IDENTIFICATION AND ACREAGE MEASUREMENT UTILIZING ERTS IMAGERY Progress Report, 20 Aug. - 19 Oct. 1973
Donald H. VonSteen, Principal Investigator 19 Oct. 1973 19 p ERTS
(NASA Order S-70251-AG-3)
(E74-10070; NASA-CR-135819) Avail: NTIS HC $3.00 CSCL 02C

N74-12143* Kansas Univ. Center for Research, Inc., Lawrence. Evapotranspiration Lab.
WHEAT: ITS WATER USE, PRODUCTION AND DISEASE DETECTION AND PREDICTION
Edward T. Kanemasu, Principal Investigator *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 5 p ERTS
(Rept-2263-7) CSCL 02C
The author has identified the following significant results. Ground truth measurements indicate that reflectance ratios of the 545 and 655 mm wavebands provide an index of plant development and possibly physiological stress.

N74-12144* Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
EXTRACTION OF AGRICULTURAL STATISTICS FROM ERTS-A DATA OF KANSAS
Stanley A. Morain, Principal Investigator and Donald I. Williams *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 7 p ERTS

(Rept-2264-7) CSCL 02C
The author has identified the following significant results. Agricultural consultants have expressed substantial interest in work being conducted on center pivot irrigation and have inquired as to how ERTS-1 imagery can be used to aid those in the irrigation field. Results of the land use mapping experiment indicate that ERTS-1 imagery has major potential in regionalization. The ways in which land is utilized within these regions may then be studied more effectively than if no adequate regionalization is available.

N74-12149*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Plans and Progress Report, 1-31 Oct. 1973
Charles E. Poulton, Principal Investigator 31 Oct. 1973 7 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13286)
(E74-10095; NASA-CR-136086) Avail: NTIS HC $3.00 CSCL 08B

N74-13026*# Arizona Univ., Tucson.
A STUDY TO EXPLORE THE USE OF REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 15 Oct. 1973
William G. McGinnies, Principal Investigator 15 Oct. 1973 2 p ERTS
(Contract NAS5-21812)
(E74-10099; NASA-CR-136090) Avail: NTIS HC $3.00 CSCL 08F

N74-13032*# Geological Survey, Tucson, Ariz.
DYNAMICS OF DISTRIBUTION AND DENSITY OF PHREATOPHYTES AND OTHER ARID-LAND PLANT COMMUNITIES Progress Report, 1 Jan. - 30 Jun. 1973
Raymond M. Turner, Principal Investigator 1 Jul. 1973 22 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70243-AG-2)
(E74-10105; NASA-CR-136096) Avail: NTIS HC $3.00 CSCL 08F
The author has identified the following significant results. Six ERTS-1 images of the Tucson area, Arizona were analyzed to detect seasonal flushes of plant growth. Paired MSS-6 and MSS-5 bulk images were analyzed, using a ratioing technique, on the Electronic Satellite Image Analysis Console at Stanford Research Institute. Because of unique phenology, desert areas, covered only briefly by dense growths of ephemeral plants, are readily discerned. Grassland, evergreen forest, and riparian communities are also uniquely defined by their phenologies. Relatively sterile areas with little or no plant growth are easily discerned as are areas with varying degrees of plant productivity. The ratioing procedure detects plant coverage in excess of a threshold lying between 25% and 50%. The method is flexible and other coverage thresholds can be used.

N74-13038*# Arizona Univ., Tucson. Office of Arid Lands Studies.
A STUDY TO EXPLORE THE USE OF ORBITAL REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 15 Aug. 1973
William G. McGinnies, Edward F. Hease, Principal Investigators, and H. Brad Musick, comp. 15 Aug. 1973 30 p ERTS
(Contract NAS5-21812)
(E74-10111; NASA-CR-136102) Avail: NTIS HC $3.50 CSCL 08F
The author has identified the following significant results. Ground truth spectral signature data for various types of scenes, including ground with and without annuals, and various shrubs, were collected. When these signature data are plotted with infrared (MSS band 6 or 7) reflectivity on one axis and red (MSS band 5) reflectivity on the other axis, clusters of data from the various types of scenes are distinct. This method of expressing spectral signature data appears to be more useful for distinguishing types of scenes than a simple infrared to red reflectivity ration. Large areas of varnished desert pavement are visible and mappable on ERTS-1 and high altitude aircraft imagery. A large scale vegetation pattern was found to be correlated with the presence of the desert pavement. The large scale correlation was used in mapping the vegetation of the area. It was found that a distinctive soil type was associated with the presence of the varnished desert pavement. The high salinity and exchangeable sodium percentage of this soil type provide a basis for the explanation of both the large scale and small scale vegetation pattern.

N74-13039*# Mississippi State Univ., State College. Inst. for Environmental Studies.
APPLICATION OF ERTS-A DATA TO AGRICULTURAL PRACTICES IN THE MISSISSIPPI DELTA REGION Progress Report, period ending 30 Nov. 1973
C. W. Bouchillon, Principal Investigator 5 Dec. 1973 10 p ERTS
(Contract NAS5-21881)
(E74-10112; NASA-CR-136108; PR-5) Avail: NTIS HC $3.00 CSCL 02C
There are no author-identified significant results in this report.

N74-13040*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Progress Report, Apr. - Sep. 1973

John W. Rouse, Jr., Principal Investigator, R. H. Haas, D. W. Deering, and J. A. Schell Oct. 1973 86 p ERTS
(Contract NAS5-21857)
(E74-10113; NASA-CR-136103; RSC-1978-2) Avail: NTIS HC $6.50 CSCL 08F

The author has identified the following significant results. The Great Plains Corridor rangeland project utilizes natural vegetation systems as phenological indicators of seasonal development and climatic effects upon regional growth conditions. A method has been developed for quantitative measurement of vegetation conditions over broad regions using ERTS-1 MSS data. Radiance values recorded in ERTS-1 spectral bands 5 and 7, corrected for sun angle, are used to compute a band ratio parameter which is shown to be correlated with green biomass and vegetation moisture content. This report details the progress being made toward determining factors associated with the transformed vegetation index (TVI) and limitations on the method. During the first year of ERTS-1 operation (cycles 1-20), an average of 50% usable ERTS-1 data was obtained for the ten Great Plains Corridor test sites.

N74-13047*# Alaska Univ., Fairbanks.
APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER Bimonthly Progress Report
Peter C. Lent, Principal Investigator 30 Nov. 1973 5 p ERTS
(Contract NAS5-21833)
(E74-10120; NASA-CR-136165; BMPR-8) Avail: NTIS HC $3.00 CSCL 06C

N74-13060*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Monthly Progress Report, 16 Nov. - 15 Dec. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 22 Dec. 1973 5 p EREP
(NASA Order T-4106-B)
(E74-10123; NASA-CR-136168; MPR-8) Avail: NTIS HC $3.00 CSCL 02F

N74-13052*# Purdue Univ., Lafayette, Ind.
A STUDY OF THE UTILIZATION OF ERTS-1 DATA FROM THE WABASH RIVER BASIN Bimonthly Progress Report, 1 Sep. - 31 Oct. 1973
David A. Landgrebe, Principal Investigator 31 Oct. 1973 6 p refs ERTS
(Contract NAS5-21773)
(E74-10125; NASA-CR-136170) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. In soil association mapping, computerized analysis of ERTS-1 MSS data has yielded images which will prove useful in the ongoing Cooperative Soil Survey program, involving the Soil Conservation Service of USDA and other state and local agencies. In the present mode of operation, a soil survey for a county may take up to 5 years to be completed. Results indicate that a great deal of soils information can be extracted from ERTS-1 data by computer analysis. This information is expected to be very valuable in the premapping conference phase of a soil survey, resulting in more efficient field operations during the actual mapping. In the earth surface features mapping effort it was found that temporal data improved the classification accuracy of forest classification in Tippecanoe County, Indiana. In water resources study a severe scanner look angle effect was observed in the aircraft scanner data of a test lake which was not present in ERTS-1 data of the same site. This effect was greatly accentuated by surface roughness caused by strong winds. Quantitative evaluation of urban features classification in ERTS-1 data was obtained. An 87.1% test accuracy was obtained for eight categories in Marion County, Indiana.

N74-13054*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND AND DETECTION OF FOREST STRESS Progress Report, 1 Sep. - 31 Oct. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 20 Nov. 1973 15 p ERTS
(NASA Order S-70251-AG)
(E74-10127; NASA-CR-136172; FS-I-6; PR-6) Avail: NTIS HC $3.00 CSCL 02F

The author has identified the following significant results. Eucalyptus tree stands killed by low temperatures in December 1972 were outlined by image enhancement of two separate dates of ERTS-1 images (January 22, 1973-I.D. 1183-18175 and April 22, 1973-I.D. 1273-18183). Three stands larger than 500 meters in size were detected very accurately. In Colorado, range and grassland communities were analyzed by visual interpretation of color composite scene I.D. 1028-17135. It was found that mixtures of plant litter, amount and kind of bare soil, and plant foliage cover made classification of grasslands very difficult. Changes in forest land use were detected on areas as small as 5 acres when ERTS-1 color composite scene 1264-15445 (April 13, 1973) was compared with 1966 ASCS index mosaics (scale 1:60,000). Verification of the changes were made from RB-57 underflight CIR transparencies (scale 1:120,000).

N74-13069*# Texas A&M Univ., College Station. Remote Sensing Center.
MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATION (GREEN WAVE EFFECT) OF NATURAL VEGETATION Progress Report, 28 Sep. - 27 Nov. 1973
John W. Rouse, Jr., Principal Investigator 27 Nov. 1973 12 p ERTS
(Contract NAS5-21857)
(E74-10143; NASA-CR-136188; PR-5) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Emphasis has been given to an inventory of land resource types and land use at the ten Great Plains Corridor test sites. A resource and land use classification system was developed which uses available soil survey information and interpretations from NASA obtained high flight aerial photography to locate discrete areas of similar rangeland vegetation. Existing classification systems, even those developed for use with remote sensor data, were found to be inadequate for this project. This system is expected to be of general use for remote sensing related to land use and management. It has specific applicability to any effort aimed at regional use of ERTS-1 MSS digital data products. A preliminary assessment of the relative importance of rangelands in the Great Plains Corridor states indicates that the value of the livestock industry supported by this resource exceeds 23 billion dollars. The development of a Rangeland Feed Conditions index for this region could be used by more than 400,000 farm and ranch operators involved in the production of more than 40% of the nation's beef and much of the country's grain.

N74-13071*# Wyoming Univ., Laramie. Remote Sensing Lab.
VEGETATION ANALYSIS IN THE LARAMIE BASIN, WYOMING FROM ERTS-1 IMAGERY Special Report
Michael A. Evans and F. R. Redfern Nov. 1973 54 p refs
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E74-10145; NASA-CR-136190; ERTS-1-573-5) Avail: NTIS HC $4.75 CSCL 08F

The author has identified the following significant results. The application of ERTS-1 imagery to vegetation mapping and identification was tested and confirmed by field checking. ERTS-1 imagery interpretation and density contour mapping allows definition of minute vegetation features and estimation of

vegetative biomass and species composition. Large- and small-scale vegetation maps were constructed for test areas in the Laramie Basin and Laramie mountains of Wyoming. Vegetative features reflecting grazing intensity, moisture availability, changes within the growing season, cutting of hay crops, and plant community constituents in forest and grassland are discussed and illustrated. Theoretical considerations of scattering, sun angle, slope, and instrument aperture upon image and map resolution were investigated. Future suggestions for applications of ERTS-1 data to vegetative analysis are included.

N74-14020*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Progress Report, Dec. 1973
Harvey K. Nelson, Principal Investigator Dec 1973 2 p EREP
(NASA Order T-4114-B)
(E74-10152; NASA-CR-136211) Avail: NTIS HC $3.00 CSCL 06C

N74-14029*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS Monthly Progress Report, 16 Oct. - 15 Nov. 1973
Robert C. Heller, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 27 Nov. 1973 4 p EREP
(NASA Order T-4106-B)
(E74-10161; NASA-CR-136288; MPR-7) Avail: NTIS HC $3.00 CSCL 02F

N74-14035*# Iowa State Univ. of Science and Technology, Ames. Iowa Agriculture Experiment Station.
REMOTE SENSING IN IOWA AGRICULTURE Progress Report, period ending 31 Dec. 1973
John P. Mahlstede, Principal Investigator, R. E. Carlson, and Tom E. Fenton 4 Jan. 1974 3 p ERTS
(Contract NAS5-21839)
(E74-10167; NASA-CR-136294) Avail: NTIS HC $3.00 CSCL 02C

The author has identified the following significant results. Analysis of 1972 single-date coverage indicated that a complete crop classification was not attainable at the test sites. Good multi-date coverage during 1973 indicates that many of the problems encountered in 1972 will be minimized. In addition, the compilation of springtime imagery covering the entire state of Iowa has added a new dimension to interpretation of Iowa's natural resources. ERTS-1 has provided data necessary to achieve the broad synoptic view not attainable through other means. This should provide soils and crop researchers and land use planners a base map of Iowa. Granted and due to the resolution of ERTS-1, not all details are observable for many land use planning needs, but this gives a general and current view of Iowa.

N74-14037*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
AUTOMATIC PHOTOINTERPRETATION FOR LAND USE MANAGEMENT IN MINNESOTA Progress Report
George D. Swanlund, Principal Investigator, L. Kirvida, and M. Cheung Dec. 1973 2 p ERTS
(Contract NAS5-21742)
(E74-10169; NASA-CR-136296) Avail: NTIS HC $3.00 CSCL 08B

N74-14039*# Agricultural Research Service, Weslaco, Tex. Citrus Insects Research.
A STUDY OF THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY/DISTRIBUTION OF HOST PLANTS Progress Report, 1-30 Sep. 1973
William G. Hart, Sammy J. Ingle, and M. R. Davis, Principal Investigators 30 Sep. 1973 2 p EREP
(NASA Order T-4109-B)
(E74-10171; NASA-CR-136298; PR-8) Avail: NTIS HC $3.00 CSCL 02C

N74-14041*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA Progress Report
Robert N. Colwell, Donald T. Lauer, Robert H. Burgy, Gerald Schubert, John E. Estes, Leonard W. Bowden, Vidal Algazi, William E. Wildman, and Gordon L. Huntington, Principal Investigators 31 Dec. 1973 3 p refs ERTS
(Contract NAS5-21827)
(E74-10173; NASA-CR-136300; PR-6) Avail: NTIS HC $3.00 CSCL 08B

N74-14042*# Agricultural Research Service, Weslaco, Tex. Citrus Insects Research.
A STUDY OF THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY/DISTRIBUTION OF HOST PLANTS Progress Report, 1-31 Oct. 1973
William G. Hart, Sammy J. Ingle, and M. R. Davis, Principal Investigators 31 Oct. 1973 2 p EREP
(NASA Order T-4109-B)
(E74-10174; NASA-CR-136303; PR-9) Avail: NTIS HC $3.00 CSCL 02C

N74-14047*# Bureau of Indian Affairs, Washington, D.C.
TIMBER RESOURCE INFORMATION SYSTEM Progress Report, 1 Jul. - 31 Oct. 1973
Arthur M. Woll, Principal Investigator 21 Nov. 1973 5 p ERTS
(NASA Order S-70243-AG-3)
(E74-10181; NASA-CR-136320) Avail: NTIS HC $3.00 CSCL 02F

N74-14052*# Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Dec. 1973
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Dec. 1973 19 p EREP
(Contract NAS9-13273)
(E74-10188; NASA-CR-136327) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. Correlations between the S-194 antenna temperature and soil moisture have been obtained for three sets of data; one for Skylab 2 and two for Skylab 3. The best correlations were obtained for the surface to one inch depth in two cases and for the surface to two inches for the third case. Correlation coefficients for the surface to one inch depth were -0.98, -0.95, and -0.82. The lowest correlation coefficient was obtained with total soil moisture variations less than 4% across the test site.

N74-14075* California Univ., Berkeley. Forestry Remote Sensing Lab.
APPLICATION OF REMOTE SENSING IN FORESTRY
Donald T. Lauer *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 40-41

CSCL 02F

The use of remote sensing techniques in forestry studies is investigated. In particular, inventory, monitoring, detection, and management are discussed. Data show that infrared imagery

appears to be the best technique for forestry studies. Data also show that color photographs are more easily interpreted than black and white ones. E.H.W.

N74-14076* California Univ., Berkeley. Forest Remote Sensing Lab.
APPLICATIONS OF REMOTE SENSING TO AGRICULTURE
Claire M. Hay *In* Mich. State Univ. Proc. of the Conf. of Pract. Appl of Remote Sensing May 1973 p 42-43

CSCL 02C

Remote sensing applications to agriculture in the areas of: (1) general land use mapping and stratification, (2) identification, and inventory of distinct crops, and (3) detection of stress conditions and other factors affecting crop yields are discussed. Author

N74-14906# Minnesota Univ., St. Paul. Dept. of Ecology and Behavioral Biology.
RAPTOR CONSERVATION AND MANAGEMENT APPLICATIONS OF BIO-TELEMETRY STUDIES FROM CEDAR CREEK NATURAL HISTORY AREA
M. R. Fuller, T. H. Nicholls, and J. R. Tester [1973] 16 p refs Presented at Conf. on Raptor Conserv. Tech., Ft. Collins, Colo., 22-25 Mar. 1973 Sponsored by AEC and NIH
(COO-1332-87; Conf-730340-1) Avail: NTIS HC $3.00

The habitat preference and intensity of use were determined for the Barred Owl to aid the conservationists in his decision making for managing wildlife habitats. It is shown that the manager must strive for conditions that allow for the development of spatial-temporal relationship among species. F.O.S.

N74-14997*# Centre for Overseas Pest Research, London (England).
TESTING FEASIBILITY OF DETECTING POTENTIAL LOCUST BREEDING SITES BY SATELLITE Final Report, Jul. 1972 - Aug. 1973
D. E. Pedgley, Principal Investigator Sep. 1973 27 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10193; NASA-CR-136364) Avail: NTIS HC $3.50 CSCL 08C

N74-14999*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Oct. 1973
Roger M. Hoffer, Principal Investigator Oct. 1973 6 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(Contract NAS9-13380)
(E74-10195; NASA-CR-136368) Avail: NTIS HC $3.00 CSCL 05B

N74-15009*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Plans and Progress Report, 1-31 Dec. 1973
Charles E. Poulton, Principal Investigator 31 Dec. 1973 11 p EREP
(Contract NAS9-13286)
(E74-10201; NASA-CR-136383; PR-11) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Below approximately 25% cover visual photointerpretation of vegetation analogs of Skylab 2 SI9OA color infrared imagery is poor. Correct identifications of vegetation analogs in this category range from 28 to 57%. Good photointerpretation results (64 to 96%) were obtained on vegetation analogs with higher cover values. The four semidesert vegetation analogs (greasewood, saltbush, big sagebrush, and pinyon-juniper) are consistently distinguishable as a group. Photointerpretation accuracy equals 90.1%. When these same types are broken into two sub-groups (salt desert vegetation and shrub steppe/sparse pinyon-juniper vegetation) interpretation success drops to 76% and 85%, respectively. Band ratioing and transmittance differences between two forested analogs as imaged on Skylab 2 S19OA film shows significant differences. In the infrared wavelength both analogs have very similar transmittance characteristics while the visible wavelength shows separation between the two. Relative transmittance values for stands of ponderosa pine forestland and pinyon-juniper woodland are 719.3 + or - 65.9 and 223.6 + or - 48.1, respectively on negative transparencies. In image interpretation along the low-elevation fringe of forested regions these are the two forest analogs most frequently requiring separation.

N74-15019*# Department of Agriculture, Washington, D.C. Statistical Reporting Service.
CROP IDENTIFICATION AND ACREAGE MEASUREMENT UTILIZING ERTS IMAGERY Progress Report, 20 Jun. - 19 Dec. 1973
Donald H. VonSteen, Principal Investigator 19 Dec. 1973 46 p ERTS
(NASA Order S-70251-AG-3)
(E74-10211; NASA-CR-136393) Avail: NTIS HC $4.50

The author has identified the following significant results. Results of temporal overlays, equal and unequal prior probabilities, and independent test data are discussed. The amount of improvement that each technique contributed are summarized: (1) Results in Missouri where temporal overlays were made, show that temporal information improved the overall classification by 10%. (2) The dates were not optimum that were overlaid. (3) Data analysis in both Missouri and Idaho indicates that the use of prior probabilities improves the overall classification rates by at least 10% overusing the assumption that the crops are all equally likely. (4) Using both procedures together indicates that overall performance can be improved by 20% over one data and equal prior probabilities. (5) Idaho data has banding problems that may have caused serious problems in the crop classification. (6) The twelve crop types in Idaho seem to be quite similar spectrally, and hence, classification is quite difficult. (7) ERTS may not contain enough information to have perfect classification, but the data may still be useful for making crop acreage estimates. (8) Remotely sensed data could be used with a regression estimator if there is a correlation between ground data and classification results. (9) Remotely sensed data could be used with a double sample model.

N74-15027*# Earth Satellite Corp., Berkeley, Calif.
PLAN FOR THE UNIFORM MAPPING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES FROM SKYLAB IMAGERY Monthly Progress Report, 1-30 Nov. 1973
Charles E. Poulton, Principal Investigator 30 Nov. 1973 9 p EREP
(Contract NAS9-13286)
(E74-10222; NASA-CR-136485; MPR-10) Avail: NTIS HC $3.00 CSCL 08B

N74-15032*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA

PROCESSING TECHNIQUES Monthly Progress Report, Nov. 1973
Roger M. Hoffer, Principal Investigator Nov. 1973 6 p EREP
(Contract NAS9-13380)
(E74-10227; NASA-CR-136490) Avail: NTIS HC $3.00 CSCL 05B

N74-15034*# Kansas Univ. Center for Research, Inc., Lawrence.
KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL Progress Report, Oct. - Nov. 1973
R. M. Haralick, E. T. Kanemasu, S. A. Morain, H. L. Yarger, Fawwaz T. Ulaby, John C. Davis, Principal Investigators, Robert J. Bosley, Donald L. Williams, James R. McCauley, and James L. McNaughton Dec. 1973 62 p refs ERTS
(Contract NAS5-21822)
(E74-10229; NASA-CR-136492) Avail: NTIS HC $5.25 CSCL 08F

The author has identified the following significant results. Improvement in the land use classification accuracy of ERTS-1 MSS multi-images over Kansas can be made using two distances between neighboring grey tone N-tuples instead of one distance. Much more information is contained texturally than spectrally on the Kansas image. Ground truth measurements indicate that reflectance ratios of the 545 and 655 nm wavebands provide an index of plant development and possibly physiological stress. Preliminary analysis of MSS 4 and 5 channels substantiate the ground truth interpretation. Results of the land use mapping experiment indicate that ERTS-1 imagery has major potential in regionalization. The ways in which land is utilized within these regions may then be studied more effectively than if no adequate regionalization is available. A model for estimating wheat yield per acre has been applied to acreage estimates derived from ERTS-1 imagery to project the 1973 wheat yields for a ten county area in southwest Kansas. The results are within 3% of the preharvest estimates for the same area prepared by the USDA. Visual identification of winter wheat is readily achieved by using a temporal sequence of images. Identification can be improve by stratifying the project area into subregions having more or less homogeneous agricultural practices and crop mixes.

N74-15049*# Nebraska Univ., Lincoln. Dept. of Agronomy.
EVALUATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA Progress Report, 1 Jul. - 31 Dec. 1973
James V. Drew, Principal Investigator and Paul M. Seevers 18 Jan. 1974 16 p ERTS
(Contract NAS5-21758)
(E74-10245; NASA-CR-136543) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Interpretations of imagery from the Earth Resources Technology Satellite (ERTS-1) indicate that soil associations and attendant range sites can be identified on the basis of vegetation and topography using multitemporal imagery. Optical density measurements of imagery from the visible red band of the multispectral scanner(MSS band 5) obtained during the growing season were related to field measurements of vegetative biomass, a factor that closely parallels range condition class on specific range sites. ERTS-1 imagery also permitted inventory and assessment of center-pivot irrigation systems in the Sand Hills region in relation to soil and topographic conditions and energy requirements. Four resource maps of the Upper Loup Natural Resource District located entirely within the Sand Hills region were prepared from ERTS-1 imagery.

N74-15071*# East Tennessee State Univ., Johnson City. Dept. of Geography.
SOME FOREST INTERPRETATION POTENTIALS OF HYPER-ALTITUDE PHOTOGRAPHY AND ERTS-A IMAGERY APPLICATIONS AND PROGNOSTICATIONS, TENNESSEE VALLEY TEST SITE Final Report
Richard E. Witmer Apr. 1972 23 p refs Sponsored by NASA and Geol. Survey
(NASA-CR-136591; PB-226216/AS; USGS-248; USGS-IR-NASA-248) Avail: NTIS HC $3.25 CSCL 06F

To test the potential of high altitude, color infrared photography and multispectral satellite imagery to provide forestry information to meet TVA needs, forest cover of an area in northern Alabama was mapped using 1:120,000-scale photography. Maps drawn from a mosaic and one drawn from the original transparency proved the increased accuracy of the map prepared from the transparency. Seven basic forest patterns were created by relating characteristic slopes, topographic positions, and drainage networks to the forest cover. The ability to produce a valid catalog of repeatable patterns that could be applied to specific case situations over a larger area was demonstrated. Author

02
ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

A74-10579 **Radar imagery of oil slicks.** R. O. Pilon and C. G. Purves (U.S. Navy, Naval Research Laboratory, Washington, D.C.). *IEEE Transactions on Aerospace and Electronic Systems*, vol. AES-9, Sept. 1973, p. 630-636. 9 refs.

Radar imagery is shown to represent an effective tool in the detection and monitoring of oil slicks. Positive imagery of oils slicks has been obtained on four (428, 1228, 4455, and 8910 MHz) frequencies. The results and conclusions arrived at are applicable to relatively low sea state and wind conditions. M.V.E.

A74-12764 * **A multisensor system for airborne surveillance of oil pollution.** A. T. Edgerton (Aerojet Electrosystems Co., Azusa, Calif.), R. Ketchal (U.S. Coast Guard, Washington, D.C.), and C. Catoe (U.S. Coast Guard; NASA, Advanced Technology Program Office, Washington, D.C.). In: Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1973, p. 139-147. 6 refs.

The U.S. Coast Guard is developing a prototype airborne oil surveillance system for use in its Marine Environmental Protection Program. The prototype system utilizes an X-band side-looking radar, a 37-GHz imaging microwave radiometer, a multichannel line scanner, and a multispectral low light level system. The system is geared to detecting and mapping oil spills and potential pollution violators anywhere within a 25 nmi range of the aircraft flight track under all but extreme weather conditions. The system provides for false target discrimination and maximum identification of spilled materials. The system also provides an automated detection alarm, as well as a color display to achieve maximum coupling between the sensor data and the equipment operator. (Author)

A74-12788 **Man and environment - Remote sensing from space.** K. Ia. Kondrat'ev, G. T. Beregovoi, A. A. Buznikov, O. B. Vasil'ev, A. A. Grigor'ev, A. G. Nikolaev, V. I. Sevast'ianov, O. I. Smoktii, E. V. Khrunov, and V. A. Shatalov. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 11 p. 5 refs.

Premonitions voiced by some scientists that an unchequed progress of technology would lead to a general deterioration of the environment are disputed as speculations unsupported by factual data. Remote space sensing is suggested as an effective approach to collecting such data on a global scale. The various space sensing techniques applicable in different space-borne environmental survey assignments are discussed. V.Z.

A74-12902 # **Space sensing of harm to the marine environment - Damages in international law.** C. Q. Christol (Southern California, University, Los Angeles, Calif.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 25 p. 53 refs.

It is shown that the convergence of the international law of space, the international law of the human environment, and the international law of the sea is producing a new set of legal norms. The discussion touches, in particular, upon the general issue of the legality and capabilities of earth sensing satellites used to identify ocean pollution and polluters, and on the issue of damages. M.V.E.

A74-14019 * # **Detection of particulate air pollution plumes from major point sources using ERTS-1 imagery.** W. A. Lyons and S. R. Pease (Wisconsin, University, Milwaukee, Wis.). *American Meteorological Society, Bulletin*, vol. 54, Nov. 1973, p. 1163-1170. 14 refs. Research supported by the State of Wisconsin Department of Natural Resources. U.S. Environmental Protection Agency Grant No. R-800873; Contract No. NAS5-21736.

The Earth Resources Technology Satellite (ERTS-1) launched by NASA in July 1972 has been providing thousands of high resolution multispectral images of interest to geographers, cartographers, hydrologists, and agroculturists. It has been found possible to detect the long-range (over 50 km) transport of suspected particulate plumes from the Chicago-Gary steel mill complex over Lake Michigan. The observed plumes are readily related to known steel mills, a cement plant, refineries, and fossil-fuel power plants. This has important ramifications when discussing the interregional transport of atmospheric pollutants. Analysis reveals that the Multispectral Scanner Band 5 (0.6 to 0.7 micrometer) provides the best overall contrast between the smoke and the underlying water surface. F.R.L.

A74-14479 **Experimental application of remote sensing to solid waste planning and management.** D. Garofalo and F. J. Wobber (Earth Satellite Corp., Washington, D.C.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 210-232. 7 refs.

The acquisition of statistical data for solid waste management is considered, giving attention to solid waste estimation techniques. Aerial photographs can be used to compute the quantities of waste generated in a given area. Wastes are traditionally grouped into household, commercial, industrial, and agricultural refuse categories. Detailed information within these categories can be obtained. Estimates of waste quantities in Tampa, Florida are discussed. G.R.

A74-14488 **Population estimation from ERTS imagery - Methodology and evaluation.** S.-Y. Hsu (New York, State University, Binghamton, N.Y.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 583-591. 10 refs.

By the use of large scale conventional aerial photos population can be estimated by housing counts. This method, however, is not applicable to ERTS data because of resolution limitation. An alternative approach is to use ERTS radiation data obtained from microcontrol cells in the sample area. The approach is based on the phenomenon that the roof of houses usually has a higher reflectance than the surrounding area. G.R.

A74-14877 **Analyses and applications of multiple cycles of ERTS-1 imagery over County of Los Angeles - Assessment of data utility for urban development and regional planning.** S. Raje, R. Economy (General Electric Co., Space Div., Philadelphia, Pa.), J. McKnight (Los Angeles County Regional Planning Commission, Los Angeles, Calif.), G. Willoughby (OVAAC8, International, Inc., Columbia, Md.), and D. Goehring. In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 67-82.

A74-14878 **Applications of remote sensing in urban and regional planning.** A. L. Grey, F. V. Westerlund, and G. J. Hartlmueller (Washington, University, Seattle, Wash.). In: Manage-

ment and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 94-116. 14 refs. U.S. Geological Survey Contract No. 14-08-001-12864.

Six examined potential uses of remote sensing for urban and regional planning include (1) acquisition of an overview, (2) development of base maps, (3) area-coextensive surface accounting, (4) identification of discrete phenomena, (5) administration and monitoring, and (6) public communication. The term area-coextensive surface accounting is used to denote the functions of land-use planning and mapping, and four different tasks falling within this category are analyzed in greater detail. These tasks include detection at various scales, historical interpretation of an airport area, interpretation and projection in an environmentally sensitive natural area, and machine-aided data extraction. T.M.

A74-14907 Applications of ERTS-I data to landscape change in eastern Tennessee. J. B. Rehder (Tennessee, University, Knoxville, Tenn.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 598-609. 6 refs.

The analysis of landscape change in eastern Tennessee from ERTS-I data is being derived from three avenues of experimentation and analysis: (1) a multi-stage sampling procedure utilizing ground and aircraft imagery for ground truth and control, (2) a densitometric and computer analytical experiment for the analysis of gray tone signatures and comparisons for landscape change detection and monitoring, and (3) an ERTS image enhancement procedure for the detection and analysis of photomorphic regions. Significant results include: maps of strip mining changes and forest inventory, watershed identification and delimitation, and agricultural regions derived from spring plowing patterns appearing on the ERTS-I imagery. (Author)

A74-16127 Remote sensing as an environmental tool. A. R. Marshall (Miami, University, Coral Gables, Fla.). In: Technology today and tomorrow; Proceedings of the Tenth Space Congress, Cocoa Beach, Fla., April 11-13, 1973. Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1973, p. 8-21 to 8-24.

From even limited exposure to the techniques of remote sensing, the value of the application of this tool to the preservation and restoration of environmental quality is obvious. In a report to the Cabinet of Florida a panel of scientists used photographs furnished by Kennedy Space Center to demonstrate some of the effects of the incursion of Canal-38 into the Kissimmee River basin and to depict an infestation of the aquatic weed (hydrilla) in an area of Lake Okeechobee: (1) color shot taken from a Gemini 12 Satellite; (2) infrared imagery; (3) low-altitude infrared color. The synoptic overview provided by high altitude monitoring will afford basic information so necessary in the application of the vital interdisciplinary approach to ecosystem management. (Author)

A74-16241 # Development and field tests of a laser fluorosensor for environmental monitoring. R. M. Measures, W. Houston (Toronto, University, Toronto, Canada), and M. Bristow (Canada Centre for Remote Sensing, Ottawa, Canada). *(Canadian Aeronautics and Space Institute, Aerospace Electronics Symposium, Saskatoon, Saskatchewan, Canada, Feb. 5-7, 1973.) Canadian Aeronautics and Space Journal*, vol. 19, Dec. 1973, p. 501-506.

Laser induced fluorescence of the environment offers exciting possibilities as a means of both detecting and identifying certain ground truth features from a remote airborne platform, such as a helicopter or an aircraft. A prototype version of an instrument based on this approach and called a 'laser fluorosensor' has been developed. Fields tests of this system from a site overlooking Lake Ontario have demonstrated that the laser fluorosensor, when airborne, should, in principle, have no problems in detecting small oil patches at night. Furthermore, in a parallel laboratory program a tunable laser fluorosensor has been developed and has shown that two-wavelength excitation of oils represents a significant advance toward the remote identification of the type of oil detected. (Author)

A74-17343 Study on the conditions of application of thermal measurements to archeological prospecting (Essai sur les conditions d'application des mesures thermiques à la prospection archéologique). A. Tabbagh (CNRS, Centre de Recherches Géophysiques, Garchy, Nièvre, France). *Annales de Géophysique*, vol. 29, Apr.-June 1973, p. 179-188. 7 refs. In French.

A74-17524 # A review of remote sensing research. W. G. Collins (University of Aston, Birmingham, England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 29-37.

A program is described in which multiscale, sequential, and multispectral aerial photography and quantitative photogrammetric/digitization methods will be used to obtain information for mapping soils, for reclamation of spoiled land, evaluation of the environmental quality of landscapes, etc. The development of a computerized interactive digitizing display system which will permit a greater degree of automation in data handling operations is noted. Some applications to the management of resources and environment are examined. V.P.

A74-17551 A land use classification system for use with remote-sensor data. E. E. Hardy (Cornell University, Ithaca, N.Y.) and J. R. Anderson (U.S. Geological Survey, Washington, D.C.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-1 to 2A-6.

A land use classification system based on the capabilities of various remote sensors and manageable within the format constraints of automatic or semiautomatic data processing is required for better land management practices. This paper presents information on the background, origin, and performance of a land use classification system that allows remotely sensed data to be managed in a manner suitable to the needs of machine processing. This is the proposed land use classification system for use with remote sensor data, published in Geological Survey Circular 671 in 1972 and submitted for general review by users as a necessary catalyst between data acquisition from remote sensors and data processing by machine methods. T.M.

A74-17552 * Urban land-use mapping by machine processing of ERTS-1 multispectral data - A San Francisco Bay Area example. R. Ellefsen (California State University, San Jose, Calif.), P. Swain (Purdue University, West Lafayette, Ind.), and J. Wray (U.S. Geological Survey, Washington, D.C.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-7 to 2A-22. 9 refs. Research supported by the U.S. Department of the Interior; Grants No. NGL-14-005-202; No. NGL-15-005-112.

A74-17553 * Land use classification of Marion County, Indiana by spectral analysis of digitized satellite data. W. J. Todd (Purdue University, West Lafayette, Ind.) and M. F. Baumgardner (Indiana State University, Terre Haute, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-23 to 2A-32. 6 refs. Contract No. NAS5-21773.

A74-17554 **ERTS-1 aircraft support, 24-channel MSS CCT experiences and land use classification results.** A. J. Richardson, M. R. Gautreaux, and C. L. Wiegand (U.S. Department of Agriculture, Weslaco, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-33 to 2A-53. 7 refs.

Data collected from an airborne 24-channel multispectral scanner over portions of the lower Rio Grande valley of Texas were studied to determine what crop, soil, and water categories could be discriminated in an area where detailed ground truth was available. Specific objectives were: (1) to determine the optimal MSS channels for land use inventories, (2) to study factors indicating the general quality of the 24-channel multispectral scanner data, (3) to determine the spectral signature of various crop, soil, and water scenes, and (4) to measure the recognition performance of various data-processing procedures for crop, soil, and water discrimination. The recognition performance with the MSS data in distinguishing among agricultural land use scenes was not as high as hoped for (overall recognition of 78.1%). Sugarcane, cotton, water and highway, were fairly well recognized but citrus trees and grass were poorly recognized. T.M.

A74-17555 **A computer recognition of bridges, islands, rivers and lakes from satellite pictures.** R. Bajcsy and M. Tavakoli (Pennsylvania, University, Philadelphia, Pa.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-54 to 2A-68. 8 refs.

This paper describes a computer program which recognizes bridges, rivers, islands and lakes from satellite pictures. The program is structured into three basic parts: the world model, the low level operators, and the higher level program. The recognition process is conceived as a process of continuously refined verification of the hypothesized descriptions of objects. We use conceptual identification of objects during the recognition process as soon as we can; we equip these concepts with meanings in the three-dimensional world. We present several concrete examples as a demonstration of the capabilities of our program. (Author)

A74-17556 * **Comparative evaluation of spatial features in automatic land use classification from photographic imagery.** J. H. Herzog and R. C. Rathja (Oregon State University, Corvallis, Ore.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2A-69 to 2A-77. 5 refs. Contract No. NAS5-21831.

Five spatial features have been evaluated for their applicability in automatic land use classification of photographic imagery. Data arrays of approximately 10,000 square meters were classified on the basis of an 8 by 8 point data array. Statistical features, information features, sequency features and texture features were evaluated using a distance to prototype classifier and an adaptive classifier. The results indicate approximately 70% accuracy in the classification. (Author)

A74-17666 **Pattern analysis and recognition techniques applied to the identification of ecological anomalies.** R. J. Hoffmann and J. D. Turinetti (USAF, Rome Air Development Center, Griffiss AFB, N.Y.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-60 to 3A-68. 10 refs.

The purpose of this paper is to introduce the remote sensing community to an interactive analysis system which was designed and implemented at the Rome Air Development Center (RADC), and to report on some preliminary investigations utilizing the capabilities of the system to provide meaningful features for automated classification of multispectral inputs. (Author)

A74-18576 **Solid waste and remote sensing.** D. Garofalo and F. J. Wobber (Earth satellite Corp., Washington, D.C.). *(American Society of Photogrammetry, Annual Convention, Washington, D.C., Mar. 11-16, 1973.) Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 45-59. 5 refs.

Interpretation of high-altitude aircraft remote-sensing records is shown to provide essential data for solid-waste planning, including the location of waste disposal sites and facilities. It may also contribute valuable suggestions toward selecting the most suitable disposal method or methods for a given region. M.V.E.

A74-18580 **Industrial site study with remote sensing.** D. J. Barr (Missouri, University, Rolla, Mo.) and M. D. Hensey (Proctor and Gamble Co., Cincinnati, Ohio). *Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 79-85. 8 refs.

A74-18904 # **Remote sensing system for the oil and ice watch in the Baltic.** R. Sturm. *Dornier-Post* (English Edition), no. 4, 1973, p. 16-19.

Sensing equipment carried aboard aircraft is to be used for the early detection of oil spills and for routine surveillance of winter ice in the Gulf of Bothnia. The information to be provided by the sensing system includes the geographical location of the oil spill, the drift direction of the spill, and the area, thickness, and nature of the oil. Details of the sensor equipment are discussed along with the proposed operational system for oil control. G.R.

N74-10235* General Electric Co., Philadelphia, Pa. Missile and Space Div.

GENERAL ELECTRIC COMPANY UNDERWATER ENVIRONMENTAL LABORATORY'S ZERO G TECHNIQUES APPLIED TO THE ENVIRONMENT

Ruth H. Fry *In* NASA. Goddard Space Flight Center Space Simulation, 7th 1973 p 19-30

CSCL 14B

The conversion is considered of zero G simulation techniques applicable to water environmental pollution areas such as oil spill clean-up techniques, thermal pollution, solid waste materials, industrial wastes, storm water discharge and radioactive or nuclear waste evaluation, also discussed are aircraft emergency ejection studies, automotive water impact and submersion studies, buoy/small submersible development, ocean wave/glitter pattern research and similar areas of water related research and development. Author

N74-10357*# South Dakota State Univ., Brookings. Remote Sensing Inst.

LAND CLASSIFICATION OF THE LAKE DAKOTA PLAIN IN SOUTH DAKOTA WITH REMOTE SENSING METHODS

Lawrence A. Benson Aug. 1973 23 p refs

(Grant NGL-42-003-007)

(NASA-CR-135841; SDSU-RSI-73-13) Avail: NTIS $3.25 CSCL 08B

Research has been conducted to investigate the use of remote sensing data for making land use decisions in the Lake Dakota Plain of South Dakota. These studies have verified the feasibility of detecting and mapping the principal soil limitations in the area from aerial photography. A method is presented, which integrates the detection of soil limitations into a land classification system based on photointerpretation. The technique requires photointerpretation at progressively larger scales and field checking

of the photo-derived units. The photointerpretation begins with an analysis of ERTS-1 imagery at 1:1,000,000 scale to determine large physiographic and land use categories. High altitude imagery at 1:120,000 scale is used to subdivide the ERTS derived units based on physiographic aspects and pattern elements. Soils containing specific soil limitations are delineated from either low altitude photography or enlarged high altitude photography at 1:20,000 scale. Application of this technique to a detailed study area located in Spink County, South Dakota, resulted in a classification that should be of value to farmers, resource managers, and land planners alike. Author

N74-10359*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ATMOSPHERIC CONSTITUENT MEASUREMENTS USING COMMERCIAL 747 AIRLINERS
Porter J. Perkins and Gregory M. Reck 1973 15 p refs Presented at 2d Joint Conf. on the Sensing of Environ. Pollutants, Washington, D. C., 10-12 Dec. 1973; sponsored by Instr. Soc. of Am.
(NASA-TM-X-71469; E-7770) Avail: NTIS HC $3.00 CSCL 04A

NASA is implementing a Global Atmospheric Monitoring Program to measure the temporal and spatial distribution of particulate and gaseous constituents related to aircraft engine emissions in the upper troposphere and lower stratosphere (6 to 12 Km). Several 747 aircraft operated by different airlines flying routes selected for maximum world coverage will be instrumented. An instrumentation system is being assembled and tested and is scheduled for operation in airline service in late 1974. Specialized instrumentation and an electronic control unit are required for automatic unattended operation on commercial airliners. An ambient air sampling system was developed to provide undisturbed outside air to the instruments in the pressurized aircraft cabin. Author

N74-11142*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Oct. 1973
Irvin J. Sattinger, Principal Investigator 2 Nov. 1973 2 p EREP
(Contract NAS9-13283)
(E74-10001; NASA-CR-135842; ERIM-103300-12-L) Avail: NTIS HC $3.00 CSCL 08B

N74-11148*# Earth Satellite Corp., Washington, D.C.
APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT Progress Report, period ending 31 Oct. 1973
Roland S. Yunghans, Edward B. Feinberg, Frank J. Wobber, Robert L. Mairs, Principal Investigators, Robert T. Macomber, and Dennis Stanczuk 9 Nov. 1973 14 p Prepared for N. J. Dept. of Environ. Protection ERTS
(Contract NAS5-21765)
(E74-10010; NASA-CR-135851) Avail: NTIS HC $3.00 CSCL 08J

The author has identified the following significant results. A Coastal Zone Surveillance Program has been developed in which systematic comparisons of early ERTS-1 images and recently acquired images are regularly made to identify areas where changes have occurred. A methodology for assessing and documenting benefits has been established. Quantification of benefits has been directed toward four candidate areas: shore protection, ocean outfalls, coastal land resources, and offshore waste disposal. A refinement in the change detection analysis procedure has led to greater accuracy in spotting developmental changes in the Coastal Zone. Preliminary conclusions drawn from the Shore Erosion case study indicate that in the northern test area (developed beach) erosion has occurred more often, is generally more severe, and the beach is slower to recover than in the southern test area (natural beach). From these data it appears that it may be possible to define areas most likely to experience further erosion. The assumption of continued erosion in areas that have at one time experienced severe erosion is supported by the simple fact that as a beach narrows wave energy is concentrated on a narrower beach surface. The higher energy condition subsequently results in accelerated erosion.

N74-11168*# Geological Survey, Washington, D.C. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Sep. 1973
Robert H. Alexander, Principal Investigator, John. Lewis, and James R. Wray 20 Oct. 1973 4 p EREP
(NASA Order T-5290-B)
(E74-10047; NASA-CR-135888) Avail: NTIS HC $3.00 CSCL 08B

N74-11169*# Geological Survey, Washington, D.C. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report
Robert H. Alexander, Principal Investigator and James R. Wray 16 Jul. 1973 4 p EREP
(NASA Order T-5290-B)
(E74-10048; NASA-CR-135889) Avail: NTIS HC $3.00 CSCL 08B

N74-11170*# Geological Survey, Washington, D.C. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report.
Robert H. Alexander, Principal Investigator and John Lewis 23 Aug. 1973 8 p EREP
(NASA Order T-5290-B)
(E74-10049; NASA-CR-135890) Avail: NTIS HC $3.00 CSCL 08B

N74-11174*# Minnesota State Planning Agency, St. Paul.
LAND USE MANAGEMENT IN MINNESOTA Progress Report, 1 Sep. - 31 Oct. 1973
Joseph E. Sizer, Principal Investigator 31 Oct. 1973 5 p ERTS
(Contract NAS5-21801)
(E74-10053; NASA-CR-135894) Avail: NTIS HC $3.00 CSCL 08B

N74-11183*# Vermont Univ., Burlington. Remote Sensing Lab.
APPLICATION OF ERTS-1 IMAGERY IN THE VERMONT-NEW YORK DISPUTE OVER POLLUTION OF LAKE CHAMPLAIN
A. O. Lind, Principal Investigator Oct. 1973 5 p refs ERTS
(Contract NAS5-21753)
(E74-10062; NASA-CR-135962) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. ERTS-1 imagery and a composite map derived from ERTS-1 imagery were presented as evidence in a U.S. Supreme Court case involving the pollution of an interstate water body (Lake Champlain). A pollution problem generated by a large paper mill forms the basis of the suit (Vermont vs. International Paper Co. and State of New York) and ERTS-1 imagery shows the effluent pattern on the lake surface as extending into Vermont during three different times.

N74-11187*# Cornell Univ., Ithaca, N.Y. New York State Coll. of Agriculture and Life Sciences.
APPLICATIONS OF ERTS IMAGERY TO INVESTIGATING LAND-USE AND NATURAL RESOURCES Progress Report, 14 Aug. - 13 Oct. 1973
Ernest E. Hardy, Principal Investigator 13 Oct. 1973 11 p ERTS
(Contract NAS5-21886)
(E74-10072; NASA-CR-135817) Avail: NTIS HC $3.00 CSCL 08F

N74-11194*# Cornell Univ., Ithaca, N.Y. New York State Coll. of Agriculture and Life Sciences.
EVALUATION OF SATELLITE IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES (SKYLAB) Progress Report
Ernest E. Hardy, Principal Investigator 31 Oct. 1973 2 p EREP
(Contract NAS9-13364)
(E74-10082; NASA-CR-135971) Avail: NTIS HC $3.00 CSCL 05B

N74-11212*# East Tennessee State Univ., Johnson City. Commission of Geographic Applications of Remote Sensing.
THE APPLICABILITY OF REMOTE SENSING TO THE DETECTION, IDENTIFICATION, AND MONITORING OF POWER TRANSMISSION RIGHT-OF-WAYS WITHIN SELECTED AREAS OF THE TVA REGION Final Report
John B. Rehder (Tenn. Univ.) May 1972 14 p Sponsored in part by NASA and TVA
(NASA-CR-135868; USGS-IR-247) Avail: NTIS HC $3.00 CSCL 08B

The feasibility of using high altitude imagery is discussed for the analysis of power transmission phenomena in the TVA region. The procedure and methodology are given for identifying small, low resolution phenomena: transmission lines and towers, large scale, high resolution phenomena; right- of-ways, and power production sites, and steam plant transmission lines. T.M.R

N74-11213*# Dartmouth Coll., Hanover, N.H. Dept. of Geography.
URBAN-FIELD LAND USE FROM RB-57 PHOTOGRAPHY: THE BOSTON AND NEW HAVEN AREAS Final Report
Robert B. Simpson, Robert S. Yuill, and David T. Lindgren 30 Jun. 1972 87 p refs
(NASA Order W-13318; Contract USGS-14-08-0001-12958) (NASA-CR-136078; USGS-IR-252) Avail: NTIS HC $6.50 CSCL 08B

Comparison of information from aerial photography with concurrently derived U.S. Census information for the New Haven area is a follow-on to a prototype effort in the Boston area. Using computer techniques developed in the earlier study, a land use map was created supplemented by tabular printouts of statistical data per land use category. The combined experience suggests that interpretation of photography directly into machine readable form would be desirable and comparison of repetitive coverage would permit meaningful change detection of urban land use. Author

N74-12129*# Geological Survey, Washington, D.C.
LAND USE MAPPING AND MODELLING FOR THE PHOENIX QUADRANGLE Progress Report, 1 Sep. - 31 Oct. 1973
John L. Place, Principal Investigator 1 Nov. 1973 4 p ERTS (NASA Order S-70243-AG)
(E74-10041; NASA-CR-135882) Avail: NTIS HC $3.00 CSCL

The author has identified the following significant results. In comparing the land use changes from the overlay as detected from ERTS-1 and the high altitude change overlay, total areas of change were of the same magnitude. The greatest variations were a result of differences in dates and areas of coverage between ERTS-1 images and aerial photographs. Separation of citrus from other agricultural land has been moderately successful in the ERTS-1 1:100,000 scale Level 2 land use mapping around Phoenix, although accuracy estimates are not yet available. No feeding operations have been detected from ERTS-1 so far. Preliminary indications are that commercial and services, industrial, and institutional land are not separable from each other using present image interpretation techniques. Urban open areas such as parks and golf courses are readily detectable, particularly when local maps are consulted even though out-of-date. Strip and clustered settlements may be detected depending upon their size and contrast with the surrounding area on the ERTS-1 image.

N74-12132*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA, VOLUME 1 Progress Report
Robert N. Colwell, Gene A. Thorley, and Robert Burgy, Principal Investigators 31 Jul. 1973 217 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E74-10065; NASA-CR-135823; PR-2) Avail: NTIS HC $13.00 CSCL 08F

N74-12133*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA, VOLUME 2 Progress Report
Robert N. Colwell, Gerald Schubert, John E. Estes, Leonard W. Bowden, Vidal Algazi, William E. Wildman, and Gordon L. Huntington, Principal Investigators 31 Jul. 1973 236 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21827)
(E74-10066; NASA-CR-135965) Avail: NTIS HC $14.00 CSCL 08F

N74-12136*# Maine State Highway Dept., Bangor.
DETECTION AND MONITORING OF VEGETATION DAMAGE ASSOCIATED WITH HIGHWAY FACILITIES Progress Report, period ending 1 Sep. 1973
Ernest G. Stoeckeler, Principal Investigator Sep. 1973 2 p ERTS
(Contract NAS5-21724)
(E74-10076; NASA-CR-135813; PR-8) Avail: NTIS HC $3.00 CSCL 08F

N74-12140*# Kansas Univ. Center for Research, Inc., Lawrence.
KANSAS ENVIRONMENTAL AND RESOURCE STUDY: A GREAT PLAINS MODEL Progress Report, Aug. - Sep. 1973
R. M. Haralick, Edward T. Kanemasu, Stanley A. Morain, Harold L. Yarger, and Fawwaz T. Ulaby, Principal Investigators Oct. 1973 38 p ERTS
(Contract NAS5-21822)
(E74-10091; NASA-CR-136003) Avail: NTIS HC $4.00 CSCL 08F

The land use category of subimage regions over Kansas within an MSS image can be identified with an accuracy of about 70% using the textural-spectral features of the multi-images from the four MSS bands. Ground truth measurements indicate that reflectance ratios of the 545 and 655 nm wavebands provide an index of plant development and possibly physiological stress. Agricultural consultants have expressed substantial interest in work conducted on center pivot irrigation and have inquired as to how they may use ERTS-1 imagery to aid those in the irrigation

field. Results of the land use mapping experiment indicate that ERTS-1 imagery has major potential in regionalization. The ways in which land is utilized within these regions may then be studied more effectively than if no adequate regionalization is available.

N74-12141* Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
USE OF FEATURE EXTRACTION TECHNIQUES FOR THE TEXTURE AND CONTEXT INFORMATION IN ERTS IMAGERY
R. M. Haralick, G. L. Kelly, Principal Investigators, and Robert J. Bosley *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 5 p ERTS

(Rept-2261-7) CSCL 05B

The author has identified the following significant results. The land use category of subimage regions over Kansas within an MSS image can be identified with an accuracy of about 70% using the textural-spectral features of the multi-images from the four MSS bands.

N74-12188*# East Tennessee State Univ., Johnson City.
POTENTIAL OF LAND USE MAPPING IN THE TVA WITH HYPER-ALTITUDE AND SPACE PHOTOGRAPHY
William O. Lockman and Floyd M. Henderson May 1972 41 p refs Sponsored by NASA
(NASA-CR-136195; USGS-IR-NASA-245) Avail: NTIS HC $4.25 CSCL 08B

Color and color infrared photography obtained at three different scales over northern Alabama in November 1971 and supplemented by earlier photography from May 1971 are analyzed to evaluate the potential of hyper-altitude and space photography to satisfy the Tennessee Valley Authority's information needs regarding land use. Based primarily on imagery of seven test sites selected because of their topography, land use, and vegetation, analyses are made to determine the amount of detailed data obtainable at each scale and at two different times of year, and its possible application in monitoring land use. In most cases a 40 acre cell is the basis for land use evaluation.
Author

N74-13028*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Div.
AUTOMATIC PHOTOINTERPRETATION FOR LAND USE MANAGEMENT IN MINNESOTA Progress Report
George D. Swanlund, Principal Investigator and L. Kirvida Oct. 1973 2 p ERTS
(Contract NAS5-21742)
(E74-10101; NASA-CR-136092; PR-9) Avail: NTIS HC $3.00 CSCL 08B

N74-13036*# Geological Survey, Washington, D.C. Geographic Applications Program.
CENTRAL ATLANTIC REGIONAL ECOLOGICAL TEST SITE (CARETS): A PROTOTYPE REGIONAL ENVIRONMENTAL INFORMATION SYSTEM Progress Report, 1 Jul. - 31 Aug. 1973
Robert H. Alexander, Principal Investigator 1 Sep. 1973 12 p ERTS
(NASA Order S-70243-AG-3)
(E74-10109; NASA-CR-136100) Avail: NTIS HC $3.00 CSCL 05B

N74-13042*# Mississippi State Univ., State College. Dept. of Electrical Engineering.
STUDY OF THE APPLICATION OF REMOTE SENSING DATA TO LAND USE PLANNING ON THE MISSISSIPPI GULF COAST Progress Report, period ending 30 Nov. 1973
Frank Ingels, Principal Investigator 6 Dec. 1973 10 p ERTS
(Contract NAS5-21817)
(E74-10115; NASA-CR-136127; PR-6) Avail: NTIS HC $3.00 CSCL 08B

N74-13048*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Nov. 1973
Irvin J. Sattinger, Principal Investigator 7 Dec. 1973 2 p EREP
(Contract NAS9-13283)
(E74-10121; NASA-CR-136166; ERIM-103300-14-L) Avail: NTIS HC $3.00 CSCL 08B

N74-13056*# Geological Survey, Denver, Colo.
A STUDY OF MORPHOLOGY, PROVENANCE, AND MOVEMENT OF DESERT SAND SEAS IN AFRICA, ASIA, AND AUSTRALIA Progress Report, 1 Sep. - 31 Oct. 1973
Edwin D. McKee and Carol S. Breed, Principal Investigators 1 Nov. 1973 25 p ERTS
(NASA Order S-70243-AG-4)
(E74-10129; NASA-CR-136174) Avail: NTIS HC $3.25 CSCL 08M

The author has identified the following significant results. The regional studies of sand seas made possible by analysis of ERTS-1 imagery have established that widespread patterns of eolian sand deposition exist in many places and that similarities and differences in these patterns can be measured and compared, on a worldwide scale. Analysis of the relationships of depositional patterns to controlling factors will require completion of the color mosaics of the test sites, and acquisition of adequate supporting ground truth data, especially wind data. Once analyses are complete, the results will be applicable to the regional study of ancient eolian sandstones. Such sandstones were formed many millions of years ago under conditions believed to be indentical to those under which the sand seas that are observed being formed today. The understanding of the deposition of eolian sands provided by analysis of ERTS-1 imagery will be applicable to an understanding of the structure and distribution of ancient eolian sandstones and their potential as reservoirs of oil and water.

N74-13057*# Alaska Univ., Palmer.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Bimonthly Progress Report
Jay D. McKendrick, Principal Investigator 30 Nov. 1973 32 p ERTS
(Contract NAS5-21833)
(E74-10130; NASA-CR-136175; BMPR-8) Avail: NTIS HC $3.75 CSCL 08F

The author has identified the following significant results. Classification of digital data for mapping Alaskan vegetation has been compared to ground truth data and found to have accuracies as high as 90%. These classifications are broad scale types as are currently being used on the Major Ecosystems of Alaska map prepared by the Joint Federal-State Land Use Planning Commission for Alaska. Cost estimates for several options using the ERTS-1 digital data to map the Alaskan land mass at the 1:250,000 scale ranged between $2.17 to $1.49 per square mile.

N74-13059*# Delaware Univ., Newark. Coll. of Marine Studies.
MAPPING COASTAL VEGETATION, LAND USE AND ENVIRONMENTAL IMPACT FROM ERTS-1 Report on Significant Results
V. Klemas, Principal Investigator 13 Dec. 1973 2 p ERTS
(Contract NAS5-21837)
(E74-10132; NASA-CR-136177) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Digital analysis of ERTS-1 imagery was used in an attempt to map and inventory the significant ecological communities of Delaware's coastal zone. Eight vegetation and land use discrimina-

tion classes were selected: (1) Phragmites communis (giant reed grass); (2) Spartina alterniflora (salt marsh cord grass); (3) Spartina patens (salt marsh hay); (4) shallow water and exposed mud; (5) deep water (greater than 2 m); (6) forest; (7) agriculture; and (8) exposed sand and concrete. Canonical analysis showed the following classification accuracies: Spartina alterniflora, exposed sand, concrete, and forested land - 94% to 100%; shallow water - mud and deep water - 88% and 93% respectively; Phragmites communis 83%; Spartina patens - 52%. Classification accuracy for agriculture was very poor (51%). Limitations of time and available class-memory space resulted in limiting the analysis of agriculture to very gross identification of a class which actually consists of many varied signature classes. Abundant ground truth was available in the form of vegetation maps compiled from color and color infrared photographs. It is believed that with further refinement of training set selection, sufficiently accurate results can be obtained for all categories.

N74-13066*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Oct. - 30 Nov. 1973
John W. Hannah, Garland L. Thomas, and Ferd Esparza, Principal Investigators 30 Nov. 1973 10 p Prepared in cooperation with Brevard County Planning Dept., Titusville, Fla. ERTS (Contract NAS5-21847)
(E74-10140; NASA-TM-X-69302) Avail: NTIS HC $3.00 CSCL 08B

N74-13147*# Michigan State Univ., East Lansing.
IMAGE INTERPRETATION FOR A MULTILEVEL LAND USE CLASSIFICATION SYSTEM
Oct. 1973 37 p refs
(Grant NGL-23-004-083)
(NASA-CR-136264) Avail: NTIS HC $4.00 CSCL 08B

The potential use is discussed of three remote sensors for developing a four level land use classification system. Three types of imagery for photointerpretation are presented: ERTS-1 satellite imagery, high altitude photography, and medium altitude photography. Suggestions are given as to which remote sensors and imagery scales may be most effectively employed to provide data on specific types of land use. K.M.M.

N74-13159# Research Inst. of National Defence, Stockholm (Sweden).
PHOTOGRAPHIC SPECTROPHOTOMETRY AND COLLECTION OF DATA FROM A DISCHARGE OF OIL ON WATER [FOTOGRAFISK SPEKTROFOTOMETRI OCH DATAINSAMLING OM OLJEUTSLAEPP PA VATTEN]
Anders Boberg Dec. 1971 46 p refs In SWEDISH
(ROA-2-C-2508-E1) Avail: NTIS HC $4.50

The spectral reflections of oil and water are studied by means of photographic spectrophotometry and conclusions are presented about the possibilities of the photographic collection of data from oil streaks on water, together with practical points of view on how to carry it out. Photographic spectrophometry implies multispectral photography of the object and a calibrated grey scale from which the objects spectral reflection is obtained by comparison with the grey scale, via the blackening density curve. Reflected light from the water consists of surface reflection and backward diffusion from the water volume. The experiments show that the former is the highest in UV, whilst the latter has a peak in green. Oil has a very low reflection. The possibilities of separating oil from water photographically are good within the green part of the spectrum. Different types of fuel oil can hardly be inter-distinguished at all and as regards layer thickness, only the molecular layers which result in interference can be distinguished from other thicknesses. Author

N74-13291# Royal Inst. of Tech., Stockholm (Sweden). Mathematics Dept.
THE SYSTEMS STRUCTURE AND THE EVALUATION OF FUTURE TRENDS IN A STUDY OF SULFUR AS AN ENVIRONMENTAL POLLUTANT
Lars Ingelstam 1972 44 p refs
(PT-1972:1) Avail: NTIS HC $4.25

The environmental impact of sulfur and sulfur precipitation in the atmosphere is investigated. Data cover damage to vegetation, biological effects, corrosion, and technological costs of reducing sulfur concentrations. E.H.W.

N74-14011* California Univ., Santa Barbara. Geography Remote Sensing Unit.
ASSESSMENT OF RESOURCES IN THE CENTRAL REGIONAL TEST SITE
Robert N. Colwell, John E. Estes, Principal Investigators, Leslie W. Senger, Randolph R. Thaman, Steven Kraus, Kris Bjorklund, Dal Cottrell, Don Brunelle, Betsy Palmer, and Rick Hoffman *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Technqiues 30 Jun. 1973 64 p refs ERTS
CSCL 08G

N74-14012* California Univ., Riverside. Dept. of Geography.
ENVIRONMENTAL MONITORING AND ASSESSMENT IN SOUTHERN CALIFORNIA USING REMOTE SENSING TECHNIQUES
Robert N. Colwell, Leonard W. Bowden, Principal Investigators, J. B. Bale, C. W. Johnson, J. Viellenave, D. Goehring, P. Wilke, V. Coleman, J. Huning, C. Hutchinson et al *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 139 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
CSCL 08B

N74-14036*# Army Construction Engineering Research Lab., Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 9 Jun. - 8 Dec. 1973
Ravinder K. Jain, Principal Investigator 8 Dec. 1973 21 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70255-AG)
(E74-10168; NASA-CR-136295) Avail: NTIS HC $3.25 CSCL 08H

N74-14051*# Geological Survey, Denver, Colo.
A STUDY OF MORPHOLOGY, PROVENANCE, AND MOVEMENT OF DESERT SAND SEAS IN AFRICA, ASIA, AND AUSTRALIA Progress Report, 1 Nov. - 31 Dec. 1973
Edwin D. McKee, Principal Investigator and Carol S. Breed 1 Jan. 1974 12 p refs ERTS
(NASA Order S-70243-AG-4)
(E74-10187; NASA-CR-136326) Avail: NTIS HC $3.00 CSCL 08M

The author has identified the following significant results. Recent acquisition of generally high quality color prints for most of the test sites has enabled this project to make significant advances in preparing mosaics of sand desert areas under study. Computer enhancement of imagery, where details of complex dune forms need to be determined, has been achieved with arrival of computer-compatible ERTS-1 tapes. Further, a comparator, recently received, gives precise visual measurements of width, length, and spacing of sand bodies and so improves comparison of patterns in various test sites. Considerable additional meteorological data recently received on sand-moving winds in China, Pakistan, Libya, and other study areas enabled much progress to be made in developing overlays for the dune mosaics. These data show direction, speed, and frequency of winds. Other new data for use in preparing overlays used with ERTS-1 image mosaics include ground truth on moisture control, geologic

settings, and plant distribution. With the addition of visual observation data and prints from hand-held photography now being obtained by the Skylab 4 mission, much progress in interpreting the patterns of sand seas for 17 desert sites is anticipated.

N74-14071* Denver Univ., Colo.
REMOTE SENSING AND THE URBAN ENVIRONMENT: AN ASSESSMENT OF USEFULNESS
William B. Howard and Linda B. Driscoll *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 9-18 refs
CSCL 08B

The usefulness of remote sensing in urban planning and development relative to social and economic factors as well as physical factors is examined. Particular attention was given to environmental quality assessment and land use problems.
E.H.W.

N74-14072* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE GREATER NEW ORLEANS STAR PROJECT
Joseph William Smollen, III *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 19-20

CSCL 08B

A description is given of STAR, a computer project designed to provide urban planners with needed information rapidly and accurately. Particular attention was given to planning for the New Orleans area. Attempts were also made to analyze interactive effects of urban problems and predict their effects on each other.
E.H.W.

N74-14073* Geological Survey, Washington, D.C.
A LAND USE AND ENVIRONMENTAL IMPACT ANALYSIS OF THE NORFOLK-PORTSMOUTH SMSA
William B. Mitchel and G. Lennis Berlin (Northern Ariz. Univ., Flagstaff) *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 21-35 refs

CSCL 08B

The feasibility of using remote sensing techniques for land use and environmental assessment in the Norfolk-Portsmouth area is discussed. Data cover the use of high altitude aircraft and satellite remote sensing data for: (1) identifying various heirarchial levels of land use, (2) monitoring land use changes for repetitive basis, (3) assessing the impact of competing land uses, and (4) identifying areas of potential environmental deterioration. High altitude aircraft photographs (scale 1:120,000) acquired in 1959, 1970, and 1972, plus Earth Resources Technology Satellite (ERTS-1) color composite images acquired in 1972 were used for the land use and environmental assessments. The high altitude aircraft photography, as expected, was successfully used to map Level 1, Level 2, as well as some urban Level 3 land use categories. However, the detail of land use analysis obtainable from the ERTS imagery exceeded the expectations for the U.S. Geological Survey's land use classification scheme. Study results are consistent with the initial investigation which determined Level 1 land use change to be 16.7 square km per year.
Author

N74-14266# Hitachi, Ltd., Tokyo (Japan).
MEASUREMENT OF ENVIRONMENTAL POLLUTION AND ITS SYSTEMIZATION
Kaoru Saka, Junya Sasama, Nobuharu Matsui, Kazuomi Kashiwazako, and Takeshi Arai Jun. 1972 30 p refs Transl. into ENGLISH from Hitachi Hyoron (Japan), v. 54, no. 6, Jun. 1972 p 80-85
(APTIC-42405; TR-294-73) Avail: NTIS HC $3.50

Various instruments which were developed to comply with regulations for measuring air and water pollution are described. Examples of their application in computer systems for pollution surveys are included.
Author

N74-14993*# Ohio Dept. of Economic and Community Development, Columbus.
[REGIONAL AND LOCAL LAND USE PLANNING AND MAPPING IN OHIO FROM SKYLAB EREP DATA] Quarterly Progress Report, Oct. - Dec. 1973
David C. Sweet, Principal Investigator 8 Jan. 1974 1 p EREP
(NASA Order C-21372-C)
(E74-10176; NASA-CR-136305; QPR-3) Avail: NTIS HC $3.00 CSCL 08B

N74-14994*# Wisconsin Univ., Madison. Environmental Monitoring and Data Acquisition Group.
EVALUATION OF THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS Progress Report, 1 Jun. - 1 Dec. 1973
James L. Clapp, Principal Investigator 20 Dec. 1973 129 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21754)
(E74-10178; NASA-CR-136309) Avail: NTIS HC $8.50 CSCL 08B

N74-15000*# Oregon State Univ., Corvallis.
THE COMPARATIVE EVALUATION OF ERTS-1 IMAGERY FOR RESOURCE INVENTORY IN LAND USE PLANNING Interim Report, Mar. - Aug. 1973
G. H. Simonson, Principal Investigator, D. P. Paine, R. D. Lawrence, W. T. Pyott, J. H. Herzog, R. J. Murray, J. A. Norgren, J. A. Cornwell, and R. A. Rogers Nov. 1973 110 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21831)
(E74-10196; NASA-CR-136369) Avail: NTIS HC $7.50 CSCL 08B

The author has identified the following significant results. Multidiscipline team interpretation and mapping of resources for Crook County is nearly complete on 1:250,000 scale enlargements of ERTS-1 imagery. Maps of geology, landforms, soils and vegetation-land use are being interpreted to show limitations, suitabilities and geologic hazards for land use planning. Mapping of lineaments and structures from ERTS-1 imagery has shown a number of features not previously mapped in Oregon. A timber inventory of Ochoco National Forest has been made. Inventory of forest clear-cutting practices has been successfully demonstrated with ERTS-1 color composites. Soil tonal differences in fallow fields shown on ERTS-1 correspond with major soil boundaries in loess-mantled terrain. A digital classification system used for discriminating natural vegetation and geologic materials classes has been successful in separation of most major classes around Newberry Cauldera, Mt. Washington and Big Summit Prairie. Computer routines are available for correction of scanner data variations; and for matching scales and coordinates between digital and photographic imagery. Methods of Diazo film color printing of computer classifications and elevation-slope perspective plots with computer are being developed.

N74-15001*# Grumman Ecosystems Corp., Bethpage, N.Y.
ERTS-1 VIRGIN ISLANDS EXPERIMENT 589: DETERMINE BOUNDARIES OF ERTS AND AIRCRAFT DATA WITHIN WHICH USEFUL WATER QUALITY INFORMATION CAN BE OBTAINED Final Report, Jul. 1972 - Oct. 1973
W. C. Coulbourn, W. G. Egan (Grumman Aerospace Corp.), D. A. Olsen, Principal Investigators (Marine Resources Develop. Found.), and G. B. Heaslip (Grumman Data Systems Corp.) Oct. 1973 255 p refs Original contains imagery. Original

photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21811)
(E74-10197; NASA-CR-136362) Avail: NTIS HC $14.75 CSCL 08H

The author has identified the following significant results. The boundaries of application of ERTS-1 and aircraft data are established for St. Thomas harbor within which useful water quality information can be obtained. In situ physical, chemical, and biological water quality and benthic data were collected. Moored current meters were employed. Optical measurements of solar irradiance, color test panel radiance and water absorption were taken. Procedures for correlating in situ optical, biological, and chemical data with underflight aircraft I2S data and ERTS-1 MSS scanner data are presented. Comparison of bulk and precision CCT computer printout data for this application is made, and a simple method for geometrically locating bulk data individual pixels based on land-water interface is described. ERTS spacecraft data and I2S aircraft imagery are correlated with optical in situ measurements of the harbor water, with the aircraft green photographic and ERTS-1 MSS-4 bands being the most useful. The biological pigments correlate inversely with the optical data for inshore areas and directly further seaward. Automated computer data processing facilitated analysis.

N74-15002* Grumman Ecosystems Corp., Bethpage, N.Y.
SUMMARY OF ERTS-1 VIRGIN ISLANDS EXPERIMENT 589
W. C. Coulbourn, Principal Investigator *In its* ERTS-1 Virgin Islands Expt. 589. Determine Boundaries of ERTS and Aircraft Data Within Which Useful Water Quality Information Can Be Obtained Oct. 1973 42 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

CSCL 08H

N74-15003* Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
CORRELATION OF ERTS-1 AND AIRCRAFT OPTICAL DATA WITH WATER QUALITY PARAMETERS OF CHARLOTTE AMALIE HARBOR, ST. THOMAS, VIRGIN ISLANDS
W. C. Coulbourn (Grumman Ecosystems Corp.) and W. G. Egan, Principal Investigators *In* Grumman Ecosystems Corp. ERTS-1 Virgin Islands Expt. 589. Determine Boundaries of ERTS and Aircraft Data Within Which Useful Water Quality Information Can Be Obtained Oct. 1973 65 p refs ERTS

CSCL 08H

The author has identified the following significant results. Attempts to correlate optical aircraft remote sensing of water quality with the optical data from the ERTS-1 satellite using calibrated imagery of Charlotte Amalie harbor, St. Thomas, Virgin Islands are reported. The harbor at Charlotte Amalie has a concentration of a number of factors affecting water quality: untreated sewage, land runoff, and sediment from navigation and dredging operations. Calibration procedures have been originated and applied to ERTS-1 and I2S camera imagery. The results indicate that the ERTS-1 and I2S imagery are correlated with optical in situ measurements of the harbor water. The aircraft green photographic and ERTS-1 MSS-4 bands have been found most suitable for monitoring the scattered light levels under the conditions of the investigation. The chemical parameters of the harbor water were found to be correlated to the optical properties for two stations investigated in detail. The biological properties of the harbor water (chlorophyll and carotenoids), correlate inversely with the optical data near the pollution sources compared to further away. Calibration procedures developed in this investigation were essential to the interpretation of the photographic and ERTS-1 photometric responses.

N74-15004* Marine Resources Development Foundation, San German (Puerto Rico).
WATER QUALITY PARAMETERS OF HARBORS OF CHARLOTTE AMALIE, ST. THOMAS, VIRGIN ISLANDS: ACQUISITION OF IN SITU WATER DATA, INTERCORRELATION OF SELECTED WATER PARAMETERS, AND INITIAL CORRELATION OF THESE IN SITU BIOLOGICAL, CHEMICAL AND PHYSICAL DATA WITH ERTS-1 BULK CCT MSS BAND 5 DATA
W. C. Coulbourn (Grumman Ecosystems Corp.) and David A. Olsen, Principal Investigators *In* Grumman Ecosystems Corp. ERTS-1 Virgin Islands Expt. 589. Determine Boundaries of ERTS and Aircraft Data Within Which Useful Water Quality Information Can Be Obtained Oct. 1973 54 p refs ERTS

The author has identified the following significant results. Remote sensing by the ERTS-1 satellite was compared with selected water quality parameters including pH, salinity, conductivity, dissolved oxygen, water depth, water temperature, turbidity, plankton concentration, current variables, chlorophylla, total carotenoids, and species diversity of the benthic community. Strong correlation between turbidity and MSS-sensed radiance was recorded and less strong correlations between the two plankton pigments and radiance. Turbidity and benthic species diversity were highly correlated furnishing an inferential tie between an easily sensed water quality variable and a sensitive indicator of average water quality conditions.

N74-15018*# Environmental Research Inst. of Michigan, Ann Arbor.
STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Dec 1973
Irvin J. Sattinger, Principal Investigator 8 Jan. 1974 2 p EREP
(Contract NAS9-13283)
(E74-10210; NASA-CR-136392; ERIM-103300-17-L) Avail: NTIS HC $3.00 CSCL 08B

N74-15042*# Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
EVALUATION OF SATELLITE IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES (SKYLAB) Progress Report, 1-31 Dec. 1973
Ernest E. Hardy, Principal Investigator [1974] 1 p EREP
(Contract NAS9-13364)
(E74-10237; NASA-CR-136535) Avail: NTIS HC $3.00 CSCL 08B

N74-15045*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
OIL POLLUTION DETECTION, MONITORING AND LAW ENFORCEMENT Quarterly Progress Report
Robert Horvath, Principal Investigator 22 Jan. 1974 3 p EREP
(Contract NAS9-13281)
(E74-10241; NASA-CR-136539; ERIM-101800-8-L; QPR-3) Avail: NTIS HC $3.00 CSCL 08J

N74-15347*# General Dynamics/Convair, San Diego, Calif. Aerospace Div.
AIR POLLUTION MEASUREMENTS FROM SATELLITES
C. B. Ludwig, M. Griggs, W. Malkmus, and E. R. Bartle Washington NASA Nov. 1973 224 p refs
(Contract NAS1-10466)
(NASA-CR-2324; GDCA-HAB-73-011) Avail: NTIS HC $5.50 CSCL 04B

A study is presented on the remote sensing of gaseous and particulate air pollutants which is an extension of a previous report. Pollutants can be observed by either active or passive remote sensing systems. Calculations discussed herein indicate that tropospheric CO, CO2, SO2, NO2, NH3, HCHO, and CH4 can be measured by means of nadir looking passive systems. Additional species such as NO, HNO3, O3, and H2O may be

measured in the stratosphere through a horizon experiment. A brief theoretical overview of resonance Raman scattering and resonance fluorescence is given. It is found that radiance measurements are most promising for general global applications, and that stratospheric aerosols may be measured using a sun occultation technique. The instrumentation requirements for both active and passive systems are examined and various instruments now under development are described. Author

03
GEODESY AND CARTOGRAPHY

Includes mapping and topography.

A74-10338 # Mapping from ERTS 1 imagery. P. G. Mott (Hunting Surveys, Ltd., Boreham Wood, Herts., England). *(British Interplanetary Society, Symposium on Earth Observation Satellites, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 26, Nov. 1973, p. 662-666.

In 1972 NASA launched an Earth Resources Technology Satellite equipped with imaging systems capable of covering most of the world at 18 day intervals. This is the first in a series of satellites designed for Earth applications. ERTS 1 produces small scale imagery in a number of separate spectral bands showing different interpretational detail. In cooperation with NASA, Huntings are working on two projects utilising ERTS imagery for mapping purposes. One is a study of the mapping potential based on U.K. coverage, the other a geological mapping study of Ethiopia. (Author)

A74-10340 # Combined restitution of aerial and satellite photographs for topographic mapping. O. Kölbl (Swiss Forest Research Institute, Birmensdorf, Switzerland). *(British Interplanetary Society, Symposium on Earth Observation Satellites, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 26, Nov. 1973, p. 677-687. 17 refs.

It is shown how topographic mapping especially for the needs of developing countries could be rationalized by the incorporation of satellite photographs. These considerations are mainly concerned with map scales between 1:50,000 and 1:100,000. The satellite photographs are used both for bridging and for supplying the geometric information for topographic mapping. For topographic photointerpretation aerial photographs are used with picture scales between 1:50,000 and 1:100,000. For the combined restitution of the two kinds of pictures a new procedure has been developed. For this purpose satellite photographs and aerial photographs are coordinated in a rectifier. Thereby the previously rectified and greatly enlarged satellite photographs serve as base for the following rectification of the individual aerial photographs and for their compilation into a mosaic. This controlled mosaic of aerial photographs can serve as a base for further cartographic amendments or for the derivation of a line map. (Author)

A74-11728 Application of laser techniques to geodesy and geophysics. J. Berger (California, University, La Jolla, Calif.). In: Advances in geophysics. Volume 16. New York, Academic Press, Inc., 1973, p. 1-56. 57 refs. NSF Grant No. GA-25700; Grant No. NOAA-N-22-17-72(G).

Terrestrial laser ranging devices are discussed, giving attention to fundamental considerations, electrooptic light modulators, LRD instrumental description, LRD accuracy, two color techniques, and a two-color LRD instrumental description. Extraterrestrial laser ranging devices are considered together with the results of strain and range measurements and miscellaneous laser applications. Laser strain meters are also examined, taking into account linear extensometers, lasers applied to linear extensometers, the laser's wavelength, methods of laser stabilization, a Michelson interferometer, and a Fabry-Pérot interferometer. G.R.

A74-12579 # Brightness maps of the earth, plotted from Zond interplanetary probe photographic data (Iarkostnye karty zemli, sostavlennye po fotograficheskim dannym AMS 'Zond'). N. P. Lavrova and A. B. Sandomirskii (Moskovskii Institut Inzhenerov Geodezii, Aerofotos'emki i Kartografii, Moscow, USSR). *Geodeziia i Aerofotos'emka*, no. 3, 1973, p. 75-85. 14 refs. In Russian.

Results of a photometric analysis of pictures of the earth obtained from outer space with the aid of the Zond 5, 6, and 8 interplanetary probes. The procedure employed in the photometric treatment of the negatives obtained is reviewed, including a method of converting transmissivity values into brightnesses, leading up to the construction of brightness maps of the earth which are characterized by six brightness gradations. In setting up the cartographic grids, allowance was made for the distance from the space station to the object photographed, the location of the station in orbit, and the exposure time. With the aid of the maps thus plotted the sidereal value of the earth is determined, and an analysis is made of the earth's phase function. A.B.K.

A74-12787 Satellite radar altimetry - Application to geodesy (Altimétrie radar par satellite - Application à la géodesie). G. Tarel and G. Balmino (Centre National d'Etudes Spatiales, Paris, France). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 13 p. In French.

The principles of satellite radar altimetry measurements aimed at precise determination of the geoide are outlined, and the principal characteristics of a radar having a nominal precision on the order of 1 m are discussed. The application of such a radar to precision measurements of the earth's potential is examined, together with the possibility of automatic orbit determination on the basis of a chart of the fine structure of the geoide. Possible applications of the radar proposed in the fields of oceanography, navigation, and planetary topography are studied. V.P.

A74-12827 * # Analyses of precision reduced optical observations from the International Satellite Geodesy Experiment /ISAGEX/. J. G. Marsh (NASA, Goddard Space Flight Center, Geodynamics Program Div., Greenbelt, Md.), B. C. Douglas, and S. M. Klosko (Wolf Research and Development Corp., Riverdale, Md.). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 23 p. 5 refs.

A74-14476 American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973. 659 p. Members, $2.50; nonmembers, $5.00.

Variations of symmetrical lens distortion with object distance in close range photogrammetry are discussed together with the determination of geodetic control points from Doppler satellite observations and the practical significance of environmental terrain parameters in the planning of recreational areas. Other topics investigated include geometric aspects in the digital analysis of a multispectral scanner, the characteristics of holographic stereo models, and the use of coordinates by the private surveyor. Topographic mapping of Mars is also discussed along with the use of orthogonal transformations in the adjustment of aerial triangulation and recent developments in photogrammetric instrumentation in North America. G.R.

A74-14489 Cartographic accuracy of E.R.T.S. images. V. Kratky (National Research Council, Ottawa, Canada). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 592-607. 9 refs.

The size of a ground scene covered by images taken from the Earth Resources Technology Satellite (ERTS) is too large to

disregard inherent limitations of a cartographic projection used for the precision processing of images. In the case of the standard U.T.M. projection, adopted for the ERTS project, some of the scenes are extended beyond the zone boundaries and the distortion then exceeds the cartographic specifications usually expected within single zones. An analysis of these cartographic aspects is presented, showing the type and magnitude of resulting geometric changes for both types of imageries produced by the ERTS. (Author)

A74-14897 **Automated thematic mapping and change detection of ERTS-1 images.** N. Gramenopoulos (Itek Corp., Optical Systems Div., Lexington, Mass.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 432-446. 6 refs.

A resources satellite-data based, resource inventoring and updating system is described that combines multispectral and spatial pattern recognition techniques to produce thematic maps. This system has been applied to ERTS-1 MSS images, and the results obtained are discussed. M.V.E.

A74-16265 **EROS cartographic progress.** A. P. Colvocoresses and R. B. McEwen (U.S. Geological Survey, McLean, Va.). *Photogrammetric Engineering*, vol. 39, Dec. 1973, p. 1303-1309.

Preliminary results are given for the EROS cartographic program whose purpose is the development of a series of maps by using satellite and imagery techniques. The informative contents of maps, the geometric accuracy of images, and the first and second phases of the mapping process are discussed. The experiments of the Geological Survey associated with the program are reviewed. V.Z.

A74-17523 # **Synoptic observations at a global scale.** K. Clayton (East Anglia, University, Norwich, England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 23-28.

Earth observation satellites are known to provide a basis for mapping both permanent and more ephemeral features of the earth's surface. While emphasis so far has been on their potential for detecting hazards such as floods, forest fires, etc., it is here suggested that their role in providing a uniform data base for mapping global distributions has been underestimated. (Author)

A74-17558 **Experience with the program system Karin for the mapping of remote sensing information.** E. R. Bosman, E. Clerici, K. Kubik (Rijkswaterstaat, The Hague, Netherlands), and D. Eckhart (International Institute for Aerial Survey and Earth Sciences, Delft, Netherlands). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2B-14 to 2B-24. 6 refs.

A program system was jointly developed by NIWARS and Rijkswaterstaat, the Netherlands, for the mapping of geographic detail from single or overlapping remote sensing images (Sidelooking Radar, Infrared, a.o.). The system consists, similar to the conventional systems for aerial triangulation, of programs for strip formation, strip and block adjustment and for the plotting of the information. Examples of infrared and sidelooking radar projects are included to demonstrate the application of the system. (Author)

A74-17792 # **Technology of large-scale aerial topographic surveys (Tekhnologiia krupnomasshtabnykh aerotopograficheskikh s'emok).** N. A. Sokolova. Moscow, Izdatel'stvo Nedra, 1973. 184 p. 103 refs. In Russian.

Specific requirements to be met by equipment and techniques in large-scale aerial mapping surveys are discussed. Attention is given to the improvement of photogrammetric precision by the elimination of errors due to the distortion and deformation of film in the determination of the altitudes of points on terrains, and due to instrumental error and erroneous point identifications in the determination of the planar positions of contours and objects. Distortion of aerial objective is also considered as the source of error. Recommendations are given concerning the adequate density of the geodetic network for a large-scale aerial topographic survey. V.Z.

A74-18928 **Tests for the determination of the geometric accuracy of ERTS multispectral pictures (Versuche zur Ermittlung der geometrischen Genauigkeit von ERTS-Multispektral-Bildern).** H.-P. Bähr and W. Schuhr. *Bildmessung und Luftbildwesen*, vol. 42, Jan. 1, 1974, p. 22-24. In German.

The questions investigated are concerned with the level of accuracy with which topographic points can be obtained from an ERTS picture and with the degree of absolute positional accuracy available to the user. The degree of accuracy improvement possible in the case of an employment of simple compensation methods is also explored as a basis for more extended cartographical applications and the analysis of dynamic processes. G.R.

A74-19097 # **Experiments in the office decoding of aerial photographs in combination with stereoscopic relief drawing for the production of maps in a scale of 1:25,000 (Opyt kameral'nogo deshifrirovaniia aerosnimkov v komplekse so stereoskopicheskoi risovkoi rel'efa pri sozdanii kart masshtaba 1:25,000).** N. P. Astakhova, A. V. Bazheeva, and V. G. Kotorskaia. *Geodeziia i Kartografiia*, Nov. 1973, p. 37-40. In Russian.

N74-10345 Wisconsin Univ., Madison.
GEOPHYSICAL INVESTIGATIONS IN MARIE BYRD LAND, ANTARCTICA Ph.D. Thesis
John Edward Beitzel 1972 123 p
Avail: Univ. Microfilms Order No. 73-7178

During the 1966-67 Antarctic field season 4000 nautical miles of aeromagnetic data were collected in Marie Byrd Land, between 110 deg and 160 deg west longitude and within a 300 km belt along the Amundsen Sea coast. Concurrently, 190 gravity stations were established in the vicinity of the Ford Ranges, principally between 142 deg and 154 deg west longitude and between 76 deg and 78 deg south latitude. Total intensity profiles display narrow, high amplitude anomalies, probably largely associated with Cenozoic volcanics, in a zone stretching from approximately 142 W to 134 W. The residual total intensity map trends suggest a possible geologic province boundary near 142 W, separating the Mesozoic intrusive terrane of the Ford Ranges on the west from the Cenozoic volcanic province to the east. Dissert. Abstr.

N74-10354*# Bendix Corp., Southfield, Mich.
EOS MAPPING ACCURACY STUDY Final Report, Apr. - Aug. 1972
Robert B. Forrest, Thomas A. Eppes, and Robert J. Ouellette Mar. 1973 138 p refs
(Contract NAS5-21727; BRL Proj. 2516)
(NASA-CR-132820; BRL-6562) Avail: NTIS HC $9.00 CSCL 08B

Studies were performed to evaluate various image positioning methods for possible use in the earth observatory satellite (EOS) program and other earth resource imaging satellite programs. The primary goal is the generation of geometrically corrected and registered images, positioned with respect to the earth's surface. The EOS sensors which were considered were the thematic mapper, the return beam vidicon camera, and the high resolution pointable imager. The image positioning methods evaluated consisted of various combinations of satellite data and

ground control points. It was concluded that EOS attitude control system design must be considered as a part of the image positioning problem for EOS, along with image sensor design and ground image processing system design. Study results show that, with suitable efficiency for ground control point selection and matching activities during data processing, extensive reliance should be placed on use of ground control points for positioning the images obtained from EOS and similar programs. Author

N74-10371*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETAILED GEOID COMPUTATIONS FOR GEOS-C ALTIMETER EXPERIMENT AREAS
James G. Marsh and Samir Vincent Oct. 1973 29 p refs Submitted for publication
(NASA-TM-X-70503; X-592-73-303) Avail: NTIS HC $3.50 CSCL 08E

The GEOS-C spacecraft is scheduled to carry onboard a radar altimeter for the purpose of measuring the geoid undulations in oceanic areas. An independently derived geoid map will provide a valuable complement to these experiments. A detailed gravimetric geoid is presented for the Atlantic and northeast Pacific Ocean areas based upon a combination of the Goddard Space Flight Center GEM-6 earth model and surface 1 deg x 1 deg gravity data. As part of this work a number of satellite derived gravity models were evaluated to establish the model which best represented the long wave length features of the geoid in the above mentioned area. Comparisons of the detailed geoid with the astrogeodetic data provided by the National Ocean Survey and dynamically derived tracking station heights indicate that the accuracy of this combined geoid is on the order of 2 meters or better where data was dense and 5 to 7 meters where data was less dense. Author

N74-10374*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL DETAILED GRAVIMETRIC GEOID
Samir Vincent (Computer Sciences Corp., Falls Church, Va.) and James G. Marsh Sep. 1973 44 p refs Submitted for publication
(NASA-TM-X-70492; X-592-73-266) Avail: NTIS HC $4.25 CSCL 08E

A global detailed gravimetric geoid has been computed by combining the Goddard Space Flight Center GEM-4 gravity model derived from satellite and surface gravity data and surface 1 deg-by-1 deg mean free air gravity anomaly data. The accuracy of the geoid is + or - 2 meters on continents, 5 to 7 meters in areas where surface gravity data are sparse, and 10 to 15 meters in areas where no surface gravity data are available. Comparisons have been made with the astrogeodetic data provided by Rice (United States), Bomford (Europe), and Mather (Australia). Comparisons have also been carried out with geoid heights derived from satellite solutions for geocentric station coordinates in North America, the Caribbean, Europe, and Australia. Author

N74-10398# Army Foreign Science and Technology Center, Charlottesville, Va.
CHARACTERISITCS OF FOREIGN PHOTO MAPS
L. M. Goldman 3 Jan. 1973 11 p refs Transl. into ENGLISH from Geodez. Kartograf. (Moscow), no. 12, 1969 p 32-36
(AD-765899; FSTC-HT-23-970-72) Avail: NTIS CSCL 08/2

A literature review was conducted of articles published outside of the U.S.S.R. dealing with photomaps. The basic variations of photomaps are listed along with their advantages and shortcomings. The status of photomap technology in various countries is summarized. D.L.G.

N74-10406# Army Foreign Science and Technology Center, Charlottesville, Va.
INVESTIGATION OF ACCURACY OF INDIVIDUAL PHOTOTRIANGULATION PROCESS BY METHODS OF MATHEMATICAL STATISTICS
V. A. Polyakova 1 Nov. 1972 9 p refs Transl. into ENGLISH from Geodez. i Kartograf. (Moscow), no. 6, 1971 p 52-56
(AD-765967; FSTC-HT-23-917-72) Avail: NTIS CSCL 08/2

Statistics developed from large samples of photographs of varying quality are used to determine the distribution of measurement errors and errors in coordinating adjacent photographs. Tables are given for the case of aerial photographs at a scale of 1:25,000. Author (GRA)

N74-11151*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-31 Oct. 1973
A. G. Mourad and D. M. J. Fubara, Principal Investigators 16 Nov. 1973 25 p refs EREP
(Contract NAS9-13276)
(E74-10013; NASA-CR-135854; PR-8) Avail: NTIS HC $3.25 CSCL 08E

N74-11197*# Battelle Columbus Labs., Ohio.
GEODETIC ANALYSIS OF SKYLAB ALTIMETRY PRELIMINARY DATA - SL/2 EREP PASS 9
A. G. Mourad, Principal Investigator and D. M. J. Fubara 21 Nov. 1973 28 p refs Presented at the Fall Ann. Meeting of the Am. Geophys. Union, San Francisco, 11 Dec. 1973 EREP
(Contract NAS9-13276)
(E74-10086; NASA-CR-135975) Avail: NTIS HC $3.50 CSCL 08E

The author has identified the following significant results. The analysis was based on a time series intrinsic relationship between the satellite ephemeris, altimeter measured ranges, and the corresponding a priori values of subsatellite geoidal heights. Using sequential least squares processing with parameter weighting, the objective was to recover (1) the absolute geoidal heights of the subsatellite points, and (2) the associated altimeter calibration constant(s). Preliminary results from Skylab altimetry are given, using various combinations of orbit ephemeris and altimeter ranges as computed differently by NASA/JSC and NASA/Wallops. The influences of orbit accuracy, weighting functions, and a priori ground truth are described, based on the various combination solutions. It is shown that to deduce geoidal height by merely subtracting the height of the satellite from the altimeter range is inadmissible. The results of such direct subtraction can be very misleading if the orbit used is computed from data that included altimeter data used as height constraints. In view of the current state of knowledge, the use of geodetic ground truth samples as control benchmarks appears indispensable for the recovery of absolute geoidal heights with correct scale.

N74-12107 Ohio State Univ., Columbus.
APPLICATION OF KINEMATICAL GEODESY FOR DETERMINING THE SHORT WAVE LENGTH COMPONENTS OF THE GRAVITY FIELD BY SATELLITE GRADIOMETRY Ph.D. Thesis
George Bruce Reed 1973 173 p
Avail: Univ. Microfilms Order No. 73-18944

A geodesy oriented investigation was carried out to develop a possible procedure for the use of satellite gradient measurements in obtaining gravity boundary values and to determine if gradiometry can provide, with sufficient accuracy, discrete geopotential information equivalent to harmonic degree 90. Since real data was not available, the investigation relied heavily on computer simulation experiments in the form of simulated squares solutions. Further, because of various proposals for gradiometer instrumentation which are under development, simulations were limited to two possible instrument configurations: (1) A hard-mounted system capable of sensing five independent components of the gravity gradient tensor mounted in satellite utilizing active attitude control and gradient torque stabilization; (2) A rotating system which produces a harmonic oscillating signal which can be analyzed in terms of signal amplitude as a function of three components of the gravity gradient tensor, and which is attitude controlled by spin stabilization. Dissert. Abstr.

N74-12118*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Oct. 1973
Allan Shapiro, Principal Investigator 27 Nov. 1973 2 p EREP
(NASA Order T-4716-B)
(E74-10028; NASA-CR-135869) Avail: NTIS HC $3.00 CSCL 08E

N74-13033*# Geological Survey, Washington, D.C.
OVERALL EVALUATION OF ERTS IMAGERY FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Jul. - 1 Sep. 1973
Alden P. Colvocoresses, Principal Investigator 24 Sep. 1973 16 p ref ERTS
(NASA Order S-70243-AG-2)
(E74-10106; NASA-CR-136097) Avail: NTIS HC $3.00 CSCL 08B

N74-13034*# Geological Survey, Washington, D.C. Topographic Div.
INVESTIGATION OF ERTS/RBV IMAGERY FOR PHOTOMAPPING OF THE UNITED STATES Progress Report, 1 Jul. - 31 Aug. 1973
Joseph T. Pilonero, Principal Investigator 1 Sep. 1973 2 p ERTS
(NASA Order S-70243-AG)
(E74-10107; NASA-CR-136098) Avail: NTIS HC $3.00 CSCL 08B

N74-13035*# Geological Survey, Washington, D.C.
THE CARTOGRAPHIC APPLICATION OF ERTS/RBV IMAGERY IN POLAR REGIONS Progress Report, 1 Jul. - 31 Aug. 1973
William R. MacDonald, Principal Investigator 1 Sep. 1973 3 p ERTS
(NASA Order S-70243-AG-2)
(E74-10108; NASA-CR-136099) Avail: NTIS HC $3.00 CSCL 08B

N74-13063*# Alaska Univ., Fairbanks.
IDENTIFICATION, DEFINITION AND MAPPING OF TERRESTRIAL ECOSYSTEMS IN INTERIOR ALASKA Bimonthly Progress Report
James H. Anderson, Principal Investigator 30 Nov. 1973 16 p refs ERTS
(Contract NAS5-21833)
(E74-10137; NASA-CR-136182; BMPR-8) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The vegetation map in preparation at the time of the last report was refined and labeled. This map is presented as an indication of the spatial and classificatory detail possible from interpretations of enlarged ERTS-1 color photographs. Using this map, areas covered by the several vegetation types characterized by white spruce were determined by planimetry. A 1:63,360 scale land use map of the Juneau area was drawn. This map incorporates the land use classification system now under development by the U.S. Geological Survey. The ERTS-1 images used in making the Juneau map were used to determine changes in surface area of the terminal zones of advancing and receding glaciers, the Taku, Norris, and Mendenhall. A new 1:63,360 scale land use map of the Bonanza Creek Experimental Forest and vicinity was drawn. Several excellent new sciences of test areas were received from NASA in color-infrared transparency format. These are being used for making photographic prints for analysis and mapping according to procedures outlined in this report.

N74-13064*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-30 Nov. 1973
A. G. Mourad and D. M. J. Fubara, Principal Investigators 30 Nov. 1973 13 p refs EREP
(Contract NAS9-13276)
(E74-10138; NASA-CR-136183; PR-9) Avail: NTIS HC $3.00 CSCL 08E

N74-13148*# Michigan State Univ., East Lansing. Project for the Use of Remote Sensing in Land Use Policy Formulation.
USERS GUIDE TO HIGH ALTITUDE IMAGERY OF MICHIGAN
Apr. 1973 40 p
(Grant NGL-23-004-083)
(NASA-CR-136222) Avail: NTIS HC $4.00 CSCL 08B

A guide to the high altitude imagery of Michigan outlines the areas of the state covered by selected recent high altitude aircraft and Earth Resources Technology Satellite flights. The types of remote sensing used are described. Maps of the flight coverage areas are included along with price lists of available imagery. K.M.M.

N74-14024*# Geological Survey, Washington, D.C.
INVESTIGATION OF SKYLAB IMAGERY FOR APPLICATION TO THEMATIC MAPPING Quarterly Progress Report, 1 Aug. - 31 Oct. 1973
Doyle G. Smith, Principal Investigator 26 Nov. 1973 2 p EREP
(NASA Order T-4649-B)
(E74-10156; NASA-CR-136283) Avail: NTIS HC $3.00 CSCL 08B

N74-14025*# Geological Survey, Reston, Va. National Center.
CARTOGRAPHIC EVALUATION OF SKYLAB-A S-192 SCANNER IMAGES Quarterly Progress Report, 1 Aug. - 31 Oct. 1973
John D. McLaurin, Principal Investigator 31 Oct. 1973 5 p EREP
(NASA Order T-4111-B)
(E74-10157; NASA-CR-136284) Avail: NTIS HC $3.00 CSCL 08B

N74-14038*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Nov. 1973
Allan Shapiro, Principal Investigator 7 Jan. 1974 1 p EREP
(NASA Order T-4716-B)
(E74-10170; NASA-CR-136297) Avail: NTIS HC $3.00 CSCL 08E

N74-14046*# Earth Satellite Corp., Washington, D.C.
FACILITATING THE EXPLOITATION OF ERTS IMAGERY USING SNOW ENHANCEMENT TECHNIQUES Bimonthly Progress Report, 1 Nov. - 31 Dec. 1973
Frank J. Wobber, Kenneth R. Martin, Principal Investigators, Roger V. Amato, and Thomas Leshendok 4 Jan. 1974 10 p ERTS
(Contract NAS5-21744)
(E74-10180; NASA-CR-136311) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. The procedure for conducting a regional geological mapping program utilizing snow-enhanced ERTS-1 imagery has been summarized. While it is recognized that mapping procedures in geological programs will vary from area to area and from geologist to geologist, it is believed that the procedure tested in this project is applicable over a wide range of mapping programs. The procedure is designed to maximize the utility and value of ERTS-1 imagery and aerial photography within the initial phase of geological mapping programs. Sample products which represent interim steps in the mapping formula (e.g. the ERTS Fracture-Lineament Map) have been prepared. A full account of these procedures and products will be included within the Snow Enhancement Users Manual.

N74-14048*# Geological Survey, Reston, Va.
THE CARTOGRAPHIC APPLICATION OF ERTS RBV IMAGERY IN POLAR REGIONS Progress Report, 1 Sep. - 31 Oct. 1973
William R. MacDonald, Principal Investigator 1 Nov. 1973 4 p ERTS
(NASA Order S-70243-AG-2)
(E74-10182; NASA-CR-136321) Avail: NTIS HC $3.00 CSCL 08B

N74-14049*# Geological Survey, Washington, D.C.
OVERALL EVALUATION OF ERTS IMAGERY FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Sep. - 1 Nov. 1973
Alden P. Colvocoresses, Principal Investigator 13 Nov. 1973 2 p ERTS
(NASA Order S-70243-AG-2)
(E74-10183; NASA-CR-136322) Avail: NTIS HC $3.00 CSCL 08B

N74-14055*# National Ocean Survey, Rockville, Md. Photogrammetric Research Branch.
SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY Quarterly Report, 16 Oct. 1973 - 15 Jan. 1974
Morton Keller, Principal Investigator 15 Jan. 1974 1 p EREP
(NASA Order T-4110-B)
(E74-10191; NASA-CR-136332) Avail: NTIS HC $3.00

N74-15007*# Battelle Columbus Labs., Ohio.
CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID Progress Report, 1-31 Dec. 1973
A. G. Mourad and D. M. J. Fubara, Principal Investigators 17 Jan. 1974 9 p ref EREP
(Contract NAS9-13276)
(E74-10199; NASA-CR-136381; PR-10) Avail: NTIS HC $3.00 CSCL 08E

N74-15023*# Servicio Geologico de Bolivia, La Paz.
SPACE PHOTOMAP OF THE SUBRE - BOLIVIA REGION
C. E. Brockmann, Principal Investigator and F. Ocampo Villa [1973] 10 p Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data, Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10216; NASA-CR-136479) Avail: NTIS HC $3.00 CSCL 08B

N74-15026*# Geological Survey, Reston, Va.
OVERALL EVALUATION OF SKYLAB (EREP) IMAGES FOR CARTOGRAPHIC APPLICATION Progress Report, 1 Aug. - 31 Dec. 1973
Alden P. Colvocoresses, Principal Investigator 1 Jan. 1974 2 p EREP
(NASA Order T-5395-B)
(E74-10220; NASA-CR-136483) Avail: NTIS HC $3.00 CSCL 08B

N74-15041*# Itek Corp., Lexington, Mass. Optical Systems Div.
AUTOMATED THEMATIC MAPPING AND CHANGE DETECTION OF ERTS-A IMAGES Interim Report, Feb. - Jul. 1973
Nicholas Gramenopoulos, Principal Investigator Aug. 1973 73 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21766)
(E74-10236; NASA-CR-136556) Avail: NTIS HC $5.75 CSCL 08B

The author has identified the following significant results. For the recognition of terrain types, spatial signatures are developed from the diffraction patterns of small areas of ERTS-1 images. This knowledge is exploited for the measurements of a small number of meaningful spatial features from the digital Fourier transforms of ERTS-1 image cells containing 32 x 32 picture elements. Using these spatial features and a heuristic algorithm, the terrain types in the vicinity of Phoenix, Arizona were recognized by the computer with a high accuracy. Then, the spatial features were combined with spectral features and using the maximum likelihood criterion the recognition accuracy of terrain types increased substantially. It was determined that the recognition accuracy with the maximum likelihood criterion depends on the statistics of the feature vectors. Nonlinear transformations of the feature vectors are required so that the terrain class statistics become approximately Gaussian. It was also determined that for a given geographic area the statistics of the classes remain invariable for a period of a month but vary substantially between seasons.

N74-15054# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CARTOGRAPHIC AND SURVEYING REPORTS. SERIES 1: ORIGINAL STUDIES [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE]
1973 42 p refs In GERMAN; ENGLISH summary
(Bull-63) Avail: NTIS HC $4.25

In the past ten years the technological progress in the construction of light aircraft has been extremely great. Its influence on the geosciences, especially on aerial surveying, is studied. Numerous data on modern aircraft are given in table form.
Author

N74-15055# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CARTOGRAPHIC AND SURVEYING REPORTS. SERIES 1: ORIGINAL STUDIES [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE]
1973 89 p refs In GERMAN; ENGLISH summary
(Bull-60) Avail: NTIS HC $6.50

The Fertsch effect in photogrammetry is considered by using a usable measure of altimetric error sources in drawing contour lines. 30 topographic geomorphological map samples 1:25,000 are utilized as a basis of computing mean and average values of inclination of banks and terrain slopes; these data are then used for estimating orthophotographic errors. Examples of photographic processing of orthophotographs are included.
Author

04
GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

A74-12803 # **Recent advances in geologic applications of remote sensing from space.** A. F. Gregory and H. D. Moore (Gregory Geoscience, Ltd., Ottawa, Canada). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 34 p. 35 refs.

Remote sensing of geology from space is shown to be now in transition from space research to applied geological research and practical application. The use of ERTS images for direct interpretation of geology, as a guide in planning and managing field operations, and as a basis for preliminary recording of regional traverses is examined. It is shown how rock and soil classes can be extrapolated on the image by correlating with available field data and verifying with selected traverses. V.P.

A74-12955 **Aerial electromagnetic teledetection in eruptive terrains (La télédétection électromagnétique aérienne en terrains éruptifs).** S. Paul (Laboratoire de Volcanologie-Pétrographie, Orsay, Essonne, France). *La Recherche Spatiale,* vol. 12, Sept.-Oct. 1973, p. 14-16. In French.

Tests were carried out in the Chaine des Puys, the Massifs of the Mont-Dore and the Cantal, as well as in the region of Agde. In the day photographs were taken with panchromatic, infrared, and black and white emulsions at an altitude of 4500 m. At night radiometer observations were made at 1700 m altitude during the period two hours after twilight and two hours before dawn. Results are given of analyses of surface geothermal data revealed in the electromagnetic windows of 3 to 5 micron and 10.5 to 12.5 micron. Contributions of multiband analysis (between 0.4 and 0.9 micron) to the morphostructural knowledge of the volcanic structures of the Chaine des Puys are discussed. F.R.L.

A74-14891 **Spectral geological content of ERTS-1 imagery over a variety of geological terranes in New York State.** Y. W. Isachsen (New York State Museum and Science Service, Albany; Rensselaer Polytechnic Institute, Troy, N.Y.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 342-363. 13 refs.

A74-14893 * **Spectral ratio imaging methods for geological remote sensing from aircraft and satellites.** R. K. Vincent (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 377-397. 9 refs. ARPA Contract No. HO-210041; Contracts No. NAS9-9784; No. NAS5-2183.

An improved photogrammetric technique (scannergrammetry) for the production of ratio images from multispectral scanner data is described. The multispectral technique is less affected by variations in atmospheric and solar illumination levels than single-channel scanner imagery of aerial photographs. Another advantage of the multispectral technique is the proportionality between ratios of a target deduced from ratio images, on the one hand, and ratios of reflectances calculated from laboratory spectra of samples from the target area, on the other hand. Several representative ratio images from aircraft and satellite data in the visible, reflective IR, and thermal IR regions are included. The geological applications suggested for ratio scannergrammetry include exploration of construction materials, soils, stratigraphy, volcanic ash flows, beaches, and sand dunes. V.Z.

A74-14932 **Equipment for carrying out quantitative geoelectromagnetic model experiments.** O. P. Verma and V. K. Gaur (Roorkee, University, Roorkee, India). *Pure and Applied Geophysics,* vol. 110, no. 9, 1973, p. 2085-2098. 9 refs. Research supported by the Council of Scientific and Industrial Research.

The paper describes equipment designed to study the effect of a conducting host-rock overburden on the electromagnetic anomaly of sulphide ore bodies embedded therein. The model was constructed strictly according to the theory of electromagnetic similitude so as to constitute a direct reading reproduction of the field vectors. The experiments were conducted at a fixed, crystal-controlled frequency of 100 kHz using mainly a graphite sheet immersed in a dilute hydrochloric acid solution of predetermined conductivity to simulate vein and manto type of ore deposits surrounded by a partially conducting zone. Both the inphase and quadrature components of the anomaly were measured in terms of the primary field after elimination of the regional anomaly by means of a measuring bridge and a compensator. (Author)

A74-17805 # **The Nicaragua earthquake - Aerial photography for disaster assessment and damage.** D. Garofalo and F. J. Wobber. *Photographic Applications in Science, Technology and Medicine,* vol. 9, Jan. 1974, p. 18, 19, 36-38.

Analysis of NASA aerial photography of the Managua earthquake to evaluate its use for earthquake disaster assessment, support of relief efforts, reconstruction planning, and geological analysis. It is shown that both pre- and post-earthquake photoanalysis provide data which can help to ensure the safety of persons living within earthquake-prone areas. Analysis of pre-earthquake photography is useful for emergency contingency, damage avoidance, and reconstruction planning. Post-earthquake remote sensing records provide data useful for facilitating the relief of disaster victims. Used in combination, comparative pre- and post-earthquake aerial photographs can aid in damage assessment, including economic analysis of destroyed or damaged facilities. A.B.K.

A74-17870 * **Application of real-time mass spectrometric techniques to environmental organic geochemistry. II - Organic matter in San Francisco Bay area water.** B. R. Simoneit, A. L. Burlingame (California, University, Berkeley, Calif.), D. H. Smith, and G. Eglinton (Bristol, University, Bristol, England). *Archives of Environmental Contamination and Toxicology,* vol. 1, no. 3, 1973, p. 193-208. 24 refs. Grant No. NGL-05-003-003.

A74-17988 **Mapping of subsurface natural resources using pseudo-noise electromagnetic signals.** E. A. Quincy, J. E. Lindsay, Jr., W. Davenport, and G. L. Pope (Wyoming, University, Laramie, Wyo.). In: National Telecommunications Conference, Atlanta, Ga., November 26-28, 1973, Conference Record. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 9E-1 to 9E-8. 16 refs. Research supported by the State of Wyoming Department of Economic Planning and Development, and University of Wyoming.

An experimental system is described which utilizes pseudo-noise (PN), cross-correlation techniques to characterize subsurface conducting bodies such as those pertaining to natural resources. The

system is essentially an extension of the loop-loop, transient-electromagnetic, induction systems used in ore prospecting. In lieu of a low duty-cycle pulse, this system transmits a wide-bandwidth PN digital waveform. The mapping signature is obtained by cross-correlation of the received signal with a replica of the sounding PN waveform. The receiver also averages several signatures to improve the SNR. (Author)

A74-18659 # **Application of ERTS-1 imagery in geology and hydrology to selected test sites in Iran.** K. Ebtehadj (Plan and Budget Organization, Remote Sensing and Data Collection Div., Teheran, Iran). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 10th, Washington, D.C., Jan. 28-30, 1974, Paper 74-251.* 9 p. 5 refs. Members, $1.50; nonmembers, $2.00.

ERTS-1 imagery of selected test sites in Iran was studied in detail, with emphasis on geological and hydrological phenomena. As a result, a previously unknown fault about 800 kilometers long was identified, and another fault approximately 1880 kilometers in length was traced with notable differences in pattern and direction when compared to available maps. Detailed analysis of satellite photography of southern Iran revealed numerous faults of varying length. Furthermore, several new lakes were observed in the southwestern region of the country, and the water fluctuation of the Darya-e-Namak (Salt Lake) was studied using ERTS-1 repetitive imagery coverage. (Author)

N74-11145*# Maryland Geological Survey, Baltimore.
[GEOLOGICAL SURVEY OF MARYLAND USING EREP FLIGHT DATA] Quarterly Report
Kenneth N. Weaver, Principal Investigator 12 Nov. 1973 2 p EREP
(Contract NAS9-13294)
(E74-10004; NASA-CR-135845) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Underflight photography has been used in the Baltimore County mined land inventory to determine areas of disturbed land where surface mining of sand and ground clay, or stone has taken place. Both active and abandoned pits and quarries were located. Aircraft data has been used to update cultural features of Calvert, Caroline, St. Mary's, Somerset, Talbot, and Wicomico Counties. Islands have been located and catalogued for comparison with older film and map data for erosion data. Strip mined areas are being mapped to obtain total area disturbed to aid in future mining and reclamation problems. Coastal estuarine and Atlantic Coast features are being studied to determine nearshore bedforms, sedimentary, and erosional patterns, and manmade influence on natural systems.

N74-11148*# Texas Instruments, Inc., Dallas. Services Group.
ERTS-1 IMAGERY USE IN RECONNAISSANCE PROSPECTING: EVALUATION OF THE COMMERCIAL UTILITY OF ERTS-1 IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM Interim Report, 1 Mar. - 31 Aug. 1973
D. F. Saunders, Principal Investigator, G. Thomas, and F. E. Kinsman Sep. 1973 37 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21796)
(E74-10007; NASA-CR-135848; U1-702700-2) Avail: NTIS HC $4.00 CSCL 08G

The author has identified the following significant results. Five areas of North America (North Slope, Alaska; Superior Province, Canada; Williston Basin, Montana; Colorado; and New Mexico-West Texas) are being studied for discernibility of geological evidence on ERTS-1 imagery. Evidence mapped is compared with known mineral/hydrocarbon accumulations to determine the value of the imagery in commercial exploration programs. The conclusion is that there is a great advantage in photogeologic interpretation from the satellite viewpoint to provide a truly synoptic examination of regional geologic features. In addition to detecting lineaments which may be continental in scale, many large circular or curvilinear tonal or dissection patterns not generally detected on conventional aerial photos have been discovered. Preliminary analysis of these lineaments and curvilinear anomalies has established close empirical relationships between these features and both mineral deposits and the structure of sedimentary basins. Details are presented of the Colorado region interpretation.

N74-11150*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Oct. 1973
Jack G. Quade, Principal Investigator Oct. 1973 2 p EREP
(Contract NAS9-13274)
(E74-10012; NASA-CR-135853) Avail: NTIS HC $3.00 CSCL 08E

N74-11152*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Oct. 1973
Keenan Lee, Principal Investigator 14 Nov. 1973 5 p EREP
(Contract NAS9-13394)
(E74-10014; NASA-CR-135855) Avail: NTIS HC $3.00 CSCL 08F

N74-11153*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MAPPING OF THE MAJOR STRUCTURES OF THE AFRICAN RIFT SYSTEM Progress Report, 1 Jul. - 31 Aug. 1973
Paul Mohr, Principal Investigator 31 Aug. 1973 2 p ERTS
(Contract NAS5-21748)
(E74-10015; NASA-CR-135856) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The new fault map of the main Ethiopian rift, based on aerial photo compilations, generally agrees well with the maps produced from ERTS-1 imagery. Characteristically, the ERTS-1 imagery shows some of the major faults to be more extensive than realized from ground studies, though due to the angle of sun illumination some east-facing fault scarps are not easily discernible on the imagery. The Corbetti caldera, shows up surprisingly poor on the imagery, and is shown to be an adjunct to an older, larger caldera now occupied by Lakes Awassa and Shallo. The lithological boundaries mapped by De Paola in the rift are difficult to discern on the ERTS-1 imagery. On the Somalian plateau, east of the rift, a denuded caldera has been identified as the source of much of the lavas of the Batu Mountains. Further south, ERTS-1 imagery amplifies the structural and lithological mapping of the Precambrian rocks of the Shakisso-Arero area, and of the Kenya-Ethiopia border region. For the first time with some certainty, it is now possible to say that on the evidence of the ERTS-1 imagery, the Western Rift does not continue northeast beyond the Sudan-Uganda border, and is thus not to be sought in western Ethiopia.

N74-11159*# State of Ohio Dept. of Development, Columbus.
RELEVANCE OF ERTS TO THE STATE OF OHIO Progress Report, Sep. - Oct. 1973
David C. Sweet, Principal Investigator Oct. 1973 8 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21782)
(E74-10024; NASA-CR-135865) Avail: NTIS HC $3.00 CSCL 08B

N74-11163*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Oct. 1973
Paul M. Merifield, Principal Investigator 5 Nov. 1973 2 p EREP
(Contract NAS2-7698)
(E74-10042; NASA-CR-135883; MPR-5) Avail: NTIS HC $3.00 CSCL 08G

N74-11166*# Alaska Univ., Fairbanks.
EVALUATION OF FEASIBILITY OF MAPPING SEISMICALLY ACTIVE FAULTS IN ALASKA Bimonthly Progress Report
Larry Gedney, Principal Investigator 8 Oct. 1973 2 p refs ERTS
(Contract NAS5-21833)
(E74-10045; NASA-CR-135886; BMPR-7) Avail: NTIS HC $3.00 CSCL 08C

N74-11167*# Delaware Univ., Newark. Coll. of Marine Studies.
DYNAMICS OF PLANKTON POPULATIONS IN UPWELLING AREAS
Karl-Heinz Szekielda, Principal Investigator Aug. 1973 12 p EREP
(Contract NAS9-13344)
(E74-10046; NASA-CR-135887) Avail: NTIS HC $3.00 CSCL 08A

N74-11177*# Kennecott Exploration, Inc., Salt Lake City, Utah. Exploration Services Dept.
RECOGNITION OF THE GEOLOGIC FRAMEWORK OF PORPHYRY COPPER DEPOSITS ON ERTS-1 IMAGERY Progress Report, Sep. - Oct. 1973
John C. Wilson, Principal Investigator 6 Nov. 1973 2 p ERTS
(Contract NAS5-21769)
(E74-10056; NASA-CR-135897) Avail: NTIS HC $3.00 CSCL 08G

N74-11178*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Status Report, Oct. 1973
Kenneth Watson, Principal Investigator 26 Oct. 1973 2 p EREP
(NASA Order T-6555-B)
(E74-10057; NASA-CR-135957) Avail: NTIS HC $3.00 CSCL 08E

N74-11185*# Dartmouth Coll., Hanover, N.H. Dept. of Earth Sciences.
VOLCANIC ACTIVITY AND SATELLITE-DETECTED THERMAL ANOMALIES AT CENTRAL AMERICAN VOLCANOES Progress Report, Aug. - Oct. 1973
Richard E. Stoiber, Principal Investigator and William I. Rose, Jr. (Michigan Technological Univ.) Oct. 1973 6 p EREP
(Contract NAS9-13311)
(E74-10068; NASA-CR-135821) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. A large nuee ardente eruption occurred at Santiaguito volcano, within the test area on 18 September 1973. Through a system of local observers, the eruption has been described, reported to the international scientific community, extent of affected area mapped, and the new ash sampled. A more extensive report on this event will be prepared. The eruption is an excellent example of the kind of volcanic situation in which satellite thermal imagery might be useful. The Santiaguito dome is a complex mass with a whole series of historically active vents. It's location makes access difficult, yet its activity is of great concern to large agricultrual populations who live downslope. Santiaguito has produced a number of large eruptions with little apparent warning. In the earlier ground survey large thermal anomalies were identified at Santiaguito. There is no way of knowing whether satellite monitoring could have detected changes in thermal anomaly patterns related to this recent event, but the position of thermal anomalies on Santiaguito and any changes in their character would be relevant information.

N74-11188*# Geological Survey, Washington, D.C.
SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND Progress Report, 15 Jan. - 31 Aug. 1973
Richard S. Williams, Jr., Principal Investigator 1 Sep. 1973 28 p refs ERTS
(NASA Order S-70243-AG)
(E74-10073; NASA-CR-135816) Avail: NTIS HC $3.50 CSCL 08G

The author has identified the following significant results. Under a binational, multidisciplinary experiment ERTS-1 imagery is being used to measure and map dynamic natural phenomena in Iceland. A few of the initial results from the project are: (1) a large variety of geological and volcanic features can be studied, particularly on imagery acquired at low sun angle (< 10 deg), which have not been previously recognized; (2) under optimum snow cover conditions, geothermal areas can be discerned by their snowmelt pattern or by warm spring discharge into frozen lakes; (3) a variety of map types at scale of 1:1,000,000 and 1:500,000, can be compiled, made more accurate, or updated (changes in coastline, glaciers, lakes, etc.); (4) the persistence of snow in the highland areas, during the summer months, has important ramifications to rangeland management; (5) false color composites (MSS) permitted the mapping of four types of vegetation: forested, reclaimed, cultivated areas and grasslands, and the mapping of the seasonal change of the vegetation, all of high value to rangeland management when complete, repetitive coverage of Iceland becomes a reality with an operational satellite; and (6) the volcanic eruption on Heimaey was recorded.

N74-11189*# Geological Survey, Denver, Colo.
APPLICATION OF ERTS-1 IMAGERY TO DETECTING AND MAPPING MODERN EROSION FEATURES, AND TO MONITORING EROSIONAL CHANGES, IN SOUTHERN ARIZONA Progress Report, 1 Feb. - 31 Jul. 1973
Roger B. Morrison, Principal Investigator and Maurice E. Cooley 1 Aug. 1973 11 p refs ERTS
(NASA Order S-70243-AG-4)
(E74-10074; NASA-CR-135815) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. ERTS-1 multispectral images have been used, without additional data, to prepare three maps at 1:1 million scale of the 18,000 sq. mi. project area: (1) modern (post-1890 A. D.) arroyos and channels; (2) types of stream channels; and (3) potential erodibility of soils: surficial deposits, and bedrock. Also completed was the collection and compilation of ground truth geologic, soil, and hydrologic data. Field studies to obtain ground control for the photointerpretive mapping include: (1) measurements, at many sites, of the depth, width, and channel characteristics of arroyos and gullies, and cross profiles of stream channels, flood plains, and Holocene terraces; and (2) stratigraphic measurements of the Holocene alluvial deposits. Significant conclusions from these extensive stratigraphic studies are: Slow deposition of sediment was the dominant process on stream lowlands throughout the project area for at least 2000 years prior to 1890 A.D. The deposition was broken by only two relatively brief and minor erosional episodes of regional importance, when channels no more than a third of the depth of modern channels were cut. The modern erosion has produced within about 80 years substantially more and larger arroyos than any erosion episode during the last 2000 years, and the end is not in sight.

N74-11190*# Geological Survey, Washington, D.C.
EVALUATION OF ERTS-1 DATA APPLICATIONS TO GEOLOGIC MAPPING, STRUCTURAL ANALYSIS AND MINERAL RESOURCE INVENTORY OF SOUTH AMERICA WITH SPECIAL EMPHASIS ON THE ANDES MOUNTAIN REGION Progress Report, 15 Jan. - 31 Aug. 1973
William D. Carter, Principal Investigator 1 Sep. 1973 28 p refs ERTS
(NASA Order S-70243-AG)
(E74-10075; NASA-CR-135814) Avail: NTIS HC $3.50 CSCL 08B

The author has identified the following significant results. ERTS-1 data is ideally suited for small-scale geologic mapping and structural analysis of remote, inaccessible areas such as the Andes of South America. The synoptic view of large areas, low sun-angle and multispectral nature of the images provide the right ingredients for improving existing geologic and other maps of the regions. In most areas it has been possible to compile geologic, drainage, and cultural interpretive overlays to individual scenes mainly using MSS bands 4, 5, and 7. A test image mosaic using MSS band 6 is being compiled for Test Area 7 (La Paz, Bolivia). It will be at a scale of 1:1,000,000 and cover 4 x 6 degrees of latitude and longitude and will serve as a compilation base on which to join the overlays. Repetitive data shows changes in river channels and sedimentation plumes, changes in lake shorelines, and surface moisture distribution. Vegetation and snow line changes in the Andes have been recognized. A year of seasonal data, however, has not yet been acquired due to tape recorder failure.

N74-11192*# Earth Satellite Corp., Washington, D.C. Geosciences and Environmental Applications Div.
FACILITATING THE EXPLOITATION OF ERTS-1 IMAGERY USING SNOW ENHANCEMENT TECHNIQUES Progress Report, 1 May - 1 Oct. 1973
Frank J. Wobber, Principal Investigator, Kenneth R. Martin, Roger V. Amato, and Thomas Leshendok Nov. 1973 63 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21744)
(E74-10080; NASA-CR-135969; ESC-141) Avail: NTIS HC $5.25 CSCL 14E

The author has identified the following significant results. The applications of ERTS-1 imagery for geological fracture mapping regardless of season has been repeatedly confirmed. The enhancement provided by a differential cover of snow increases the number and length of fracture-lineaments which can be detected with ERTS-1 data and accelerates the fracture mapping process for a variety of practical applications. The geological mapping benefits of the program will be realized in geographic areas where data are most needed - complex glaciated terrain and areas of deep residual soils. ERTS-1 derived fracture-lineament maps which provide detail well in excess of existing geological maps are not available in the Massachusetts-Connecticut area. The large quantity of new data provided by ERTS-1 may accelerate and improve field mapping now in progress in the area. Numerous other user groups have requested data on the techniques. This represents a major change in operating philosophy for groups who to data judged that snow obscured geological detail.

N74-11195*# Indiana Geological Survey, Bloomington.
STUDY OF APPLICATION OF ERTS-A IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Sep. - 1 Nov. 1973
Charles E. Wier, Frank J. Wobber, Principal Investigators, Orville R. Russell, Roger V. Amato, and Thomas Leshendok 9 Nov. 1973 9 p Prepared in cooperation with Earth Satellite Corp., Washington, D. C. ERTS
(Contract NAS5-21795)
(E74-10083; NASA-CR-135972) Avail: NTIS HC $3.00 CSCL 08I

The author has identified the following significant results. The Mined Land Inventory map of Pike, Gibson, and Warrick Counties, Indiana, prepared from ERTS-1 imagery, was included in the 1973 Annual Report of the President's Council on Environmental Quality as an example of ERTS applications to mined lands. Increasing numbers of inquiries have been received from coal producing states and coal companies interested in the Indiana Program.

N74-11201*# Bureau de Recherches Geologiques et Minieres, Orleans (France). Dept. Carte Geologique et Geologie Generale.
GEOLOGICAL STUDY IN THE SOUTHERN PART OF MADAGASCAR Progress Report, Jun. - Oct. 1973
G. Weecksteen, Principal Investigator and B. Koch Oct. 1973 17 p refs Sponsored by NASA ERTS
(E74-10090; NASA-CR-136002) Avail: NTIS HC $3.00 CSCL 08G

N74-12111*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
GEOLOGIC ANALYSIS AND EVALUATION OF ERTS-A IMAGERY FOR THE STATE OF NEW MEXICO Progress Report, 14 Mar. - 29 Oct. 1973
Frank E. Kottlowski, Principal Investigator 29 Oct. 1973 12 p refs ERTS
(Contract NAS5-21861)
(E74-10008; NASA-CR-135849) Avail: NTIS HC $3.00 CSCL 08G

N74-12115*# Argus Exploration Co., Los Angeles, Calif.
A RECONNAISSANCE SPACE SENSING INVESTIGATION OF CRUSTAL STRUCTURE FOR A STRIP FROM THE EASTERN SIERRA NEVADA TO THE COLORADO PLATEAU Progress Report, 1 Sep. - 31 Oct. 1973
Mark Liggett, Principal Investigator 9 Nov. 1973 19 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21809)
(E74-10018; NASA-CR-135859) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. An operational technique for producing high resolution false color composites of ERTS-1 MSS imagery has been developed. The technique uses standard NASA (NDPF) or EROS black/white data products, and permits a broad range of control on composite color balance and contrast range. The use of an additive color viewer has proven valuable for determining the optimum color balance of composites for effective interpretation. The compositing technique is adaptable for effective interpretation. The technique is adaptable to data from a variety of multispectral imaging systems, including multi-seasonal and multipolarization data. A 50 mile north-trending linear anomaly recongized in ERTS-1 MSS imagery west of Goldfield, Nevada has been confirmed as a steeply west-dipping normal fault, here termed the Paymaster Fault. This structure trends southward from the General Thomas Hills along Paymaster Valley and the east side of Clayton Valley into the Palmetto Mountains. There, it terminates against a less pronounced east-trending transverse anomaly which is also believed to be fault controlled. The Paymaster Fault is the most prominent of several large normal faults which terminate southward against this transverse anomaly.

N74-12119*# Eason Oil Co., Oklahoma City, Okla.
AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION Progress Report, Aug. - Sep. 1973
Robert J. Collins, Principal Investigator 28 Nov. 1973 6 p ERTS
(Contract NAS5-21735)
(E74-10029; NASA-CR-135870) Avail: NTIS HC $3.00 CSCL 08G

N74-12128*# Bureau of Reclamation, Denver, Colo.
APPLICATION OF REMOTE SENSING TO SELECTED BUREAU OF RECLAMATION PROJECTS Progress Report, 1 Sep. - 31 Oct. 1973
Larry D. Cast, Principal Investigator 1 Nov. 1973 2 p ERTS
(NASA Order S-70243-AG)
(E74-10040; NASA-CR-135881) Avail: NTIS HC $3.00 CSCL 13B

N74-12137*# Alaska Univ., Fairbanks.
GLACIOLOGICAL AND VOLCANOLOGICAL STUDIES IN THE WRANGELL MOUNTAINS, ALASKA Bimonthly Progress Report
Carl S. Benson, Principal Investigator 30 Sep. 1973 3 p ref ERTS
(Contract NAS5-21833)
(E74-10078; NASA-CR-135747; BMPR-7) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. A field trip was made to the summit of Mt. Wrangell to verify conclusions reached by study of ERTS-1 imagery and aerial photographs. Twelve points were surveyed on the snow surface of the north crater from two primary control points established in 1961-1965 on the rim. The snow surface has dropped by about 20m in the western half of the crater since 1965. In the eastern half the settling is much greater. The total amount of ice which has melted by volcanic heat appears close to 18 x 10 to the 9th power Kg. The heat flux calculated from this estimate over the 500,000 sq m area of the crater is slightly more than 1000 microcal/sq cm/sec. It is now clear that the increase in rock area observed on ERTS-1 images is due entirely to volcanic heat.

N74-12146* Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
GROUND PATTERN ANALYSIS IN THE GREAT PLAINS
Fawwaz T. Ulaby and John C. Davis, Principal Investigators *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 7 p ERTS
(Rept-2266-7) CSCL 08B

N74-12148*# Geological Survey, Washington, D.C.
ANALYSIS STUDY OF MULTISPECTRAL DATA, ERTS-A, FROM AN AREA IN WEST PAKISTAN Progress Report, 1 Sep. - 31 Oct. 1973
Robert G. Schmidt, Principal Investigator 15 Nov. 1973 2 p ERTS
(NASA Order S-70243-AG)
(E74-10094; NASA-CR-136085) Avail: NTIS HC $3.00 CSCL 08F

N74-12157*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EARTH OBSERVATIONS FROM SPACE: OUTLOOK FOR THE GEOLOGICAL SCIENCES
Nicholas M. Short and Paul D. Lowman, Jr. Oct. 1973 119 p refs
(NASA-TM-X-70519; X-650-73-316) Avail: NTIS HC $8.00 CSCL 08G

Remote sensing from space platforms is discussed as another tool available to geologists. The results of Nimbus observations, the ERTS program, and Skylab EREP are reviewed, and a multidisciplinary approach is recommended for meeting the challenges of remote sensing. F.O.S.

N74-12159# Bureau of Mines, Morgantown, W.Va. Energy Research Center.
DIRECTIONAL PROPERTIES OF COAL AND THEIR UTILIZATION IN UNDERGROUND GASIFICATION EXPERIMENTS Technical Progress Report
C. A. Komar, W. K. Overbey, Jr., and J. Pasini, III Nov. 1973 14 p refs
(BM-TPR-73) Avail: NTIS HC $3.00

Renewed interest in the underground gasification of coal evolves from comprehensive studies of earth fracture systems that indicate that the movement of fluids can be controlled in the coalbed. In particular, directional property studies of natural microfissure occurrence, permeability, ultrasonic velocity, tensile strength, and orientation of intervals of inherent rock weakness, together with geologic structure setting and fracture trace analysis, can predict the gaseous flow paths in the coalbed. Having this information, the dominant direction in which gases generated and/or liberated by heat can be determined so that appropriate well patterns can be developed. Together with advances made in drilling technology that permit long horizontal holes to be drilled through the coal seams, tests can be conducted to determine whether directional control will permit devolatilization of the coalbed low-Btu gas suited for the generation of electricity. Author

N74-12162# Geological Survey, Washington, D.C.
AN INTEGRATED SYSTEM OF GEOLOGIC MAPPING AND GEOCHEMICAL SAMPLING BY LIGHT AIRCRAFT
C. L. Sainsbury, K. J. Curry, and J. C. Hamilton 1973 32 p refs
(USGS-Bull-1361; LC-72-600230) Avail: SOD HC $0.90 Domestic Postpaid or $0.75 GPO Bookstore

Reconnaissance geologic mapping and sampling for geochemical analyses from a light aircraft were proved feasible. On the Seward Peninsula, Alaska, in areas of fair to good exposures, reconnaissance geologic maps suitable for publication at 1:250,000 scale were prepared at a rate of one 15-by 30-minute quadrangle per day, at a cost, excluding salary, of approximately $100.00 per quadrangle. Several of these maps were checked by an impartial observer from a helicopter and were found to be sufficiently accurate for reconnaissance maps. From the air, mineralized structural features, gossans, and potentially mineralized areas are easily seen, plotted, and sampled. Devices were developed by which samples of soils, sands, stream sediments, rock fragments, and humus can be collected from light aircraft. Sampling devices were developed also for use with helicopters. Use of these devices enables collection of geologic and geochemical samples from tree-covered areas, steep slopes, and tree-lined streams, which heretofore could only be sampled by long foot traverses; collection of all types of samples by helicopter is materially speeded up. Author

N74-13023*# Geological Survey, Washington, D.C.
IRON-ABSORPTION BAND ANALYSIS FOR THE DISCRIMINATION OF IRON-RICH ZONES Progress Report, 1 Sep. - 31 Oct. 1973
Lawrence C. Rowan, Principal Investigator 6 Oct. 1973 7 p ref ERTS
(NASA Order S-70243-AG-4)
(E74-10096; NASA-CR-136087) Avail: NTIS HC $3.00 CSCL 08G

N74-13027*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Nov. 1973
Kenneth Watson, Principal Investigator Nov. 1973 3 p EREP
(NASA Order T-6555-B)
(E74-10100; NASA-CR-136091) Avail: NTIS HC $3.00 CSCL 08E

N74-13030*# Geological Survey, Denver, Colo.
THERMAL SURVEILLANCE OF VOLCANOES OF THE CASCADE RANGE UTILIZING ERTS DCP SYSTEMS AND IMAGERY Progress Report, 1 Jan. - 1 Jul. 1973
Jules D. Friedman, Principal Investigator 1 Jul. 1973 7 p ERTS
(NASA Order S-70243-AG)
(E74-10103; NASA-CR-136094) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Successful installation of DCP sets at Mt. Baker volcano and at Mt. St. Helens volcano, Washington, completed the installation phase of experiment SR 251. Aerial IR scanner missions over the Cascade volcanoes were completed with a mission April 29th which provided thermographic IR images of Glacier Peak, Mt. Baker, Mt. St. Helens, Mt. Rainier, and Mt. Adams. Earlier repetitive coverage had obtained IR images depicting thermal anomalies of Lassen Volcanic National Park, Shasta, Crater Lake, and the northern Cascades. The April 29th mission and subsequent ground reconnaissance yielded new information on 48 heretofore unreported pinpoint radiation anomalies, of possible fumarolic origin, on the flanks of Mt. Rainier and several new thermal points on Mt. Baker. Cartographic plots of these anomalies, in conjunction with surface temperature and other data obtained as a result of experiment SR 251 will permit estimation of radiation heat loss during the repose periods of the host volcanoes.

N74-13041*# California Earth Science Corp., Santa Monica.
THE APPLICATION OF SKYLAB IMAGERY TO ANALYSIS OF FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly Progress Report, Nov. 1973
Paul M. Merifield, Principal Investigator 5 Dec. 1973 3 p EREP
(Contract NAS2-7698)
(E74-10114; NASA-CR-136126; MPR-6) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. Frame 114 of the Salton Sea area was studied in all bands to analyze the appearance of important faults. These faults were also studied in the field as well as from aircraft and in aerial photography. The San Andreas/Banning and the Mission Creek faults can be traced across Coachella Valley even though they are buried by alluvium. The faults form ground water barriers and the near surface ground water on the northeast sides of the faults supports patches of vegetation (mesquite and palms) in an otherwise barren desert. These oases are best seen in band 3 (color IR). Otherwise, faults are best seen in band 4 (aerial color). Of the B and W bands, 5 (red) is best for delineating faults. Bands 1 and 2 are excessively grainy and the resolution is considerably inferior to the other bands.

N74-13043*# Alaska Univ., Fairbanks.
EVALUATION OF FEASIBILITY OF MAPPING SEISMICALLY ACTIVE FAULTS IN ALASKA Bimonthly Progress Report
Larry D. Gedney, Principal Investigator 30 Nov. 1973 2 p refs ERTS
(Contract NAS5-21833)
(E74-10116; NASA-CR-136128; BMPR-8) Avail: NTIS HC $3.00 CSCL 08B

N74-13049*# Iowa Univ., Iowa City.
UTILIZING ERTS-1 IMAGERY FOR TECTONIC ANALYSIS THROUGH STUDY OF THE BIGHORN MOUNTAINS REGION Progress Report, 16 Sep. - 15 Nov. 1973
Richard A. Hoppin, Principal Investigator 15 Nov. 1973 1 p ERTS
(Contract NAS5-21852)
(E74-10122; NASA-CR-136167) Avail: NTIS HC $3.00 CSCL 08E

N74-13061*# Ministry of Natural Resources, Nairobi (Kenya).
[THE APPLICABILITY OF ERTS-1 DATA COVERING THE MAJOR LANDFORMS OF KENYA] Final Report
J. H. O. Omino, Principal Investigator 7 Dec. 1973 10 p Sponsored by NASA ERTS
(E74-10134; NASA-CR-136179) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Five investigators report on the applicability of ERTS-1 data covering the major landforms of Kenya. Deficiencies due to lack of equipment, repetitive coverage and interpretation know-how are also reported on. Revision of lake shorelines is an immediate benefit. Basement system metasediments are rapidly differentiated, but dune areas are not readily distinguishable from sandy soils. Forest, moorland, high altitude grass, tea, and conifer plantations are readily distinguished, with podocarpus forest especially distinguishable from podocarpus/juniperus forest. In the arid areas physiographic features, indicating the major soil types, are readily identified and mapped. Preliminary vegetation type analysis in the Mara Game Reserve indicates that in a typical savannah area about 36% of the vegetation types are distinguishable at a scale of 1:1 million as well as drainage patterns and terrain features.

N74-13062*# Bureau de Recherches Geologiques et Minieres, Orleans (France).
STRUCTURAL INVESTIGATIONS IN THE MASSIF-CENTRAL, FRANCE
Guy Weecksteen, Principal Investigator and J.-Y. Scanvic [1973] 20 p refs Sponsored by NASA ERTS
(E74-10135; NASA-CR-136180) Avail: NTIS HC $3.00 CSCL 08E

N74-13067*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Nov. 1973
Jack G. Quade, Principal Investigator Nov. 1973 3 p EREP
(Contract NAS9-13274)
(E74-10141; NASA-CR-136186) Avail: NTIS HC $3.00 CSCL 08G

N74-14016*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SKYLAB SHORT-LIVED EVENT ALERT PROGRAM Quarterly Progress Report, 1 Aug. - 31 Oct. 1973
Robert A. Citron, Principal Investigator Nov. 1973 4 p EREP
(Contract NAS9-13474)
(E74-10147; NASA-CR-136185; QPR-2) Avail: NTIS HC $3.00 CSCL 22C

N74-14027*# New Mexico State Bureau of Mines and Mineral Resources, Socorro.
GEOLOGIC ANALYSIS AND EVALUATION OF ERTS-A IMAGERY FOR THE STATE OF NEW MEXICO Progress Report, 29 Oct. - 29 Nov. 1973
Frank E. Kottlowski, Principal Investigator 29 Nov. 1973 5 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21861)
(E74-10159; NASA-CR-136286) Avail: NTIS HC $3.00 CSCL 08G

N74-14028*# Wolf Research and Development Corp., Pocomoke City, Md.
APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES Quarterly Progress Report, 8 Sep. - 31 Dec. 1973
R. L. Brooks, Principal Investigator and J. D. Pennewell 28 Dec. 1973 6 p EREP
(Contract NAS9-13310)
(E74-10160; NASA-CR-136287; QPR-3) Avail: NTIS HC $3.00 CSCL 08I

N74-14045*# California Earth Science Corp., Santa Monica.
FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA Monthly

Progress Report, Jan. 1974
Paul M. Merifield, Principal Investigator 5 Jan. 1974 2 p EREP
(Contract NAS2-7698)
(E74-10179; NASA-CR-136310; MPR-7) Avail: NTIS HC $3.00 CSCL 08G

N74-14056*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA Progress Report, 1 Nov. - 31 Dec. 1973
William A. Deutschman, Principal Investigator 31 Dec. 1973 1 p ERTS
(Contract NAS5-21858)
(E74-10192; NASA-CR-136333) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Detection of short-lived events has continued. Forest fires, oil spills, vegetation damage, volcanoes, storm ridges, earthquakes, and floods have been detected and analyzed.

N74-14995*# Geological Survey, Reston, Va.
SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND. VATNAJOEKULL AREA, ICELAND: NEW VOLCANIC AND STRUCTURAL FEATURES ON ERTS-1 IMAGERY Special Report No. 3
Richard S. Williams, Jr., Principal Investigator, Sigurour Thorarinsson (Iceland Univ.), and Kristjan Saemundsson (Natl. Energy Authority, Reykjavik, Iceland) 15 Dec. 1973 3 p Repr. from Geol. Soc. of Am. Abstr. with Programs, 1973 Ann. Meetings, v. 5, no. 7, Oct. 1973 p 864-865 Presented at 1973 Ann. Meeting of the Geol. Soc. of Am. Sponsored by NASA ERTS
(E74-10184; NASA-CR-136323) Avail: NTIS HC $3.00 CSCL 08G

N74-14996*# Geological Survey, Reston, Va.
SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND: PRELIMINARY RESULTS OF GEOLOGIC, HYDROLOGIC, OCEANOGRAPHIC, AND AGRICULTURAL STUDIES WITH ERTS-1 IMAGERY Special Report No. 2
Richard S. Williams, Jr., Principal Investigator, Agust Boeovarsson (Icelandic Surveying Dept.), Sturla Fririksson (Agr. Res. Inst., Iceland), Guomundur Palmason (Natl. Energy Authority, Iceland), Sigurjon Rist (Natl. Energy Authority), Hlynur Sigtryggsson (Icelandic Meteorol. Serv.), Kristjan Saemundsson (Natl. Energy Authority), Sigurour Thorarinsson (Iceland Univ.), and Ingvi Thorsteinsson (Agr. Res. Inst.) 1 Dec. 1973 20 p refs Repr. from Proc. of Symp. on Management and Utilization of Remote Sensing Data, 29 Oct. - 1 Nov. 1973 p 17-35 Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10185; NASA-CR-136324) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. The wide variety of geological and geophysical phenomena which can be observed in Iceland, and particularly their very direct relation to the management of the country's natural resources, has provided great impetus to the use of ERTS-1 imagery to measure and map the dynamic natural phenomena in Iceland. MSS imagery is being used to study a large variety of geological and geophysical eruptive products, geologic structure, volcanic geomorphology, hydrologic, oceanographic, and agricultural phenomena of Iceland. Some of the preliminary results from this research projects are: (1) a large number of geological and volcanic features can be studied from ERTS-1 imagery, particularly imagery acquired at low sun angle, which had not previously been recognized; (2) under optimum conditions the ERTS-1 satellite can discern geothermal areas by their snow melt pattern or warm spring discharge into frozen lakes; (3) various maps at scales of 1:1 million and 1:500,000 can be updated and made more accurate with ERTS-1 imagery; (4) the correlation of water reserves with snowcover can improve the basis for planning electrical production in the management of water resources; (5) false-color composites (MSS) permitted the mapping of four types of vegetation: forested; grasslands, reclaimed, and cultivated areas, and the seasonal change of the vegetation, all of high value to rangeland management.

N74-14998*# Alaska Univ., Fairbanks. Geophysical Inst.
SEISMICALLY ACTIVE STRUCTURAL LINEAMENTS IN SOUTH-CENTRAL ALASKA AS SEEN ON ERTS-1 IMAGERY Interim Scientific Report
Larry Gedney, Principal Investigator and James VanWormer 30 Nov. 1973 8 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E74-10194; NASA-CR-136367) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. A mosaic of south-central Alaska composed of 19 ERTS-1 images, when compared with the seismicity pattern of the area, reveals that the larger earthquakes tend to fall on lineaments which are easily recognizable on the imagery. In most cases, these lineaments have not been mapped as faults. One particular lineament, which was the scene of three earthquakes of magnitude 4 or greater during 1972, passes very close to Anchorage.

N74-15010*# Colorado School of Mines, Golden. Dept of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Dec. 1973
Keenan Lee, Principal Investigator 17 Jan. 1974 5 p EREP
(Contract NAS9-13394)
(E74-10202; NASA-CR-136384) Avail: NTIS HC $3.00 CSCL 08G

N74-15011*# Nevada Univ., Reno. Mackay School of Mines.
THE GREAT BASIN INVESTIGATION Monthly Progress Report, Dec. 1973
Jack G. Quade, Principal Investigator Dec. 1973 2 p EREP
(Contract NAS9-13274)
(E74-10203; NASA-CR-136385) Avail: NTIS HC $3.00 CSCL 08G

N74-15013*# Argus Exploration Co., Los Angeles, Calif.
FAULT PATTERN AT THE NORTHERN END OF THE DEATH VALLEY - FURNACE CREEK FAULT ZONE, CALIFORNIA AND NEVADA
Mark A. Liggett, Principal Investigator and John F. Childs Jan. 1974 10 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21809)
(E74-10205; NASA-CR-136387) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. The pattern of faulting associated with the termination of the Death Valley-Furnace Creek Fault Zone in northern Fish Lake Valley, Nevada was studied in ERTS-1 MSS color composite imagery and color IR U-2 photography. Imagery analysis was supported by field reconnaissance and low altitude aerial photography. The northwest-trending right-lateral Death Valley-Furnace Creek Fault Zone changes northward to a complex pattern of discontinuous dip slip and strike slip faults. This fault pattern terminates to the north against an east-northeast trending zone herein called the Montgomery Fault Zone. No evidence for continuation of the Death Valley-Furnace Creek Fault Zone is recognized north of the Montgomery Fault Zone. Penecontemporaneous displacement in the Death Valley-Furnace Creek Fault Zone, the complex transitional zone, and the Montgomery Fault Zone suggests that the systems are genetically related. Mercury mineralization appears to have been localized along faults recognizable in ERTS-1 imagery within the transitional zone and the Montgomery Fault Zone.

N74-15014*# Argus Exploration Co., Los Angeles, Calif.
PAHRANAGAT SHEAR SYSTEM, LINCOLN COUNTY, NEVADA
Mark A. Liggett, Principal Investigator and Helmut E. Ehrenspreck Jan. 1974 12 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21809)
(E74-10206; NASA-CR-136388) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. A structural model which relates strike-slip deformation to Basin Range extensional tectonics was formulated on the basis of analysis and interpreatation of ERTS-1 MSS imagery over southern Lincoln County, Nevada. Study of published geologic data and field reconnaissance of key areas has been conducted to support the ERTS-1 data interpretation. The structural model suggests that a left-lateral strike-slip fault zone, called the Pahranagat Shear System, formed as a transform fault separating two areas of east-west structural extension.

N74-15015*# Argus Exploration Co., Los Angeles, Calif.
A RECONNAISSANCE SPACE SENSING INVESTIGATION OF CRUSTAL STRUCTURE FOR A STRIP FROM THE EASTERN SIERRA NEVADA TO THE COLORADO PLATEAU Progress Report, 1 Jul. - 31 Dec. 1973
Mark A. Liggett, Principal Investigator et al Jan. 1974 26 p refs ERTS
(Contract NAS5-21809)
(E74-10207; NASA-CR-136389) Avail: NTIS HC $3.50 CSCL 08E

The author has identified the following significant results. Research progress in an investigation using ERTS-1 MSS imagery to study regional tectonics and related natural resources is summarized. Field reconnaissance guided by analysis of ERTS-1 imagery has resulted in development of a tectonic model relating strike-slip faulting to crustal extension in the southern Basin Range Province. The tectonics of the northern Death Valley-Furnace Creek Fault Zone and spacially associated volcanism and mercury mineralization were also investigated. Field work in the southern Sierra Nevada has confirmed the existence of faults and diabase dike swarms aligned along several major lineaments first recognized in ERTS-1 imagery. Various image enhancement and analysis techniques employed in the study of ERTS-1 data are summarized.

N74-15020*# Servicio Geologico de Bolivia, La Paz.
PETROLEUM EXPLORATION SUBPROGRAM: GEOLOGICAL INTERPRETATION OF PROPORTIONAL IMAGERY FROM ERTS-A SATELLITE [SUB PROGRAMA EXPLORACION PETROLERA: INTERPRETACION GEOLOGICA DE IMAGENES PROPORCIO NADAS POR EL SATELITE ERTS-A]
C. E. Brockmann, Principal Investigator and Carlos Vargas Flores 30 Nov. 1973 14 p In SPANISH Sponsored by NASA ERTS
(E74-10213; NASA-CR-136476) Avail: NTIS HC $3.00 CSCL 08G

N74-15022*# Servicio Geologico de Bolivia, La Paz.
GEOMORPHOLOGY SUBPROGRAM: GEOMORPHOLOGICAL MAP OF OCCIDENTAL REGION OF BOLIVIA, UTILIZING ERTS IMAGERY [SUB-PROGRAMA GEOMORFOLOGIA: BOSQUEJO GEOMORFOLOGICO DE LA REGION OCCIDENTAL DE BOLIVIA UTILIZANDO IMAGENES ERTS]
C. E. Brockmann, Principal Investigator and M. Milton Suarez 6 Nov. 1973 14 p In SPANISH; ENGLISH summary Sponsored by NASA ERTS
(E74-10215; NASA-CR-136478) Avail: NTIS HC $3.00 CSCL 08E

The author has identified the following significant results. Due to the receipt of ERTS-1 imagery, Bolivia will have for the first time a geomorphological map at a scale of 1:100,000. Now the researcher and the student will be able to compare the distribution of the existing shapes of the country, which have been modelled by diverse processes, factors, and agents. This geomorphological information will be very useful in its application to mining, especially alluvial beds, engineering work, and other geological studies. This map is divided into ten geomorphological units which coincide with the geostructural units of the western region of the country.

N74-15024*# Servicio Geologico de Bolivia, La Paz.
REGIONAL GEOLOGY SUBPROGRAM: GEOLOGICAL INTERPRETATION OF ERTS IMAGERY OF THE OCCIDENTAL REGION OF BOLIVIA [SUB-PROGRAMA GEOLOGIA REGIONAL INTERPRETACION GEOLOGICA DE IMAGENES ERTS REGION - OCCIDENTAL DE BOLIVIA]
C. E. Brockmann, Principal Investigator and Raul Ballon Ayllon 30 Oct. 1973 24 p In SPANISH; ENGLISH summary Sponsored by NASA ERTS
(E74-10217; NASA-CR-136480) Avail: NTIS HC $3.25 CSCL 08G

The author has identified the following significant results. Using ERTS-1 imagery, it is possible to delimit great lithological units, folds, lineaments, faults, and in lesser degree unconformities. In the morphological aspect, the images show clearly the relief necessary for geological interpretation. The ERTS-1 images are important for the preparation of the geological and tectonic map of Bolivia, on a 1:1 million scale, if conventional methods of work are used as a base.

N74-15025*# Servicio Geologico de Bolivia, La Paz.
VOLCANISM SUBPROGRAM: VOLCANOLOGICAL INTERPRETATION OF THE NORTHERN PART OF THE OCCIDENTAL CORDILLERA OF BOLIVIA, UTILIZING ERTS IMAGERY [SUB-PROGRAMA VULCANISMO: INTERPRETACION VULCANOLOGICA DE LA PARTE SEPTENTRIONAL DE LA CORDILLERA OCCIDENTAL DE BOLIVIA, UTILIZANDO IMAGENES ERTS]
C. E. Brockmann, Principal Investigator and Siegfried Kussmaul 26 Oct. 1973 17 p refs In SPANISH; ENGLISH summary Sponsored by NASA ERTS
(E74-10218; NASA-CR-136481) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. In the present study, 6 ERTS-1 images have been interpreted on a 1:1 million scale (black and white) with the respective field reconnaissance. The area studied is located in the region bordering with Chile and includes the western part of the Bolivian Altiplano, the volcano Cordillera (western cordillera) and the northern part of Chile to the Pacific Coast. The greater part of this region is formed by Pliocene/Pleistocene volcani rock, which is discordant with the Tertiary sediments with intercalations of calcareous tuff. The ERTS-1 imagery permits the tracing of regional boundaries of the great volcanic formations and the alinements of the volcanic bodies along the fault zones. They also permit a clear examination of the volcanic apparatus, including their secondary forms, such as lava flows, parasitic cones, and lava domes. Because of the great scale, it is not possible to identify either the small structures or those of low relief. On the basis of the interpretation of the images, it is possible to give an idea of the relative age of the volcanoes.

N74-15029*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Nov. 1973
Keenan Lee, Principal Investigator 14 Dec. 1973 5 p EREP
(Contract NAS9-13394)
(E74-10224; NASA-CR-136487) Avail: NTIS HC $3.00 CSCL 08F

N74-15031*# Geological Survey, Denver, Colo.
REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Dec. 1973

Kenneth Watson, Principal Investigator Dec. 1973 3 p EREP (NASA Order T-6555-B)
(E74-10226; NASA-CR-136489) Avail: NTIS HC $3.00 CSCL 08E

N74-15033*# Kennecott Exploration, Inc., Salt Lake City, Utah. Exploration Services Dept.
RECOGNITION OF THE GEOLOGIC FRAMEWORK OF PORPHYRY DEPOSITS ON ERTS-1 IMAGERY Progress Report, Jul. - Dec. 1973
John C. Wilson, Principal Investigator 18 Jan. 1974 5 p ERTS
(Contract NAS5-21769)
(E74-10228; NASA-CR-136491) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Three major tectonic provinces have been mapped by geologic photointerpretation of ERTS-1 imagery over the Ok Tedi test site. These areas can be characterized as follows: (1) A broad area of low relief and mature topography suggesting a history of relative tectonic stability. (2) A narrow belt of moderate to high relief, broad open folds and prominent linear features. The Mount Fubilan-type porphyry copper deposits and recent volcanic effusive centers occur in this province. (3) A heterogeneous zone of high relief and high drainage density suggestive of relative structural complexity.

N74-15036*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Sep. - Nov. 1973
Charles W. Welby, Principal Investigator 11 Jan. 1974 2 p EREP
(Contract NAS9-13321)
(E74-10231; NASA-CR-136494) Avail: NTIS HC $3.00 CSCL 08B

N74-15048*# Wyoming Univ., Laramie. Dept. of Geology.
APPLICATION OF ERTS IMAGERY TO GEOLOGIC MAPPING IN THE VOLCANIC TERRANE OF NORTHWEST WYOMING Special Report
Roy M. Breckenridge 10 Dec. 1973 24 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21799)
(E74-10244; NASA-CR-136542; ERTS-1-5-73-5) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. ERTS-1 image interpretations in the Yellowstone/Absaroka volcanic province indicate that the ERTS-1 imagery can be successfully employed in mapping large-scale structures and gross lithologic differences within the volcanic rocks. The volcanic rocks are readily separable from the sedimentary and crystalline rocks but the various volcanic units are seldom distinguishable unless they exhibit a characteristic morphology. Color anomalies were detected on the ERTS-1 imagery and found to be related to zones of alteration and mineralization. High altitude aircraft imagery provided a means of checking and improving the interpretations.

N74-15050*# Lund Univ. (Sweden). Dept. of Physical Geography.
EVALUATION OF DATA UTILITY FOR EARTH SCIENCES FROM METHODICAL POINT OF VIEW Progress Report, Aug. 1973 - Jan. 1974
Harald Svensson, Sven Behrens, Karl Erik Bergsten, Karna Lidmar-Bergstroem, Sven Lindqvist, Jan Mattsson, and Siw Nordstroem, Principal Investigators 15 Jan. 1974 81 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10249; NASA-CR-136560) Avail: NTIS HC $6.25 CSCL 05B

N74-15057# Bureau of Mines, Denver, Colo.
DETECTION AND DELINEATION OF FAULTS BY SURFACE RESISTIVITY MEASUREMENTS: GAS HILLS REGION, FREMONT AND NATRONA COUNTIES, WYO.
Robert Lee Stahl 1973 32 p refs
(BM-RI-7824) Avail: NTIS HC $3.75

Comprehensive field tests were made in the Gas Hills, Wyo., to determine whether surface geophysical techniques could be used to detect and delineate faults in marginal uranium deposits. The tests included seismic refraction self-potential, induced polarization, magnetometer, electrical resistivity, airborne infrared thermal scanning, and airborne photography. Of the several geophysical techniques tested in the field, horizontal resistivity profiling with electrode spacings in the range of 25 to 50 feet was most diagnostic of faults. Author

N74-15070*# Scientific Translation Service, Santa Barbara, Calif.
OIL EXPLORATION SUBPROGRAM GEOLOGICAL INTERPRETATION OF IMAGES PROVIDED BY THE ERTS-A SATELLITE
C. Vargas F. Washington NASA Jan. 1974 10 p Transl. into ENGLISH of "Sub Program a Exploracion Petrolera, Interpretacion Geologica de Imagenes Proporcio Nadas por el Satelite ERTS-A", Servicio Geol. de Bolivia, Programa del Satelite Technol. de Resursos Nat., La Paz, report, 1973 9 p
(Contract NASw-2483)
(NASA-TT-F-15265) Avail: NTIS HC $3.00 CSCL 08G

Geological interpretation of three black and white images provided by the ERTS-A satellite is discussed. The study was to determine to what extent these images may be used to compile geological survey maps, using conventional photointerpretation techniques in the process. Author

N74-15072*# Scientific Translation Service, Santa Barbara, Calif.
TECTONIC PHYSICS SUBPROGRAM STRUCTURAL GEOLOGY OF BOLIVIA'S NORTHERN HIGH PLATEAU (SOUTHERN PERU AND NORTHERN CHILE)
C. Martinez Washington NASA Jan. 1974 11 p Transl. into ENGLISH of "Sub-Programa Tectonofisica Geologia Estructural del Altiplano Norte de Bolivia (Sur del Peru y norte de Chile)" La Paz, Servico Geologico di Bolivia, 1973 4 p
(Contract NASw-2483)
(NASA-TT-F-15263) Avail: NTIS HC $3.00 CSCL 08G

Data are based on two images from the ERTS-1 satellite. The purpose is to attempt a photogeological interpretation of these images. Author

05
OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

A74-10383 * # **Transequatorial effects of sea-surface temperature anomalies in a global general circulation model.** J. Spar (New York University, Bronx, N.Y.). *Monthly Weather Review*, vol. 101, July 1973, p. 554-563. 9 refs. Grant No. NGR-33-016-174.

An effort is made to describe the development of the model atmosphere's response to the sea-surface temperature (SST) anomalies in terms of their effect on the pole-to-pole meridional profile of the zonal mean 600-mb surface, which represents approximately the middle level of the model. The initial effect of a positive SST anomaly located in extratropical latitudes of the Pacific Ocean is found to be an inflation of the isobaric surfaces, relative to a control run, within the latitude band of the warm pool. In experiments with a North Pacific warm pool, the inflation continued for about 3 weeks in both winter and summer. G.R.

A74-10780 **Cloud parameters measured from the Cosmos-384 satellite.** A. B. Akvilonova, A. E. Basharinov, A. K. Gorodetskii, A. S. Gurvich, M. S. Krylova, B. G. Kutuza, D. T. Matveev, and A. P. Orlov (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki and Institut Fiziki Atmosfery, Moscow, USSR). *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol. 9, Feb. 1973, p. 187-189.) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics*, vol. 9, Feb. 1973, p. 102, 103. 5 refs. Translation.

A74-11400 # **Eddies along a Gulf Stream boundary viewed from a very high resolution radiometer.** R. J. DeRycke and P. K. Rao (NOAA, National Environmental Satellite Service, Suitland, Md.). *Journal of Physical Oceanography*, vol. 3, Oct. 1973, p. 490-492.

Pronounced eddies along the western edge of the Gulf Stream were observed by the Very High Resolution Radiometer aboard the NOAA-2 satellite. Similar eddies were seen on one previous occasion. In each case, there was an apparent relationship between the occurrence of the eddies and strong westerly winds. These eddies can also be attributed to the bottom topography of the region and the baroclinic instability along the Gulf Stream boundary. (Author)

A74-12197 * **Radar satellite altimetry and ocean wave height estimation.** R. P. Dooley and L. W. Brooks (Technology Service Corp., Silver Spring, Md.). In: EASCON '73; Electronics and Aerospace Systems Convention, Washington, D.C., September 17-19, 1973, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 193-198. Contract No. NAS6-2241.

The design of a radar satellite altimeter having a plus or minus 10 cm topographic resolution at 20 meter (peak-to-trough) ocean wave heights is described. In addition to altimetry, the resulting design also provides a measurement of significant wave height over the range of 1.0 to 20 meters to within plus or minus 10%. A full deramp pulse compression technique followed by an analog filter bank to separate individual range returns is used in the radar transmitter/receiver design to reduce the A/D converter bandwidth from a rather impractical 330 MHz to less than 1 MHz. The altimeter design utilizes an onboard maximum likelihood estimate (MLE) processor to achieve the plus or minus 10 cm topographic resolution. It is shown that an MLE processor provides simultaneous optimum (minimum variance) estimates of satellite altitude, ocean wave height and electromagnetic ocean surface reflectivity. (Author)

A74-12958 **The techniques of exploitation of ERTS-1 data used in the FRALIT program (Les techniques d'exploitation des données d'ERTS-1 utilisées dans le programme FRALIT).** F. Verger (Ecole Normale Supérieure, Paris, France) and P. Demathieu (Institut Géographique National, Paris, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 24-27. In French.

The FRALIT (French Atlantic Littoral) program concerns the study of swampy coasts of the ocean front of France and their maritime fringe. The program extends from Cap Gris-Nez to the south of the basin of Arcachon. The data of the FRALIT program were provided by NASA in the SYCI (System Corrected Image) system. Qualitative and quantitative techniques are described. They made use of separate and combined spectral bands. F.R.L.

A74-13700 **Ocean current monitoring employing a new satellite sensing technique.** A. E. Strong and R. J. DeRycke (NOAA, National Environmental Satellite Service, Hillcrest Heights, Md.). *Science*, vol. 182, Nov. 2, 1973, p. 482-484. 15 refs.

The very-high-resolution radiometer on the NOAA-2 (National Oceanic and Atmospheric Administration) satellite has recently obtained imagery in the visible channel containing sunglint over a major portion of the coastal waters off the eastern seaboard of the United States. An abrupt change in surface roughness has been observed at the shoreward edge of the Gulf Stream Current from Florida to Cape Hatteras that results from the opposition of waves propagating against the flow of the Gulf Stream. (Author)

A74-13866 **Wind dependence of radar sea return.** J. C. Daley (U.S. Navy, Naval Research Laboratory, Washington, D.C.). *Journal of Geophysical Research*, vol. 78, Nov. 20, 1973, p. 7823-7833. 16 refs. Navy-supported research.

Recently significant progress has been made in modeling sea return by means of a composite surface theory. All of the four-frequency radar sea return data obtained by the Naval Research Laboratory have been incorporated into this theory to provide a more accurate determination of the magnitude of sea return for vertical polarization. A value of the power law for the wave number spectrum of the sea close to that of -3.75 previously found by Kinsman (1965) was determined from the radar data. By means of this spectrum, equations have been developed that model vertically polarized sea return as a function of wind velocity and direction, radar wavelength, and depression angle. A power law dependence of sea return with wind velocity is introduced that is in agreement with the data in many cases. (Author)

A74-14484 # **ADP of airborne line scan imagery for nearshore bathymetry.** L. A. LeSchack and D. E. McIvor (Development and Resources Transportation Co., Silver Spring, Md.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 478-496. Contracts No. N00014-71-C-0327; No. N00014-73-C-0188. NR Project 387-055; NR Project 387-068.

The relationships which enable oceanographers to use photo-interpretation as a tool for the preliminary mapping of coastal areas are discussed, taking into account arguments determined from line-scan imagery. Individual airborne line scans are considered as aerial photographs whose dimension approaches zero as a limit in the direction of flight. Questions concerning the implementation of theory are investigated, giving attention to sample data, sample data preprocessing, and a preliminary test concerning the feasibility of the described concepts. G.R.

A74-14486 * **Application of automated multispectral analysis to Delaware's coastal vegetation mapping.** V. Klemas, F. Daiber, D. Bartlett, O. Crichton, and A. Fornes (Delaware, University, Newark, Del.). In: American Society of Photogrammetry, Annual

Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 512-527. 6 refs. NSF Grant No. GI-33369; Contracts No. NAS5-21837; No. N00014-69-A-0407.

A baseline mapping project was undertaken in Delaware's coastal wetlands as a prelude to an evaluation of the relative value of different parcels of marsh and the setting of priorities for use of these marshes. A description of Delaware's wetlands is given and a mapping approach is discussed together with details concerning an automated analysis. The precision and resolution of the analysis was limited primarily by the quality of the imagery used. G.R.

A74-16105 * Manned Earth Observatory - Possible contributions towards enhanced understanding of the marine environment. R. B. Gerding, G. F. Johnson (TRW Systems Group, Redondo Beach, Calif.), and D. K. Weidner (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Technology today and tomorrow; Proceedings of the Tenth Space Congress, Cocoa Beach, Fla., April 11-13, 1973. (A74-16101 04-31) Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1973, p. 2-3 to 2-12.

The Manned Earth Observatory (MEO) study being conducted by TRW under the management of NASA/MSFC will establish the conceptual design of and the mission requirements for an Earth Observation Laboratory that will be flown on Shuttle missions beginning in 1980. MEO offers a variety of unique inroads to improving our understanding of the marine environment. The Shuttle-MEO is a valuable addition to a multi-level multi-disciplinary remote sensing program. The unique attributes of MEO are its experimental flexibility due to man-instrument interaction, its complimentary orbit (intermediate between nonorbital and high-orbital platforms), its high weight and volume capacity, and short duration missions. (Author)

A74-16242 # Remote sensing at the Marine Sciences Directorate /Pacific Region/. J. F. R. Gower. *(Canadian Aeronautics and Space Institute, Aerospace Electronics Symposium, Saskatoon, Saskatchewan, Canada, Feb. 5-7, 1973.) Canadian Aeronautics and Space Journal,* vol. 19, Dec. 1973, p. 507-510.

A program of remote sensing evaluation for oceanography and hydrography is reviewed, and some of the projects in this program that are now underway are discussed. The discussed projects are in some cases only tentative evaluations of ideas, but they show the range of possibilities available for remote sensing of the ocean. M.V.E.

A74-17342 A new method for the study of magnetic anomalies of the 'sea shore' type (Nouvelle méthode d'étude des anomalies magnétiques de type 'bord de mer'). K. Babour and J. Mosnier (Ecole Normale Supérieure, Paris, France). *Annales de Géophysique,* vol. 29, Apr.-June 1973, p. 171-178. 24 refs. In French. Research supported by the Centre National de la Recherche Scientifique.

When simultaneous measurements of the transient variation of the horizontal components of the earth magnetic field, are made in several stations, not too far from each other, it is possible to bring to notice very weak anomalies produced by an irregularity in the distribution of the telluric currents. We have used this method for the study of the sea shore effect in Britany and noticed quite unexpected results. Electric currents flowing in salt water produce a supplementary field which can be calculated with a good approximation, but the theoretical distribution of this field is entirely different from the observed one. For a good analysis of the experimental results we must assume that the telluric currents responsible for the anomaly are flowing under the sea floor and that their distribution reflects the geological structure of the rock layers. (Author)

A74-17564 Classification of turbidity levels in the Texas marine coastal zone. E. A. Weisblatt, C. A. Reeves (Lockheed Electronics Co., Inc., Houston, Tex.), and J. B. Zaitzeff (NOAA, Rockville, Md.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-42 to 3A-59. 8 refs.

The unsupervised Iterative Self-Organizing Clustering System (ISOCLS) and the supervised Earth Resources Interactive Processing System (ERIPS) were used to detect, delineate, and classify near-surface turbidity patterns in Texas coastal waters using ERTS-1 Multispectral Scanner (MSS) digital data in the visible spectral bands from 0.5 to 1.1 micrometers, and related in situ water measurements. ERTS-1 multispectral scanner data are capable of discriminating water turbidity levels covering the range of 20 to 120 ppm observed in this study. The unsupervised classification algorithms were determined to be a more accurate technique for water classification. Of the four ERTS-1 channels available for classification, channel 5 (600-700 nm) and 6 (700-800 nm) yielded the most accurate results when compared with in situ measurements of water turbidities. T.M.

A74-17857 # Aerospace remote sensing oceanography. J. W. Sherman, III (NOAA, National Environmental Satellite Service, Washington, D.C.). *Environmental Data Service,* Sept. 1973, p. 3-12. 19 refs.

A status report is provided concerning the application of remote sensing techniques to oceanography. The basic ocean parameters which can be measured from space include surface wind and topography, surface temperature, sea ice, and ocean color. Considerations in remote sensing oceanography are discussed together with aspects of ocean dynamics, taking into account sea-surface temperature, ocean currents, sea-surface topography, and internal waves. Other subjects considered are biological activity, sea ice, and coastal processes. An abbreviated description of representative space sensors is given to indicate the range of space platforms that can be used to study and monitor the ocean environment. G.R.

A74-19032 * An iterative scheme for determining sea surface temperatures, temperature profiles, and humidity profiles from satellite-measured infrared data. M.-D. Chow (New York University; NASA, Goddard Institute for Space Studies, New York, N.Y.). *Journal of Geophysical Research,* vol. 79, Jan. 20, 1974, p. 430-434. 12 refs. Contract No. N00014-67-A-0467-0022.

N74-10352*# National Marine Fisheries Service, Bay Saint Louis, Miss.
OCEANIC GAMEFISH/SKYLAB PROJECT FIELD OPERATING PLAN FOR OPERATIONS 4, 5 AUGUST
27 Jul. 1973 159 p Sponsored by NASA
(NASA-CR-136032) Avail: NTIS HC $10.00 CSCL 08A

The operation plans are presented for the oceanic Gamefish/Skylab Experiment 240, which was conducted to obtain fish catch data for the northeast area of the Gulf of Mexico. The plans for surface measurements, aerial observations, and communications are included. F.O.S.

N74-10356*# Virginia Inst. of Marine Science, Gloucester Point.
APPLICATION OF REMOTE SENSING TO STUDY NEARSHORE CIRCULATION Annual Report
C. S. Welch and L. Haas Sep. 1973 85 p refs
(Grant NGL-47-022-005)
(NASA-CR-135827; AR-1) Avail: NTIS HC $6.75 CSCL 08C

Immediate use of drogued buoy tracking was made when the Virginia State Highway Department requested assistance in selecting the best route for a new bridge-tunnel complex across the James River at Newport News. The result was that the

Highway Department acted and chose a preferred route from several alternatives. It was also observed that the drogues did not follow the channel as predicted by the James River hydraulic model. This permitted telling the Navy why it is that part of their channel always silts up. The Hampton Roads Sanitation District asked help locate the best route and position of an ocean sewer outfall. Biological activities are focused primarily on delineating biological interaction between the marsh and continental shelf waters on Virginia's Eastern Shore. Information derived is helpful in categorizing the relative biological value of different marsh areas so that meaningful use and management decisions can be made concerning their eventual disposition.
Author

N74-10360*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF SLAR FOR MONITORING GREAT LAKES TOTAL ICE COVER
R. J. Jirberg, R. J. Schertler, R. T. Gedney, and H. Mark 1973 11 p refs Presented at the Interdisciplinary Symp. on Advan. Concepts and Tech. in the Study of Snow and Ice Resources, Monterey, Calif., 2-6 Dec. 1973
(NASA-TM-X-71473; E-7786) Avail: NTIS HC $3.00 CSCL 08L

A series of X-band SLAR images is presented showing the development and disintegration of the entire ice cover on Lake Erie during the winter of 1972-1973. Simultaneous ground truth observations and ERTS-1 photography establish accurate correlations of radar responses with ice conditions. The all-weather, broad areal mapping capability of SLAR is seen to be the means for obtaining the repeated coverage needed for winter navigation on the Great Lakes.
Author

N74-10373*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE MAPS OF THE POLAR ICE OF THE EARTH
P. Gloersen, T. T. Wilheit, T. C. Chang, W. Nordberg, and W. J. Campbell (USGS) Aug. 1973 40 p refs Submitted for publication Original contains color illustrations
(NASA-TM-X-70493; X-652-73-269) Avail: NTIS HC $4.00 CSCL 08L

Synoptic views of the entire polar regions of earth were obtained free of the usual persistent cloud cover using a scanning microwave radiometer operating at a wavelength of 1.55 cm on board the Nimbus-5 satellite. Three different views at each pole are presented utilizing data obtained at approximately one-month intervals during the winter of 1972-1973. The major discoveries resulting from an analysis of these data are as follows: (1) Large discrepancies exist between the climatic norm ice cover depicted in various atlases and the actual extent of the canopies. (2) The distribution of multiyear ice in the north polar region is markedly different from that predicted by existing ice dynamics models. (3) Irregularities in the edge of the Antarctic sea ice pack occur that have neither been observed previously nor anticipated. (4) The brightness temperatures of the Greenland and Antarctica glaciers show interesting contours probably related to the ice and snow morphologic structure.
Author

N74-10580*# Kansas Univ. Center for Research, Inc., Lawrence.
THE METEOROLOGICAL EFFECTS ON MICROWAVE APPARENT TEMPERATURES LOOKING DOWNWARD OVER A SMOOTH SEA
Steve Wu Washington NASA Nov. 1973 37 p refs
(Contract NAS1-10048)
(NASA-CR-2325; TR-186-1) Avail: NTIS HC $3.00 CSCL 04B

The effects of clouds and rain on microwave apparent temperatures for a flat sea surface are examined. The presence of clouds and rain can be expressed as a change of absorption coefficient and the total absorption is computed as the sum of individual effects. Various cloud and rain models proposed by meteorologists are employed to compute the microwave apparent temperature when viewing downward through these model atmospheres. It is shown that stratus, cumulus, overcast, and rain all contribute significantly to the observed temperature. Larger sensitivities to clouds and rain are observed for horizontally polarized apparent temperature at large nadir angles than for vertically polarized apparent temperature.
Author

N74-11160*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENTS Interim Report, May - Nov. 1973
George A. Maul, Principal Investigator Nov. 1973 10 p ERTS
(NASA Order S-70246-AG)
(E74-10025; NASA-CR-135866) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. Fourteen field experiments in support of the NOAA investigation of ocean color boundary determination using ERTS-1 data have been conducted since June 1972. The boundary between coastal waters and the Loop Current has been detected by ERTS-1 as a result of sea state changes as well as color differences. Computer enchancement of MSS data are revealing many features not shown in the NDPF product. Analysis of the 24 channel MSS data shows that a thermal IR channel is required on an ERTS MSS to distinguish between atmospheric and sea state effects. Cloud cover analysis suggests the need for daily coverage of this type sensor for routinely useful oceanographic applications.

N74-11167*# Delaware Univ., Newark. Coll. of Marine Studies.
DYNAMICS OF PLANKTON POPULATIONS IN UPWELLING AREAS
Karl-Heinz Szekielda, Principal Investigator Aug. 1973 12 p EREP
(Contract NAS9-13344)
(E74-10046; NASA-CR-135887) Avail: NTIS HC $3.00 CSCL 08A

N74-11180*# National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Oct. 1973
George A. Maul, Principal Investigator Oct. 1973 2 p EREP
(NASA Order T-4713-B)
(E74-10059; NASA-CR-135959; MPR-4) Avail: NTIS HC $3.00 CSCL 08C

N74-11202*# Research Triangle Inst., Research Triangle Park, N.C.
[RADAR BACKSCATTERING AS A MEANS FOR MEASURING OCEAN SURFACE PARAMETERS USING S193 ALTIMETRY AND S190B PHOTOGRAPHY] Monthly Progress Report, 1-31 Oct. 1973
Charles L. Britt, Jr., Principal Investigator 26 Nov. 1973 1 p EREP
(Contract NAS9-13304)
(E74-10092; NASA-CR-136004) Avail: NTIS HC $3.00 CSCL 08J

N74-11221 New York Univ., N.Y. Dept. of Meteorology and Oceanography.
A PROOF OF CONCEPT TEST OF A METHOD FOR DETERMINING THE WIND AND PRESSURE FIELDS IN THE PLANETARY BOUNDARY LAYER AND MEASURING WAVE HEIGHT OVER THE OCEAN BY MEANS OF A COMBINATION RADAR-PASSIVE MICROWAVE-ALTIMETER ON SKYLAB
W. J. Pierson and R. K. Moore *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 9-46 refs

(Contract NOAA-NG-31-72)

A combination scanning pencil beam radar-radiometer and altimeter, carried on Skylab, is described. The radar sea return and passive microwave measurements can be used to infer the winds and the wind stress over the oceans, and determine the vector wind and the atmospheric pressure field. The pulse shape in the altimeter mode contains information on wave height. This information can be used both to improve and verify numerical wave forecasting schemes. The aircraft program that developed these concepts is described. Theoretical work to develop the computer software to analyze the data from this instrument and integrate it into conventional data is described. This includes procedures for forecasting wave spectra, analyzing the wind fields in the planetary boundary layer, and simulations of procedures that integrate spacecraft data into the analysis of conventional data. Author (ESRO)

N74-11222 Environmental Protection Agency, Washington, D.C.

REMOTE SENSORS AND THEIR APPLICATION TO OCEANOGRAPHIC MONITORING

A. S. Lefohn and W. T. Sayers *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 48-55 refs

Remote sensing techniques as monitoring tools are described along with several types of sensor. These include infrared thermal scanners, simple camera systems (infrared color film), multiband cameras, multichannel scanning radiometers and chlorophyll correlation radiometers. The advantages and the state-of-the-art usage of these sensors are briefly noted. ESRO

N74-11223 Puget Sound Univ., Tacoma, Wash.

NASA REMOTE SENSING OF SEA ICE IN AIDJEX

W. J. Campbell *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 56-66 refs

AIDJEX (Arctic Ice Dynamics Joint Experiment) is described as an international and interdisciplinary study of the sea ice of the Arctic Ocean whose objective is to understand the dynamics and thermodynamic interaction between sea ice and its environment. A series of three AIDJEX pilot experiments using microwave radiometers aboard a CV-990 aircraft were made during the spring of 1970, 1971, and 1972, in the southern Beaufort Sea. The experiments and their results are described. ESRO

N74-11224 Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.

SEA ICE RECONNAISSANCE WITH THE RADAR

T. Tabata *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 67-75 refs

A radar network enabling the observation of sea ice distribution, and movement, along the Okhotsk Sea coast of Hokkaido, at any desired moment is described. ESRO

N74-11245 Miami Univ., Coral Gables, Fla. National Hurricane Research Lab.

USE OF SATELLITE INFRARED IMAGERY, AIRBORNE EXPENDABLE BATHYTHERMOGRAPHS AND AIRBORNE PRECISION INFRARED THERMOMETERS TO INFER THE MUTUAL INTERACTION OF HURRICANES AND THE UPPER MIXED LAYER OF THE OCEAN

P. G. Black and W. D. Mallinger *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 290-314 refs

It is shown that use of remote sensing methods such as satellite-borne, medium resolution, infrared radiometers; aircraft-borne, precision infrared thermometers; and expendable bathythermographs can be used to improve detection of the sea surface and sub surface temperature patterns. These tools are described and shown to be helpful in determining changes in tropical storm and hurricane intensity due to changes in sea surface temperature. ESRO

N74-11246 Japan Meteorological Agency, Tokyo. Meteorological Research Inst.

ON THE PLAN OF AMTEX OBSERVATIONAL PROBLEMS

M. Magata *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 315-325 refs

The aims of the air mass transformation experiment (AMTEX), a subprogram of GARP, are outlined. In order to solve the problems inherent in these aims, AMTEX is planned to carry out systematic meteorological observations which include boundary layer, cumulus convection and ocean studies, around the southwest islands of Japan. The problems and observations are discussed. ESRO

N74-11248 Scripps Institution of Oceanography, La Jolla, Calif.

THE NORTH PACIFIC EXPERIMENT: A STUDY OF LARGE SCALE OCEAN AND ATMOSPHERE FLUCTUATIONS IN THE PACIFIC

T. P. Barnett *In* WMO Means of Acquisition and Commun. of Ocean Data Vol. 2 1973 p 333-344 refs

(Contract N00014-69-A-0200-6006; Grant NSF GX-32481)

The North Pacific Experiment (NORPAX) which will be directed towards describing and understanding the interactions of the ocean/atmosphere systems in the North Pacific Basin, is described. The study will necessitate a data acquisition program capability of simultaneously monitoring selected geophysical fields in various areas of the Pacific Basin. The program will utilize data from moored and drifting buoys, ships, island stations, satellites and aircraft. The background, program, participation, and organization of the experiment are discussed. ESRO

N74-11255 Maritime Weather Office, Cape Town (South Africa).

SEA-SURFACE TEMPERATURE BY DIRECT SAMPLING

A. B. Crawford *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 410-424

Programs in the designing of special instruments to measure sea surface temperature by direct sampling methods, are reviewed. Five instruments are described - three remote reading electronic thermometers and two sea buckets. A comparison is made and results and costs are given. ESRO

N74-11257 National Environmental Satellite Service, Suitland, Md.

MARINE APPLICATIONS OF THE US ENVIRONMENTAL SATELLITE PROGRAM

H. W. Yates *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 438-466 refs

The use of satellites as observation platforms for meteorological and oceanographic parameters is discussed. The types of orbit best suited to satellites - polar and geostationary - are described and the methods of collecting data while in these orbits are considered. The limitations of satellite observations for oceanologic studies are noted. The parameters to be observed and measured are detailed and the instruments and their operation are described. Experiments in the observation of sea ice, sea temperature, cloud temperature and wind field are discussed. ESRO

N74-11258 Laboratoire de Meteorologie Dynamique, Paris (France).

THE EOLE EXPERIMENT

P. Morel *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 471-491 refs

The preliminary results of the EOLE experiment are presented. The principle of the experiment is to collect meteorological

data especially relating to atmospheric circulation from a large number of automatic instrument stations operating in the atmosphere either on the ocean surface or aloft (constant level balloons). The design of the system is described and the Southern Hemisphere mean circulation at 200 mb during the EOLE experiment discussed. The general circulation as a quasi two-dimensional turbulent flow is estimated and divergence of the horizontal flow at 200 mb is indicated. Marine applications of EOLE are considered. ESRO

N74-11263 National Center for Atmospheric Research, Boulder, Colo.
ATMOSPHERIC MEASUREMENTS OVER THE TROPICAL OCEANS USING SUPERPRESSURE BALLOONS
V. E. Lally *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 564-566 refs

The use of the superpressure balloon to determine the wind field in the tropical stratosphere and the atmospheric circulation in the Southern Hemisphere is discussed. The carrier balloon vehicle is described together with the communication system. The need for compatible data collection systems is discussed and the cost of carrier balloon soundings estimated. ESRO

N74-11264 Reading Univ. (England). Dept. of Geophysics.
THE OPERATION OF RADIOSONDES IN THE BOUNDARY LAYER OVER THE SEA
G. P. Britton *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 567-581

A method is described whereby remote sensing of the lowest layers of the atmosphere over the ocean is achieved by radiosondes. The method is an extension of the principle whereby after a time interval the sonde returns to the sea surface as a drop sonde permitting two or more transits of the boundary layer so that at least two, and usually four, sets of independent soundings can be obtained. The various components of the system - release mechanisms, float, pressure valve - are described as well as the radiosonde itself. The problems of windfinding are considered and some cases of variation in rates of ascent and descent are given. ESRO

N74-11265 National Oceanic and Atmospheric Administration, Boulder, Colo.
A NOTE ON THE FM-CW RADAR AS A REMOTE PROBE OF THE PACIFIC TRADE WIND INVERSION
B. R. Bean, R. E. McGavin, and B. D. Warnert *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 582-593 refs

A vertically pointed FM-CW radar was used to monitor the Pacific trade wind inversion in the Hawaiian Islands during the summer of 1971. An instrumented aircraft was used for in-situ measurements of radio refractivity and temperature. The correspondence between the position of the radar returns and the aircraft data was excellent. The strong returns seen by the radar were due chiefly to the strong lapse of humidity across the inversion. The radar indicated that over the island of Lanai the trade wind inversion was highly variable both in position and intensity. At times the layer would move from above 2 km to less than 1 km in the space of five minutes associated with strong mechanical turbulence. Its thickness would change rapidly from tens of meters to hundreds of meters. Wave-like structure induced by the mountains on the east side were observed by the radar. The analysis indicates the interpretation of in-situ aircraft measurements may be greatly aided by using the FM-CW radar as a guide. Author (ESRO)

N74-11282# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EFFECT OF SEA STATE ON BRIGHTNESS TEMPERATURE
A. E. Basharinov and A. M. Shutko 31 Jul. 1973 27 p refs Transl. into ENGLISH Akad. Nauk SSSR, Inst. Radiotekhn. i Elektroniki, report, 1971 p 1-29
(AD-765996; FTD-HT-23-001-74) Avail: NTIS CSCL 08/3

The authors present the results of experimental studies and appropriate model calculations of the characteristics of the thermal radiation field of a water surface in the shf range - the average values of emittance, the degree of polarization, and the space-time variations of radiation intensity. Measurements made at a coastal point on the 0.8, 1.35, 1.6, 3.2, and 3.37-cm bands from on board an aircraft on the 3-cm band, and aboard the Kosmos-243 satellite on the 0.8, 1.35, 3.4, and 8.5-cm bands made it possible to obtain dependences of the radiation characteristics on the force of sea swells. Observations from the coastal region and aboard the aircraft were performed with wind speeds to 5-7.5 m/s, those from the Kosmos-243 - to 15-20 m/s. GRA

N74-12135*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC CALIBRATION OF EREP IMAGERY AND OCEANOGRAPHY OF BLOCK ISLAND SOUND Monthly Progress Report, Oct. 1973
Edward Yost, Principal Investigator 19 Oct. 1973 3 p EREP (Contract NAS9-13308)
(E74-10071; NASA-CR-135818) Avail: NTIS HC $3.00 CSCL 08J

N74-12147*# National Environmental Satellite Service, Washington, D.C.
EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES Semiannual Report, May - Oct. 1973
Alan E. Strong, Principal Investigator Oct. 1973 8 p ERTS (NASA Order S-70246-AG)
(E74-10093; NASA-CR-136005; SAR-3) Avail: NTIS HC $3.00 CSCL 08A

The author has identified the following significant results. (1) Sunglint effects over water can be expected in ERTS-1 images whenever solar elevations exceed 55 deg. (2) Upwellings were viewed coincidently by ERTS-1 and NOAA-2 in Lake Michigan on two occasions during August 1973. (3) A large oil slick was identified 100 km off the Maryland coast in the Atlantic Ocean. Volume of the oil was estimated to be least 200,000 liters (50,000 gallons). (4) ERTS-1 observations of turbidity patterns in Lake St. Clair provide circulation information that correlates well with physical model studies made 10 years ago. (5) Good correlation has been established between ERTS-1 water color densities and NOAA-2 thermal infrared surface temperature measurements. Initial comparisons have been made in Lake Erie during March 1973.

N74-12202# Army Coastal Engineering Research Center, Washington, D.C.
AN ANNOTATED BIBLIOGRAPHY OF AERIAL REMOTE SENSING IN COASTAL ENGINEERING
Donald B. Stafford, Richard O. Bruno, and Harris M. Goldstein May 1973 133 p
(AD-766720; CERC-Misc-Paper-2-73) Avail: NTIS CSCL 08/6

A bibliography is presented of representative literature covering the applications of aerial remote sensing techniques to coastal engineering. About 200 references published since 1934 are presented. Annotations accompany each bibliographic entry and are a concise and informative summary of the references describing the characteristics of each remote sensor in coastal engineering investigations. Computer indexes of authors, titles and keywords are included. Author (GRA)

N74-13045*# Alaska Univ., Fairbanks.
SEA, ICE AND SURFACE WATER CIRCULATION, ALASKAN CONTINENTAL SHELF Bimonthly Progress Report
G. D. Sharma, F. F. Wright, and J. J. Burns, Principal Investigators [1973] 5 p ERTS

(Contract NAS5-21833)
(E74-10118; NASA-CR-136131; BMPR-8) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. ERTS-1 imagery has been extremely useful in understanding the tidal water movements in a large estuary such as Cook Inlet. As more imagery obtained during various tidal stages become available it appears that complex and fast changing micro-circulation patterns develop in various regions of Cook Inlet during each advancing and receding tide. More ERTS-1 synoptic imagery is needed to fully understand the effect of the approach of tidal front on the water movements in the various regions through the estuary. The conventional onboard ship data gathered during various cruises although revealed the overall circulation pattern in Cook Inlet but failed to show micro-subgyres which develop in various regions during each tide which are discernible on ther ERTS-1 imagery. Suspended load distribution in the Bering Sea during summer varies significantly. In areas of phytoplankton bloom and at the river mouths the suspended load is higher than the 1 mg/l which is found over most areas. The influence of major rivers on temperature, salinity, and suspended load in surface water as well as at shallow depth is apparent. On the Bering shelf a strong pycnocline generally at depth 10-20 m is formed by surface fresh water flow which retains sediment in suspension over extended periods.

N74-13060*# Delaware Univ., Newark. Coll. of Marine Studies.
MONITORING COASTAL WATER PROPERTIES AND CIRCULATION FROM ERTS-1
V. Klemas, Principal Investigator 13 Dec. 1973 2 p ERTS (Contract NAS5-21837)
(E74-10133; NASA-CR-136178) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. Imagery and digital tapes from nine successful ERTS-1 passes over Delaware Bay during different portions of the tidal cycle have been analyzed with special emphasis on turbidity, current circulation, waste disposal plumes, and convergent boundaries between different water masses. ERTS-1 image radiance correlated well with Secchi depth and suspended sediment concentration. MSS band 5 seemed to give the best representation of sediment load in the upper one meter of the water column. Circulation patterns observed by ERTS-1 during different parts of the tidal cycle, agreed well with predicted and measured currents throughout Delaware Bay. During flood tide the suspended sediment as visible from ERTS-1 also correlated well with the depth profile. Convergent shear boundaries between different water masses were observed from ERTS-1, with foam lines containing high concentrations of lead, mercury, and other toxic substances. Several fronts have been seen. Those near the mouth of the bay are associated with the tidal intrusion of shelf water. Fronts in the interior of the bay on the Delaware side appear to be associated with velocity shears induced by differences in bottom topography. Waste disposal plumes have benn detected 36 miles offshore.

N74-13070*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC CALIBRATION OF EREP IMAGERY AND OCEANOGRAPHY OF BLOCK ISLAND SOUND Monthly Progress Report, Nov. 1973
Edward Yost, Principal Investigator 20 Nov. 1973 2 p EREP (Contract NAS9-13308)
(E74-10144; NASA-CR-136189) Avail: NTIS HC $3.00 CSCL 08J

N74-13090*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
POLAR SEA ICE OBSERVATIONS BY MEANS OF MICROWAVE RADIOMETRY
P. Gloersen, T. C. Chang, T. T. Wilheit, and W. J. Campbell (Geol. Surv., Tacoma) Nov. 1973 12 p refs Presented at Interdisciplinary Symp. on Advanced Concepts and Techniques in the Study of Snow and Ice Resources
(NASA-TM-X-70529; X-652-73-341) Avail: NTIS HC $3.00 CSCL 08L

Principles pertinent to the utilization of 1.55 cm wavelength radiation emanating from the surface of the earth for studying the changing characteristics of polar sea ice are briefly reviewed. Recent data obtained at that wavelength with an imaging radiometer on-board the Nimbus 5 satellite are used to illustrate how the seasonal changes in extent of sea ice in both polar regions may be monitored free of atmospheric interference. Within a season, changes in the compactness of the sea ice are also observed from the satellite. Some substantial areas of the Arctic sea ice canopy identified as first-year ice in the past winter were observed not to melt this summer, a graphic illustration of the eventual formation of multiyear ice in the Arctic. Finally, the microwave emissivity of some of the multiyear ice areas near the North Pole was found to increase significantly in the summer, probably due to liquid water content in the firm layer. Author

N74-13111# Wisconsin Univ., Milwaukee. Dept. of Geological Sciences.
GRAVITY SURVEYS OF THE ARCTIC OCEAN BASIN Final Report
Richard J. Wold Jan. 1973 232 p refs
(Contract N00014-67-A-0128-0006; NR Proj. 307-316)
(AD-766979) Avail: NTIS CSCL 08/5

Gravity observations were conducted from ice-island ARLIS-11 from 1 July 1961 to 8 May 1965. In addition, over 800 air-lifted gravity stations were occupied during the period from 1960 through 1969. This data is described, plotted in profiles, contour maps drawn and detailed listings of all the gravity data are included. Author (GRA)

N74-13113# Scripps Institution of Oceanography, San Diego, Calif. Marine Physical Lab.
MARINE PHYSICAL LABORATORY DEEP TOW INSTRUMENTATION SYSTEM
Fred N. Spiess and Robert C. Tyce 1 Mar. 1973 43 p refs
(Contract N00014-69-A-0200-6002; Grants NSF GA-20014; NSF GA-31377X; NR Proj. 260-103)
(AD-766477; Sio-Ref-73-4; MPL-U-69/72) Avail: NTIS CSCL 08/10

A survey of the Marine Physical Laboratory deep tow instrumentation system is presented. Included are descriptions of the development and implementation of the hardware, instrumentation, and techniques involved in the use of this deep towed submersible instrument platform for oceanographic research. The system is equipped with up-, down-, forward-, and side-looking sonars, as well as low-frequency (rkHz) bottom penetrating sonar, proton precession magnetometer, precision temperature probe, stereo cameras and strobe light, and snapshot television. Control information and data are telemetered along the supporting coaxial cable bilaterally between the fish near the bottom and the laboratory aboard ship. Precision navigation of both fish and ship is accomplished by means of a network of acoustic transponders. Since its initial usage in late 1964, the system has been in operation for over 10,000 hours in depths down to and exceeding 7000 meters. Author (GRA)

N74-13116# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON COMPUTING THE CORRECTION FOR SEA-BOTTOM TOPOGRAPHY IN GRAVITY PROFILING SURVEYS
V. P. Melikhov, A. G. Gaynonov, and V. L. Panteleev Jun. 1973 14 p refs Transl. into ENGLISH from Morsk. Gravimetricheskiye Issled. (Moscow), no. 6, 1972 p 67-71
(AD-766550; DMAAC-TC-1949) Avail: NTIS CSCL 08/5

In the development of methods for computation of the correction for the sea-bottom topography, great difficulties

associated with the characteristics of the type of gravimetric survey, and with the extent of information of topography are encountered. This paper discusses a priori information, i.e., that which was obtained from surveys carried out earlier, and the data which are obtained from direct echo sounding of the ocean floor in the process of profile traversing. A priori information could be a solution to the correction problem. Author (GRA)

N74-14032*# Research Triangle Inst., Research Triangle Park, N.C.
[RADAR BACKSCATTERING AS A MEANS FOR MEASURING OCEAN SURFACE PARAMETERS USING S193 ALTIMETRY AND S190B PHOTOGRAPHY] Monthly Progress Report, Nov. 1973
Charles L. Britt, Jr., Principal Investigator 19 Dec. 1973 1 p EREP
(Contract NAS9-13304)
(E74-10164; NASA-CR-136291) Avail: NTIS HC $3.00 CSCL 08J

N74-14033*# Delaware Univ., Newark.
DYNAMICS OF PLANKTON POPULATIONS IN UPWELLING AREAS
Karl-Heinz Szekielda, Principal Investigator Jul. 1973 24 p EREP
(Contract NAS9-13344)
(E74-10165; NASA-CR-136292) Avail: NTIS HC $3.25 CSCL 08A

N74-14060*# Geological Survey, Menlo Park, Calif.
PRINCIPAL SOURCES AND DISPERSAL PATTERNS OF SUSPENDED PARTICULATE MATTER IN NEARSHORE SURFACE WATERS OF THE NORTHEAST PACIFIC OCEAN Progress Report, 1 Apr. - 15 Nov. 1973
Paul R. Carlson, Principal Investigator and Richard J. Janda 15 Nov. 1973 12 p refs ERTS
(NASA Order S-70243-AG-7)
(E74-10186; NASA-CR-136325) Avail: NTIS HC $3.00 CSCL 08J

The author has identified the following significant results. Release-recovery paths of drift cards released in conjunction with ERTS-1 overflight show that nearshore surface currents along the central and northern California coast flowed southward at an average rate in excess of 10 cm/sec (8.5 km/day) during August and September 1973 (California Current). By the middle of October 1973, the nearshore surface currents had reversed and the dominant flow velocity was northward at an average rate in excess of 20 cm/sec (17 km/ day) (Davidson Current). The August-September data suggested the presence of counter-clockwise gyres in Monterey Bay and the Gulf of the Farallones, but by the middle of October, the gyres were no longer evident. Imagery of April 1973 showed well developed plumes of suspended sediment in Monterey Bay from the Salinas River and in the Gulf of the Farallones from San Francisco Bay. ERTS-1 imagery provides an effective means of monitoring timber harvest in the redwood forest along the northern California coast. ERTS-1 imagery also clearly portrays contrasting topographic belts characterized by fluvial erosion and by mass movement. The most visually apparent and most persistent river mouth suspended sediment plumes are associated with those rivers that drain belts of topography that appear to have been eroded primarily by mass movement.

N74-14081*# Old Dominion Univ. Research Foundation, Norfolk, Va. Inst. of Oceanography.
EVALUATION OF SUBMARINE STRAIN-GAGE SYSTEMS FOR MONITORING COASTAL SEDIMENT MIGRATION
Gerald L. Shideler and Dennis G. Mcgrath Aug. 1973 59 p refs
(Contract NAS1-9434)
(NASA-CR-132368; TR-11) Avail: NTIS HC $5.00 CSCL 08C

Single and multiple strain-gage systems were respectively evaluated as in situ point and areal sensors for monitoring sand-height variations in coastal environments. Static loading tests indicate that gage response pressure is linear for sand heights up to 24 inches. Response pressures are a function of both sand height and aggregate density, with density being influenced by both sediment texture and degree of compaction. Poorer sediment sorting and greater compaction result in higher response pressures. Field tests in a beach foreshore environment indicate that the gage systems are effective qualitative instruments for monitoring long-period migration trends of beach sediments; whereas, short-period responses are not sufficiently reliable. The durability and compactness of the gage systems must be substantially increased for effective field operations. It is recommended that the systems' qualitative potentials be further developed, whereas their development as quantitative instruments be terminated. Further development should emphasize the construction of remote recording systems designed for semipermanent installation. Author

N74-14106# Washington Univ., Seattle. Div. of Marine Resources.
ARCTIC ICE DYNAMICS JOINT EXPERIMENT, AIDJEX BULLETIN
Jul. 1973 208 p refs
(Grant NSF C-625)
(PB-223387/2GA; AIDJEX-Bull-21; AIDJEX-73-21) Avail: NTIS HC $5.50 CSCL 04B

Two-dimensional stress and strain-rate in a floating ice cover, the thickness distribution of sea ice, steady drift of an incompressible Arctic ice cover, mesoscale strain in sea ice, and a method for calculating boundary stress in an atmospheric boundary layer are examined. Futher work in remote-sensed data analysis is also discussed, in particular sonar mapping of the underside of sea ice and determining pressure ridge frequency distributions from laser data. GRA

N74-14108# National Oceanic and Atmospheric Administration, Silver Spring, Md. Environmental Data Service.
INTERNATIONAL DECADE OF OCEAN EXPLORATION, JANUARY 1970 TO JULY 1972 Progress Report
Jan. 1973 39 p refs
(PB-223331; NSF/IDOE-73-19) Avail: NTIS HC $4.00 CSCL 08J

The report provides the scientific community and other interested persons with information, data inventories, and lists of scientific reports pertinent to ocean exploration. The text is arranged according to the program areas established for IDOE. The appendix contains the National Marine Data Inventory (NAMDI), a computerized summary of reported observations made at sea during the period. The program areas are: Environmental quality environmental forecasting seabed assessment program, and living resources. GRA

N74-14269*# Kansas Univ. Center for Research, Inc., Lawrence.
TOWARD RADSCAT MEASUREMENTS OVER THE SEA AND THEIR INTERPRETATION
J. P. Claassen, A. K. Fung, S. T. Wu, and H. L. Chan Washington NASA Nov. 1973 123 p refs
(Contract NAS1-10048)
(NASA-CR-2328; TR-186-6) Avail: NTIS HC $4.25 CSCL 04B

Investigations into several areas which are essential to the execution and interpretation of suborbital observations by composite radiometer - scatterometer sensor (RADSCAT) are reported. Experiments and theory were developed to demonstrate the remote anemometric capability of the sensor over the sea through various weather conditions. It is shown that weather situations found in extra tropical cyclones are useful for demonstrating the all weather capability of the composite sensor. The large scale fluctuations of the wind over the sea dictate

the observational coverage required to correlate measurements with the mean surface wind speed. Various theoretical investigations were performed to establish a premise for the joint interpretation of the experiment data. The effects of clouds and rains on downward radiometric observations over the sea were computed. A method of predicting atmospheric attenuation from joint observations is developed. In other theoretical efforts, the emission and scattering characteristics of the sea were derived. Composite surface theories with coherent and noncoherent assumptions were employed. Author

N74-14700# Naval Research Lab., Washington, D.C.
NRL PROGRESS REPORT, MAY 1973
May 1973 62 p refs
(PB-223053/0) Avail: NTIS HC $3.00; also available on subscription $22.50/year domestic, $28.25/year foreign CSCL 05B

The research activities of the NRL are reported. Two articles are presented. These are space science research in 1973, and high energy astronomy. Areas in which progress is reported include: acoustics, communications, electronics, metallurgy, oceanology, and radar. F.O.S.

N74-15006*# RAND Corp., Santa Monica, Calif.
APPLICABILITY OF ERTS TO ANTARCTIC ICEBERG RESOURCES
John L. Hult, Principal Investigator and Neill C. Ostrander Dec. 1973 26 p refs Presented at 3d ERTS-1 Symp., Washington, D. C., 10-13 Dec. 1973 Sponsored in part by NSF Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21905)
(E74-10198; NASA-CR-136363; P-5137) Avail: NTIS HC $3.50 CSCL 08L

The author has identified the following significant results. This investigation explorers the applicability of ERTS to (1) determine the Antarctic sea ice and environmental behavior that may influence the harvesting of icebergs, and (2) monitor iceberg locations, characteristics, and evolution. Imagery has shown that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the glowing promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global thirst for fresh water. Several years of comprehensive monitoring will be necessary to characterize sea ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means of harmonizing entitlements of iceberg resources. The valuable ERTS services will be more cost effective than other means will be easily justified and borne by the iceberg harvesting operations.

N74-15008*# RAND Corp., Santa Monica, Calif.
APPLICABILITY OF ERTS FOR SURVEYING ANTARCTIC ICEBERG RESOURCES Final Report, Feb. - Jul. 1973
John C. Hult, Principal Investigator and Neill C. Ostrander Nov. 1973 58 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21905; Grant NSF GI-34981)
(E74-10200; NASA-CR-136382; R-1354-NASA/NSF) Avail: NTIS HC $5.00 CSCL 08L

The author has identified the following significant results. This investigation explores the applicability of ERTS to (1) determine the Antarctic sea ice and environmental behavior that may influence the harvesting of icebergs, and (2) monitor iceberg locations, characteristics, and evolution. From image sampling, it is found that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global thirst for fresh water. Thermal sensor bands will provide coverage in daylight and darkness. Several years of comprehensive monitoring will be necessary to characterize sea ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means for harmonizing entitlements to iceberg resources. The valuable ERTS services will be more cost effective than other means and will be easily justified and borne by the iceberg harvesting operation.

N74-15017*# Research Triangle Inst., Research Triangle Park, N.C.
[RADAR BACKSCATTERING AS A MEANS FOR MEASURING OCEAN SURFACE PARAMETERS USING S193 ALTIMETRY AND S190B PHOTOGRAPHY] Monthly Progress Report, 1-31 Dec. 1973
Charles L. Britt, Jr., Principal Investigator 16 Jan. 1974 1 p EREP
(Contract NAS9-13304)
(E74-10209; NASA-CR-136391) Avail: NTIS HC $3.00 CSCL 08J

N74-15037*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Dec. 1973 - 10 Jan. 1974
William H. Stevenson, Principal Investigator 11 Jan. 1974 5 p EREP
(NASA Order T-8217-B)
(E74-10232; NASA-CR-136495; MPR-8) Avail: NTIS HC $3.00 CSCL 08A

N74-15039*# National Marine Fisheries Service, Bay Saint Louis, Miss. Fisheries Engineering Lab.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING. SKYLAB OCEANIC GAMEFISH PROJECT Monthly Progress Report, 10 Oct. - 10 Nov. 1973
William H. Stevenson, Principal Investigator and K. J. Savastano 14 Nov. 1973 331 p EREP
(NASA Order T-8217-B)
(E74-10234; NASA-CR-136501; MPR-6) Avail: NTIS HC $18.75 CSCL 08A

N74-15044*# National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
REMOTE DETECTION OF OCEAN FEATURES IN THE LESSER ANTILLES USING ERTS-1 DATA Progress Report
Kirby J. Hanson, Principal Investigator 15 Jan. 1974 24 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Ave., Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70246-AG-1)
(E74-10240; NASA-CR-136538) Avail: NTIS HC $3.25 CSCL 08J

The author has identified the following significant results. Photographic data received from the ERTS-1 satellite over the Lesser Antilles Islands shows distinct ocean features on the leeward side of each island. Attempts to relate these features to ocean eddy formations with the aid of ground truth data proved unsuccessful. However, analysis of surface and upper air wind data correlate extremely well with the size, shape, and downwind extent of the ocean features. Studies to date indicate strongly that these features result from horizontal differences in sea surface roughness due to the wind shadow effect of the islands. The results suggest that horizontal variations in the reflectance of the sea surface will make remote sensing of the ocean mixed layer more difficult than previously anticipated. The surface reflection seems to be large enough to mask the smaller variations in backscattered energy from the mixed layer. Efforts to limit the effect of surface reflectance by photographic differencing of two MSS bands were unsuccessful. A sup-

plementary study to enhance the energy reflected from the mixed layer through numerical differencing of ERTS-1 digital data is planned.

N74-15046*# National Oceanic and Atmospheric Administration, Miami, Fla. Altantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Dec. 1973
George A. Maul, Principal Investigator Dec. 1973 32 p refs
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP
(NASA Order T-4713-B)
(E74-10242; NASA-CR-136540; MPR-6) Avail: NTIS HC $3.75 CSCL 08C

The author has identified the following significant results. A time series of the Loop Current in the Gulf of Mexico, covering an annual cycle of growth, spreading, and decay, has been obtained in synchronization with ERTS-1. Computer enhanced images, which are necessary to extract useful oceanic information, show that the current can be observed either by color or sea state effects associated with the cyclonic boundary. The color effect relates to the spectral variations in the optical properties of the water and its suspended particles, and is studied by radiative transfer theory. Significant oceanic parameters identified are: the probability of forward scattering, and the ratio of scattering to total attenuation. Several spectra of upwelling diffuse light are computed as a function of the concentration of particles and yellow substance. These calculations compare favorably with experimental measurements and show that the ratio of channels method gives ambiguous interpretative results. These results are used to discuss features in images where surface measurements were obtained and are extended to tentative explanation in others.

N74-15047*# National Oceanic and Atmospheric Administration, Miami, Fla. Altantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Report, Nov. 1973
George A. Maul, Principal Investigator Nov. 1973 2 p EREP (NASA Order T-4713-B)
(E74-10243; NASA-CR-136541; MR-5) Avail: NTIS HC $3.00 CSCL 08C

N74-15061*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETECTION OF OCEAN COLOR CHANGES FROM HIGH ALTITUDES
Warren A. Hovis, Michael L. Forman, and Lamdin R. Blaine Nov 1973 30 p refs Submitted for publication
(NASA-TM-X-70559; X-652-73-371) Avail: NTIS HC $3.50 CSCL 08A

The detection of ocean color changes, thought to be due to chlorophyll concentrations and gelbstoffe variations, is attempted from high altitude (11.3km) and low altitude (0.3km). The atmospheric back scattering is shown to reduce contrast, but not sufficiently to obscure color change detection at high altitudes. Author

N74-15063*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY MODEL IMPROVEMENT INVESTIGATION
J. W. Siry, W. D. Kahn, J. W. Bryan, and F. F. Vonbun Jan. 1973 15 p refs
(NASA-TM-X-70550; X-590-73-249) Avail: NTIS HC $3.00 CSCL 08N

This investigation was undertaken to improve the gravity model and hence the ocean geoid. A specific objective is the determination of the gravity field and geoid with a space resolution of approximately 5 deg and a height resolution of the order of five meters. The concept of the investigation is to utilize both GEOS-C altimeter and satellite-to-satellite tracking data to achieve the gravity model improvement. It is also planned to determine the geoid in selected regions with a space resolution of about a degree and a height resolution of the order of a meter or two. The short term objectives include the study of the gravity field in the GEOS-C calibration area outlined by Goddard, Bermuda, Antigua, and Cape Kennedy, and also in the eastern Pacific area which is viewed by ATS-F. A.L.

N74-15068*# New York Univ., N.Y. School of Engineering and Science.
THE ELEVATION, SLOPE, AND CURVATURE SPECTRA OF A WIND ROUGHENED SEA SURFACE Final Report
Willard J. Pierson, Jr. and Robert A. Stacy Washington NASA Dec. 1973 129 p refs
(Contract NAS1-10090)
(NASA-CR-2247) Avail: NTIS HC $4.50 CSCL 08C

The elevation, slope and curvature spectra are defined as a function of wave number and depend on the friction velocity. There are five wave number ranges of definition called the gravity wave-gravity equilibrium range, the isotropic turbulence range, the connecting range due to Leykin Rosenberg, the capillary range, and the viscous cutoff range. The higher wave number ranges are strongly wind speed dependent, and there is no equilibrium (or saturated) capillary range, at least for winds up to 30 meters/sec. Some properties of the angular variation of the spectra are also found. For high wave numbers, especially in the capillary range, the results are shown to be consistent with the Rayleigh-Rice backscattering theory (Bragg scattering), and certain properties of the angular variation are deduced from backscatter measurements. Author

N74-15074*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
OCEAN GEOID DETERMINATION INVESTIGATION
J. W. Siry, W. D. Kahn, J. W. Bryan, and F. O. Vonbun Jan. 1973 20 p refs
(NASA-TM-X-70551; X-590-73-250) Avail: NTIS HC $3.00 CSCL 08J

Proposals of investigation for the GEOS-C Ocean Geoid Determination mission are discussed for studying the mean sea level geopotential surface using the altimeter and the satellite-to-satellite tracking system. Factors affecting the interpretation of GEOS-C altimeter data for determining the MSL geometry are analyzed along with data processing. F.O.S.

N74-15082# Rockwell International Corp., Downey, Calif. Space Div.
COASTAL BATHYMETRIC PLOTTING Final Summary Report, 22 Feb. - 28 Sep. 1973
David T. Hodder 28 Sep. 1973 79 p refs
(Contract N00014-72-C-0149)
(AD-767721; SD-73-SA-0131) Avail: NTIS CSCL 08/10

The report summarizes the most recent research into the spatial temporal image merging technique for remote sensing of bathymetry in turbid coastal waters. Prior research had proved the method under average to optimum turbid water seeing conditions. This report discusses the degradation of the method under more severe environmental conditions and evaluates auxiliary methods for its improvement under difficult conditions. Factors such as sea state bottom reflectance variation and differing sediment loads are considered. Auxiliary methods for remote calibration include thermal IR scanning for surface current mapping, electronic removal of solar glitter patterns and spectral brightness variations in the sea, together with multiple color dye releases at their characteristic optical extinction depths to infer vertical current and hence sediment distribution. A final task is the preliminary evaluation of this bathymetry plotting method from ERTS-1 space imagery in a number of non-California, turbid coastal water types. (Modified author abstract) GRA

N74-15525*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.

THE SPACE SHUTTLE PAYLOAD PLANNING WORKING GROUPS. VOLUME 8: EARTH AND OCEAN PHYSICS

Final Report

May 1973 30 p

(NASA-TM-X-69460) Avail: NTIS HC $3.50 CSCL 22B

The findings and recommendations of the Earth and Ocean Physics working group of the space shuttle payload planning activity are presented. The requirements for the space shuttle mission are defined as: (1) precision measurement for earth and ocean physics experiments, (2) development and demonstration of new and improved sensors and analytical techniques, (3) acquisition of surface truth data for evaluation of new measurement techniques, (4) conduct of critical experiments to validate geophysical phenomena and instrumental results, and (5) development and validation of analytical/experimental models for global ocean dynamics and solid earth dynamics/earthquake prediction. Tables of data are presented to show the flight schedule estimated costs, and the mission model. Author

06
HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

A74-10339 # **Satellites - What can they offer hydrology.** R. B. Painter (Institute of Hydrology, Wallingford, Berks., England). *(British Interplanetary Society, Symposium on Earth Observation Satellites, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 26, Nov. 1973, p. 667-676. 20 refs.

The tasks of the hydrologist are described with particular reference to the problems of measurement and data collection. Some user requirements in hydrology are defined, and their potential solution by the use of satellites, as a platform for remote sensors or as a relay station for real time transmission of data from ground based stations, is discussed. Finally attention is drawn to the need for clear definition of funding responsibility; it is considered that, without this, few of the potential benefits of satellites in hydrology can be realised. (Author)

A74-11335 # **Statistical estimation of precipitable water with SIRS-B water vapor radiation measurements.** W. C. Shen (Control Data Corp., Minneapolis, Minn.) and W. L. Smith (NOAA, National Environmental Satellite Service, Hillcrest Heights, Md.). *Monthly Weather Review*, vol. 101, Jan. 1973, p. 24-32. 13 refs.

A multiple-parameter model has been formulated to estimate precipitable water profiles above the standard pressure levels from the satellite infrared spectrometer B (SIRS-B) radiation observations taken from the Nimbus 4 satellite. The method was verified with coincident radiosonde data. The relative error of SIRS-derived precipitable water above the 1000-mb level was approximately 20 per cent. The 532/cm water vapor channel alone explained 72 per cent of the variance of the precipitable water. This method was used to specify the optimum SIRS-B spectral intervals for future water vapor sounding. (Author)

A74-12183 **The applications of remote sensing to hydrology.** A. Adelman, R. Ambaruch, and J. W. Simmons (IBM Corp., Federal Systems Div., Gaithersburg, Md.). In: EASCON '73; Electronics and Aerospace Systems Convention, Washington, D.C., September 17-19, 1973, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 43-51. 7 refs.

This report describes the concept, progress, and initial results of a program which forecasts streamflow through simulation models containing operating parameters determined by remote observation. Demonstration of the feasibility of this concept will lead to a means of predicting the hydrological behavior of ungaged watersheds without extensive instrumentation or the need to wait several years for accumulation of historical data. The area chosen for study is the Tennessee Valley Region, for which copious climatological streamflow and physiographic data have been acquired. A simulation program, based on the well known Stanford Watershed Model IV and a companion parameter-optimization program, has been operated to determine optimum model parameters for several watersheds in the region. An analysis of the sensitivity of the simulation model's accuracy to variations in parameters indicates a comfortable tolerance of error in individual parameter values. The utilization of aircraft photography and ERTS multispectral scanner information is shown by deriving key input parameters related to basin topography. (Author)

A74-14875 * **An ERTS-1 study of the land use and geophysical character of the Great Salt Lake area.** A. F. Smith (General Electric Co., Space Div., Beltsville, Md.), A. T. Anderson, V. V. Salomonson, and A. Rango (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 36-49. 9 refs.

A74-14879 **Seasonal, multispectral flood inundation mapping in Iowa.** B. E. Hoyer, G. R. Hallberg, and J. V. Taranik (Iowa Geological Survey, Remote Sensing Laboratory, Iowa City, Iowa). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 130-141. Research supported by the U.S. Geological Survey.

A74-14880 * **Utilization of remotely-sensed data in the management of inland wetlands.** V. Carter and D. G. Smith (U.S. Geological Survey, Washington, D.C.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973.
Falls Church, Va., American Society of Photogrammetry, 1973, p. 144-158. 10 refs. Contract No. NAS5-21752. NASA Order S-70243-AG.

ERTS data and aerial photography are shown to represent valuable tools for the inventory and management of inland wetlands. The two discussed examples of the application of remotely-sensed data to specific wetland management needs and requirements are the Great Dismal Swamp of Virginia-North Carolina and the Water Conservation District of southern Florida. M.V.E.

A74-14881 **Location of flowing artesian wells and natural springs using thermal infrared imagery.** D. G. Moore and V. I. Myers (South Dakota State University, Brookings, S. Dak.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 159-165. U.S. Geological Survey Contract No. 14-08-0001-12510.

A74-14882 **Use of satellite data for mapping snow cover in the western United States.** J. C. Barnes, C. J. Bowley, and D. A. Simmes (Environmental Research and Technology, Inc., Lexington, Mass.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 166-176. 7 refs.

A74-14883 **Remote sensing for the Lake Ontario Hydrology Test Site.** A. Falconer (Guelph, University, Guelph, Ontario, Canada). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 177-190. 17 refs. Research supported by the National Research Council of Canada; U.S. Geological Survey Contract No. 14-08-0001-13169.

Evaluation of remote sensing data gathered over the Lake Ontario Test Site for hydrological purposes. High altitude imagery of the lake is shown to have proved a very powerful tool in recording the rate of change of features within the lake and is potentially a significant new source of data for major lake projects. M.V.E.

A74-14884 **Analysis of ERTS-relayed water-resources data in the Delaware River Basin.** R. W. Paulson (U.S. Geological Survey, Harrisburg, Pa.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 191-205.

A74-14909 **Oceans, streams and water resources.** J. W. Sherman, III (NOAA, Spacecraft Oceanography Group, Washington, D.C.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 633-656. 19 refs.

The future applications of remote sensing to monitoring of the resources from water, streams and oceans, depend on the present state of knowledge and the data requirement. While the ocean applications are stressed, many of the results are extendable to stream and water applications. The former applications include ocean dynamics, biological activity, sea ice, and coastal processes. The remote sensing requirements for these applications require platforms ranging from in situ ships or buoys, to aircraft, to polar and geostationary satellites. Sensor requirements exist for microwave, infrared and visible region instruments on the aerospace platforms. (Author)

A74-16245 # **Airborne spectroscopic measurement over water.** J. R. Miller, G. G. Shepherd, and R. A. Koehler (York University, Downsview, Ontario, Canada). *Canadian Aeronautics and Space Journal*, vol. 19, Dec. 1973, p. 521-524.

Review of airborne spectroscopic measurements made over several lakes in southern Ontario with the aid of a four-channel scanning photometer. The performed data analysis was aimed at investigating the relationship between the spectrum of the back-scattered solar radiation and the concentration of algae and phytoplankton in the surface waters. The results indicate a reasonable agreement in the absolute reflectance and the shape of the spectrum as a function of chlorophyll concentration. M.V.E.

A74-16247 # **Snow and ice depth measurements by high range resolution radar.** D. F. Page, G. O. Venier, and F. R. Cross (Department of Communications, Communications Research Centre, Ottawa, Canada). *Canadian Aeronautics and Space Journal*, vol. 19, Dec. 1973, p. 531-533.

Brief review of the equipment and techniques used and results obtained in applying high range resolution radar to snow and ice depth measurements. The described radar system is shown to be the most promising approach to achieving a simple, rugged and relatively inexpensive, remote sensor of fresh-water ice thickness and snow depth. The approach is based on the frequency-modulated radar technique commonly used for achieving high-range resolution. M.V.E.

A74-17562 **Numerical classification procedures in fluvial geomorphology.** G. C. Gustafson (München, Universität, Munich, West Germany). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3A-20 to 3A-34. 42 refs. Deutsche Forschungsgemeinschaft Contract No. GI-9/17.

A number of up-to-date numerical classification techniques are described. These include the orthogonal and oblique factor analysis methods, and the unweighted pair-group cluster analysis procedure. The techniques are applied to morphometric data from 159 small drainage basins from two geographical regions. Transformation techniques to achieve the normal distribution with respect to symmetry are applied. (Author)

A74-17808 * # **Application of SLAR for monitoring Great Lakes total ice cover.** R. J. Jirberg, R. J. Schertler, R. T. Gedney, and H. Mark (NASA, Lewis Research Center, Cleveland, Ohio). *Interdisciplinary Symposium on Advanced Concepts and Techniques in the Study of Snow and Ice Resources, Monterey, Calif., Dec. 2-6, 1973, Paper.* 10 p.

A series of X-band SLAR images is presented showing the development and disintegration of the entire ice cover on Lake Erie during the winter of 1972-1973. Simultaneous ground truth observations and ERTS-1 photography establish accurate correlations of radar responses with ice conditions. The all-weather, broad areal mapping capability of SLAR is seen to be the means for obtaining the repeated coverage needed for winter navigation on the Great Lakes. (Author)

A74-17809 * # **Application of thermal imagery to the development of a Great Lakes ice information system.** R. J. Schertler, C. A. Raquet, and R. A. Svehla (NASA, Lewis Research Center, Cleveland, Ohio). *Interdisciplinary Symposium on Advanced Concepts and Techniques in the Study of Snow and Ice Resources, Monterey, Calif., Dec. 2-6, 1973, Paper.* 10 p.

Recent measurements and analysis have shown that thermal infrared imagery can be employed to delineate the relative thicknesses of various regions of freshwater ice and to differentiate new ice from both open water areas and thicker (young) ice. Thermal imagery was observed to be generally superior to visual (0.4 - 0.7 micron) and SLAR (3.3 cm) imagery for estimating relative ice thicknesses and delineating open water from new ice growth. In a real-time Great Lakes ice information system, thermal imagery can not only provide supplementary imagery but can also aid in developing interpretative methods for all-weather SLAR imagery. (Author)

A74-17810 * # **Airborne profiling of ice thickness using a short pulse radar.** R. S. Vickers (Colorado State University, Fort Collins, Colo.), J. E. Heighway, and R. T. Gedney (NASA, Lewis Research Center, Cleveland, Ohio). *Interdisciplinary Symposium on Advanced Concepts and Techniques in the Study of Snow and Ice Resources, Monterey, Calif., Dec. 2-6, 1973, Paper.* 10 p. 6 refs.

This paper describes helicopter-borne measurements of ice thickness in Lake Superior, Lake St. Clair, and the St. Clair river as part of NASA's program to develop an ice information system. The profiler described is a high resolution, nonimaging, short pulse radar, operating at a carrier frequency of 2.7 GHz. The system can resolve reflective surfaces separated by as little as 10 cm and permits measurement of the distance between resolvable surfaces with an accuracy of about 1 cm. Data samples are given for measurements both in a static (helicopter hovering), and a traverse mode. Ground truth measurements taken by an ice auger team traveling with the helicopter are compared with the remotely sensed data and the accuracy of the profiler is discussed based on these measurements. (Author)

A74-17579 * **The JSC clustering program ISOCLS and its applications.** E. P. Kan, W. A. Holley, and H. D. Parker, Jr. (Lockheed Electronics Co., Inc., Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-36 to 4B-50. 8 refs. Contract No. NAS9-12200.

The clustering program ISOCLS developed at the Johnson Space Center, Houston, Texas, has been extensively used in the pattern analysis and classification of remote sensor data collected by aircraft and by the Earth Resources Technology Satellite ERTS-1. This paper discusses the theory behind this clustering algorithm. Several new ideas that have been incorporated in ISOCLS are discussed. Among these are the novel philosophy of operation behind the procedure, which assumes that a population (i.e., a class or a cluster) can be treated as the union of an appropriate number of subpopulations, and the termination of the clustering program by a 'chaining

algorithm.' Finally, this paper reports the results of the application of ISOCLS to an investigation on rangeland vegetation mapping using ERTS-1 data. (Author)

N74-10348*# Corps of Engineers, Waltham, Mass.
ERTS-1 DATA USER INVESTIGATION OF THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 14 Jun. - 14 Aug. 1973
Saul Cooper and Paul Bock, Principal Investigators 15 Sep. 1973 5 p ERTS
(Contract NASA Order S-70256-AG)
(E73-11144; NASA-CR-135703) Avail: NTIS HC $3.00 CSCL 08H

N74-10381*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE SIGNATURES OF SNOW AND FRESH WATER ICE
T. Schmugge, T. T. Wilheit, P. Gloersen, M. F. Meier (USGS, Tacoma; Wash.), D. Frank (USGS, Tacoma, Wash.), and I. Dirmhirn (Utah State Univ.) Nov. 1973 15 p refs Presented at the Interdisciplinary Symp. on Advanced Concepts and Tech. in the Study of Snow and Ice Resources Original contains color illustrations
(NASA-TM-X-70515; X-652-73-335) Avail: NTIS HC $3.00 CSCL 08L

During March of 1971, the NASA Convair 990 Airborne Observatory carrying microwave radiometers in the wavelength range 0.8 to 21 cm was flown over dry snow with different substrata: Lake ice at Bear Lake in Utah; wet soil in the Yampa River Valley near Steamboat Springs, Colorado; and glacier ice, firm and wet snow on the South Cascade Glacier in Washington. The data presented indicate that the transparency of the snow cover is a function of wavelength. False-color images of microwave brightness temperatures obtained from a scanning radiometer operating at a wavelength of 1.55 cm demonstrate the capability of scanning radiometers for mapping snowfields. Author

N74-11143*# Geological Survey, Tacoma, Wash.
EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS Progress Report, 1 Jul. - 31 Aug. 1973
Mark F. Meier, Principal Investigator 31 Aug. 1973 4 p ERTS
(NASA Order S-70243-AG-2)
(E74-10002; NASA-CR-135843) Avail: NTIS HC $3.00 CSCL 08B

N74-11144*# American Univ., Washington, D.C. Dept. of Biology.
ERTS-1 DATA USER INVESTIGATION OF WETLANDS ECOLOGY Progress Report, Jul. - Sep. 1973
Richard R. Anderson, Principal Investigator 30 Sep. 1973 10 p ref ERTS
(Contract NAS5-21752)
(E74-10003; NASA-CR-135844; PR-7) Avail: NTIS HC $3.00 CSCL 08H

N74-11146*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY Bimonthly Progress Report, 23 Aug. - 23 Oct. 1973
Duwayne M. Anderson, H. L. McKim, R. K. Haugen, L. W. Gatto, C. W. Slaughter, and T. L. Marlar, Principal Investigators 23 Oct. 1973 3 p refs ERTS
(NASA Order S-70253-AG)
(E74-10005; NASA-CR-135846; BMPR-6) Avail NTIS HC $3.00 CSCL 08L

N74-11156*# Old Dominion Univ. Research Foundation, Norfolk, Va.
TO RELATE CHLOROPHYLL AND SUSPENDED SEDIMENT CONTENT IN THE LOWER CHESAPEAKE BAY TO ERTS-1 IMAGERY Semiannual Report, 1 Feb. - 31 Jul. 1973
Peter Fleischer, Principal Investigator 14 Nov. 1973 11 p refs ERTS
(Contract NAS5-21816)
(E74-10021; NASA-CR-135862) Avail: NTIS HC $3.00 CSCL 08A

N74-11171*# Texas Univ., Austin. Dept. of Geological Sciences.
STREAM NETWORK ANALYSIS FROM ORBITAL AND SUBORBITAL IMAGERY, COLORADO RIVER BASIN, TEXAS Quarterly Progress Report, Aug. - Oct. 1973
Victor R. Baker, Principal Investigator 5 Nov. 1973 6 p EREP
(Contract NAS9-13312)
(E74-10050; NASA-CR-135891; QPR-2) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. Orbital SL-2 imagery (earth terrain camera S-190B), received September 5, 1973, was subjected to quantitative network analysis and compared to 7.5 minute topographic mapping (scale: 1/24,000) and U.S.D.A. conventional black and white aerial photography (scale: 1/22,200). Results can only be considered suggestive because detail on the SL-2 imagery was badly obscured by heavy cloud cover. The upper Bee Creek basin was chosen for analysis because it appeared in a relatively cloud-free portion of the orbital imagery. Drainage maps were drawn from the three sources digitized into a computer-compatible format, and analyzed by the WATER system computer program. Even at its small scale (1/172,000) and with bad haze the orbital photo showed much drainage detail. The contour-like character of the Glen Rose Formation's resistant limestone units allowed channel definition. The errors in pattern recognition can be attributed to local areas of dense vegetation and to other areas of very high albedo caused by surficial exposure of caliche. The latter effect caused particular difficulty in the determination of drainage divides.

N74-11175*# Corps of Engineers, Waltham, Mass.
NEW ENGLAND RESERVOIR MANAGEMENT Quarterly Progress Report, 23 Jul. - 23 Oct. 1973
Saul Cooper and Duwayne Anderson, Principal Investigators (CRREL) 23 Oct. 1973 4 p EREP
(NASA Order T-4646-B)
(E74-10054; NASA-CR-135895; QPR-2) Avail: NTIS HC $3.00 CSCL 08H

N74-11182*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
INTERDISCIPLINARY APPLICATIONS AND INTERPRETATIONS OF ERTS DATA WITHIN THE SUSQUEHANNA RIVER BASIN (RESOURCE INVENTORY, LAND USE, AND POLLUTION) Annual Report, 1 Jun. 1972 - 30 May 1973
George J. McMurtry and Gary W. Petersen, Principal Investigators Oct. 1973 260 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-23133)
(E74-10061; NASA-CR-135961 ; ORSER-SSEL-TR-9-73) Avail: NTIS HC $15.00 CSCL 08H

The author has identified the following significant results. An interdisciplinary group at Penn State University is analyzing ERTS-1 data. The geographical area of interest is that of the Susquehanna River Basin in Pennsylvania. The objectives of the work have been to ascertain the usefulness of ERTS-1 data in the areas of natural resources and land use inventory, geology and hydrology, and environmental quality. Specific results include a study of land use in the Harrisburg area, discrimination between types of forest resources and vegetation, detection of previously unknown geologic faults and correlation of these with known mineral deposits and ground water, mapping of mine spoils in the anthracite region of eastern Pennsylvania, and mapping of strip mines and acid mine drainage in central Pennsylvania. Both photointerpretive techniques and automatic computer processing methods have been developed and used, separately and in a combined approach.

N74-11184*# Old Dominion Univ. Research Foundation, Norfolk, Va. Inst. of Oceanography.
INVESTIGATION TO RELATE THE CHLOROPHYLL AND SUSPENDED SEDIMENT CONTENT IN THE WATERS OF THE LOWER CHESAPEAKE BAY TO ERTS-1 IMAGERY Bimonthly Report, 1 Aug. - 31 Sep. 1973
Peter Fleischer, Principal Investigator, John C. Ludwick, Hanna, Thomas Gosink, and David Bowker 31 Sep. 1973 2 p refs ERTS
(Contract NAS5-21816)
(E74-10067; NASA-CR-135822) Avail: NTIS HC $3.00 CSCL 08A

N74-11199*# National Environmental Satellite Service, Washington, D.C.
EVALUATION OF ERTS DATA FOR CERTAIN HYDROLOGICAL USES Progress Report, Aug. - Sep. 1973
Donald R. Wiesnet and David F. McGinnis, Principal Investigators Sep. 1973 4 p ERTS
(NASA Order S-70246-AG)
(E74-10088; NASA-CR-136000) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. A snow-extent map of the American River basin was prepared for 27 May 1973 from MSS band 4 imagery. The basin was 14% snow covered. NOAA-2 visible band imagery was used to determine date of disappearance of snow in the basin: 15 July 1973. A snowmelt curve comparing ERTS-1 and NOAA-2 snow-extent maps is provided. ERTS-1 data were superior in quality and outstanding in cartographic fidelity and were found to be an excellent control or calibration for the distorted and coarse (1 km) imagery from NOAA-2's VHRR which, however, is available on a daily basis.

N74-11204*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
AIRBORNE PROFILING OF ICE THICKNESS USING A SHORT PULSE RADAR
R. S. Vickers (Colo. State Univ.), J. Haighway, and R. Gedney 1973 7 p refs Presented at Advanced Concepts and Techniques in the Study of Snow and Ice Resources, Monterey, Calif., 2-6 Dec. 1973
(NASA-TM-X-71481) Avail: NTIS HC $3.00 CSCL 08L

The acquisition and interpretation of ice thickness data from a mobile platform has for some time been a goal of the remote sensing community. Such data, once obtainable, is of value in monitoring the changes in ice thickness over large areas, and in mapping the potential hazards to traffic in shipping lanes. Measurements made from a helicopter-borne ice thickness profiler of ice in Lake Superior, Lake St. Clair and the St. Clair river as part of NASA's program to develop an ice information system are described. The profiler described is a high resolution, non-imaging, short pulse radar, operating at a carrier frequency of 2.7 GHz. The system can resolve reflective surfaces separated by as little as 10 cm, and permits measurement of the distance between resolvable surfaces with an accuracy of about 1 cm. Data samples are given for measurements both in a static (helicopter hovering), and a traverse mode. Ground truth measurements taken by an ice auger team traveling with the helicopter are compared with the remotely sensed data and the accuracy of the profiler is discussed based on these measurements. Author

N74-11205*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
APPLICATION OF THERMAL IMAGERY TO THE DEVELOPMENT OF A GREAT LAKES ICE INFORMATION SYSTEM
R. J. Schertler, C. A. Raquet, and R. A. Svehla 1973 11 p refs Presented at the Interdisciplinary Symp. on Advanced Concepts and Tech. in the Study of Snow and Ice Resources, Monterey, Calif., 2-6 Dec. 1973
(NASA-TM-X-71478) Avail: NTIS HC $3.00 CSCL 08L

Recent measurements and analysis have shown that thermal infrared imagery (wavelength, 8-14 microns) can be employed to delineate the relative thicknesses of various regions of freshwater ice, as well as, differentiate new ice from both open water areas and thicker (young)ice. Thermal imagery was observed to be generally superior to visual (0.4 - 0.7 microns) and our SLAR (3.3 cm) imagery for estimating relative ice thicknesses and delineating open water from new ice growth. In a real-time Great Lakes Ice Information System, thermal imagery can not only provide supplementary imagery but also aid in developing interpretative methods for all-weather SLAR imagery, as well as, establishing the areal extent of spot thickness measurements. Author

N74-11218*# National Aeronautics and Space Administration, Washington, D.C.
TERMINAL MORAINES OBSERVED IN ERTS-1 PICTURES
H. Svensson Nov. 1973 9 p refs Transl. into ENGLISH from Geol. Foren. Stockholm Forch. (Sweden), v. 95, 31 Mar. 1973 p 146-149
(NASA-TT-F-15204) Avail: NTIS HC $3.00 CSCL 08E

The ERTS-1 experiment is briefly presented. Based on ERTS images of the southwestern part of Sweden and the adjacent coast area of Norway the detection of terminal moraines from the deglaciation period of the last glaciation is discussed. The moraine line of the Ra-substage (Younger Dryas) is especially observable. Author

N74-12113*# Army Engineer District, San Francisco, Calif.
CALIFORNIA COAST NEARSHORE PROCESSES STUDY Progress Report, 1 Sep. - 31 Oct. 1973
Douglas M. Pirie and David D. Steller, Principal Investigators (Geosource Intern., Inc., Seal Beach, Calif.) Nov. 1973 5 p ERTS
(NASA Order S-70257-AG)
(E74-10011; NASA-CR-135852; ERTS-1-1-5; PR-5) Avail: NTIS HC $3.00 CSCL 08J

There are no author-identified significant results in this report.

N74-12114*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY Progress Report, Dec. 1972 - Jun. 1973
Duwayne M. Anderson, Harlan L. McKim, Richard K. Haugen, Lawrence W. Gatto, Charles W. Slaughter, and Thomas L. Marlar, Prinicpal Investigators 23 Jun. 1973 75 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70253-AG)
(E74-10017; NASA-CR-135858) Avail: NTIS HC $5.75 CSCL 08L

The author has identified the following significant results. Physiognomic landscape features were used as geologic and vegetative indicators in preparation of a surficial geology, vegetation, and permafrost map at a scale of 1:1 million using ERTS-1 band 7 imagery. The detail from this map compared favorably with USGS maps at 1:250,000 scale. Physical boundaries mapped from ERTS-1 imagery in combination with ground truth obtained from existing small maps and other sources resulted in improved and more detailed maps of permafrost terrain and vegetation for the same area. ERTS-1 imagery provides for the first time, a means of monitoring the following regional estuarine processes: daily and periodic surface water circulation patterns; changes in the relative sediment load of rivers discharging into the inlet; and, several local patterns not recognized before, such as a clockwise back eddy offshore from Clam Gulch and a counterclockwise current north of the Forelands. Comparison of ERTS-1 and Mariner imagery has revealed that the thermokarst depressions found on the Alaskan North Slope and polygonal patterns on the Yukon River Delta are possible analogs to some Martian terrain features.

N74-12120*# Texas Technological Univ., Lubbock. Remote Sensing Lab.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS Progress Report, 1 Oct. - 30 Nov. 1973
C. C. Reeves, Jr., Principal Investigator 30 Nov. 1973 3 p ERTS
(Contract NAS5-21720)
(E74-10031; NASA-CR-135872) Avail: NTIS HC $3.00 CSCL 08H

N74-12125*# Geological Survey, Tacoma, Wash.
EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS Progress Report, 1 Sep. - 31 Oct. 1973
Mark F. Meier, Principal Investigator 31 Oct. 1973 4 p ERTS
(NASA Order S-70243-AG-2)
(E74-10037; NASA-CR-135878) Avail: NTIS HC $3.00 CSCL 08L

The author has identified the following significant results. The standard error of measurement of snow-covered areas in major drainage basins in the Cascade Range, Washington, using single measurements of ERTS-1 images, was found to range from 11% to 7% during a typical melt season, but was as high as 32% in midwinter. Many dangerous glacier situations in Alaska, Yukon, and British Columbia were observed on ERTS-1 imagery. Glacier dammed lakes in Alaska are being monitored by ERTS-1. Embayments in tidal glaciers show changes detectable by ERTS-1. Surges of Russell and Tweedsmuir Glaciers, now in progress, are clearly visible. The Tweedsmuir surge is likely to dam the large Alsek River by mid-November, producing major floods down-river next summer. An ERTS-1 image of the Pamir Mountains, Tadjik S.S.R., shows the surging Medvezhii (Bear) Glacier just after its surge of early summer which dammed the Abdukagor Valley creating a huge lake and later a flood in the populous Vanch River Valley. A map was compiled from an ERTS-1 image of the Lowell Glacier after its recent surge, compared with an earlier map compiled from pain-stakingly compiled from a mosaic of many aerial photographs, in a total elapsed time of 1.5 hours. This demonstrates the value of ERTS-1 for rapid mapping of large features.

N74-12126*# Geological Survey, Reston, Va.
DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO Progress Report, 1 Sep. - 31 Oct. 1973
Edward J. Pluhowski, Principal Investigator 1 Nov. 1973 3 p ERTS
(NASA Order S-70243-AG-2)
(E74-10038; NASA-CR-135879) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. An extensive clear-water plume emanating at the mouth of the Niagara River was detected on imagery obtained September 3, 1973 (frame no. 1407-15343). This plume (area over 500 sq. km.), which appears darker than the surrounding lake waters, extended 30 km offshore, or more than 60% across the width of the lake. The plume was 20 km across at its widest point. This plume is, by far, the largest generated by the Niagara River as viewed from the ERTS-1 satellite. A combination of high background lake turbidity relative to that of the Niagara River and gentle offshore (southerly) winds produced the well-defined turbidity feature.

N74-12131*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Quarterly Progress Report, 1 Jul. - 31 Oct. 1973
John W. Hannah, Garland L. Thomas, and Fernando Esparza, Principal Investigators 1 Nov. 1973 10 p ref Prepared in cooperation with Brevard County Planning Dept. EREP
(NASA Order CC-30281-A)
(E74-10064; NASA-TM-X-69470) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Lake Apopka and three lakes downstream of it (Dora, Eustis, and Griffin) are in an advanced state of eutrophication with high algal concentrations. This feature has shown up consistently on ERTS-1 images in the form of a characteristic water color for those lakes. As expected, EREP photographs also show a characteristic color for those lakes. What was not expected is that Lake Griffin shows a clear pattern of this coloration. Personnel familiar with the lake believe that the photograph does, indeed, show an algal bloom. It is reported that the algal concentration is often significantly higher in the southern portion of the lake. What the photograph shows that was not otherwise known is the pattern of the algal bloom. A similar, but less pronounced, effect is seen in Lake Tohopekaliga. Personnel stationed at Kissimmee reported that there was an algal bloom on that lake at the time of the EREP pass and that its extent corresponded approximately to that shown on the photograph. Again, the EREP photograph gives information about the extent of the bloom that could not be obtained practically by sampling. ERTS-1 images give some indication of this algal distribution on Lake Griffin in some cases, but are inconclusive.

N74-12138*# Army Engineer District, San Francisco, Calif.
CALIFORNIA COAST NEARSHORE PROCESSES STUDY Progress Report, 1 Mar. - 31 Aug. 1973
Douglas M. Pirie and David D. Steller, Principal Investigators (Rockwell International Corp., Downey, Calif.) Sep. 1973 114 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(NASA Order S-70257-AG)
(E74-10079; NASA-CR-135824) Avail: NTIS HC $7.75 CSCL 08J

The author has identified the following significant results. Large scale sediment plumes from intermittent streams and rivers form detectable seasonal patterns on ERTS-1 imagery. The ocean current systems, as plotted from three California coast ERTS mosaics, were identified. Offshore patterns of sediment in areas such as the Santa Barbara Channel are traceable. These patterns extend offshore to heretofore unanticipated ranges as shown on the ERTS-1 imagery. Flying spot scanner enhancements of NASA tapes resulted in details of subtle and often invisible (to the eye) nearshore features. The suspended sediments off San Francisco and in Monterey Bay are emphasized in detail. These are areas of extremely changeable offshore sediment transport patterns. Computer generated contouring of radiance levels resulted in maps that can be used in determining surface and nearsurface suspended sediment distribution. Tentative calibrations of ERTS-1 spectral brightness against sediment load have been made using shipboard measurements. Information from the combined enhancement and interpretation techniques is applicable to operational coastal engineering programs.

N74-12145* Kansas Univ. Center for Research, Inc., Lawrence. Kansas Geological Survey.
MONITORING FRESH WATER RESOURCES
Harold L. Yarger, Principal Investigator *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 6 p ERTS
(Rept-2265-7) CSCL 08H

N74-12166*# Smithsonian Institution, Washington, D.C. Chesapeake Bay Center for Environmental Studies.
COLLECTION AND ANALYSIS OF REMOTELY SENSED DATA FROM THE RHODE RIVER ESTUARY WATERSHED
Dale W. Jenkins 1972 95 p refs Original contains color illustrations
(Contract NAS6-1913)
(NASA-CR-62097) Avail: NTIS HC $6.75 CSCL 08H

NASA chose the watershed of Rhode River, a small sub-estuary of the Bay, as a representative test area for intensive studies of remote sensing, the results of which could be extrapolated to other estuarine watersheds around the Bay. A broad program of ecological research was already underway within

the watershed, conducted by the Smithsonian Institution's Chesapeake Bay Center for Environmental Studies (CBCES) and cooperating universities. This research program offered a unique opportunity to explore potential applications for remote sensing techniques. This led to a joint NASA-CBCES project with two basic objectives: to evaluate remote sensing data for the interpretation of ecological parameters, and to provide essential data for ongoing research at the CBCES. A third objective, dependent upon realization of the first two, was to extrapolate photointerpretive expertise gained at the Rhode River watershed to other portions of the Chesapeake Bay. Author

N74-13029*# Stanford Research Inst., Menlo Park, Calif.
STUDY OF TIME-LAPSE DATA PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS Progress Report, 7 Sep. - 6 Nov. 1973
Sidney M. Serebreny, Principal Investigator 7 Nov. 1973 6 p ERTS
(Contract NAS5-21841)
(E74-10102; NASA-CR-136093) Avail: NTIS HC $3.00 CSCL 08H

N74-13031*# Geological Survey, Phoenix, Ariz. Water Resources Div.
APPLICATIONS OF ERTS-1 DATA COLLECTION SYSTEM (DCS) IN THE ARIZONA REGIONAL ECOLOGICAL TEST SITE (ARETS) Progress Report, 15 Dec. 1972 - 15 Jun. 1973
Herbert H. Schumann, Principal Investigator 15 Jun. 1973 9 p ref ERTS
(NASA Order S-70243-AG-7)
(E74-10104; NASA-CR-136095) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The DCS water-stage data from the USGS streamflow gaging station on the Verde River near Camp Verde furnished information sufficient for the accurate computation of daily mean streamflow rates during the first 2 months of operation. Daily mean flow rates computed from the DCS data agreed with those computed from the digital recorder data within + or - 5% during periods of stable or slowly changing flow and within + or - 10% during periods of rapidly changing high flow. The SRP was furnished near-real time DCS information on snow moisture content and streamflow rates for use in the management and operation of the multiple-use reservoir system. The SRP, by prudent water management and the use of near-real time hydrologic data furnished by microwave and ERTS DCS telemetry, was successful in anticipating the amount of flow into the Salt and Verde Rivers and in the subsequent release of water at rates that did not create flooding in metropolitan Phoenix. Only minor flooding occurred along the Gila River west of Phoenix. According to the Maricopa County Civil Defense agency, wage and salary losses of about $11,400,000 resulted from closing of roads across the Salt River in the winter and spring of 1972-73; however, the number and duration of the closing were minimized by use of DCS data.

N74-13046*# Alaska Univ., Fairbanks. Inst. of Marine Science.
THE CIRCULATION OF PRINCE WILLIAM SOUND Bimonthly Progress Report
Robin D. Muench, Principal Investigator 30 Nov. 1973 2 p ERTS
(Contract NAS5-21833)
(E74-10119; NASA-CR-136132; BMPR-8) Avail: NTIS HC $3.00 CSCL 08C

N74-13055*# Norwegian Water Resources and Electricity Board, Oslo.
EVALUATION OF GLACIER MASS BALANCE BY OBSERVING VARIATIONS IN TRANSIENT SNOWLINE POSITIONS Progress Report, Apr. - Sep. 1973
Gunnar Oestrem, Principal Investigator Oct. 1973 10 p refs Sponsored by NASA ERTS
(E74-10128; NASA-CR-136173; Rept-2) Avail: NTIS HC $3.00 CSCL 08L

The author has identified the following significant results. The transient snowline on five outlet glaciers from the Jostedalsbreen ice-cap in Southwestern Norway could be determined from ERTS-1 image 1336-10260, when bands MSS 5, 6, and 7 were combined in an additive color viewer. The snowline was situated at a very low altitude at the time of imagery (24 June 1973) indicating that glacier melt was behind normal schedule, a fact that has a hydrologic bearing: one could expect less melt water in the streams. The idea to use ERTS-1 imagery in snowline determinations proved realistic and relatively easy to apply in practice. The method will be useful to estimate the glaciers' mass balance for large areas, provided some ground truth observations are made. Images from the end of the melt season are of course vital in this work.

N74-13072*# Bureau of Reclamation, Denver, Colo.
MONITOR WEATHER CONDITIONS FOR CLOUD SEEDING CONTROL Progress Report, 1 Sep. - 31 Oct. 1973
Archie M. Kahan, Principal Investigator 1 Nov. 1973 96 p refs ERTS
(NASA Order S-70243-AG-8)
(E74-10146; NASA-CR-136205) Avail: NTIS HC $7.00 CSCL 04B

The author has identified the following significant results. The near real-time DCS platform data transfer to the time-share compare is a working reality. Six stations are now being automatically monitored and displayed with a system delay of 3 to 8 hours from time of data transmission to time of data accessibility on the computer. The DCS platform system has proven itself a valuable tool for near real-time monitoring of mountain precipitation. Data from Wolf Creek Pass were an important input in making the decision when to suspend seeding operations to avoid exceeding suspension criteria in that area. The DCS platforms, as deployed in this investigation, have proven themselves to be reliable weather resistant systems for winter mountain environments in the southern Colorado mountains.

N74-13101*# Michigan State Univ., East Lansing.
THE USE OF COLOR INFRARED PHOTOGRAPHY FOR WETLANDS MAPPING WITH SPECIAL REFERENCE TO SHORELINE AND WATERFOWL HABITAT ASSESSMENT Project for the Use of Remote Sensing in Land Use Policy Formulation
Oct. 1973 36 p refs
(Grant NGL-23-004-083)
(NASA-CR-136271) Avail: NTIS HC $4.00 CSCL 08B

Evaluation of low altitude oblique photography obtained by hand-held cameras was useful in determining specifications of operational mission requirements for conventional smaller-scaled vertical photography. Remote sensing techniques were used to assess the rapid destruction of marsh areas at Pointe Mouillee. In an estuarian environment where shoreline features change yearly, there is a need for revision in existing area maps. A land cover inventory, mapped from aerial photography, provided essential data necessary for determining adjacent lands suitable for marshland development. To quantitatively assess the wetlands environment, a detailed inventory of vegetative communities (19 categories) was made using color infrared photography and intensive ground truth. A carefully selected and well laid-out transect was found to be a key asset to photointerpretation and to the analysis of vegetative conditions. Transect data provided the interpreter with locally representative areas of various vegetative types. This facilitated development of a photointerpretation key. Additional information on vegetative conditions in the area was also obtained by evaluating the transect data. Author

N74-13102*# Wisconsin Univ., Madison. Inst. for Environmental Studies.
ON MULTIDISCIPLINARY RESEARCH ON THE APPLICATION OF REMOTE SENSING TO WATER RESOURCES PROBLEMS Progress Report, 1972 - 1973
James L. Clapp 1973 77 p Original contains color illustrations
(Grant NGL-50-002-127)
(NASA-CR-136280) Avail: NTIS HC $6.00 CSCL 08H

Research objectives during 1972-73 were to: (1) Ascertain the extent to which special aerial photography can be operationally used in monitoring water pollution parameters. (2) Ascertain the effectiveness of remote sensing in the investigation of nearshore mixing and coastal entrapment in large water bodies. (3) Develop an explicit relationship of the extent of the mixing zone in terms of the outfall, effluent and water body characteristics. (4) Develop and demonstrate the use of the remote sensing method as an effective legal implement through which administrative agencies and courts can not only investigate possible pollution sources but also legally prove the source of water pollution. (5) Evaluate the field potential of remote sensing techniques in monitoring algal blooms and aquatic macrophytes, and the use of these as indicators of lake eutrophication level. (6) Develop a remote sensing technique for the determination of the location and extent of hydrologically active source areas in a watershed. Author

N74-13330 Atmospheric Environment Service, Downsview (Ontario).
PRECIPITATION NETWORK DESIGN FOR LARGE MOUNTAINOUS AREAS
Howard L. Ferguson *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 1 1973 p 85-110 refs

The problem of precipitation network design for mountainous areas larger than about 1000 sq km is examined. It is assumed that a principal objective of the network is to optimize the area precipitation distributions under the constraint of economic factors on the general network density and time-resolution. Network design is related to the problem of developing practical analytical models. The application of results from small intensively-instrumented research basins is discussed, along with the implications of rapidly expanding remote sensing technology. Principal recommendations concern integration of meteorological and hydrological network planning and analyses, increased emphasis on the use of physiographic models, consistent application of benefit-cost analyses and the development of a classification system for representative basins to facilitate transposition of research results. Author (ESRO)

N74-13339# World Meteorological Organization, Geneva (Switzerland).
DISTRIBUTION OF PRECIPITATION IN MOUNTAINOUS AREAS. VOLUME 2: TECHNICAL PAPERS
1972 593 p refs Partly in ENGLISH; partly in FRENCH Proc. of the Symp. at Geilo, Norway, 31 Jul. - 5 Aug. 1972 2 Vol.
(WMO-326-vol-2) Avail: NTIS HC $31.75; WMO, Geneva

Instruments and measuring techniques, orographic influences on precipitation distribution, precipitation network design in mountainous areas, and methods of computation of areal precipitation are presented.

N74-13348 Hydrometeorological Scientific Research Center (USSR).
ANALYSIS OF SNOW COVER DISTRIBUTION FROM AEROPHOTOGRAPHY DATA OVER EXPERIMENTAL MOUNTAIN BASIN OF VARZOB RIVER
T. S. Abaljan *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 103-110 refs

The main characteristics of the snow cover in the mountain basin of the Varzob river (Central Asia) in the height interval 1400-4000 m are reported. To obtain these characteristics, data were used of aerial snow surveys made several times during the year 1964-1967. Author (ESRO)

N74-13381 Stanford Research Inst., Menlo Park, Calif.
PRECIPITATION ESTIMATES FROM METEOROLOGICAL SATELLITE DATA
P. A. Davis and Sidney M. Serebreny *In* WMO Distribution of Precipitation in Mountainous Areas, Vol. 2 1972 p 474-483

Existing series of cloud photographs from polar-orbiting satellites were utilized in a technique designed to estimate total precipitation (rain and snow) over a mountainous drainage basin in northwestern Montana. Daily precipitation for the entire basin was defined from analyses of surface observations and climatological data within the basin. Satellite-viewed cloud cover was distinguished in terms of eight exclusive categories representative of differing probable contributions to basin precipitation. After a dominant categorization was assigned to each successive 12-hour period, estimates of the cumulative basin precipitation were obtained by summation of probable amounts assigned to each cloud category. Author (ESRO)

N74-13413# Texas A&M Univ., College Station. Dept. of Oceanography and Meteorology.
A STUDY OF THE APPLICABILITY OF WEATHER RADAR IN STREAMFLOW FORECASTING
Robert G. Curry Jul. 1973 65 p refs
(Contract DAAB07-68-C-0073; DA Proj. 1T0-14501-B-81A; Proj. Themis)
(AD-767556; A/M-Ref-73-3-T; ECOM-0073-T-7-68; TR-7) Avail: NTIS CSCL 04/2

Streamflow routing techniques are applied for hydrograph synthesis to the 234 square mile East Yegua Creek basin in Central Texas. Digitized data for a grid size of 5 mi by 5 mi are obtained from a 10.3-cm radar and are used in the estimation of rainfall over the basin. These data are compared with rainfall measured by 27 recording and non-recording gages spaced uniformly over the basin. Hydrographs have been synthesized for four flood events based on radar-estimated and actually-observed rainfall. The results, when compared with the observed hydrographs, are encouraging. The routing coefficients, however, vary considerably with antecedent soil-moisture conditions, rainfall intensity, and time of the year. The primary difficulty in the use of radar estimated rainfall was that rainfall intensities were underestimated rather severely. The spatial variability of the rainfall was quite good and revealed the capability of radar to measure mesoscale variations of rainfall in a real-time sense.
Author (GRA)

N74-14006*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES Annual Progress Report
Robert N. Colwell, C. West Churchman, Robert H. Burgy, Gerald Schubert, John E. Estes, Leonard W. Bowden, R. Algazi, and K. L. Coulson, Principal Investigators 30 Jun. 1973 402 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Grant NGL-05-003-404)
(E74-10136; NASA-CR-136181) Avail: NTIS HC $22.25 CSCL 08F

The University of California has been conducting an investigation which seeks to determine the usefulness of modern remote sensing techniques for studying various components of California's earth resources complex. Most of the work has concentrated on California's water resources, but with some attention being given to other earth resources as well and to the interplay between them and California's water resources.

N74-14008* California Univ., Davis. Dept. of Water Science and Engineering.
USER REQUIREMENTS FOR THE APPLICATION OF REMOTE SENSING IN THE PLANNING AND MANAGEMENT OF WATER RESOURCE SYSTEMS
Robert N. Colwell, Principal Investigators and Robert H. Burgy *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 9 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

N74-14009* California Univ., Berkeley. Forestry Remote Sensing Lab.
REMOTE SENSING DATA AS AN AID TO RESOURCE MANAGEMENT IN NORTHERN CALIFORNIA
Robert N. Colwell, Principal Investigator, Gene A. Thorley, Andrew S. Benson, David M. Carneggie, William C. Draeger, Paul F. Krumpe, Donald T. Lauer, James D. Nichols, Howard O. Thrall, Randall W. Thomas et al *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 92 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
CSCL 08B

N74-14010* California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
RIVER MEANDER STUDIES
Robert N. Colwell, Gerald Schubert, Principal Investigators, and Richard E. Lingenfelter *In its* An Integrated Study of Earth Resources in the State on California Using Remote Sensing Techniques 30 Jun. 1973 26 p refs ERTS

CSCL 08H

N74-14017*# Wolf Research and Development Corp., Riverdale, Md.
THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA Interim Report, Jun. - Nov. 1973
Allan J. Jelacic, Principal Investigator Dec. 1973 34 p refs ERTS
(Contract NAS5-21761)
(E74-10149; NASA-CR-136208; IR-3) Avail: NTIS HC $3.75 CSCL 08L

The author has identified the following significant results. A comparison of lake freeze transition zone migration with the movement of large pressure centers reveals the following consistencies: (1) polar centinental cyclones originate within and/or travel along the trend of the transition zone; (2) polar continental anticyclones fail to cross the transition zone; (3) polar outbreak anticyclones pass through the transition zone, apparently unaffected. In addition, storm centers associated with the transition zone undergo significant intensification manifest by a deepening of the pressure through and increased precipitation outside the zone.

N74-14019*# Alaska Univ., Fairbanks. Inst. of Water Resources.
BREAK-UP CHARACTERISTICS OF THE CHENA RIVER WATERSHED, CENTRAL ALASKA Interim Scientific Report, Nov. 1973
Robert F. Carlson, Principal Investigator, Gerd Wendler, and Doug Kane 1 Dec. 1973 12 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21833)
(E74-10151; NASA-CR-136210) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. The snow melt for a small watershed (5130 sq km) in Central Alaska was successfully monitored with ERTS-1 imagery. Aerial photography was used as supporting data for periods without satellite coverage. Comparison both with actual measurements and with a computer model showed good agreement.

N74-14021*# Environmental Research and Technology, Inc., Lexington, Mass.
STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA Quarterly Progress Report, 15 Sep. - 15 Dec. 1973
James C. Barnes, Principal Investigator 15 Dec. 1973 5 p EREP
(Contract NAS9-13305)
(E74-10153; NASA-CR-136223; P-412-5; QPR-3) Avail: NTIS HC $3.00 CSCL 08L

N74-14022*# Stanford Research Inst., Menlo Park, Calif.
STUDY OF TIME LAPSE DATA PROCESSING FOR DYNAMIC HYDROLOGIC CONDITIONS Progress Report, 7 Nov. 1973 - 6 Jan. 1974
Sidney M. Serebreny, Principal Investigator 7 Jan. 1974 5 p ERTS
(Contract NAS5-21841)
(E74-10154; NASA-CR-136281) Avail: NTIS HC $3.00 CSCL 08H

N74-14026*# Ghent Univ. (Belgium). Geological Inst.
RELATIONSHIP BETWEEN SNOW COVER AND DISCHARGE AND WATER QUALITY OF WATERSHEDS, ARDENNES (BELGIUM)
Rene Tavernier, Principal Investigator 15 Nov. 1973 5 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10158; NASA-CR-136285) Avail: NTIS HC $3.00 CSCL 08H

N74-14030*# Kansas Univ., Lawrence. Space Technology Center.
SKYLAB STUDY OF WATER QUALITY Progress Report, Sep. - Nov. 1973
H. L. Yarger, Principal Investigator and James R. McCauley Nov. 1973 4 p EREP
(Contract NAS9-13271)
(E74-10162; NASA-CR-136289) Avail: NTIS HC $3.00 CSCL 08H

N74-14034*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY Bimonthly Progress Report, 23 Oct. - 23 Dec. 1973
Duwayne M. Anderson, H. L. McKim, R. K. Haugen, L. W. Gatto, C. W. Slaughter, and T. Marlar, Principal Investigators 23 Dec. 1973 6 p refs ERTS
(NASA Order S-70253-AG)
(E74-10166; NASA-CR-136293; BMPR-7) Avail: NTIS HC $3.00 CSCL 08E

N74-14040*# Geological Survey, Bay Saint Louis, Miss.
THE HYDROLOGIC SIGNIFICANCE OF FAULTS IN THE GREAT SMOKY MOUNTAINS NATIONAL PARK Quarterly Progress Report, 1 Sep. - 30 Nov. 1973
Gerald K. Moore and Este F. Hollyday, Principal Investigators 11 Dec. 1973 4 p EREP
(NASA Order H-2810-B-DOI)
(E74-10172; NASA-CR-136299) Avail: NTIS HC $3.00 CSCL 08H

N74-14043*# Prescott College, Ariz.
THE HYDROLOGY OF PREHISTORIC FARMING SYSTEMS IN A CENTRAL ARIZONA ECOTONE Quarterly Report, period ending 31 Dec. 1973
George J. Gumerman, Principal Investigator 3 Jan. 1974 6 p EREP
(Contract NAS9-13342)
(E74-10175; NASA-CR-136304) Avail: NTIS HC $3.00 CSCL 08H

N74-14105# Tennessee Univ., Knoxville. Water Resources Research Center.
STRIP-MINED WATERSHED HYDROLOGIC DATA ACQUISITION STUDY
Bruce A. Tschantz 27 Aug. 1973 24 p refs
(Contract DI-14-31-0001-3843)
(PB-223558/8GA; OWRR-A-030-TENN(1); W73-14368; RR-35) Avail: NTIS HC $2.75 CSCL 08H

Remotely sensed aerial photography of two small strip mined East Tennessee watersheds was used as a means for obtaining land use information essential to econometric and hydrologic studies and for reclamation practice surveillance. 1:12,000 scale maps were produced for both watersheds from three color IR photographic flights. Other available high altitude photography and thermal imagery data were used to help map strip mine disturbed areas. The study demonstrated the usefulness of using low altitude IR photography for identifying, mapping, and measuring strip mine disturbance areas. (Modified author abstract) GRA

N74-15021*# Servicio Geologico de Bolivia, La Paz.
HYDROLOGY SUBPROGRAM: PRELIMINARY STUDY OF THE SALAR DE UYUNI AND COIPASA REGION [SUBPROGRAMA HIDROLOGIA ESTUDIO PRELIMINAR DE LA REGION SALAR DE UYUNIY COIPASA]
C. E. Brockmann, Principal Investigator and G. Mateo Ilijic [1973] 14 p In SPANISH Sponsored by NASA ERTS
(E74-10214; NASA-CR-136477) Avail: NTIS HC $3.00 CSCL 08H

N74-15028*# Corps of Engineers, Waltham, Mass.
ERTS-1 DATA USER INVESTIGATION OF THE USE OF ERTS IMAGERY IN RESERVOIR MANAGEMENT AND OPERATION Progress Report, 14 Aug. 14 Oct. 1973
Saul Cooper and Paul Bock, Principal Investigators 15 Dec. 1973 7 p ERTS
(NASA Order S-70256-AG)
(E74-10223; NASA-CR-136486; PR-8) Avail: NTIS HC $3.00 CSCL 08H

N74-15040*# Calspan Corp., Buffalo, N.Y.
S190 INTERPRETATION TECHNIQUES DEVELOPMENT AND APPLICATION TO NEW YORK STATE WATER RESOURCES Quarterly Report, 1 Sep. - 30 Nov. 1973
Kenneth R. Piech, Principal Investigator 30 Nov. 1973 5 p refs EREP
(Contract NAS9-13336)
(E74-10235; NASA-CR-136502; QR-3) Avail: NTIS HC $3.00 CSCL 08H

N74-15078# World Meteorological Organization, Geneva (Switzerland).
SNOW SURVEY FROM EARTH SATELLITES. A TECHNICAL REVIEW OF METHODS
1973 56 p refs Presented at the WMO/IHD meeting, Geneva, Mar. 1972
(WMO-353; Rept-19) Avail: NTIS HC $5.00; WMO, Geneva

Brief background information on satellite and sensor systems available for snow studies is provided, and methods used by various countries, as well as results obtained, are detailed. The methods used include direct opto-mechanical, opto-electronic, and automated electronic ones. Emphasis was placed on the use of satellite near-infrared and visual parts of the spectrum measurements for detection of thawing snow and ice surfaces. Recommendations for future action in the area of snow studies by satellites are made. Studies and techniques are proposed to fill existing gaps in knowledge and to take advantage of the data, data processing, or display equipment available. A simultaneous comparison of various methods over common test sites is proposed. ESRO

N74-15324 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 139, NO. 1: THE EUROPEAN CLIMATOLOGY 1973. WEATHER SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 1 [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT I: DAS EUROPAEISCHE WETTERBILD 1973. WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH. TEIL I, 1. VIERTELJAHR]
1973 204 p refs In GERMAN
Avail: Issuing Activity

ESSA 8 and NOAA 2 photographic maps of the European continent are interpreted for their cloud formations and snow field distributions during the first quarter in 1973.
Transl. by G.G.

N74-15338# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY NO. 9, 1973
14 Dec. 1973 129 p refs Transl. into ENGLISH from Meteorol. i Gidrol. (Moscow), no. 9, 1973 p 3-68, 80-110
(JPRS-60787) Avail: NTIS HC $8.50

Articles are presented on microclimate, agriculture meteorology, weather forecasting and climate control, and hydrological forecasting.

07
DATA PROCESSING AND DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

A74-11205 # **Study of the problems of data management for earth resources missions.** W. Gilg and E. Velten. *Dornier-Post* (English Edition), no. 3, 1973, p. 28-31.

A study of the problems relating to the acquisition, transmission, processing, and evaluation of data in connection with earth resources missions has been conducted as part of an applications program covering exploration of the earth's resources. This 'data management study' sets out to improve understanding of the systems that could be used for earth exploration missions and underlines the interdependence of the various systems parameters. It also broadly outlines general systems problems, as well as certain individual technical problems. (Author)

A74-12777 **Getting it together - Multispectral imager data and the user community.** K. R. Jenkin (TRW Systems Group, Redondo Beach, Calif.). In: Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1973, p. 277-282.

Recently a class of airborne and spaceborne sensors, generally referred to as multispectral imagers, has generated considerable interest in various scientific communities. The spectra of earth radiation at many spatial points across the flight path are measured and examined for characteristics indicative of various resource phenomena such as crop disease, phytoplankton location, and water pollution. This paper examines an approach to the task of converting raw multispectral data into a convenient and meaningful display for utilization by a nonsensor oriented user community. Specific topics include calibration techniques, 'quick-look' output, algorithm derivation and application, contour plotting, and false color map construction. (Author)

A74-12778 **Multichannel image analysis system.** R. E. Holmes (Systems Research Laboratories, Inc., Dayton, Ohio) and D. G. Smith (U.S. Geological Survey, Washington, D.C.). In: Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1973, p. 283-287. Research supported by U.S. Geological Survey.

A multichannel image analysis system is described that is a video system designed to sequentially scan and display multiple combinations of photographic transparencies and other graphic portrayals of the earth's surface. The system is used for analyzing multispectral photographs obtained by means of spacecraft and aircraft. M.V.E.

A74-14487 **Geometric aspects in digital analysis of multispectral scanner /MSS/ data.** E. M. Mikhail and J. R. Baker (Purdue University, West Lafayette, Ind.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 528-562. 17 refs.

The multispectral scanner (MSS) is a passive system, used on a moving platform, with potential image formation and records object data in a point by point mode. The term 'point' is used to mean a small, though finite, area representing the system's resolution element. The MSS system is discussed together with the remote sensing transformation for MSS, aspects of an assumed ideal geometry, collinearity equations, and details of experimental research. G.R.

A74-14872 **Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973.** Symposium sponsored by the American Geological Institute, AIAA, ASP, and IEEE. Edited by A. Anson. Falls Church, Va., American Society of Photogrammetry, 1973. 687 p. Members, $7.50; nonmembers, $12.50.

Applications of remote sensing to the planning and management of specific earth resources are described along with developments in remote imagery hardware and in data processing software. Papers cover cost comparisons of aircraft and satellite systems for earth resource surveys, evaluations of data collected by the ERTS-1 satellite, applications to urban planning, water resource studies involving lakes and riverbeds, geological interpretations of multispectral imagery, identifications of soil quality and vegetation, digital and nondigital image processing techniques, personnel training requirements for analysis of remote sensing data, advanced solid-state sensor systems for use on spacecraft, and expected future developments in remote sensing of earth resources. T.M.

A74-14885 * **Evaluation of digitally corrected ERTS imagery.** S. S. Rifman (TRW Systems Group, Redondo Beach, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 206-221. 5 refs. Contract No. NAS5-21814.

Utilizing all digital processing techniques, precision rectified ERTS multispectral imagery have been produced. Precision geometric correction is accomplished by: (1) utilizing a low order piecewise approximation to the image distortions; (2) incorporating spacecraft attitude refinement derived from ground control points utilized in a Kalman filter; (3) utilizing interpolation techniques which preserve value and slope continuity in the image data. Imagery produced is represented in a UTM projection, and has been evaluated for precision by statistical and analytical methods. Extrapolations to modest size computers indicate good throughput with no sacrifice in precision. (Author)

A74-14886 * **A semi-automated system for plotting and computer cataloging of remote sensing imagery.** G. E. Gnauck, D. J. Hurd, and R. M. Kroeck (ESL, Inc., Sunnyvale, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 222-247. NASA-supported research.

Description of a computer-assisted system for plotting and descriptor-cataloging of aerial imagery - an ingredient of the aerial image data handling system of the NASA Earth Resources Aircraft Project (ERAP). The system under consideration uses two graphic tablets linked interactively with a digital computer as input devices for deriving frame coordinates by correlating image points to map points. The various software programs and operating modes facilitate a semiautomatic plotting of an image by selecting two or more points within the image for matching with map details. The computer performs the scaling and orientation transformations for the calculation of the center and corner coordinates of the frame. Twenty five other descriptors for each frame are fed into a computerized data base requiring a minimum operator's time for verification and correction. V.Z.

A74-14887 * Unsupervised classification techniques as components of a data and information system. R. E. Cummings and R. R. Jayroe, Jr. (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 248-256. 6 refs.

The phenomenal increase in the amount of data and information being generated by remote sensing systems is stressed. A total system design approach as a solution to this problem is discussed with specific reference to the data and information system needs for Sortie Lab - a multiple use payload for the Shuttle. The development of a multispectral data processing system as a needed component of such a system is reviewed with emphasis on unsupervised multispectral classification techniques developed and presently in use at Marshall Space Flight Center. (Author)

A73-14889 International Conference on Transportation and the Environment, Washington, D.C., May 31-June 2, 1972, Proceedings. Part 1. Conference sponsored by the Society of Automotive Engineers, U.S. Environmental Protection Agency, and U.S. Department of Transportation. New York, Society of Automotive Engineers, Inc., 1972. 435 p. Members, $30.; nonmembers, $40.

Planned development of transportation systems is examined with emphasis on the reduction of adverse effects on the environment. Topics examined include theories of transportation economics, transport demand forecasts and simulation, characteristic emissions of various surface and air transport vehicles, prospects for new powerplants, future automotive fuels, measurement of air pollution at airports, noise pollution from aircraft and trucks, and expected national regulations restricting emissions and noise. T.M.

A74-14894 GRIDS and DNR. R. A. Harding (Washington State, Dept. of Natural Resources, Olympia, Wash.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 398-412. 13 refs.

Description of the Gridded Resource Inventory Data System (GRIDS) that has been in full operation since the spring of 1972. The system consists of a one-acre sample for each ten acres of land managed by the Department of Natural Resources throughout the State of Washington. The large array of data collected on these sample points comes from aerial photographs, maps, field measurements, field activities or any valid source. Quick and easy data-change feasibility makes possible up-to-date accurate information. The data are coded and stored on electronic data processing files for quick retrieval. M.V.E.

A74-14895 A peripheral change detection process. H. A. Humiston and G. E. Tisdale (Westinghouse Defense and Electronic Systems Center, Baltimore, Md.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 413-426. 6 refs.

Discussion of a 'Quick Look' change detection function - a technique incorporating an on-line image recording capability independent of relative orientation and scale, and not involving identifiable control points within images. The 'Quick Look' function is described as a peripheral processor which permits a combination of images for displays with automatic thresholding of temporal changes. Experimental results obtained by this technique on a pilot model system are included. V.Z.

A74-14898 Combining human and computer interpretation capabilities to analyze ERTS imagery. J. D. Nichols and W. M. Senkus (California, University, Berkeley, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 447-453.

A74-14899 Image processing and enhancement applied to ERTS photographs - A case study of the Bay of Carpentaria. J. W. White (Photo Science, Inc., Gaithersburg, Md.), P. G. Teleki (U.S. Army, Coastal Engineering Research Center, Fort Belvoir, Va.), and G. A. Rabchevsky (Terratek, Inc., Lanham, Md.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 454-471. 5 refs.

Comparison of a number of optical-mechanical and photographic processing techniques for investigating the circulation of water masses. The methods discussed fall into two general categories - namely, image enhancement techniques and electronic color densitometry. The image enhancement techniques are based on the use of a multispectral color viewer or an additive color viewer, in which false color composites are generated and enhanced. The other techniques involve the use of an electronic scanning microdensitometer which instantaneously displays photographic density contours in 32 colors on a color television screen. Also used in this connection was Agfacontour film, a high-contrast film designed to reproduce equal-density enhancements of original positive and negatives by a direct and simplified processing procedure. Using all these techniques, an attempt is made to obtain the most definitive delineation of water- and land-associated features in the Bay of Carpentaria, Australia. A.B.K.

A74-14900 Throughput model of EROS Data Center. C. L. Hensel (General Electric Co., Space Div., Valley Forge, Pa.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 472-490.

Description of the development and operation of a model of the functional elements of the EROS Data Center (EDC), which processes and disseminates remotely sensed imagery. A functional simulation model of the EDC was developed on the basis of a detailed analysis of the performance of the EDC system and of each of its functional elements. As a result of this analysis, system flow diagrams were established which served as the baseline of the simulation development and were continually updated to reflect changes in system design. The simulation was developed on two levels of detail. A high-level 'system model' was designed with each of the functional areas of the EDC represented independently and all interfaces between functional areas provided, while detailed modules were developed for each functional area within the EDC. The simulation was then developed with the aid of a symbolic language which provides for simulation of a logical flow of data or information through a system. The results of a set of runs of this model are presented which demonstrate system performance in terms of manpower utilization, equipment usage, and throughput. A.B.K.

A74-14902 The need for more information and less data. H. M. Gurk (RCA, Astro-Electronics Div., Princeton, N.J.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 513-527. 10 refs.

Review of a number of methods of reducing data rates and volumes from remote sensors while still retaining the capability of extracting the information desired by the user. The techniques

discussed are data compression, the limitation of data selection by statistical sampling of areas and spectral sampling, and reduced-resolution methods involving the use of so-called 'mixed highs' or the statistical estimation of the proportions of objects included within a picture element. In certain cases applications of the methods are indicated, and estimates are made of their potential savings. A.B.K.

A74-14903 • **Tse computers.** J. P. Strong, III (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 539-542.

Tse computers have the potential of operating four or five orders of magnitude faster than present digital computers. The computers of the new design use binary images as their basic computational entity. The word 'tse' is the transliteration of the Chinese word for 'pictograph character.' Tse computers are large collections of devices that perform logical operations on binary images. The operations on binary images are to be performed over the entire image simultaneously. G.R.

A74-16266 **Digital correction for high-resolution images.** H. Markarian, R. Bernstein, D. G. Ferneyhough, L. E. Gregg, and F. S. Sharp (IBM Corp., Gaithersburg, Md.). *Photogrammetric Engineering*, vol. 39, Dec. 1973, p. 1311-1320. 13 refs.

Discussion of a high-speed digital computer algorithm for introducing geometric corrections to high-resolution images. The algorithm was applied to two images representative of those generated by the return beam vidicon used in the Earth Resources Technology Satellite Program. Processing of each image required only 80 seconds of CPU time and 450 kilobytes of memory on an IBM System/360 Model 65. A reseau detection technique is shown to be adequate for support of the algorithm in image correction applications. V.Z.

A74-16276 **Perception of displayed information.** Edited by L. M. Biberman (Institute for Defense Analyses, Arlington, Va.; Rhode Island, University, Kingston, R.I.). New York, Plenum Press, 1973. 358 p. $25.

The papers deal with image quality, observer performance, analysis of noise-required contrast and modulation in image-detecting and display systems, recent psychophysical experiments, and the display signal-to-noise ratio concept. Image reproduction by a line raster process and the aliasing problems in two-dimensional sampled imagery are treated. The text presents a positive approach toward the design and specification of display parameters. F.R.L.

A74-17205 # **Problems in data management for earth monitoring missions (Probleme beim Data Management für erdbeobachtende Missionen).** E. Velten (Dornier-System GmbH, Friedrichshafen, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-109.* 37 p. 6 refs. In German. Bundesministerium für Forschung und Technologie Contract No. RVII1-V17/72-KA-15.

Consideration of the problems connected with the handling of large quantities of data (generally in the form of images) obtained by aircraft and spacecraft during earth-monitoring missions. A parametric study is made of the problems connected with data acquisition, onboard data processing, data transmission, ground station data processing, and data evaluation by the user. Considering various sensor platforms such as buoy- and ground-based measurement networks, aircraft, satellites, and unmanned spacecraft, the various measurement procedures which could theoretically be used for earth monitoring are discussed with reference to the possibilities of onboard data processing and the preparation of the data for transmission to the ground station. In connection with data processing at the ground station, the basic problems of processing large quantities of data, especially image data, are indicated, and methods of solution are suggested. The possibilities of user-oriented data evaluation are indicated on the basis of characteristic examples such as texture analysis and change detection. A.B.K.

A74-17206 # **A design proposal for an experimental data acquisition and data processing system within the framework of earth resources technology programs (Konzeptvorschlag für eine experimentelle Datenerfassungs- und Datenaufbereitungsanlage im Rahmen von Erderkundungsprogrammen).** W. Tiefenbach and A. Davidson (Gesellschaft für Weltraumforschung mbH, Porz-Wahn, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-110.* 15 p. In German.

A74-17207 # **Ground stations, especially user stations for meteorology and earth resources surveys - State of the art and developmental trends (Bodentationen, besonders Benutzerstationen für Meteorologie und Erderkundung - Stand der Technik und Entwicklungstendenzen).** B. F. Ernst (Rhode und Schwarz, Munich, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-111.* 11 p. In German.

Description of the equipment used at the ground stations for the European meteorological program METEOSAT and for current and future American meteorological programs, such as that involving the NOAA satellite. In this discussion emphasis is placed on the design and technology of typical user stations, as opposed to large central ground stations. The development of such a user station for the reception of high-resolution images transmitted in the 1.7-GHz frequency range of the NOAA 2 satellite is reported. Since the selection and technology of the image-reproduction device play an important role in the technical design of the receiver equipment, the technical parameters of this device, such as resolution, number of gray stages, and the choice of image carrier, are discussed, as well as the possibility of digital image processing. Finally, some possible designs of a ground station for earth resources survey satellites are presented. A.B.K.

A74-17226 # **Classification of multispectral ERTS images (Klassifizierung multispektraler ERTS Bilder).** E. E. Triendl (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Satellitenelektronik, Oberpfaffenhofen, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, Paper.* 18 p. In German.

Consideration of the problem of evaluating multispectral scanner images obtained in four spectral bands by the earth resources technology satellite ERTS-A. After a brief description of the ERTS satellite and the multispectral scanner employed, the various forms in which ERTS images can be obtained are cited, with special attention being paid to the computer-compatible magnetic tape format, which is the only one in which the images can be completely evaluated, since for each scanning point the radiation intensity in all four spectral ranges is given numerically. These four intensities span a four-dimensional object space in which the points belonging to specific surfaces form clusters, which either stand out clearly or merge into one another. A number of examples are presented in

which the properties of images read from magnetic tape are evaluated. A classification of water surfaces according to the rule of minimum distance is also presented. A.B.K.

A74-17243 * Film/chemistry selection for the earth resources technology satellite /ERTS/ ground data handling system. R. M. Shaffer (General Electric Co., Space Div., Philadelphia, Pa.; NASA, Goddard Space Flight Center, Greenbelt, Md.). *Image Technology*, vol. 15, Apr.-July 1973, p. 12-17. Contract No. NAS5-11529.

A detailed description is given of the methods of choose the duplication film and chemistry currently used in the NASA-ERTS Ground Data Handling System. The major ERTS photographic duplication goals are given as background information to justify the specifications for the desirable film/chemistry combination. Once these specifications were defined, a quantitative evaluation program was designed and implemented to determine if any recommended combinations could meet the ERTS laboratory specifications. The specifications include tone reproduction, granularity, MTF and cosmetic effects. A complete description of the techniques used to measure the test response variables is given. It is anticipated that similar quantitative techniques could be used on other programs to determine the optimum film/chemistry consistent with the engineering goals of the program. (Author)

A74-17486 * Moiré patterns and two-dimensional aliasing in line scanner data acquisition systems. C. D. McGillem and T. E. Riemer (Purdue University, West Lafayette, Ind.). *IEEE Transactions on Geoscience Electronics*, vol. GE-12, Jan. 1974, p. 1-8. 13 refs. Grant No. NGL-15-005-112.

The basic mechanism underlying the generation of Moiré patterns in line scanner data acquisition systems is examined. A general expression is developed in terms of typical system parameters for the reproduced image of such systems and the interaction of the image spectrum; the raster frequency and digital sampling frequency of the A/D conversion process are discussed and examples given. System design requirements for avoiding Moiré pattern generation and two-dimensional aliasing are discussed. (Author)

A74-17525 # Information from remote sensed data. Q. S. Earl (Plessey Co., Ltd., Slough, Bucks., England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 38-44.

The author discusses what can be done to improve the methods and machinery for processing data from Earth Resource satellites and why the U.K. should do it. Existing methods are reviewed very briefly. The crucial step is to use the data to decide a hypothesis about a place using Bayes' formula (at least implicitly). (Author)

A74-17526 # A computerised system for identifying changes in the earth's surface cover. I. E. Hill and J. R. Tarrant (East Anglia, University, Norwich, England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 45-47.

The need for and design requirements of a rapid data filtering system for selecting satellite imagery containing significant new information on the earth's surface cover are discussed. One possible method of performing this filtering by comparison of brightness signatures is described. T.M.

A74-17543 * Machine processing of remotely sensed data; Proceedings of the Conference, Purdue University, West Lafayette, Ind., October 16-18, 1973. Conference sponsored by the American Society of Agronomy, IEEE, Crop Science Society of America, NASA, Purdue University, and Soil Science Society of America. New York, Institute of Electrical and Electronics Engineers, Inc., 1973. 438 p. Members, $18.75; nonmembers, $25.

Topics discussed include the management and processing of earth resources information, special-purpose processors for the machine processing of remotely sensed data, digital image registration by a mathematical programming technique, the use of remote-sensor data in land classification (in particular, the use of ERTS-1 multispectral scanning data), the use of remote-sensor data in geometrical transformations and mapping, earth resource measurement with the aid of ERTS-1 multispectral scanning data, the use of remote-sensor data in the classification of turbidity levels in coastal zones and in the identification of ecological anomalies, the problem of feature selection and the classification of objects in multispectral images, the estimation of proportions of certain categories of objects, and a number of special systems and techniques. A.B.K.

A74-17544 * On the management and processing of earth resources information. C. W. Skinner (North Carolina State University, Raleigh, N.C.) and R. C. Gonzalez (Tennessee, University, Knoxville, Tenn.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973 New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1A-1 to 1A-11. 13 refs. Grant No. NGT-01-003-044.

The basic concepts of a recently completed large-scale earth resources information system plan are reported. Attention is focused throughout the paper on the information management and processing requirements. After the development of the principal system concepts, a model system for implementation at the state level is discussed. (Author)

A74-17545 * The role of computer networks in remote sensing data analysis. P. H. Swain, T. L. Phillips, and J. C. Lindenlaub (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1A-12 to 1A-18. Grant No. NGL-15-005-112.

It has been hypothesized that computer networks can be used to make data processing facilities available to the remote sensing community both quickly and effectively. An experiment to test this hypothesis is being conducted by the Laboratory for Applications of Remote Sensing at Purdue University, with the participation of potential users at several remote sites. Initial indications have been highly favorable, although final evaluation awaits further experience and the accumulation of usage data. (Author)

A74-17546 Combining human and computer interpretation capabilities to analyze ERTS imagery. J. D. Nichols and W. M. Senkus (California, University, Berkeley, Calif.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1A-19 to 1A-24.

When processing ERTS imagery, several factors affecting the cost and accuracy of land use classification become apparent. There are numerous, irregularly shaped areas in the imagery which can be rapidly delineated into classes by the photo interpreter accurately enough to meet user requirements. Some of these areas, because they are of little or no interest to the user, can be disregarded. In localized areas, detailed automatic spectral pattern classification of plant species and plant communities can be done with a high degree of accuracy. Computer classification costs increase rapidly with the number of classes being considered for each picture element. There is a one-to-one relationship between the number of points being classified and the cost of computer classification. With these factors in mind, a hardware-software system has been developed at the Center for Remote Sensing Research that integrates human and computer capabilities to increase classification accuracy and reduce processing costs. T.M.

A74-17547 **The design and use of special purpose processors for the machine processing of remotely sensed data.** G. R. Allen, L. O. Bonrud (Control Data Corp., Minneapolis, Minn.), J. J. Cosgrove, and R. M. Stone (Control Data Corp., Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1A-25 to 1A-42. 7 refs.

The processing of the expected volumes of remotely sensed data will overburden the available computer resources. One solution to the problem is the use of special purpose processors. This paper describes two such processors which are suitable for processing remotely sensed data. Also, examples of the use of the processors on specific problems encountered in remotely sensed data are described. (Author)

A74-17548 **Techniques for image registration.** W. F. Webber (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1B-1 to 1B-7. Contract No. F44620-71-C-0052.

Techniques are developed for determining spatial or geometric distortions between two images of the same scene. The first procedure is iterative linearized least squares estimation (LLSE) for determining small geometric distortions between images. Error variances for these estimators are derived which are interpreted as noise-to-signal ratios for translational and rotational registration. The natural measure of the signal strength of an image for translational registration obtained from these variances is used to establish threshold settings in a new algorithm for fast translational registration. This algorithm belongs to the class of sequential similarity detection algorithms (SSDA's) recently developed for translational registration. Finally, an implementation of an image registration system incorporating all these techniques is described. (Author)

A74-17549 * **A method for digital image registration using a mathematical programming technique.** S. S. Yao (Lockheed Electronics Co., Inc., Plainfield, N.J.; NASA, Johnson Space Center, Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1B-8 to 1B-23.

A new algorithm based on a nonlinear programming technique to correct the geometrical distortions of one digital image with respect to another is discussed. This algorithm promises to be superior to existing ones in that it is capable of treating localized differential scaling, translational and rotational errors over the whole image plane. A series of piece-wise 'rubber-sheet' approximations are used, constrained in such a manner that a smooth approximation over the entire image can be obtained. The theoretical derivation is included. The result of using the algorithm to register four channel S065 Apollo IX digitized photography over Imperial Valley, California, is discussed in detail. (Autnor)

A74-17550 **Multitemporal geometric distortion correction utilizing the affine transformation.** R. A. Emmert (California, University, Livermore, Calif.) and C. D. McGillem (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 1B-24 to 1B-32.

In the analysis of multitemporal remotely sensed imagery, it is necessary to place these data into registration. To implement this operation the data are divided into subimages, and the misregistration between the data subsets is modeled by an affine transformation. The properties of the Fourier transform of a two-dimensional function under the affine transformation are given, and examples of these relations between the spatial and spatial frequency domains are shown. Techniques for the estimation of the coefficients of the distortion model using the spatial frequency information are developed, and an example of the use of this method for the correction of line scanner imagery is given. (Author)

A74-17557 * **Correlation of ERTS MSS data and earth coordinate systems.** W. A. Malila, R. H. Hieber, and A. P. McCleer (Environmental Research Institute of Michigan, Ann Arbor, Mich.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2B-1 to 2B-13. 9 refs. Contracts No. NAS5-21783; No. NAS5-21834.

Experience has revealed a problem in the analysis and interpretation of ERTS multispectral scanner (MSS) data. The problem is one of accurately correlating ERTS MSS pixels (picture elements) with analysis areas specified on aerial photographs or topographic maps for training recognition computers and/or evaluating recognition results. A computer-aided procedure to correlate coordinates from topographic maps and/or aerial photographs with ERTS data coordinates has been developed. In the procedure, a map transformation from earth coordinates to ERTS scan line and point numbers is calculated using selected ground control points and the method of least squares. The map transformation is then applied to the earth coordinates of selected areas to obtain the corresponding ERTS point and line numbers. T.M.

A74-17559 **Weighting function techniques for storage and analysis of mass remote sensing data.** J. R. Jancaitis and J. L. Junkins (Virginia, University, Charlottesville, Va.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 2B-25 to 2B-37. 9 refs. Grant No. DAAK02-72-C-0256.

A weighting function interpolation and approximation technique (WIT) for modeling discretely measurable functions of n independent variables with m-th order continuity has been developed. This technique utilizes piecewise locally valid functions formed from local functional approximations using polynomial weighting functions. The weighting functions have been formulated to insure that each piecewise locally valid function join with m-th order continuity with each of its adjacent piecewise functions. Analytic formulas for the coefficients of the weighting functions for n dimensions and m-th order continuity have been derived. This modeling technique is applicable to arbitrarily large data sets and allows complete freedom in the choice of the form of the local functional approximations. Utilization of this technique for representation of large geodetic data sets typically results in very significant reductions in physical storage requirements and greater ease and flexibility of analysis of the data. T.M.

A74-17566 * **An iterative approach to the feature selection problem.** H. P. Decell, Jr. (Houston, University, Houston, Tex.) and J. A. Quirein (TRW Systems Group, Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3B-1 to 3B-12. 11 refs. Contract No. NAS9-12777.

The B-average divergence for m-distinct classes, resulting from the linear transformation $y = Bx$, is proposed as a feature selection criterion, where B is a k by n matrix of rank k not greater than n. It is shown that if the B-average divergence resulting from B is large enough, then the probability of misclassification, considered as a function of the class of all k by n matrices, is essentially minimized by B. A computer program, utilizing a gradient procedure, is

developed to numerically maximize the B-average divergence and results are presented for the CI flight line. For this example, corresponding to 9-distinct classes, most of the discriminatory information is found to lie in a 3-dimensional subspace, defined by an appropriately chosen 3 by 12 matrix B. (Author)

A74-17568 * Extraction and classification of objects in multispectral images. T. V. Robertson (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3B-27 to 3B-34. Contract No. NAS5-21773.

Presented here is an algorithm that partitions a digitized multispectral image into parts that correspond to objects in the scene being sensed. The algorithm partitions an image into successively smaller rectangles and produces a partition that tends to minimize a criterion function. Supervised and unsupervised classification techniques can be applied to partitioned images. This partition-then-classify approach is used to process images sensed from aircraft and the ERTS-1 satellite, and the method is shown to give relatively accurate results in classifying agricultural areas and extracting urban areas. (Author)

A74-17569 * The use of the modified Cholesky decomposition in divergence and classification calculations. D. L. Van Rooy, M. S. Lynn, and C. H. Snyder (Rice University, Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3B-35 to 3B-47. 8 refs. Contract No. NAS9-12776.

This report analyzes the use of the modified Cholesky decomposition technique as applied to the feature selection and classification algorithms used in the analysis of remote sensing data (e.g., as in LARSYS). This technique is approximately 30% faster in classification and a factor of 2-3 faster in divergence, as compared with LARSYS. Also numerical stability and accuracy are slightly improved. Other methods necessary to deal with numerical stability problems are briefly discussed. (Author)

A74-17570 * Iterative techniques to estimate signature vectors for mixture processing of multispectral data. P. Salvato, Jr. (TRW Systems Group, Houston, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3B-48 to 3B-62. 5 refs. Contract No. NAS9-12330.

Two methods for obtaining the required spectral signatures for a particular mixture model are considered. For the model considered, the spectral signatures become signature vectors. The first method is based upon determination of the signature vectors in such a way that a measure of the inconsistency between the mixture model and the observed data is minimized. The second method is based upon determination of the signature vectors in such a way that the estimated mean percentage coverage of individual species matches apriori or ground truth estimates. The two methods proposed are applied to actual multispectral data in order to verify the concepts presented. (Author)

A74-17572 Machine processing of ERTS and ground truth data. R. H. Rogers and K. Peacock (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4A-14 to 4A-27. 5 refs.

Results achieved by ERTS-Atmospheric Experiment PR303, whose objective is to establish a radiometric calibration technique, are reported. This technique, which determines and removes solar and atmospheric parameters that degrade the radiometric fidelity of ERTS data, transforms the ERTS sensor radiance measurements to absolute target reflectance signatures. A Radiant Power Measuring Instrument (RPMI) and its use in determining atmospheric parameters needed for ground truth are discussed. The procedures used and results achieved in machine processing ERTS computer-compatible tapes and atmospheric parameters to obtain target reflectance are reviewed. (Author)

A74-17573 * Information preserving coding for multispectral data. J. R. Duan and P. A. Wintz (Purdue University, West Lafayette, Ind.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4A-28 to 4A-35. 14 refs. Grants No. NGR-15-005-152; No. NGL-15-005-112.

A general formulation of the data compression system is presented. A method of instantaneous expansion of quantization levels by reserving two codewords in the codebook to perform a folding over in quantization is implemented for error free coding of data with incomplete knowledge of the probability density function. Results for simple DPCM with folding and an adaptive transform coding technique followed by a DPCM technique are compared using ERTS-1 data. (Author)

A74-17574 Fast automated analysis and classification of color pictures by signature and pattern recognition using a color scanner. H. S. Helbig (Deutsche Forschungs und Versuchsanstalt für Luft- und Raumfahrt, Institut für Satellitenelektronik, Oberpfaffenhofen, West Germany). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4A-36 to 4A-41.

A commercial high-resolution color scanner is used with a color computer, a gradation processor, an operational amplifier, and a comparator in automatic analysis and classification of color picures. The procedures involved are classified here as global, local, and point operations. Global operations refer to the whole picture, involving rectification, enlargement, or density transformations. Local operations are mostly used for texture and pattern recognition and are related to the scanned picture element and its surrounding area. Point operations manipulate the information of a single picture element. The scanner generates three color signals from each picture element; these are handled in the color computer for color and signature recognition. Several operations may be carried out in the same scan. The processed picture is displayed on a b/w transparency or on a color film. T.M.

A74-17575 Deriving spectral and spatial features to establish a hierarchical classification system. J. E. Skaley (Cornell University, Ithaca, N.Y.) and R. J. Hoffmann (USAF, Rome Air Development Center, Griffiss AFB, N.Y.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-1 to 4B-5. 7 refs.

Automatic processing of remotely sensed data has to date been constrained to using training sets to classify a small number of categories within the context of a limited geographical area. In order to promote a more flexible user-oriented data processing system, a hierarchical taxonomic structure is proposed. This structure incorporates data inputs from several different sensors together with a priori information on the characteristics of different materials of interest to facilitate efficient design of feature sets to classify those materials. A Boolean approach may be used to assign these feature sets including both spectral and spatial criteria to different hierarchical levels. (Author)

A74-17576 * **Feature extraction of multispectral data.** R. B. Crane, T. Crimmins, and J. F. Reyer (Environmental Research Institute of Michigan, Ann Arbor, Mich.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-6 to 4B-15. 6 refs. Contract No. NAS9-9784.

A method is presented for feature extraction of multispectral scanner data. Non-training data is used to demonstrate the reduction in processing time that can be obtained by using feature extraction rather than feature selection. (Author)

A74-18579 **Hydrographic verification of wetland delineation by remote sensing.** D. F. Polis, M. Salter, and H. Lind (Delaware, University, Newark, Del.). *Photogrammetric Engineering*, vol. 40, Jan. 1974, p. 75-78. Contract No. N00014-69-A-0407.

A74-19081 * **Textural features for image classification.** R. M. Haralick, I. Dinstein (Kansas, University; Center for Research, Inc., Lawrence, Kan.), and K. Shanmugam (Wichita State University, Wichita, Kan.). *IEEE Transactions on Systems, Man, and Cybernetics*, vol. SMC-3, Nov. 1973, p. 610-621. 25 refs. Contract No. NAS5-21822; Grant No. DAAK02-70-C-0388.

Description of some easily computable textural features based on gray-tone spatial dependances, and illustration of their application in category-identification tasks of three different kinds of image data - namely, photomicrographs of five kinds of sandstones, 1:20,000 panchromatic aerial photographs of eight land-use categories, and ERTS multispectral imagery containing several land-use categories. Two kinds of decision rules are used - one for which the decision regions are convex polyhedra (a piecewise-linear decision rule), and one for which the decision regions are rectangular parallelpipeds (a min-max decision rule). In each experiment the data set was divided into two parts, a training set and a test set. Test set identification accuracy is 89% for the photomicrographs, 82% for the aerial photographic imagery, and 83% for the satellite imagery. These results indicate that the easily computable textural features probably have a general applicability for a wide variety of image-classification applications. (Author)

N74-10180*# General Research Corp., Arlington, Va.
IMAGE DATA PROCESSING SYSTEM REQUIREMENTS STUDY. VOLUME 2: APPENDIXES Final Report, May 1973 - Aug. 1973
T. Honikman, E. McMahon, E. Miller, L. Pietrzak, and W. Yorsz Oct. 1973 362 p
(Contract NAS5-21920)
(NASA-CR-132853; WGRC-73-3274; CR-1-417) Avail: NTIS HC $20.25 CSCL 09B

Supporting information for the ERS loading study contains computer simulation loading output including printout description, and similar output representing data that include night station contacts. Author

N74-10365*# General Research Corp., Arlington, Va.
IMAGE DATA PROCESSING SYSTEM REQUIREMENTS STUDY. VOLUME 1: ANALYSIS Final Technical Report, May - Aug. 1973
T. Honikman, E. McMahon, E. Miller, L. Pietrzak, and W. Yorsz Oct. 1973 161 p ref
(Contract NAS5-21920)
(NASA-CR-132852; WGRC-73-3273-Vol-1; CR-1-417-Vol-1) Avail: NTIS HC $10.25 CSCL 14B

Digital image processing, image recorders, high-density digital data recorders, and data system element processing for use in an Earth Resources Survey image data processing system are studied. Loading to various ERS systems is also estimated by simulation. Author

N74-10380*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
INVESTIGATION OF TECHNIQUES FOR CORRECTION ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS Interim Report, Feb - Jul. 1973
Robert H. Rogers Aug. 1973 53 p refs
(Contract NAS5-21863)
(NASA-CR-132860) Avail: NTIS HC $4.75 CSCL 05B

Significant findings during this report period are: (1) The feasibility of using techniques for obtaining and using atmospheric parameter to transform ERTS data into absolute target reflectance was demonstrated. (2) Ground-truth instrumentation must have a dynamic range of 100,000 for obtaining the full set of atmospheric parameters encountered in the field. (3) Atmospheric transmittance for January through May 1973 varied from 13 to 18 percent in the ERTS bands. (4) Energy scattered to the spacecraft from the atmosphere for the March overflight was equivalent to that produced by a target having a reflectance of 11% in band 4, 5% in band 5, 3% in band 6, and 1% in band 7. (5) This atmospheric radiance varies as a function of sun zenith angle (scatter angle) and is predicted to change by 30% for sun angles at the latitude of the Michigan test site. (6) If not removed from spacecraft measurements before computing reflectance of surface targets, this radiance is a major source of error. Author

N74-11157*# TRW Systems Group, Redondo Beach, Calif.
EVALUATION OF DIGITAL CORRECTION TECHNIQUES FOR ERTS IMAGES Bimonthly Progress Report, Sep. - Oct. 1973
John E. Taber, Principal Investigator and S. S. Rifman Oct. 1973 4 p ERTS
(Contract NAS5-21814)
(E74-10022; NASA-CR-135863) Avail: NTIS HC $3.00 CSCL 05B

N74-11158*# Oceanographic Services, Inc., Santa Barbara, Calif.
ACQUISITION AND ANALYSIS OF COASTAL GROUND-TRUTH DATA FOR CORRELATION WITH ERTS-1 IMAGERY Progress Report, 2 Aug. - 2 Nov. 1973
William A. Anikouchine, Principal Investigator 12 Nov. 1973 5 p ERTS
(Contract NAS5-21877)
(E74-10023; NASA-CR-135864; PR-5) Avail: NTIS HC $3.00 CSCL 08J

The author has identified the following significant results. Radiance profiles drawn along cruise tracks have been examined for use in correlating digital radiance levels with ground truth data. Preliminary examination results are encouraging. Adding weighted levels from the 4 MSS bands appears to enhance specular surface reflections while rendering sensor noise white. Comparing each band signature to the added specular signature ought to enhance non-specular effects caused by ocean turbidity. Preliminary examination of radiance profiles and ground truth turbidity measurements revealed substantial correlation.

N74-11162*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources (ORSER).
ANALOG TO DIGITAL CONVERSION AND PROCESSING OF MSS DATA USING A HYBRID COMPUTER Interim Report
George J. McMurtry, Gary W. Petersen, Principal Investigators, and C. E. Rambert May 1973 5 p ERTS
(Contract NAS5-23133)
(E74-10033; NASA-CR-135874; ORSER-SSEL-TR-24-73) Avail: NTIS HC $3.00 CSCL 09B

N74-11172*# Swiss Inst. of Meteorology, Zurich.
METEOROLOGICAL INTERPRETATION OF CLOUDS OR CLOUD SYSTEMS APPEARING ON PICTURES OF THE ALPINE REGION RECEIVED FROM THE EARTH RE-

SOURCES TECHNOLOGY SATELLITE (ERTS-1) Preliminary Report No. 1
Alexandre Piaget Nov. 1973 35 p refs Sponsored by NASA
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(E74-10051; NASA-CR-135892; Rept-37) Avail: NTIS HC $3.75 CSCL 04B

The author has identified the following significant results. Three examples of cloud-interpretation from ERTS-1 pictures are presented. When the wind speed is large enough, the cumuli are found arranged in lines that are in average two kilometers apart from each other. These lines are grouped in lines made of small cumuli and in lines made up of well developed ones. These last lines are fused on the APT picture and appear as single lines. Fog-mapping for a given region is possible if the topography of the region is known. The stratified clouds lying over mountains or in valleys begin to dissolve above the middle of the valleys and not against the slopes. As water shows a weak albedo in the near infrared, wet surfaces will appear darker than their neighborhoods. This feature seems to be confirmed by the dark spot in the north of Bozen (Southern Tyrol) that can be seen on the ERTS-1 picture taken on 31 August 1972.

N74-11176*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL RESOLUTION IN PHOTOGRAPHIC FORM Progress Report, 1 Mar. - 1 Sep. 1973
P. N. Slater, Principal Investigator, R. L. Antos, and R. A. Schowengerdt Oct. 1973 27 p refs ERTS
(Contract NAS5-21849)
(E74-10055; NASA-CR-135896; PR-6) Avail: NTIS HC $3.50 CSCL 14E

N74-11179*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth ReSources (ORSER).
ERTS AND AIRCRAFT MULTISPECTRAL SCANNER DIGITAL DATA USERS MANUAL
George J. McMurtry, Gary W. Petersen, Principal Investigators, F. Y. Borden, D. N. Applegate, B. J. Turner, H. M. Lachowski, and J. R. Hoosty [1973] 1 p ERTS
(Contract NAS5-23133)
(E74-10058; NASA-CR-135958; ORSER-SSEL-TR-11-73) Avail: NTIS HC $3.00 CSCL 05B

N74-11198*# Naval Research Lab., Washington, D.C.
[ADAPTATION OF COMPUTER PROGRAMMING TO OUTPUT FORM OF ALTIMETER DATA] Monthly Progress Report, 1 Jul. - 1 Aug. 1973
A. Shapiro, Principal Investigator 24 Aug. 1973 1 p EREP
(NASA Order T-4716-B)
(E74-10087; NASA-CR-135976; MR-1) Avail: NTIS HC $3.00 CSCL 05B

N74-11214*# IIT Research Inst., Chicago, Ill.
CORRELATION SIGNATURES OF WET SOILS AND SNOWS Final Report, 22 Mar. 1971 - 22 Sep. 1972
M. R. Phillips Oct. 1972 180 p
(Contract NAS8-28797)
(NASA-CR-124004; IITRI-J6243-6) Avail: NTIS HC $11.00 CSCL 08M

Interpretation, analysis, and development of algorithms have provided the necessary computational programming tools for soil data processing, data handling and analysis. Algorithms that have been developed thus far, are adequate and have been proven successful for several preliminary and fundamental applications such as software interfacing capabilities, probability distributions, grey level print plotting, contour plotting, isometric data displays, joint probability distributions, boundary mapping, channel registration and ground scene classification. A description of an Earth Resources Flight Data Processor, (ERFDP), which handles and processes earth resources data under a users control is provided. Author

N74-11215*# National Aeronautics and Space Administration, Washington, D.C.
SKANE FROM AN ALTITUDE OF 900 KILOMETERS
H. Svensson Nov. 1973 6 p Transl. into ENGLISH from Sv. Geografisk Aersbok (Sweden), v. 48, 1972 p 137-140
(NASA-TT-F-15201) Avail: NTIS HC $3.00 CSCL 05B

ERTS-1, an unmanned observation satellite at an altitude of 900 km, takes pictures of the earth's surface in several frequency bands and relays them to ground by telemetry. Coastal formations are seen to be clearest in the visible spectral ranges, while ground cover is differentiated best in the IR channels. Author

N74-11216*# National Aeronautics and Space Administration, Washington, D.C.
THE FIRST ERTS-PICTURES OVER SKANE
H. Svensson Nov. 1973 13 p Transl. into ENGLISH from Geografiska Notiser (Sweden), v. 31, no. 1, 1973 p 19-23
(NASA-TT-F-15202) Avail: NTIS HC $3.00 CSCL 05B

Scientists from many countries are cooperating in the American ERTS program, which uses unmanned satellites to collect data for evaluating and managing the earth's resources. ERTS-1 has equipment for collecting data at several different wavelength ranges, for storing the data, and for transmitting it to ground. Accuracy and resolution are found to be exceptionally good and present unique possibilities for studying the earth's surface under differing weather conditions and seasons. Author

N74-11217*# National Aeronautics and Space Administration, Washington, D.C.
MULTI-SPECTRAL REPRODUCTION FROM ERTS-1
H. Svensson Nov. 1973 9 p Transl. into ENGLISH from Geografiska Notsier (Sweden), v. 31, no. 3, 1973 p 127-130
(NASA-TT-F-15203) Avail: NTIS HC $3.00 CSCL 14E

Although ERTS-1 has been in operation for one year, parts of southern Sweden have not yet been photographed because of technical problems and unfavorable weather conditions. Recording in several spectral ranges is shown to be of value for different geographical areas. ERTS pictures can be useful both for analysis of well investigated and relatively poorly investigated areas. Author

N74-11261 Meisei Electric Co. Ltd., Tokyo (Japan).
COMPUTER-AIDED SHIPBOARD UPPER-AIR OBSERVATION SYSTEM
T. Kurashige *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 548-558

A fully transistorized automatic tracking radar set for use onboard ships is described which has been developed to track echosondes, echorawins, rawinsondes or rawins. The equipment specifications are given in detail and the compensation for ship motion is discussed. The receiving and recording equipment is described and radiosonde and rawin observation modes are discussed. ESRO

N74-12139*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Oct. 1973
Richard F. Nalepka and William A. Malila, Principal Investigators 5 Nov. 1973 1 p EREP
(Contract NAS9-13280)
(E74-10084; NASA-CR-135973; ERIM-101900-17-L; MPR-8) Avail: NTIS HC $3.00 CSCL 05B

N74-12142* Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
INTERPRETATION AND AUTOMATIC IMAGE ENHANCEMENT FACILITY

R. M. Haralick, G. L. Kelly, Principal Investigators, and Robert J. Bosley *In its* Kansas Environ. and Resource Study: A Great Plains Model Oct. 1973 5 p ERTS

(Rept-2262-7) CSCL 14B

N74-12165*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A BRIEF DESCRIPTION OF AN EARTH RESOURCES TECHNOLOGY SATELLITE (ERTS) COMPUTER DATA ANALYSIS AND MANAGEMENT PROGRAM
Robert R. Jayroe, Jr. 6 Dec. 1973 17 p refs
(NASA-TM-X-64793) Avail: NTIS HC $3.00 CSCL 05A

A data analysis and management procedure currently being used at Marshall Space Flight Center to analyze ERTS digital data is described. The objective is to acquaint potential users with the various computer programs that are available for analysis of multispectral digital imagery and to show how these programs are used in the overall data management plan. The report contains a brief description of each computer routine, and references are provided for obtaining more detailed information. Author

N74-13025*# Tennessee Univ., Knoxville. Dept. of Electrical Engineering.
ERTS-A IMAGERY INTERPRETATION TECHNIQUES IN THE TENNESSEE VALLEY Progress Report, 25 Sep. - 25 Nov. 1973
Robert E. Bodenheimer, Principal Investigator 4 Dec. 1973 2 p ERTS
(Contract NAS5-21875)
(E74-10098; NASA-CR-136089) Avail: NTIS HC $3.00 CSCL 05B

N74-13037*# Environmental Research Inst. of Michigan, Ann Arbor.
CORRELATION OF ERTS MSS DATA AND EARTH COORDINATE SYSTEMS
William A. Malila, Principal Investigator, Ross H. Hieber, and Arthur P. McCleer Aug. 1973 15 p refs Presented at Purdue Conf. on Machine Process of Remotely Sensed Data, 16-18 Oct. 1973 ERTS
(Contracts NAS5-21783; NAS5-21834)
(E74-10110; NASA-CR-136101; Rept-193300-18-SA/J) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Experience has revealed a problem in the analysis and interpretation of ERTS-1 multispectral scanner (MSS) data. The problem is one of accurately correlating ERTS-1 MSS pixels with analysis areas specified on aerial photographs or topographic maps for training recognition computers and/or evaluating recognition results. It is difficult for an analyst to accurately identify which ERTS-1 pixels on a digital image display belong to specific areas and test plots, especially when they are small. A computer-aided procedure to correlate coordinates from topographic maps and/or aerial photographs with ERTS-1 data coordinates has been developed. In the procedure, a map transformation from earth coordinates to ERTS-1 scan line and point numbers is calculated using selected ground control points nad the method of least squares. The map transformation is then applied to the earth coordinates of selected areas to obtain the corresponding ERTS-1 point and line numbers. An optional provision allows moving the boundaries of the plots inward by variable distances so the selected pixels will not overlap adjacent features.

N74-13051*# Alabama Univ., University. Bureau of Engineering Research.
INVESTIGATIONS USING DATA IN ALABAMA FROM ERTS-A Bimonthly Progress Report, 7 Oct. - 6 Dec. 1973
Harold R. Henry and George P. Whittle, Principal Investigators 6 Dec. 1973 66 p ref ERTS
(Contract NAS5-21876)
(E74-10124; NASA-CR-136169; BMPR-7) Avail: NTIS HC $5.50 CSCL 08B

N74-13058*# Alaska Univ., Fairbanks.
COORDINATION AND ESTABLISHMENT OF CENTRALIZED FACILITIES AND SERVICES FOR THE UNIVERSITY OF ALASKA ERTS SURVEY OF THE ALASKAN ENVIRONMENT Bimonthly Progress Report
Albert E. Belon, Principal Investigator 30 Nov. 1973 8 p refs ERTS
(Contract NAS5-21833)
(E74-10131; NASA-CR-136176; BMPR-8) Avail: NTIS HC $3.00 CSCL 14B

N74-13086*# General Research Corp., Arlington, Va.
EOS IMAGE DATA PROCESSING SYSTEM DEFINITION STUDY Final Technical Report, May - Aug. 1973
J. Gilbert, T. Honikman, E. McMahon, E. Miller, L. Pietrzak, and W. Yorsz Oct. 1973 118 p refs
(Contract NAS5-21950)
(NASA-CR-132892; CR-1-457; WGRC-73-3297) Avail: NTIS HC $8.00

The Image Processing System (IPS) requirements and configuration are defined for NASA-sponsored advanced technology Earth Observatory System (EOS). The scope included investigation and definition of IPS operational, functional, and product requirements considering overall system constraints and interfaces (sensor, etc.) The scope also included investigation of the technical feasibility and definition of a point design reflecting system requirements. The design phase required a survey of present and projected technology related to general and special-purpose processors, high-density digital tape recorders, and image recorders. Author

N74-14013* California Univ., Davis. Dept. of Electrical Engineering and Computer Sciences.
DIGITAL HANDLING AND PROCESSING OF REMOTE SENSING DATA
Robert N. Colwell, R. Algazi, Principal Investigators, D. J. Sakrison, J. Schriebman, W. Dere, B. Romberger, and A. Samulon *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 25 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

CSCL 05B

N74-14018*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Nov. 1973
Richard F. Nalepka and William A. Malila, Principal Investigators 10 Dec. 1973 2 p EREP
(Contract NAS9-13280)
(E74-10150; NASA-CR-136209; ERIM-101900-19-L; MPR-9) Avail: NTIS HC $3.00 CSCL 05B

N74-14023*# National Environmental Satellite Service, Washington, D.C.
A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Oct. - Dec. 1973
John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Dec. 1973 4 p ref EREP
(NASA Order T-4715-B)
(E74-10155; NASA-CR-136282; QPR-3) Avail: NTIS HC $3.00 CSCL 04B

N74-14109# Geological Survey, Denver, Colo.
A FORTRAN 4 COMPUTER PROGRAM FOR DETERMINATION OF AIRBORNE CAMERA AND SCANNER VARIABLES IN GEOLOGIC REMOTE SENSING Final Report
Stephen S. Hart 1973 16 p refs
(PB-222862/5; USGS-GD-73-030) Avail: NTIS HC $3.00 CSCL 08G

A FORTRAN 4 computer program for determination and comparison of optimum variables for conventional and multiband cameras, and thermal infrared and multispectral scanners, was utilized in geologic remote sensing research. The variables determined include flightline separation, photo scale, resolution, intervalometer setting, image motion compensation, and amount of film per flightline mile for cameras. GRA

N74-14131# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
PROJECTION-VIEWER FOR MICROSCALE AERIAL PHOTOGRAPHY Final Report
Robert C. Aldrich, James VonMosch, and Wallace Greentree 1972 5 p
(PB-223064/7; FSRN-PSW-277) Avail: NTIS HC $3.00 CSCL 14E

A low cost projection viewer has been developed to enlarge portions of microscale aerial photography. These pictures can be used for interpretation or mapping, or for comparison with existing photographs, maps, and overlays to monitor environmental changes. The projection viewer can enlarge from 2.5 to 20 times, and can be calibrated so that maps may be drawn with a minimum of distortion. Author (GRA)

N74-15005* Grumman Data Systems Corp., Bethpage, N.Y.
DATA PROCESSING FOR THE ERTS-1 VIRGIN ISLANDS EXPERIMENT 589
W. C. Coulbourn, Principal Investigator (Grumman Ecosystems Corp.) and George B. Heaslip *In* Grumman Ecosystems Corp. ERTS-1 Virgin Islands Expt. 589. Determine Boundaries of ERTS and Aircraft Data Within Which Useful Water Quality Information Can Be Obtained Oct. 1973 71 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
CSCL 08H

N74-15016*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Dec. 1973
Roger M. Hoffer, Principal Investigator Dec. 1973 5 p EREP (Contract NAS9-13380)
(E74-10208; NASA-CR-136390) Avail: NTIS HC $3.00 CSCL 08F

N74-15058*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
NOTES FOR THE IMPROVEMENT OF THE SPATIAL AND SPECTRAL DATA CLASSIFICATION METHOD
Charles C. Dalton 23 Jan. 1974 33 p refs
(NASA-TM-X-64801) Avail: NTIS HC $3.75 CSCL 05B

This report examines the spatial and spectral clustering technique for the unsupervised automatic classification and mapping of earth resources satellite data, and makes theoretical analysis of the decision rules and tests in order to suggest how the method might best be applied to other flight data such as Skylab and Spacelab. Author

N74-15069# Joint Publications Research Service, Arlington, Va.
PROCESSING AND THEORETICAL ANALYSIS OF OCEANOGRAPHIC OBSERVATIONS
V. I. Belyayev 19 Dec. 1973 57 p Transl. into ENGLISH from the book "Obrabotka i Teoreticheskiy Anliz Okeanograficheskikh Nablyudeniy" Kiev, Naukova Dumka, 1973 45 p
(JPRS-60808) Avail: NTIS HC $5.00

Excerpts from a book are presented on processing and theoretical analysis of oceanographic and marine geologic-geophysical observation. A survey of oceanographic fields to compile charts for individual oceanic regions is planned. Author

08
INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

A74-10110 * # High resolution multispectral camera system for ERTS A & B. B. P. Miller, G. A. Beck, and J. M. Barletta (RCA, Astro-Electronics Div., Princeton, N.J.). *Journal of Spacecraft and Rockets*, vol. 10, Oct. 1973, p. 638-646. 17 refs. Contracts No. NAS5-11621; No. NAS5-21904.

A very high resolution multispectral television camera system has been developed for NASA for use on the Earth Resources Technology Satellite (ERTS) program. There are three cameras in the system, each viewing the same area but operating in the blue-green, red, and near-infrared spectral bands. In the laboratory the cameras' limiting resolution is 4500 TV lines over the 25 x 25-mm image format of the Return Beam Vidicon (RBV). Analysis of typical ERTS scenes shows that actual contrast ratios will be much lower than those of laboratory test targets. A model was developed to predict the resolving power performance of the RBV camera under realistic conditions. To verify the model, tests were conducted using the RBV camera, a laser-beam image reproducer and a series of AF tribar test patterns of known values of contrast. As a more graphic demonstration, simulated multispectral images were generated using color-IR photographs from Apollo 9. The measured signal-to-noise, resolution, and spectral characteristics of the ERTS Flight A and Flight B three-camera systems are presented in conclusion. (Author)

A74-10779 Radiation temperatures of ground cover in the microwave and infrared ranges measured from the Cosmos-384 satellite. A. E. Basharinov, A. K. Gorodetskii, A. S. Gurvich, S. T. Egorov, A. A. Kurskaia, D. T. Matveev, A. P. Orlov, and A. M. Shutko (Akademiia Nauk SSSR, Institut Radiotekhniki i Elektroniki and Institut Fiziki Atmosfery, Moscow, USSR). *(Akademiia Nauk SSSR, Izvestiia, Fizika Atmosfery i Okeana*, vol. 9, Feb. 1973, p. 183-186.) *Academy of Sciences, USSR, Izvestiya, Atmospheric and Oceanic Physics*, vol. 9, Feb. 1973, p. 99-101. Translation.

A74-11013 Small earth resource survey rockets. T. J. Douglass (Bristol Aerojet, Ltd., Banwell, Somerset, England) and P. E. G. Cope (Marconi Space and Defence Systems, Ltd., Rijswijk, Netherlands). *Spaceflight*, vol. 15, Nov. 1973, p. 418-426.

There is apparently a need for rockets that can be fired from mobile launchers in areas where no range facilities exist. To do this it is necessary that impact areas are predictable to a high degree of accuracy and confidence, and that the empty cases can be shown to impact in areas which have an extremely low population density. The standard Petrel and Skua rockets already have an excellent reputation for low dispersion, and both may be fired from the same mobile launchers. The Petrel rocket has sufficient payload capability to carry a simple stabilization system. This may be developed to meet most earth resources instrumentation requirements. The 5-in. Skua rocket does not have the payload capacity to carry an altitude control system, and the easiest way to point a camera toward a target on the ground is by adjusting the rocket trajectory so that it aligns itself with the target on the down leg soon after apogee. F.R.L.

A74-11338 * # Determination of stratospheric temperature and height gradients from Nimbus 3 radiation data. G. W. Nicholas, D. N. Hovland, and A. D. Belmont (Control Data Corp., Minneapolis, Minn.). *Monthly Weather Review*, vol. 101, Feb. 1973, p. 141-149. 8 refs. Contract No. NAS8-25949.

To improve the specification of stratospheric, horizontal, temperature and geopotential height fields needed for high-flying aircraft, we derived a technique to estimate data between satellite tracks using interpolated infrared interferometer spectrometer 15-micron radiation data from Nimbus 3. The interpolation is based on the observed gradients of the medium resolution infrared 15-micron radiances between subsatellite tracks. The technique was verified with radiosonde data taken within 6 hr of the satellite data. Comparison indicates that the technique developed here produces analyses that are in general agreement with those from radiosonde data. In addition, this technique provides details over areas of sparse data not shown by conventional techniques. (Author)

A74-12750 * Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Meeting sponsored by SPIE, NOAA, ARPA, NASA Ames Research Center, and Jet Propulsion Laboratory. Edited by Y. H. Katz. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Proceedings. Volume 4), 1973. 282 p. Members, $20.; nonmembers, $27.

Visual tracking performance in instrumentation is discussed together with photographic pyrometry in an aeroballistic range, optical characteristics of spherical vapor bubbles in liquids, and the automatic detection and control of surface roughness by coherent diffraction patterns. Other subjects explored are related to instruments, sensors, systems, holography, and pattern recognition. Questions of data handling are also investigated, taking into account minicomputer image storage for holographic interferometry analysis, the design of a video amplifier for a 90 MHz bandwidth, and autostereoscopic screens.

G.R.

A74-12757 Multi-spectral imaging sensor. C. W. Stephens (Martin Marietta Aerospace, Orlando, Fla.). In: Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1973, p. 65-70.

By using combinations of several selected portions of the spectrum the contrast of certain objects in a scene can be enhanced. A system utilizing this approach can be called a spectral signature system. It is possible to use a three-channel imaging sensor to create the data and a specially developed computer to process the data in real time. Questions of sensor signal formulation are discussed together with a round detector, a rectangular detector, aspects of fundamental Vidicon operation, Vidicon transducer action, Vidicon interdependencies, and consistent model equations. G.R.

A74-12763 * Remote water quality measurements with a lidar polarimeter. G. J. Wilhelmi, W. T. Mayo, Jr., and J. W. Rouse, Jr. (Texas A & M University, College Station, Tex.). In: Optical instrumentation engineering in science, technology and society; Proceedings of the Sixteenth Annual Technical Meeting, San Mateo, Calif., October 16-18, 1972. Redondo Beach, Calif., Society of Photo-optical Instrumentation Engineers, 1973, p. 131-137. 10 refs. Grant No. NsG-239-62.

A lidar polarimeter system utilizing a 5 mw He-Ne laser has been constructed and used for laboratory and day light backscatter measurements from suspensions of teflon particles and absorbing dye in water. The results of this study have shown that a lidar polarimeter system can measure 'volume reflectance' without interference of peripheral effects such as sky reflections. The polarization ratio appears to be less affected by surface waves than does the total intensity or individual polarizations. The cross polarized return is the most sensitive to changes in the single scatter albedo and absolute concentrations of absorbing and scattering materials. A criterion is indicated which states that finite beam effects must be considered when the total extinction length is greater than the incident beam width. (Author)

A74-12866 # The determination of bright and spacial characteristics of the earth and the planets from space photographs by the methods of the optical correlation. N. P. Lavrova and I. V. Almazov. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 14 p.

A74-12952 **From photointerpretation to the teledetection of natural resources (De la photo-interprétation à la télédétection des ressources naturelles).** P. Rey (Toulouse III, Université, Toulouse; CNRS, Paris, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 1-3. In French.

The satellite, an ideal teledetection vector, has prospects of exploitation that lead to a corresponding technological evolution, obliging all photointerpreters of the world to convert to teledetectors. With reference to data acquisition, the variety of teledetectors, and the characteristics of teledetection are discussed. Attention is given to image treatment and qualitative, quantitative, and experimental exploitations of data. F.R.L.

A74-12953 **The activities of the BRGM - the National Geological Service - in the field of remote detection (Les activités du BRGM - Service Géologique National - dans le domaine de la télédétection).** J. Y. Scanvic and G. Weecksteen (Bureau de Recherches Géologiques et Minières, Paris, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 3-5. In French.

A74-12954 **The activities of the French Petroleum Institute /IFP/ in the field of teledetection (Les activités de l'Institut Français du Pétrole /IFP/ dans le domaine de la télédétection).** P. Boissard, A. Fontanel, J. Guillemot, M. Guy, and C. Torres (Institut Français du Pétrole, des Carburants et Lubrifiants, Rueil-Malmaison, Hauts-de-Seine, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 6-13. In French.

The purpose of the program was research of a methodology rather than study of a particular region. The program was oriented toward comparison of results obtained by various processes and on various dates. Some aspects of the study of thermographs are discussed. This method of teledetection is sensitive, and can be applied to study of fog, haze, or simply the water vapor contained in the air. An example of analysis of spatial frequencies is given, as well as some examples of numerical treatment. A number of photographs are presented, with analytical comment. F.R.L.

A74-12956 **The activities of the CERGH in the field of teledetection of terrestrial resources (Les activités du CERGH dans le domaine de la télédétection des ressources terrestres).** C. Armangau and J. Avias (Montpellier II, Université, Montpellier, France). *La Recherche Spatiale*, vol. 12, Sept.-Oct. 1973, p. 16-21. In French.

The Centre d'Etudes et the Recherches Géologique et Hydrologique (CERGH) is now in a position to bring its contribution to the development of teledetection on the one hand and in a general way, by the means which it can make available for research, and on the other hand, and more particularly, in the direction of studies which it has specially developed. These include study of the dynamics and the pollution of coastal marine waters, and the study of carbonated rocks and water-bearing strata in cracked or karstic rocks. The work consists of participation in national and international programs, and in local development of certain research programs. F.R.L.

A74-12974 # **An earth resources aircraft facility.** J. Plevin (ESRO, Space Applications Div., Neuilly-sur-Seine, Hauts-de-Seine, France). *(British Interplanetary Society, Symposium on Earth Observation Satellites, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 26, Dec. 1973, p. 728-741. 8 refs.

Description of an earth resources aircraft facility (ERAF) fitted with a wide range of advanced remote sensing instruments, which could provide the central component for a preparatory program centered around airborne remote sensing platforms. ERAF, as a European project, would complement existing national aircraft facilities available commercially or through government agencies, which are, at present, usually relatively small aircraft fitted with simple payloads such as multiband cameras and thermal IR line scanners. (Author)

A74-13138 **Laser-Raman radar for the remote measurement of atmospheric molecular constituents.** T. Kobayasi and H. Inaba (Tohoku University, Sendai, Japan). *Electronics and Communications in Japan*, vol. 56, Feb. 1973, p. 101-109. 31 refs. Translation.

Theoretical and experimental analysis of the performance of a laser radar which uses Raman backscattering by molecular constituents of the atmosphere. A brief description is given of the basic principle of operation of this radar, the laser-Raman radar equation is discussed, and the SNR for detecting weak light signals is calculated. The cross sections and the spectral distribution of the Raman scattering of various molecules are summarized from a practical standpoint to provide an absolute measurement of molecular density. The results of observations of Raman backscattering from various atmospheres with the aid of an ultraviolet nitrogen laser source are cited. It is shown that the laser-Raman radar technique makes it possible to measure the relative density of individual molecules in both ordinary and polluted atmospheres. Moreover, it is indicated that a well-designed system incorporating a high-power pulsed laser can have enough sensitivity to remotely monitor the spatial distribution of stack smoke and water vapor at ranges as great as 1 km. A.B.K.

A74-13153 # **Remote sensing of atmospheric turbidity variation by satellite.** A. McLellan (Wisconsin, University, Madison, Wis.). *Journal of Spacecraft and Rockets*, vol. 10, Nov. 1973, p. 743-747. 18 refs.

It is shown that local vertically integrated turbidity variations can be detected and monitored by satellites. This makes it possible to monitor various molecular and particulate pollutants both on a local and global scale by means of geosynchronous space stations equipped with the proper remote sensing sounders. M.V.E.

A74-14119 * **Research and applications modules /RAM/.** J. M. Macdonald (General Dynamics Corp., Convair Aerospace Div., San Diego, Calif.). In: Space Shuttle payloads; Proceedings of the Symposium, Washington, D.C., December 27, 28, 1972. Tarzana, Calif., American Astronautical Society, 1973, p. 353-376. Contract No. NAS8-27539.

RAM, a family of payload carriers that operate in conjunction with the Space Shuttle, is shown to provide flexible and economical laboratories and facilities for the conduct of manned and man-tended scientific and applications investigations in near-earth orbit. Two primary mission modes of RAM are discussed in terms of capability provided, and major advantages and constraints. The Sortie mission mode uses the Shuttle orbiter as the space platform and RAM as the scientific equipment carrier to provide a flexible and economical means for conducting short-duration manned investigations. The man-tended observatory mode uses Shuttle for delivery, periodic on-orbit update and service, and retrieval of the observatory, with RAM providing the interface with the Shuttle for servicing and the space platform functions for operation. (Author)

A74-14478 **Characteristics of holographic stereomodels.** E. M. Mikhail and D. L. Gifford (Purdue University, West Lafayette, Ind.). In: American Society of Photogrammetry, Annual Meeting,

39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 34-64. 13 refs. Grant No. DAAK02-72-C-0063.

The term 'holographic stereomodel' was selected as an appropriate description of the hologram of terrain made via photography. A concise description of the construction of the holographic stereomodel is given, taking into account two different holographic techniques, including the Fresnel and the focused image. Questions of relative orientation or double rectification are discussed together with aspects of hologram positioning and model distortions and details of experimental design. G.R.

A74-14480 Evaluation of the helicopter as a camera platform. S. A. Veress (Washington, University, Seattle, Wash.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 252-278. 12 refs.

The helicopter belongs to the family of low vibrating camera platforms. The predominant frequency range involved is 8.5 to 24 cycles per second. Such a frequency theoretically permits a photographic exposure time of 1/50 of one second. Thus an 'all weather' photography is made possible. Aspects of the evaluation problem are discussed together with the vibration effect, questions of camera suspension, and the testing of the photographic parameters. G.R.

A74-14485 Aircraft multispectral data systems - Why use them. M. E. Lapides (Actron Industries, Inc., Monrovia, Calif.). In: American Society of Photogrammetry, Annual Meeting, 39th, Washington, D.C., March 11-16, 1973, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1973, p. 497-511.

Aircraft multispectral scanners make it possible to acquire maximum quantities of data in a form best amenable to electronic data processing. Building block schematics of a representative multispectral data system are considered together with a representative multispectral point scanner optics, imagery records from a common magnetic tape used to emphasize different coastline detail areas, and developmental equipment for real-time multispectral data processing. G.R.

A74-14890 * Some digital techniques for enhancing ERTS imagery. F. C. Billingsley (California Institute of Technology, Jet Propulsion Laboratory, Space Sciences Div., Pasadena, Calif.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 284-293. 22 refs. Contract No. NAS7-100.

In addition to the use of simple contrast stretching to improve visibility of detail, axis rotation and ratioing have been found useful for certain applications. These processes allow a considerably greater contrast stretch than is possible on normal images, with consequent increased separability of different materials. They have inherent advantages over classifier techniques for geologic studies, as they allow the interpreter to take into account other factors such as context and structure before interpreting boundaries between units. Color images reconstructed from these pictures display color variations among various materials unattainable by any combination of normal photography. (Author)

A74-14892 * Quantification of the luminescence intensity of natural materials. R. D. Watson, T. D. Hessin (U.S. Geological Survey, Denver, Colo.), and W. R. Hemphill (U.S. Geological Survey, Washington, D.C.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 364-376. 7 refs. NASA-supported research. NASA Order L-58514.

Review of some of the results of an evaluation of the use of an airborne Fraunhofer line discriminator (FLD) for the detection of sun-stimulated luminescence emitted by rhodamine WT dye and some other materials. Rhodamine dye is reported to have been detected by airborne FDL in sea water in concentrations of less than 2 ppb. Experiments with a fluorescence spectrometer in the laboratory indicate that luminescence of some samples of crude and refined petroleum exceeds the luminescence intensity of rhodamine dye in concentrations of 10 ppm. M.V.E.

A74-14896 SADE - A remote sensing system. F. A. Waltz (South Dakota State University, Brookings, S. Dak.) and J. E. Grimaldi (Dicomed Corp., Minneapolis, Minn.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 427-431.

Description of the features and functions of the remote sensing signal analysis and dissemination equipment (SADE) system that was implemented and began operation at the Remote Sensing Institute of South Dakota University. The primary elements of SADE are an analog tape converter, film scanner, film recorder, color display monitor, and teletype. M.V.E.

A74-14904 * Advanced solid state sensor system for remote sensing from satellite. L. L. Thompson (NASA, Goddard Space Flight Center, Greenbelt, Md.) and R. A. Tracy (Westinghouse Electric Co., Baltimore, Md.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 543-552.

Discussion of approaches to providing the needed performance improvement in solid state sensor systems for remote sensing from future resources surveying satellites. An advanced breadboard line array imaging system using long detector arrays from a number of small chips has been built. Test results and typical imagery produced by the breadboard system demonstrate the capabilities of solid state imager technology. M.V.E.

A74-14910 * Remote sensors - Prospects and limitations. J. Lehmann (NASA, Earth Observations Programs Office, Washington, D.C.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 657-677.

Review of the history, present status, and future prospects and limitations of remote sensing systems for satellite-based earth resources surveys. The objectives and special areas of interest of ongoing sensor development experiments are summarized, and the measurement and performance goals of current potential sensor research is discussed. M.V.E.

A74-15785 * Microwave spectrometer on the Nimbus 5 satellite - Meteorological and geophysical data. D. H. Staelin, A. H. Barrett, J. W. Waters (MIT, Cambridge, Mass.), F. T. Barath, E. J. Johnston, P. W. Rosenkranz (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.), N. E. Gaut (Environmental Research and Technology, Inc., Lexington, Mass.), and W. B. Lenoir (NASA, Johnson Space Center, Houston, Tex.). *Science*, vol. 182, Dec. 28, 1973, p. 1339-1341. 7 refs. Contract No. NAS7-100.

The Nimbus 5 microwave spectrometer has been used to measure thermal radiation in five frequency bands between 22.235 and 58.8 gigahertz, and has yielded both the temperature profile and,

over ocean, the vapor and liquid water content of the terrestrial atmosphere, even in overcast conditions. Information has also been obtained on geophysical parameters that affect the surface emissivity, such as ice type, sea roughness, and snow cover. The experiment demonstrates the considerable potential of passive microwave sensing of meteorological and geophysical parameters. (Author)

A74-15800 * Skylab's photographic workhorse. R. Gerlach (NASA, Johnson Space Center, Houston, Tex.). *Optical Spectra*, vol. 7, Dec. 1973, p. 31, 32.

There are ten Data Acquisition Cameras (DAC) aboard the Skylab workshop, and one additional is aboard each of the three command modules that ferry astronauts to Skylab. These cameras will transport approximately 40,000 feet of 16-mm film at frame rates from time exposures to 24 frames per second (fps). The heart of the 16-mm DAC system is a unique sequence camera. Approximately 80% of the Skylab 16-mm film will be exposed at 2 fps to maximize data acquisition time and remain within spacecraft return weight limitations. Of the approximately 225 accessories, the most unique item is the 400-foot magazine system. F.R.L.

A74-16246 # A new system for recording aircraft attitude. U. Nielsen (Department of the Environment, Ottawa, Canada). *Canadian Aeronautics and Space Journal*, vol. 19, Dec. 1973, p. 525-527.

An airborne, gyro-stabilized system is described that continuously measures and records aircraft or aerial camera pitch and roll angles. The system consists of a gyroscope, sensing units, electronics, display and aerial camera. The longitudinal and lateral tilt angles measured at the gimbals of the gyroscope are binary coded and are recorded on each photographic frame through the secondary optics of the camera. The range of the system is 6.0 deg in any direction, and the resolution is 6 minutes of arc. The system is designed to reduce the need for ground control in calibrating aerial photographs with a scale of about 1:2,000, which are used for forest inventories. (Author)

A74-16249 ERTS Quicklook system at PASS. R. E. Barrington, W. Rolfe (Department of Communications, Communications Research Centre, Ottawa, Canada), J. S. MacDonald, and D. S. Sloan (McDonald, Dettwiler and Associates, Ltd., Canada). *Canadian Aeronautics and Space Journal*, vol. 19, Dec. 1973, p. M-7 to M-10.

The main design and performance features of the Quicklook system at the ERTS ground station at Prince Albert, Saskatchewan, are reviewed. This system uses a high-resolution CRT and photographic-film display and recording setup and is capable of producing immediate black and white images of the earth as seen from the ERTS satellite in two visible and two infrared wavebands. M.V.E.

A74-16281 The aliasing problems in two-dimensional sampled imagery. R. Legault (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: Perception of displayed information. New York, Plenum Press, 1973, p. 279-312.

A description of the image displayed by a sampled image electrooptical sensor is developed. The aliasing of frequencies at the display is analyzed. Some design considerations for electrooptical sampled image systems are considered which eliminate or minimize the effects of aliasing. One-dimensional sampling is briefly reviewed, and an analytic representation of two-dimensional image sampling is given. Best sampling lattices are discussed. F.R.L.

A74-17199 # Multispectral scanning studies in the fields of land and water use by a ground-aircraft-satellite measurement system (Multispektrale Scanner Untersuchungen auf den Gebieten Landwirtschaft und Wasserwirtschaft durch ein Boden-Flugzeug-Erdsatellitenmessystem). M. Sartori (SPACETEC GmbH, Vienna, Austria). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-098*. 16 p. In German.

A74-17244 * The earth resources technology satellite - Photographic facility quality control program. R. M. Shaffer (General Electric Co., Space Div., Philadelphia, Pa.; NASA, Goddard Space Flight Center, Greenbelt, Md.). *Image Technology*, vol. 15, Apr.-July 1973, p. 18-23. Contract No. NAS5-11529.

A detailed description is given of the quality control program used in the photographic laboratory of the NASA-ERTS Ground Data Handling System. The product response variables measured include tone reproduction, resolution, and low spatial frequency noise. In addition to product response variables, certain performance parameters of the laboratory printers and processors are frequently measured in order to produce consistent duplications of archival photography. A description is given of the operation and use of a densitometer/computer interface which is used to calculate three tone reproduction response variables - film speed, average gradient, and base plus fog density. This procedure eliminates the need for any hand plotting of D log E curves to manually determine response variables. T.M.

A74-17520 The Skylark earth-observation platform. J. K. Abbott and R. J. Jude (Royal Aircraft Establishment, Space Dept., Farnborough, Hants., England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1972.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 10-13.

Two types of payload have received particular consideration for use in Skylark namely arrays of cameras and linescan equipment. Both will be discussed briefly in this paper but only cameras have actually been used to date. The characteristics of an attitude control system for payloads to be used for earth observation and launched by the Skylark rocket are described. (Author)

A74-17521 # The earth resource Skylark - A progress report. B. S. E. Beattie (British Aircraft Corp., Bristol, England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 14-17.

The current status and achievements of the Skylark rocket development program, initiated in early 1971, are reviewed. The trials program is summarized in tabular form, showing the first flight in 1972, followed by trials in Argentina a year later. The principal earth resource data obtained in these flights are examined. V.P.

A74-17522 # Digitised analysis of Skylark rocket imagery. E. S. O. Jones and N. D. E. Custance (Bedford College, London, England). *(British Interplanetary Society, Earth Observation Satellites Symposium, University College, London, England, Apr. 10-12, 1973.) British Interplanetary Society, Journal*, vol. 27, Jan. 1974, p. 18-22.

Cluster analysis techniques are applied to rocket imagery of a cultivated area in the Ceduna region of Australia. Considerable improvements in the classification are obtained by the implementation of a hybrid image space/measurement space clustering routine. The technique is seen as a means of creating discriminant criteria for bulk image analysis. (Author)

A74-17567 Feature selection via an upper bound /to any degree tightness/ on probability of misclassification. C. R. Hallum (Loyola University, New Orleans, La.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West

Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 3B-13 to 3B-26. 10 refs.

Currently, many techniques exist for feature selection purposes which are related (in an indeterminable way) to the probability of misclassification. In this paper, a procedure is presented which yields an upper bound (to any degree of tightness) on the probability of misclassification in sample Gaussian maximum likelihood classification between each pair of categories in p-dimensional space. The technique permits features to be selected so that the optimal q (q not greater than p) features have the property that no other subset of q features yield a smaller value to the upper bound on the probability of misclassification. A computer-assessible transformation is utilized which permits a multiple integral over the misclassification region in p-dimensional space to be approximated, to any degree of accuracy, by the product of p iterated integrals, each over univariate space, and each of which may be obtained by a simple table-look-up procedure. T.M.

A74-17571 Remote wind profile measurement at optical frequencies using a spectral density approach. J. E. Nuwer, J. Smith, F. J. Taylor (Texas, University, El Paso, Tex.), and T. H. Pries (U.S. Army, Atmospheric Sciences Laboratory, White Sands Missile Range, N. Mex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4A-1 to 4A-13. 11 refs.

The spectral properties of the intensity of a light beam, propagated in a turbulent atmosphere in the presence of wind shears, are studied. The theory of light propagation in a turbulent media is presented. Special attention is given to developing the theoretical characteristics of a spherical wave. These theoretical relations are numerically analyzed. The analysis indicate that the problem of remotely measuring winds can be automated. Several machine techniques are offered to accomplish this task. (Author)

A74-17577 * Estimation of proportions of objects and determination of training sample-size in a remote sensing application. R. S. Chhikara and P. L. Odell (Texas, University, Dallas, Tex.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-16 to 4B-24. Contract No. NAS9-12775.

A multichannel scanning device may fail to observe objects because of obstructions blocking the view, or different categories of objects may make up a resolution element giving rise to a single observation. Ground truth will be required on any such categories of objects in order to estimate their expected proportions associated with various classes represented in the remote sensing data. Considering the classes to be distributed as multivariate normal with different mean vectors and common covariance, maximum likelihood estimates are given for the expected proportions of objects associated with different classes, using the Bayes procedure for classification of individuals obtained from these classes. An approximate solution for simultaneous confidence intervals on these proportions is given, and thereby a sample-size needed to achieve a desired amount of accuracy for the estimates is determined. T.M.

A74-17580 * Multivariate interactive digital analysis system /MIDAS/ - A new fast multispectral recognition system. F. Kriegler, R. Marshall, S. Lampert, M. Gordon, C. Cornell, and R. Kistler (Environmental Research Institute of Michigan, Ann Arbor, Mich.). In: Machine processing of remotely sensed data; Proceedings of the Conference, West Lafayette, Ind., October 16-18, 1973. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 4B-51 to 4B-64. Contract No. NAS1-11979.

The MIDAS system is a prototype, multiple-pipeline digital processor mechanizing the multivariate-Gaussian, maximum-likelihood decision algorithm operating at 200,000 pixels/second. It incorporates displays and film printer equipment under control of a general purpose midi-computer and possesses sufficient flexibility that operational versions of the equipment may be subsequently specified as subsets of the system. T.M.

A74-17976 National Telecommunications Conference, Atlanta, Ga., November 26-28, 1973, Conference Record. Volumes 1 & 2. Conference sponsored by the Institute of Electrical and Electronics Engineers. New York, Institute of Electrical and Electronics Engineers, Inc., 1973. Vol. 1, 498 p.; vol. 2, 514 p. Price of two volumes, members, $18.75; nonmembers, $25.

Recent developments in communication systems theory and hardware are described in papers dealing with the general topics of data entry and display terminals, control of communications networks, industry standards, applications of digital filtering, remote sensing systems, switching technology, computer communications, electronic components for space technology, forward acting error control codes, semiconductor devices for microwave and millimeter wavelengths, timing and synchronization problems, space-based navigation systems, voice processing for narrow-band channels, high bit rate technology, domestic communications satellites, new developments in signal design, transmission technology, and new LSI devices. T.M.

A74-17986 Data acquisition for a remote sensing field measurement program. J. C. Harlan, C. A. Morgan, and R. W. Newton (Lockheed Electronics Co., Inc., Houston, Tex.). In: National Telecommunications Conference, Atlanta, Ga., November 26-28, 1973, Conference Record. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 9B-1 to 9B-8.

Field-data acquisition equipment is discussed that represents a self-contained, ground-based mobile system designed and used for remote-sensing applications research. The system consists of: (1) two main sensors; (2) their electronics and computerized data systems; (3) a data van from which the sensors are operated; (4) a flat-bed truck with a 75 foot articulated arm serving as the sensor platform; and (5) a 25-kW electrical power generator. The sensors and their computerized data systems allow large amounts of data to be collected in short periods of field work. M.V.E.

A74-17987 # Applications of real-time processing to remote sensing. W. T. Mayo, Jr.; J. W. Rouse, Jr., and J. A. Schell (Texas A & M University, College Station, Tex.). In: National Telecommunications Conference, Atlanta, Ga., November 26-28, 1973, Conference Record. Volume 1. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 9D-1 to 9D-5. 8 refs. U.S. Department of Transportation Contract No. CG-34017-A; Contracts No. N60921-72-C-0076; No. F40600-73-C-0003.

This paper describes three remote sensing systems which use real-time data processing customized to the required user action. The applications to be discussed consist of real-time air turbulence parameter determination with laser Doppler velocimeter measurements; real-time Arctic ice classification from Doppler radar return; and real-time detection and monitoring of oil spills with a lidar polarimeter system. In each case, the significant features which allow the systems to be useful are the simplicity and speed of the special purpose data processing scheme which has been determined from specific data product requirements. (Author)

A74-18658 * # The role of man in conducting earth resources observations from space. P. J. Weitz (NASA, Johnson Space Center, Houston, Tex.). *American Institute of Aeronautics and Astronautics,*

Annual Meeting and Technical Display, 10th, Washington, D.C., Jan. 28-30, 1974, Paper 74-250. 4 p. Members, $1.50; nonmembers, $2.00.

The experience gained from the Skylab Earth Resources Experiment Package indicates that future equipment should be designed to facilitate on-orbit maintenance. Man should also be used to achieve selective data gathering, thus reducing the total requirements for data handling and analysis. This should require onboard displays of selected sensor signals for real-time analysis. M.V.E.

A74-18903 * GEOS, ESRO's first geostationary satellite. F. Erbslöh. *Dornier-Post* (English Edition), no. 4, 1973, p. 14, 15.

In its fixed position in relation to the earth, GEOS will be an ideal measuring platform for the study of variable magnetic and electric fields in the low frequency range. Inductive effects between the magnetosphere and the ionosphere are to be studied. The main criteria for the satellite's mission are considered, giving attention to an inversion maneuver designed to minimize stray electromagnetic fields. The launch of the satellite is scheduled for August 1976. G.R.

N74-10385# Plessey Co., Ltd., Havant (England). Electronics Research Lab.
MULTISPECTRAL SCANNING SYSTEMS AND THEIR POTENTIAL APPLICATION TO EARTH RESOURCE SURVEYS: VOLUME 6: SUMMARY
Jun. 1973 215 p
(Contract ESTEC-1673/72-EL)
(ERL/R-248; ESRO-CR(P)-236) Avail: NTIS HC $12.75

This volume summarizes the first four technical volumes of the series together with the applications recommendations. Various processes are considered affecting the interaction of radiation and matter that give rise to useful information about the surface of the earth, the methods of sensing this information, the properties of specific materials of interest, the processing of the data acquired by an MSS system, and the applications to which such a system may be applied. The report is structured so that, in the main, direct reference can be made back to the previous volumes of the series for more detailed information. For vol. 1, see N73-22403; vol. 2, N73-22404; vol 3, N73-30356; vol. 4, N73-28450; vol 5, N73-32301; and vol. n N73-32229
Author (ESRO)

N74-10405# Goodyear Aerospace Corp., Litchfield Park, Ariz.
BASE PLANT CORRELATOR Final Technical Report, 8 May 1971 - 21 Dec. 1972
Roy H. Ogburn 9 Feb. 1973 94 p refs
(Contract DAAK02-71-C-0113)
(AD-759512; GERA-1900; ETL-CR-73-3) Avail: NTIS CSCL 08/2

The Base Plant Correlator provides the capability of processing the phase histories of side-looking interferometric coherent radars. The coherent optical system of the Base Plant Correlator provides the capability of processing a single channel of radar data in the tilted plane mode, or simultaneously processing one high-resolution channel and the corresponding interferometric channel in the dual-channel mode. Correlator performance during the final acceptance tests are described. (Author Modified Abstract) GRA

N74-10418*# Fairchild Space and Defense Systems, Syosset, N.Y. Solid State Imaging Systems Section.
SOLID STATE HIGH RESOLUTION MULTI-SPECTRAL IMAGER CCD TEST PHASE Final Report, 15 Dec. 1971 - 30 Apr. 1973
1 May 1973 129 p
(Contract NAS5-21597)
(NASA-CR-132833; ED-AX-12) Avail: NTIS HC $8.50 CSCL 14B

The program consisted of measuring the performance characteristics of charge coupled linear imaging devices, and a study defining a multispectral imaging system employing advanced solid state photodetection techniques. Author

N74-10420*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC FOCUS CONTROL FOR FACSIMILE CAMERAS Patent Application
Archibald R. Sinclair, Ernest E. Burcher, and Stephen J. Katzberg, inventors (to NASA) Filed 15 Oct. 1973 12 p
(NASA-Case-LAR-11213-1; US-Patent-Appl-SN-406715) Avail: NTIS HC $3.00 CSCL 14E

A movable stage contains two photodetectors for focusing, as well as an imaging sensor. The imaging sensor produces the video data in the fashion standard to facsimile cameras. The two photodetectors are placed with one closer to the lens of the facsimile camera than the imaging sensor and with the other farther away. The movable stage is coupled to a linear motor which is driven from an error signal generated by the electronics. In order to insure that the electrical signals at the output of the two photodetectors and the imaging sensor are in phase, electrical delays are connected to the outputs of the two photodetectors. NASA

N74-10792*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATM C AND D PANEL/EREP COOLING SYSTEM CONTAMINATION PROBLEM
James G. Williamson Oct. 1973 43 p refs
(NASA-TM-X-64788) Avail: NTIS HC $4.25 CSCL 22B

This report presents the history of a preflight contamination problem that occurred in the ATM C and D panel/EREP cooling system on the Skylab, the studies that were made to determine the cause of the problem, and corrective actions that were made prior to lift-off. The results of all the observations, analyses and laboratory testing indicated that the contamination came from one or more of the EREP tape recorder coldplates and was caused by some abnormal electrolytic action, either during bench testing or in the spacecraft. Studies indicate that no such electrolytic action is likely to occur under normal operating conditions. Author

N74-10813# National Environmental Satellite Service, Washington, D.C.
OPERATIONAL PRODUCTS FROM ITOS SCANNING RADIOMETER DATA
Edward F. Conlan, comp. Oct. 1973 61 p refs
(NOAA-TM-NESS-52) Avail: NTIS HC $5.25

A manual is presented for the potential user of processed data obtained from the ITOS scanning radiometers. The intent has been to convey primary information in the main text so as to provide an overview for the customer whether his mission be oriented toward operations or research. With this in mind, an attempt is made to minimize the use of specialized phraseology. It is to be expected that a potential user may thereby assess the potential value of the information for his mission even though his familiarity with spacecraft operations or automatic data processing may be limited. Specifically, insight may be gained as to earth location accuracy, precision and stability of calibrated data, areal extent, and time wise availability of products. Author

N74-11147*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL RESOLUTION IN PHOTOGRAPHIC FORM Progress Report, 1 Sep. - 1 Nov. 1973
P. N. Slater, Principal Investigator, R. L. Antos, and R. A. Schowengerdt Nov. 1973 2 p ERTS
(Contract NAS5-21849)
(E74-10006; NASA-CR-135847; PR-7) Avail: NTIS HC $3.00 CSCL 14E

N74-11219# World Meteorological Organization, Geneva (Switzerland).
MEANS OF ACQUISITION AND COMMUNICATION OF OCEAN DATA. VOLUME 2: SURFACE, SUB-SURFACE AND UPPER-AIR OBSERVATIONS
1973 619 p refs Partly in ENGLISH, FRENCH, and SPANISH Proc. of the WMO Tech. Conf., Tokyo, 2-7 Oct. 1972
(WMO-350; MSA-7-Vol-2) Avail: NTIS HC $33.00; WMO, Geneva

The contributions to the WMO conference are presented in two themes: surface and sub-surface observations, and upper-air observations. The first section includes papers on ocean data acquisition systems; status of buoy development; and sea surface temperature measurement. The second section covers methods of making upper air observations, which are balloon and radiosonde techniques.

N74-11235 Meteorological Office (Gt. Brit.).
OFFSHORE TELEMETERING BUOY FOR REAL-TIME MONITORING OF SENSOR PERFORMANCE
M. J. Blackwell and K. J. T. Sands *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 199-201

The long-term program of development and evaluation leading ultimately to the emergence of an economic medium-capability buoy for operational service in the North Sea and North Atlantic is discussed. The measurements (temperature, humidity, wind, pressure) to be made by the sensors are outlined and the sea trails during 1972 are discussed. The telemetry link to provide real-time monitoring of the results is described. ESRO

N74-11236 Centre National pour l'Exploitation des Oceans, Paris (France).
FRENCH EXPERIMENTS WITH BUOYS [EXPERIENCES FRANCAISES DE BOUEES]
M. Vitureau *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 202-207 In FRENCH

The French experience gained by theoretical and experimental results with buoys is discussed. The buoys themselves and the location are described. Cooperation with the Eole satellite program, in which the satellites that normally interrogate balloons will also interrogate the buoys, is discussed. Conclusions derived from the various experiments are drawn. ESRO

N74-11237 World Meteorological Organization, Geneva (Switzerland).
AN AUTOMATIC LIGHT BUOY [UNE BOUEE AUTOMATIQUE LEGERE]
M. Martinais and M. Turriere *In its* Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 208-215 In FRENCH

The experiments and results obtained with light buoys in various locations are described. The general conception of the buoy is discussed, as well as the sensors, mooring, and radio telemetry links. The use of the buoy for acquisition of oceanographic and meteorological data is discussed. ESRO

N74-11239 Japan Meteorological Agency, Tokyo. Meteorological Research Inst.
MARINE METEOROLOGICAL BUOYS OF THE JAPAN METEOROLOGICAL AGENCY
Y. Kawano *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 244-229

The experience gained by deployment and operation of meteorological buoys in the Japan Sea is discussed, together with the important engineering and environmental data obtained. The specifications and performance of the buoys are tabulated and the types of sensors outlined. ESRO

N74-11240* Washington Univ., Seattle. Lab. of Applied Physics.
THE ARCTIC DATA BUOY. A SYSTEM FOR ENVIRONMENTAL MONITORING IN THE ARCTIC
D. P. Haugen and E. G. Kerut (Natl. Data Buoy Center) *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 230-241 refs Sponsored jointly by Naval Oceanog. Office, NSF, and Naval Arctic Res. Lab.

(Contract NAS8-26886)

An automated data buoy system for environmental monitoring in the Arctic was developed. The buoy is designed to operate for a minimum of 1 year providing position and environmental data through polar-orbiting satellite telecommunications. It can be deployed by a two or three man crew using a small aircraft. It is capable of operating in both free-floating and frozen-in situations. An experimental unit successfully completed a 5-month test at Fletcher's Ice Island (T-3) during the winter of 1971-72 and six units were deployed in the Arctic during the spring of 1972. Results to data have demonstrated the utility of the basic design, the effectiveness of the satellite communications, and the feasibility of deploying and operating a large array of such buoy systems in the Arctic Ocean. Author (ESRO)

N74-11241 Washington Univ., Seattle.
ARCTIC DATA BUOYS AND AIDJEX
P. Martin *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 242-249 refs

The effect of the Arctic Ocean on the earth's weather system is discussed. In an attempt to learn more of the ice environment, the Arctic Ice Dynamics Joint Experiment (AIDJEX) was set up, and its present and future plans especially for Arctic data buoys are discussed. ESRO

N74-11251 Westinghouse Electric Corp., Annapolis, Md. Oceanic Div.
NATIONAL DATA BUOY SENSOR SYSTEM
G. A. Gilmour and R. H. Cassis *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 365-377

The engineering experimental phase (EEP) buoy of the U.S. National Data Buoy program is described. The overall purposes of the buoy - measurement of oceanographic and meteorological parameters - are described and the parameters themselves noted. The buoy system description is given together with an analysis of features and new technology. Typical modes of operation are included. ESRO

N74-11259 Ministry of Posts and Telecommunications, Tokyo (Japan). Radio Research Labs.
AN ANALOG RECEPTION OF THE SSCC PICTURES
O. Ryuguji and H. Tanaka *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 492-498

A description of the ATS 1 spacecraft and the spin scan cloud camera (SSCC) which can take high resolution pictures for synchronous altitude over the Pacific Ocean is given. The characteristics of the communication system are noted and the design of the SSCC signal processing system discussed together with analog to digital conversion of the SSCC signal. ESRO

N74-11260 Equipment Development Lab., Silver Spring, Md.
NEXAIR: DEVELOPMENT OF A NEW UPPER-AIR SOUNDING SYSTEM
J. Lovkay, Jr. and R. H. Waters *In* WMO Means of Acquisition and Commun. of Ocean Data, Vol. 2 1973 p 499-547 refs

The background to the setting up of NEXAIR (next genera-

tion upper-air system) is reviewed and the system requirements and operating characteristics are given. The two basic parts, the flight and ground subsystems are discussed in detail and the various elements such as balloon, temperature and pressure sensors, telemetry and processing systems, described. While the design and development of NEXAIR are not yet complete, certain results are presented and cost estimates are given. ESRO

N74-11276# Lowell Technological Inst. Research Foundation, Mass.
DATA ACQUISITION AND RETRIEVAL SYSTEM FOR A GEODETIC RANGEFINDER Final Report, 1 Jun. 1972 - 31 May 1973
Sumner Ackerman Jun. 1973 51 p refs
(Contract F19628-72-C-0328; AF Proj. 7600)
(AD-766460; LTIRF-359/ACK; AFCRL-TR-73-0401) Avail: NTIS CSCL 08/5

An instrument has been developed to measure, digitalize and store the amplitudes of signal pulses from an optical rangefinder. The pulses may be as short as 5 x 10 to the minus 9th power seconds in duration, 12 x 10 to the minus 6th power seconds or more apart, and may have peak values from 20 to 2,400 millivolts. These pulse amplitude measurements, and the related range-time interval and fiducial time data, are retrieved on paper tape. Format characters are inserted so that the TTY printout is in a convenient form for study or editing. This equipment is expected to reduce the preprocessing of geodetic range information accumulated during the orbital pass of a geodetic satellite from one man-week to three or four man-hours. The use of a D17B (Minuteman) computer for data processing and retrieval tasks at the AFCRL geodetic rangefinder station was studied. It was determined that this computer is not well suited to these applications. Author (GRA)

N74-11287*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS
Washington 1973 620 p refs
(NASA-SP-335) Avail: NTIS MF $1.45; SOD HC $3.90 CSCL 14B

Assessments of present and future sensors and sensor related technology are reported along with a description of user needs and applications. Five areas are outlined: (1) electromechanical scanners, (2) self-scanned solid state sensors, (3) electron beam imagers, (4) sensor related technology, and (5) user applications. Recommendations, charts, system designs, technical approaches, and bibliographies are included for each area. K.M.M.

N74-11290*# TRW Systems Group, Redondo Beach, Calif.
DEVELOPMENT AND FLIGHT TEST OF THE MULTICHANNEL OCEAN COLAR SENSOR (MOCS) Final Report
P. G. White, K. R. Jenkin, R. C. Ramsey, and M. Sorkin Washington NASA Oct. 1973 174 p refs
(Contract NAS1-10908)
(NASA-CR-2311) Avail: NTIS HC $4.75 CSCL 14B

As part of the Advanced Applications Flight Experiments (AAFE) Program, an imaging spectroradiometer known as MOCS (Multichannel Ocean Color Sensor) was designed, developed and flight tested. This unique instrument was flown on the NASA Convair 990 over various water bodies. The development program, the flight tests, and data analysis are presented. Computer routines developed specifically for reducing MOCS data are also discussed. Author

N74-11524# Houston Univ., Tex. Dept. of Electrical Engineering.
RESEARCH PROGRAMS IN ELECTRO-OPTICS AND OPTICAL COMMUNICATIONS Annual Summary Report, Sep. 1972 - Sep. 1973
Richard C. Simpson 1 Sep. 1973 8 p
(Contract N00014-72-C-0085)
(AD-766957) Avail: NTIS CSCL 20/6

The report mentions research programs in the use of optical techniques in such diverse areas as biomedical science, health care, digital communication, and remote sensing. GRA

N74-12903# Cambridge Consultants Ltd. (England).
A STUDY ON PROCESSING EQUIPMENT FOR LARGE ARRAYS
Malcolm H. Ross and Bohdan M. Watrasiewicz 28 Jun. 1973 108 p refs
(Contract ESOC-464/72-AR)
(ESRO-CR(P)-306) Avail: NTIS HC $7.50

Alternatives to earth image array processing by general purpose digital computers are presented and explained. The emphasis is on optical processing techniques, although the use of special purpose electronic hardware as auxiliary processors to general purpose computers is also included. In particular, materials for real time optical processing are described, and the principles of digital-optical processing are investigated. Author (ESRO)

N74-13053*# Kansas Univ. Center for Research, Inc., Lawrence.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB: INVESTIGATIONS IN PROGRESS SL2 AND SL3
Joe R. Eagleman, Ernest C. Pogge, and Richard K. Moore, Principal Investigators [1973] 3 p EREP
(Contract NAS9-13273)
(E74-10126; NASA-CR-136171) Avail: NTIS HC $3.00 CSCL 08M

N74-13065*# Environmental Research and Technology, Inc., Lexington, Mass.
EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENT USING THE EREP OF SKYLAB Quarterly Progress Report, 7 Aug. - 7 Nov. 1973
David T. Chang, Principal Investigator 19 Dec. 1973 2 p
(Contract NAS9-13343)
(E74-10139; NASA-CR-136184; P-410-2; QPR-2) Avail: NTIS HC $3.00 CSCL 05B

N74-13068*# City Coll. of the City of New York. Inst. of Oceanography.
A JOINT METEOROLOGICAL, OCEANOGRAPHIC AND SENSOR EVALUATION PROGRAM FOR EXPERIMENT S193 ON SKYLAB Monthly Plans and Progress Report, 14 Nov. - 15 Dec. 1973
Willard J. Pierson, R. K. Moore, and E. P. McClain, Principal Investigators 15 Dec. 1973 3 p EREP
(Contract NAS9-13642)
(E74-10142; NASA-CR-136187) Avail: NTIS HC $3.00 CSCL 14B

N74-13103# Research Inst. of National Defence, Stockholm (Sweden).
CONFERENCES ON REMOTE SENSING AND USA
F. Eklund and H. Ottersten Oct. 1971 56 p refs Symp. on Remote Sensing of the Atmosphere from Aircraft, held at Denver, 28-30 Apr. 1970; 7th Intern. Symp. on Remote Sensing of Environment, held at Ann Arbor, Mich., 17-21 May 1971; and Conf. on Propagation Limitations in Remote Sensing, held at Colorado Springs, 21-25 Jun. 1971
(FOA-3-C-3689-E1) Avail: NTIS HC $5.00

Comments are reported concerning three conferences on remote sensing. These conferences are (1) symposium on remote sensing of the atmosphere from aircraft, (2) seventh international symposium on remote sensing of the environment, and (3) propagation limitations in remote sensing. F.O.S.

N74-13154# Communications Research Centre, Ottawa (Ontario).
RADIO-FREQUENCY RADIOMETRY AS A REMOTE SENSING TECHNIQUE IN MARITIME RECONNAISSANCE AND MARINE SCIENCES IN A NORTHERN ENVIRONMENT
A. W. Adey and G. N. Reed Sep. 1973 22 p refs
(CRC-TN-660) Avail: NTIS HC $3.25

The application of the RF radiometry technique to the general maritime reconnaissance and marine sciences role in the Canadian North is discussed. Results of tests carried out with a helicopter-borne, multichannel, UHF radiometer in August 1972 in the Hudson Strait and Labrador Coast areas are included. Radiation data were obtained during flights over ships, ocean and fresh water, pack ice, icebergs, glaciers and land features. These initial results were encouraging in demonstrating the potential of the technique, not only in direct support of maritime operations through aiding in detection and identification of features of interest, but with possible application in areas such as hydrology and glaciology. Author

N74-13161# Research Inst. of National Defence, Stockholm (Sweden).
ABSTRACTS FROM A STUDY VISIT TO SWITZERLAND [SAMMANFATTNING AV STUDIERESA TILL SCHWEIZ]
Torleiv Orhaug Mar. 1972 13 p In SWEDISH; partly in ENGLISH
(FOA-2-C-2530-M7) Avail: NTIS HC $3.00

Impressions from a visit to Switzerland are reported. The visit comprised attendance at the group meeting within the (International Geophysical Union) for the preparation of a report on remote sensing, and also a visit to the University in Bern for studying observations made in microwave radiometry. Author

N74-13951*# Texas A&M Univ., College Station.
REMOTE SENSING CENTER Technical Activity Summary, Sep. 1972 - Sep. 1973
Dec. 1973 108 p refs
(Grant NGL-44-001-001)
(NASA-CR-136529; RSC-05) Avail: NTIS HC $7.50 CSCL 14B

The applications are reported of new remote sensing techniques for earth resources surveys and environmental monitoring. Applications discussed include: vegetation systems, environmental monitoring, and plant protection. Data processing systems are described. F.O.S.

N74-14014* California Univ., Davis. Dept. of Agricultural Engineering.
INVESTIGATION OF ATMOSPHERIC EFFECTS IN IMAGE TRANSFER
Robert N. Colwell, K. L. Coulson, Principal Investigators, and R. L. Walraven *In its* An Integrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 26 p Original contains color illustration. ERTS

CSCL 04A

N74-14016*# TRW Systems Group, Redondo Beach, Calif.
EVALUATION OF DIGITAL CORRECTION TECHNIQUES FOR ERTS IMAGES Bimonthly Progress Report, Nov. - Dec. 1973
J. E. Taber, Principal Investigator and S. S. Rifman 3 Jan. 1974 3 p ref ERTS
(Contract NAS5-21814)
(E74-10148; NASA-CR-136207) Avail: NTIS HC $3.00 CSCL 05B

N74-14031*# Boeing Co., Kent, Wash.
QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Oct. 1973
David L. Tingey, Principal Investigator Oct. 1973 1 p EREP
(Contract NAS9-13303)
(E74-10163; NASA-CR-136290) Avail: NTIS HC $3.00 CSCL 04A

N74-14044*# Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC CALIBRATION OF EREP IMAGERY AND OCEANOGRAPHY OF BLOCK ISLAND SOUND Monthly Progress Report, Dec. 1973
Edward Yost, Principal Investigator 20 Dec. 1973 3 p EREP
(Contract NAS9-13308)
(E74-10177; NASA-CR-136306) Avail: NTIS HC $3.00 CSCL 08J

N74-14053*# Stanford Univ., Calif. Remote Sensing Lab.
MULTISPECTRAL SIGNATURES IN RELATION TO GROUND CONTROL SIGNATURE USING NESTED SAMPLING APPROACH Progress Report, 4 Nov. 1973 - 3 Jan. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 3 Jan. 1974 24 p ref ERTS
(Contract NAS5-21884)
(E74-10189; NASA-CR-136328) Avail: NTIS HC $3.25 CSCL 05B

The author has identified the following significant results. Principal effort has been on the development of a PDP-10 software package to read the CCT tapes more cheaply and rapidly. This is 90% completed and debugged. A shade print example of Treasure Island is provided. Stanford area was overflown with the U-2 as an add-on photographic mission to help fill in record-gaps in ERTS-1 overpass which was clouded out.

N74-14054*# Environmental Research Inst. of Michigan, Ann Arbor.
DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA Quarterly Report, 1 Sep. - 1 Dec. 1973
Robert E. Turner, Principal Investigator 3 Jan. 1974 2 p EREP
(Contract NAS9-13279)
(E74-10190; NASA-CR-136329; ERIM-102200-7-L; QR-3) Avail: NTIS HC $3.00 CSCL 04A

N74-14068* Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
BASIC PRINCIPLES OF REMOTE SENSING
James L. Clapp *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 3-6 refs

CSCL 08B

Forty-eight selected bibliographic references dealing with the remote sensing of the environment are given. Emphasis was placed on data that deal with fundamental aspects and principles of the technique. E.H.W.

N74-14070* Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
CHARACTERISTICS OF REMOTE SENSING SYSTEMS
Ralph W. Kiefer *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 7-8

CSCL 14E

The characteristics of photographic, thermal and multispectral scanners, radar, and ERTS satellite remote sensing systems are discussed. E.H.W.

N74-14074* Daedalus Enterprises, Inc., Ann Arbor, Mich.
REVIEW OF OPERATIONAL APPLICATIONS OF INFRARED AND MULTISPECTRAL SCANNERS
Thomas R. Ory *In* Mich. State Univ. Proc. of the Conf. on Pract. Appl. of Remote Sensing May 1973 p 36-39

CSCL 14B

A review was made of infrared and multispectral scanners. Operating principles, sensitivity, and costs are discussed E.H.W.

N74-14270*# Kansas Univ. Center for Research, Inc., Lawrence.

A THEORY OF MICROWAVE APPARENT TEMPERATURE OVER THE OCEAN

S. T. Wu and A. K. Fung Washington NASA Nov. 1973 151 p refs

(Contract NAS1-10048)

(NASA-CR-2329; TR-186-7) Avail: NTIS HC $4.75 CSCL 04B

In the microwave region combined active (scatterometer) and passive (radiometer) remote sensors over the ocean show promise of providing surface wind speeds and weather information to the oceanographer and meteorologist. This has aroused great interest in the investigation of the scattering of waves from the sea surface. A composite surface scattering theory is investigated. The two-scale scattering theory proposed by Semyonov was specifically extended to compute the emmision and scattering characteristics of ocean surfaces. The effects of clouds and rain on the radiometer and scatterometer observations are also investigated using horizontally stratified model atmospheres with rough sea surfaces underneath. Various cloud and rain models proposed by meteorologist were employed to determine the rise in the microwave temperature when viewing downward through these model atmospheres. For heavy rain-fall rates the effects of scattering on the radiative transfer process are included.

Author

N74-14386*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PERFORMANCE EVALUATION OF A PASSIVE MICROWAVE IMAGING SYSTEM

William E. McAllum Nov. 1973 30 p refs

(NASA-TM-X-58109; JSC-08656) Avail: NTIS HC $3.50 CSCL 14B

A test program was conducted to evaluate the passive microwave imaging system for possible application in the NASA Earth Resources Program. In addition to test data analysis, the report gives a brief description of the radiometer, its software, and the ground support equipment. The microwave image quality is adequate for remote sensing applications studies. Instrument problems are described, and suggestions are given for possible improvements and potential applications. Author

N74-15035*# Science and Technology Agency, Tokyo (Japan).

APPLICATION OF ERTS DATA TO THE DETECTION OF THIN CIRRUS AND CLEAN AIR TURBULENCE Progress Report, Jul. 1972 - Aug. 1973

Kiyoshi Tsuchiya, Principal Investigator Oct. 1973 4 p Presented at ERTS Symp., Greenbelt, Md., 5-9 Mar. 1973 Sponsored by NASA ERTS

(E74-10230; NASA-CR-136493) Avail: NTIS HC $3.00 CSCL 04B

The author has identified the following significant results. The feasibility of detecting a thin cirrus and clear air turbulence from ERTS-1 MSS data is explored. The result of analyses indicates that a thin cirrus not shown in a conventional meteorological satellite picture can be revealed in ERTS-1 MSS pictures. Is also found that the core of jet stream can be located with high accuracy from ERTS-1 pictures and the possible area of clear air turbulence can be predicted if the data of the quality of ERTS-1 data are available in real time.

N74-15038*# City Coll. of the City of New York. Univ. Inst. of Oceanography.

A JOINT METEOROLOGICAL, OCEANOGRAPHIC AND SENSOR EVALUATION PROGRAM FOR EXPERIMENT S193 ON SKYLAB Monthly Plans and Progress Report, period ending 14 Jan. 1974

Willard J. Pierson, R. K. Moore, and E. P. McClain, Principal Investigators 14 Jan. 1974 3 p EREP

(Contract NAS9-13642)

(E74-10233; NASA-CR-136496) Avail: NTIS HC $3.00 CSCL 14B

N74-15043*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report Sep. - Nov. 1973

Frederick J. Thomson, Principal Investigator 22 Jan. 1974 3 p EREP

(Contract NAS9-13272)

(E74-10239; NASA-CR-236537; ERIM-101700-11-L; QPR-3) Avail: NTIS HC $3.00 CSCL 04A

N74-15154# Sparcom, Inc., Alexandria, Va.

PRELIMINARY DESIGN CRITERIA, PERFORMANCE AND LIMITATIONS OF AN AIRBORNE LASER BATHYMETRIC SYSTEM

G. D. Hickman and A. H. Ghovanlou Aug 1973 56 p refs

(Contract N00014-71-C-0202)

(AD-767391; TR-3) Avail: NTIS CSCL 08/10

Many of the salient parameters have been determined which define the capability and system requirements for an airborne laser/receiver bathymetric system operating in turbid waters. Laboratory transmission/scattering measurements which had been made of a pulsed blue-green neon laser through waters of varying turbidity were used to develop an empirical model for predicting the performance of an airborne laser bathymetric system. The maximum depth measuring capability (alpha h) sub max) was determined to be approximately 15 attenuation lengths for a laser system operating at 30 kw/peak pulse from an altitude of 500 meters. The optimum scan angle of the laser transmitter was determined to be approximately 20 degrees while the scan rate for a laser pulsing at 100 pps was 0.8 seconds. Airborne and pier measurements are currently being conducted to test the validity of this empirical model. (Modified author abstract)

GRA

N74-15343 Joint Publications Research Service, Arlington, Va.

POSSIBILITY OF MAPPING THE ICE SITUATION ON LARGE LAKES BY PHOTOGRAPHS FROM ARTIFICIAL EARTH SATELLITES

V. G. Prokacheva *In its* Meteorology and Hydrology no. 9, 1973 (JPRS-60787) 14 Dec. 1973 p 54-62 refs Transl. into ENGLISH from Meteorol. i Gidrol (Moscow), no. 9, 1973 p 48-55

A discussion is presented on the possibility of using televised information from the meteor meteorological artificial earth satellite to obtain information about the ice conditions of large lakes. A comparison of the synchronous cartograms of the air ice reconnaissance of Ladoga Lake and the ice situation according to the television image from the meteor satellite demonstrated their good compatibility and the possibility of obtaining the basic characteristics of the winter conditions of the lake by the television images. The basic decoding attributes of the lake ice objects for the television images from the meteor satellite having a resolution on the order of 1 to 2 km were established. A procedure was proposed for constructing the ice cartograms by the television image. By this procedure, 5 cartograms of the ice situation were compiled for Ladoga Lake in the winter-spring period of 1971.

Author

N74-15544*# National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md.

A GEOPAUSE SATELLITE SYSTEM CONCEPT

Joseph W. Siry Apr. 1971 53 p refs Presented at 3d Intern. Symp. on the use of Artificial Satellites for Geodesy, Washington, D. C., Apr. 1971; sponsored by the Am. Geophys Union Submitted for publication

(NASA-TM-X-70548; X-550-71-503) Avail: NTIS HC $4.75 CSCL 22B

A typical Geopause satellite orbit has a 14 hour period, a mean height of about 4.6 earth radii, and is nearly circular, polar, and normal to the ecliptic. At this height only a relatively few gravity terms have uncertainties corresponding to orbital perturbations above the decimeter level. The orbit is at the geopotential boundary, the geopause. The few remaining environmental quantities which may be significant can be determined by means of orbit analysis and accelerometers. The Geopause satellite system also provides the tracking geometry and coverage needed for determining the orbit, the tracking system biases and the station locations. Five or more fundamental stations well distributed in longitude can view Geopause over the North Pole. Geopause also provides the basic capability for satellite-to-satellite tracking of drag-free satellites for mapping the gravity field and altimeter satellites for surveying the sea surface topography. Author

09 GENERAL

Includes economic analysis.

A74-11204 # **Remote sensing of the earth's resources - Applications, benefits, methods.** H.-J. Austen, P. Böse, J.-P. Genzel, and R. Ockert. *Dornier-Post* (English Edition), no. 3, 1973, p. 22-27.

Studies are described which covered an investigation of the benefits of a remote sensing of earth resources using space technology, as well as data acquisition, transmission, processing, and evaluation for earth observation missions. For applications the basis of the study is a systematic broad-based listing of the applications already practiced or possible in the future and of their information requirements, together with an allocation to geographical areas of interest on the results of a poll of users and an extensive examination of the relevant literature. The information offers the beneficiary the possibility that planning, decision-making, or production processes can be made more efficient. The methods relevant to the project and their limitations, insofar as sensors and platforms are concerned, are discussed. F.R.L.

A74-12795 # **Teledetection of terrestrial resources and pedagogy - Balance sheet of a first experiment in over-all teaching (Télédétection des ressources terrestres et pedagogie - Bilan d'une première expérience d'enseignement global).** A. W. Stoebner (Centre National d'Etudes Spatiales, Paris, France). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 10 p. In French.

The work carried out at the summer school at Tarbes from Aug. 21 to Sept. 20, 1973 is reviewed in general terms. The purpose of the seminar was to provide an overall view of the problems posed by teledetection, at the same time making it possible to acquire indispensable basic knowledge prior to specialization in particular disciplines. The course content and the tasks of the various working groups are discussed. F.R.L.

A74-12807 # **Possibility of technical control over resource surveying from space.** I. M. Pikus. *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 9 p.

Basic legal problems associated with the use of space platforms for conducting surveys of earth's resources by remote sensing techniques are examined. An analysis of the technological aspects of ERS (earth resource surveying) and the main streams of ERS activity are reviewed. The possibility of implementing international controls by selecting the parameters which affect the transmitted data is examined. V.P.

A74-12850 # **The teledetection of terrestrial resources by satellites - Juridical aspects (La télédétection des ressources terrestres par satellites - Aspects juridiques).** A. Tchernonog (Centre National d'Etudes Spatiales, Paris, France). *International Astronautical Federation, International Astronautical Congress, 24th, Baku, Azerbaidzhan SSR, Oct. 7-13, 1973, Paper.* 16 p. 33 refs. In French.

The use of teledetection satellites can bring important advantages to the community of states, but it also imposes important economic, political, and even strategic problems which could constitute a brake on the development of this new technique. The use of teledetection satellites falls within an international framework, and the problems resulting will not be solved except on the double condition of ensuring the protection of the interests of subjacent states, and avoiding hampering the development of teledetection activities by too stringent regulation which disregards the general international interest of such activities. Various juridical aspects of the numerous problems are extensively discussed, and a number of agreements and proposals are cited. F.R.L.

A74-13202 * # **Mission planning aspects of Skylab Earth Resources Experiment.** D. DeAtkine (NASA, Johnson Space Center, Mission Planning and Analysis Div., Houston, Tex.). *AIAA, ASME, and SAE, Joint Space Mission Planning and Execution Meeting, Denver, Colo., July 10-12, 1973, AIAA Paper 73-619.* 6 p. Members, $1.50; nonmembers, $2.00.

Review of the mission planning techniques that have been developed to optimize the data return from the Earth Resources Experiments Package on Skylab. The techniques are designed to cope with a variety of missions, systems and weather constraints, and sensor development and science applications data requirements. The planning techniques developed for Skylab are applicable to similar later-generation orbital programs, both manned and unmanned. M.V.E.

A74-14102 **Space Shuttle payloads; Proceedings of the Symposium, Washington, D.C., December 27, 28, 1972.** Symposium sponsored by the American Association for the Advancement of Science, Operations Research Society of America, and American Astronautical Society. Edited by G. W. Morgenthaler and W. J. Bursnall (Martin Marietta Aerospace, Washington, D.C.). Tarzana, Calif., American Astronautical Society (Science and Technology Series. Volume 30), 1973. 509 p. $25.

The papers deal with the various characteristics of the Space Shuttle system, its payloads, and utilization. Specifically covered are the system capabilities; science and applications payloads; and the use of the Shuttle system for astronomy, plasma physics, earth resource, communications, navigation studies, for testing experimental hardware, and for manufacturing and material process experiments. Space Shuttle cost-effectiveness studies are included. V.P.

A74-14110 **Use of Space Shuttle for earth resource mapping, inventory and evaluation.** W. D. Carter (U.S. Geological Survey EROS Program Office, Washington, D.C.). In: Space Shuttle payloads; Proceedings of the Symposium, Washington, D.C., December 27, 28, 1972. Tarzana, Calif., American Astronautical Society, 1973, p. 143-153. 6 refs.

The pertinent characteristics of ERTS-1 are briefly reviewed, and some observations deduced from less than four months of data evaluation are discussed, showing that the data meet many of the posed requirements. The principal features of the Skylab experiment are examined, together with the unmanned satellites that will serve as a prelude to the Space Shuttle. The conceived design of the Space Shuttle and its missions are studied, and some suggestions aimed at enhancing the utility of the Shuttle in the earth resource area are presented. V.P.

A74-14463 **The second fifteen years in space; Proceedings of the Eleventh Goddard Memorial Symposium, Washington, D.C., March 8, 9, 1973.** Symposium sponsored by the American Astronautical Society. Edited by S. Ferdman (Grumman Aerospace Corp., Bethpage, N.Y.). Tarzana, Calif., American Astronautical Society (Science and Technology Series. Volume 31), 1973. 196 p. $15.

The forthcoming fifteen years of U.S. efforts in space are examined in papers dealing with the impact of the space program on industrial, scientific, and social aspects of life in the U.S. Attention is given to anticipated developments in rocket engines, the possibility of harnessing solar energy as a source of electric power on earth by

means of satellites, the use of computer control systems in manned and automated space vehicles, and the growth of the data communications technology. Exploration of the terrestrial planets is considered in a description of the Viking mission to Mars, and aspects of international cooperation in space are examined together with European space projects after 1980. T.M.

A74-14466 **Future national space efforts.** F. E. Moss (U.S. Senate, Committee on Aeronautical and Space Sciences, Washington, D.C.). In: The second fifteen years in space; Proceedings of the Eleventh Goddard Memorial Symposium, Washington, D.C., March 8, 9, 1973. Tarzana, Calif., American Astronautical Society, 1973, p. 57-68.

A brief review of our space effort over the past 15 years indicates that the Gemini and Apollo phase of this effort, characterized by a spirit of competition and adventure and by substantial expenditures, has now steadied down to a more settled program to take advantage of practical opportunities derived from the previous programs. The diverse and beneficiary opportunities offered by the Space Shuttle are noted, and the need to provide adequate means for the development of the Shuttle project is emphasized. V.P.

A74-14472 **Review of European space projects after 1980.** M. Levy (ESRO, Delft, Netherlands). In: The second fifteen years in space; Proceedings of the Eleventh Goddard Memorial Symposium, Washington, D.C., March 8, 9, 1973. Tarzana, Calif., American Astronautical Society, 1973, p. 177-184.

The European space effort, in the years to come, will bear on certain global objectives and on the acquisition of the techniques needed in order to achieve them. The objectives include the practical follow-up of the application programmes now under way in the fields of aeronautics, meteorology and telecommunications, with particular reference to remote sensing and radio and television broadcasting. In the scientific field, Europe has great expectations as regards the use of the Space Shuttle, and has now undertaken the development of the Spacelab as a part of this system. Finally, the Europeans think that in the matter of space activities a certain degree of specialization on a worldwide basis would be of benefit to all, provided that all the individual developments achieved throughout the community are made available to everybody, without discrimination. (Author)

A74-14473 **An international outlook of the second fifteen years in space.** A. H. Abdel-Ghani (United Nations, Outer Space Affairs Div., New York, N.Y.). In: The second fifteen years in space; Proceedings of the Eleventh Goddard Memorial Symposium, Washington, D.C., March 8, 9, 1973. Tarzana, Calif., American Astronautical Society, 1973, p. 185-193.

It is seen that with the advent of the Space Shuttle and further improvements in ERTS technology, an increasing number of developing nations will follow the example set by India and Brazil in availing themselves of U.S. space science and technology for their economic and social development. The need to adjust economic and educational programs to the specific needs of a nation is pointed out, and the many ways in which a developing nation could benefit from space programs are outlined. V.P.

A74-14873 **A performance and cost analysis of aircraft and satellites for operational earth resources systems.** C. E. Cheeseman, Jr. (GE Valley Forge Space Center, Philadelphia, Pa.). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 1-16.

A model for system analysis is considered, giving attention to the target variable set, target/carrier spatial relationships, aircraft time-cost relationships, the number of aircraft required, the number of aircraft bases needed, satellite time/cost relationships, the number of low altitude satellites, the number of geostationary satellites, and satellite operation costs. Some test case results are discussed, taking into account the imaging of the U.S. every eighteen days at resolutions varying between 2 and 50 meters. Another case considered involves the imaging of varying numbers of small targets evenly distributed over the U.S. G.R.

A74-14874 **Iceland - Preliminary results of geologic, hydrologic, oceanographic, and agricultural studies with ERTS-1 imagery.** R. S. Williams, Jr. (U.S. Geological Survey, Reston, Va.), A. Boovarsson (Icelandic Surveying Department, Iceland), S. Frioriksson, I. Thorsteinsson (Agricultural Research Institute, Reykjavik, Iceland), G. Palmason, S. Rist, K. Saemundsson (National Energy Authority Reykjavik, Iceland), H. Sigtryggsson (Icelandic Meteorological Office, Reykjavik, Iceland), and S. Thorarinsson (University of Iceland, Reykjavik, Iceland). In: Management and utilization of remote sensing data; Proceedings of the Symposium, Sioux Falls, S. Dak., October 29-November 1, 1973. Falls Church, Va., American Society of Photogrammetry, 1973, p. 17-35. 16 refs.

A74-16124 **NASA's International Satellite Projects /A technical overview/.** G. W. Ousley. In: Technology today and tomorrow; Proceedings of the Tenth Space Congress, Cocoa Beach, Fla., April 11-13, 1973. Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1973, p. 7-27 to 7-31.

Discussion of the project management responsibility assigned to the Goddard Space Flight Center for 17 international cooperative satellites previously launched, and five such satellites presently under development. The basic NASA ground rules, guidelines, and practices associated with the establishment and conduct of the NASA International Cooperative Project are reviewed. M.V.E.

A74-17182 # **Spacelab - Europe's participation in manned space flight and its long-term aspects (Spacelab - Europas Teilnahme an der bemannten Raumfahrt und seine langfristigen Aspekte).** K. D. Berge and A. Tegtmeier (ERNO Raumfahrttechnik GmbH, Bremen, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-075.* 26 p. In German.

A74-17200 # **Analysis of German earth resources technology interests - Uses and problems (Analyse Deutscher Erderkundungsinteressen - Nutzen und Probleme).** J. P. Genzel, R. Ockert, and G. Rausch (Dornier-Systems GmbH, Friedrichshafen, West Germany). *Österreichische Gesellschaft für Weltraumforschung und Flugkörpertechnik and Deutsche Gesellschaft für Luft- und Raumfahrt, Gemeinsame Jahrestagung, 6th, Innsbruck, Austria, Sept. 24-28, 1973, DGLR Paper 73-100.* 28 p. In German. Bundesministerium für Forschung und Technologie Contract No. RVII1V9/72KA-10-00-00.

Classification of earth resources technology applications, and determination of user requirements in various areas of interest. A concept of use determination is developed which is based on the construction of two models - namely, a sociological evaluation model and a technological efficiency model. This construction is based on purely pragmatic considerations. Owing to the normative character

of the sociological evaluation model, heavy involvement on the part of the decision makers is necessary in the development of this model. On the other hand, the explorative character of the technological efficiency model requires an accurate analysis of the procedures used in the various stages of data acquisition and processing and must therefore be based on the opinions of experts in the various disciplines involved. A.B.K.

A74-17858 * # **Climatology and the space program.** N. B. Guttman (NOAA, National Climatic Center, Asheville, N.C.) and S. C. Brown (NASA, Marshall Space Flight Center, Huntsville, Ala.). *Environmental Data Service*, Nov. 1973, p. 3-6.

Detailed knowledge of atmospheric properties is essential to the design and development of space vehicles, satellites, and remote earth sensing systems. The thermal effects on a spacecraft involve expansion and contraction of the structure and of the fuel. Humidity, ice formation, precipitation, and lightning cause problems. National Climatic Center (NCC) special studies and projects have been closely coordinated with NASA engineers and scientists. There was a need for more information concerning critical atmospheric parameters affecting launches at Cape Kennedy. The three parameters most often of concern are surface wind speed (affecting liftoff), opaque cloud cover (critical for optical tracking or observation), and high wind speeds (affecting vehicle structure and control in the 10-to-15 km or maximum dynamic pressure layer). Knowledge of the thermodynamic state of the atmosphere is important for a variety of vehicle-related analyses. F.R.L.

A74-18266 **Espionage by satellites and international order (L'espionnage par satellites et l'ordre international).** M. A. Dauses (Würzburg, Universität, Würzburg, West Germany) and D. O. A. Wolf (München, Universität, Munich, West Germany). *Revue Générale de l'Air et de l'Espace*, vol. 36, no. 3, 1973, p. 283-296. 76 refs. In French.

The airplane and the spy satellite today constitute complementary espionage systems of high technical effectiveness. The techniques of observation employed by spy satellites are discussed, including photography infrared and multispectral scanner recording of thermal signals, radiometers measuring the incident energy at longer wavelengths, radar, spectrometic and spectrographic techniques, and laser techniques. The orbital altitudes used by most spy satellites range between 140 and 500 km, depending on whether they are 'close-look' satellites or 'area surveillance' satellites. The juridical position of the United States and Europe is that there is no difference between espionage by overflights, whether by aircraft or satellite, and espionage carried out on the ground. F.R.L.

A74-18657 * # **The United States earth resources survey program and ERTS experiments benefit highlights.** L. Jaffe (NASA, Washington, D.C.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 10th, Washington, D.C., Jan. 28-30, 1974, Paper 74-249.* 8 p. 5 refs. Members, $1.50; nonmembers, $2.00.

With the launch of the first Earth Resources Technology Satellite in July 1972 a major new tool has become available for decision making in the assessment, exploitation, and management of the earth's resources on a national and international basis. The current status of the earth resources survey program is discussed and the future potential is reviewed. The supportive roles of all stages of the system, including surface, aircraft, and satellite components are noted. Specific cases of application of ERTS data are presented together with a discussion of benefits that might accrue. Need for cooperative, coordinated efforts between participants is emphasized. (Author)

N74-10232*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACE SIMULATION, 7TH
Washington 1973 935 p refs Conf. held at Los Angeles, 12-14 Nov. 1973; sponsored by AIAA, Am. Soc. for Testing and Mater., Inst. of Environ. Sci., and NASA
(NASA-SP-336) Avail: NTIS MF $1.45; SOD HC $6.85 CSCL 14B

Space simulation facilities and techniques are outlined that encompass thermal scale modeling, computerized simulations, reentry materials, spacecraft contamination, solar simulation, vacuum tests, and heat transfer studies.

N74-10891# Stichting Nationaal Lucht- en Ruimtevaartlaboratorium, Delft (Netherlands).
STICHTING NATIONAL AEROSPACE LABORATORY, REVIEW FOR THE YEAR 1972 [STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM VERSLAG OVER HET JAAR 1972]
1972 119 p refs In DUTCH; ENGLISH summary
Avail: NTIS HC $8.00

Aerospace research activities during 1972 included the following topics: The development of a method for calculating three-dimensional turbulent boundary layers; crack propagation in titanium alloys; various computations for aircraft development using wind tunnel results; fatigue and fracture toughness of aircraft construction materials; approach and landing control; and environmental and earth surface surveys. G.G.

N74-11161*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THIRD ERTS SYMPOSIUM: ABSTRACTS
Stanley C. Freden, Chairman and John H. Boeckel, Symp. Coordinator 14 Dec. 1973 133 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973 ERTS
(E74-10027; NASA-TM-X-69450) Avail: NTIS HC $8.75 CSCL 05B

Abstracts are provided for the 112 papers presented at the Earth Resources Program Symposium held at Washington, D.C., 10-14 December, 1973. A.L.

N74-11186*# Delaware Univ., Newark. Coll. of Marine Studies.
MAPPING COASTAL VEGETATION, LAND USE AND ENVIRONMENTAL IMPACT FROM ERTS-1 Report on Significant Results
V. Klemas, Principal Investigator 7 Nov. 1973 3 p refs ERTS
(Contract NAS5-21837)
(E74-10069; NASA-CR-135820) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Vegetation map overlays at a scale of 1:24,000 compiled by multispectral analysis from NASA aircraft imagery for all of Delaware's wetlands are being used as ground truth for ERTS-1 mapping and by state agencies for wetlands management. Six major vegetation species were discriminated and mapped, including percentages of minor species. Analogue enhancements of wetlands vegetation and dredge-fill operations have been produced using General Electric's GEMS data processing and ERTS-1 false color composites. Digital, thematic land use, and vegetation mapping of entire Delaware Bay area is in progress using Bendix Corporation's Earth Resources Data System and ERTS-1 digital tapes. Statistical evaluation of target-group selection reliability has been completed. Three papers have been published on ERTS-1 coastal vegetation and land use. Local and state officials are participating in the ERTS-1 program as co-investigators.

N74-11193*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA Progress Report, 1 Sep. - 31 Oct. 1973
William A. Deutschman, Principal Investigator 31 Oct. 1973 1 p ERTS
(Contract NAS5-21858)
(E74-10081; NASA-CR-135970) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Forest fires, oil spills, vegetation damage, volcanoes, storm ridges, earthquakes, and floods have been detected and analyzed.

N74-11196*# Servicio Geologico de Bolivia, La Paz.
APPLICATION AND EVALUATION OF ERTS COLOR COMPOSITES FOR NATURAL RESOURCES INVENTORY [APLICACION Y EVALUACION DE IMGENES ERTS DE COMPOSITION DE COLOR AL INVENTARIO DE RECURSOS NATURALES]
Carlos Brockmann, Principal Investigator and Alvaro C. Fernandez [1973] 55 p refs In SPANISH; ENGLISH summary Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D., 57198 ERTS
(E74-10085; NASA-CR-135974) Avail: NTIS HC $4.75 CSCL 05B

The author has identified the following significant results. Bolivia is participating the Earth Resources Technology Satellite Program. Within this program many interesting sets of images were received which were evaluated in the Bolivian ERTS Program. One of the images was obtained in color of the central part of the Bolivian Altiplano. The color composite and black and white images were compared in order to evaluate which class of ERTS-1 product furnishes more information about specific topics. It was found that the color composites give far more information, about 50% more data, in hydrology, geomorphology, vulcanism, geology, soils, and vegetation than can be obtained from black and white images of the same scene. For this reason, the project is processing with preference color composites of the whole country.

N74-11280*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
AN ERTS VIEW OF ALASKA, A REGIONAL ANALYSIS OF EARTH AND WATER RESOURCES BASED ON SATELLITE IMAGERY
Duwayne M. Anderson, William K. Crowder, Lawrence W. Gatto, Richard K. Haugen, Thomas L. Marlar, Harlan L. McKim, and Anthony Petrone Jun. 1973 84 p refs
(NASA Order S-70253-AG)
(NASA-CR-136073; AD-765442; CRREL-TR-241) Avail: NTIS HC $6.25 CSCL 08/6

A preliminary study has been made of the value of satellite imagery in synoptic surveys of the distribution and environmental interrelationships of permafrost terrain and of coastal sedimentation and related processes in Cook Inlet, Alaska. Earth Resources Technology Satellite multispectral scanner (MSS) imagery was the primary data source for this investigation. Aerial underflight imagery and ground observations of selected sites were secondary data sources. Emphasis has been placed on evaluating the feasibility of mapping permafrost terrain from textural and tonal patterns related to surficial geology and vegetation. A mosaic of a 153,400-sq. km. area in north-central Alaska has been prepared at a scale of 1:1 million. Seven surficial geology, eight vegetative cover and four permafrost terrain units were defined and delineated. Many geomorphic features were also recognized: thaw lakes, stream drainage patterns, glacial moraines, cirques, abandoned glacial valleys and volcanic cones. Preliminary analysis of the regional hydrologic and oceanographic processes in Cook Inlet has been accomplished. It is evident that the distribution of sediments and regional circulation patterns can be monitored using satellite imagery. Author (GRA)

N74-12116*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON SKYLAB AND SUPPORTING AIRCRAFT DATA Quarterly Progress Report
Robert N. Colwell, James D. Nichols, Leonard W. Bowden, and Wes Chambers, Principal Investigators (Bureau of Land Management, Riverside, Calif.) 31 Aug. 1973 17 p EREP
(Contract NAS2-7562)
(E74-10019; NASA-CR-135860) Avail: NTIS HC $3.00 CSCL 08F

N74-12123*# North Carolina State Univ., Raleigh. Dept. of Geosciences.
UTILIZATION OF ERTS-A DATA IN GEOLOGICAL EVALUATION, REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA
Charles W. Welby, Principal Investigator 30 Nov. 1973 4 p ERTS
(Contract NAS5-21732)
(E74-10035; NASA-CR-135876) Avail: NTIS HC $3.00 CSCL 08G

N74-12124*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA Progress Report
Robert N. Colwell, Donald T. Lauer, Robert Burgy, Gerald Schubert, John E. Estes, Leonard W. Bowden, Vidal Algazi, William E. Wildman, Gordon L. Huntington, Principal Investigators et al 31 Oct. 1973 3 p ERTS
(Contract NAS5-21827)
(E74-10036; NASA-CR-135877; PR-5) Avail: NTIS HC $3.00 CSCL 08F

N74-13024*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
[MULTIDISCIPLINARY RESEARCH FROM ERTS-1 DATA] Bimonthly Report, 1 Sep. - 31 Oct. 1973
Frederick J. Thomson, F. C. Polcyn, M. Leonard Bryan, I. J. Sattinger, W. A. Malila, R. F. Nalepka, C. T. Wezernak, R. Horvath, and R. K. Vincent, Principal Investigators 20 Nov. 1973 55 p Original contains color imagery. Original photography may be purchased form the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21783)
(E74-10097; NASA-CR-136088; Rept-193300-31-L; BMR-7) Avail: NTIS HC $4.75 CSCL 05B

N74-13044*# Alaska Univ., Fairbanks.
ERTS-A DATA AS A TEACHING AND RESEARCH TOOL IN THE DEPARTMENT OF GEOLOGY Biomonthly Progress Report
Donald Grybeck, Principal Investigator 2 Dec. 1973 2 p ERTS
(Contract NAS5-21833)
(E74-10117; NASA-CR-136130; BMPR-8) Avail: NTIS HC $3.00 CSCL 08G

N74-14007* California Univ., Berkeley. Social Sciences Group.
DEFINITION OF EARTH RESOURCE POLICY AND MANAGEMENT PROBLEMS IN CALIFORNIA
Robert N. Colwell, C. West Churchman, Principal Investigators, Ida Hoos, and William Gotcher *In its* An Intergrated Study of Earth Resources in the State of California Using Remote Sensing Techniques 30 Jun. 1973 12 p refs ERTS

CSCL 05B

N74-14068*# Michigan State Univ., East Lansing. Kellogg Center for Continuing Education.
PROCEEDINGS OF THE CONFERENCE ON PRACTICAL APPLICATIONS OF REMOTE SENSING
May 1973 79 p refs Conf. held at East Lansing, Mich., 15-16 May 1973; sponsored by Mich. State Univ., NASA, and Environ. Res. Inst. of Mich.
(Grant NGL-23-004-083)
(NASA-CR-136316) Avail: NTIS HC $6.00 CSCL 08B

Conference papers dealing with the principles of remote sensing are summarized. Summaries cover problem solving capabilities within the realms of urbanism, agriculture, forestry, and environmental impact assessment.

N74-14090*# Purdue Univ., Lafayette, Ind.
THE APPLICATION OF REMOTE SENSING TECHNOLOGY TO THE SOLUTION OF PROBLEMS IN THE MANAGEMENT OF RESOURCES IN INDIANA Semiannual Status Report, 1 Jun. - 30 Nov. 1973
D. A. Landgrebe 30 Nov. 1973 22 p ref
(Grant NGL-15-005-186)
(NASA-CR-136470) Avail: NTIS HC $3.25 CSCL 08F

__In an effort to bridge the gap between the research community and the user agencies, this investigation was designed to take the remote sensing technology and products of that technology to the user agencies and to assist them in the use of this technology. The first semi-annual report summarizes the progress which has been made in the following specific projects: (1) pilot study for land use inventory of the Great Lakes Watershed; (2) resource inventory of Marion County (Indianapolis), Indiana; (3) resource inventory of 8 central Indiana counties for the Indiana Heartland Coordinating Commission; (4) applications within the Indiana Department of Natural Resources; (5) applications within the Indiana Department of Commerce; and (6) applications within the USDA Soil Conservation Service. Author

N74-14093*# Kansas Univ. Center for Research, Inc., Lawrence.
RESEARCH ON THE APPLICATION OF SATELLITE REMOTE SENSING TO LOCAL, STATE, REGIONAL, AND NATIONAL PROGRAMS INVOLVED WITH RESOURCE MANAGEMENT AND ENVIRONMENTAL QUALITY Semiannual Progress Report, Apr. - Sep. 1973
Robert L. Walters, Robert J. Eastmond, and B. G. Barr Sep. 1973 69 p refs
(Grant NGL-17-004-024)
(NASA-CR-136472) Avail: NTIS HC $5.50 CSCL 08F

Project summaries and project reports are presented in the area of satellite remote sensing as applied to local, regional, and national environmental programs. Projects reports include: (1) Douglas County applications program; (2) vegetation damage and heavy metal concentration in new lead belt; (3) evaluating reclamation of strip-mined land; (4) remote sensing applied to land use planning at Clinton Reservoir; and (5) detailed land use mapping in Kansas City, Kansas. K.M.M.

N74-15012*# Delaware Univ., Newark. Coll. of Marine Studies.
SKYLAB/EREP APPLICATION TO ECOLOGICAL, GEOLOGICAL AND OCEANOGRAPHIC INVESTIGATIONS OF DELAWARE BAY Bimonthly Technical Letter Progress Report, Dec. 1973 Jan. 1974
V. Klemas, Principal Investigator 18 Jan. 1974 4 p refs EREP
(Contract NAS1-12304)
(E74-10204; NASA-CR-136386) Avail: NTIS HC $3.00 CSCL 08J

The author has identified the following significant results. A program has been developed to correct geometric distortion of pictures reconstructed from MSS tapes. Coastal vegetation species, land use, water turbidity and current circulation were clearly discernible in Skylab pictures of September 12, 1973. Remarkably high spatial resolution was attained.

N74-15030*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Plans and Progress Report, Nov. 1973
Lester V. Manderscheid, Principal Investigator Nov. 1973 4 p EREP
(Contract NAS9-13332)
(E74-10225; NASA-CR-136488) Avail: NTIS HC $3.00 CSCL 05B

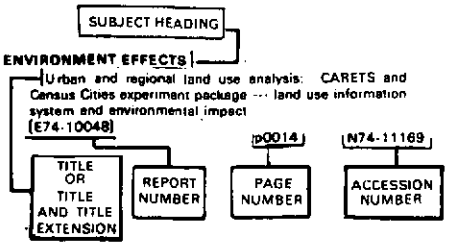
N74-15073*# General Electric Co., Philadelphia, Pa. Space Div.
ERTS-1 FLIGHT EVALUATION REPORT, 23 APRIL - 23 JULY 1973
10 Aug. 1973 205 p refs
(Contract NAS5-21808)
(NASA-CR-136617; Doc-73SD4260) Avail: NTIS HC $12.25 CSCL 05B

The flight performance of the ERTS-1 satellite is analyzed for orbits 3810 to 5100. Systems analyzed include: orbital parameters, power subsystem, attitude control, telemetry, orbit adust, thermal control, and data collection. Documents and reports related to the evaluation are also included. F.O.S.

N74-15075# World Meteorological Organization, Geneva (Switzerland).
JOINT IOC/WMO PLANNING GROUP FOR IGOSS
Oct. 1973 71 p 2nd Conf. held at Geneva, 13-17 Aug. 1973
Prepared jointly with UNESCO
Avail: NTIS HC $5.75; WMO, Geneva

Reports of progress on the Integrated Global Ocean Station System (IGOSS) are given together with a list of groups of experts and organizations interested in the program. Marine pollution monitoring aspects are discussed as well as specific operational programs such as collection, exchange, and evaluation of bathythermograph data; regionalization of IGOSS, and surface and near surface current observations. Further development and implementation of IGOSS, notably observational strategy including the use of coastal stations, and oceanographic services system are also discussed. Recommendations adopted at the session are included. ESRO

Typical Subject Index Listing



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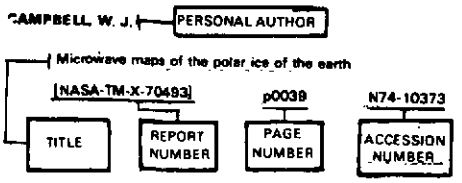
Typical Personal Author Index Listing



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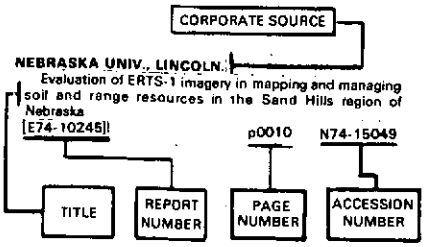

The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

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ACADEMY OF SCIENCES (USSR), MOSCOW.
Effect of sea state on brightness temperature
[AD-765996] p0041 N74-11282

AGRICULTURAL RESEARCH SERVICE, WESLACO, TEX.
Spectral survey of irrigated region crops and soils
[NASA-CR-125195] p0004 N74-10361
Reflectance of vegetation, soil, and water
[E74-10044] p0004 N74-11165
Irrigation scheduling, freeze warning and soil salinity detecting
[E74-10052] p0004 N74-11173
A study of the early detection of insect infestations and density/distribution of host plants
[E74-10171] p0008 N74-14039
A study of the early detection of insect infestations and density/distribution of host plants
[E74-10174] p0008 N74-14042

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.
Effect of sea state on brightness temperature
[AD-765996] p0041 N74-11282

ALABAMA UNIV., UNIVERSITY.
Investigations using data in Alabama from ERTS-A
[E74-10124] p0065 N74-13051

ALASKA UNIV., FAIRBANKS.
Application of ERTS-1 imagery to the study of caribou movements and winter dispersal in relation to prevailing snowcover
[E73-11087] p0004 N74-10347
Evaluation of feasibility of mapping seismically active faults in Alaska
[E74-10045] p0029 N74-11166
Glaciological and volcanological studies in the Wrangell Mountains, Alaska
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Evaluation of feasibility of mapping seismically active faults in Alaska
[E74-10116] p0032 N74-13043
ERTS-A data as a teaching and research tool in the Department of Geology
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Application of ERTS-1 imagery to the study of caribou movements and winter dispersal in relation to prevailing snowcover
[E74-10120] p0007 N74-13047
Coordination and establishment of centralized facilities and services for the University of Alaska ERTS survey of the Alaskan environment
[E74-10131] p0065 N74-13058
Identification, definition and mapping of terrestrial ecosystems in interior Alaska
[E74-10137] p0024 N74-13063
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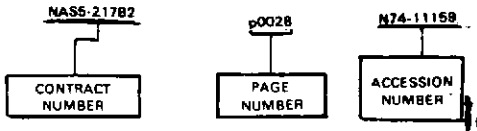

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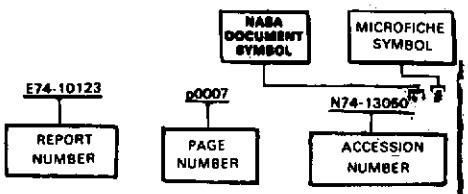

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