notitie WWKZ - 84.S226
2652

projectcode

aan :

van : ir. C.P. v.d. Velde

datum : 3 september 1984, herzien juni 1985

onderwerp : Verslag Second Seminar on Methods of Display of Ocean Survey Data gehouden te Brest, 21 - 24 augustus 1984.

Inleiding

Door de "International Cartographic Association" is de "Marine Cartography Commission" ingesteld. Deze laatste houdt zich bezig met het presenteren van diverse gegevens van oceanografische onderzoekingen. Zwaartepunt ligt hierbij (nog ?) op de bodemtopografie.

Door genoemde commissie is in 1982 een eerste seminar georganiseerd in Swindon (Engeland) welke nu werd gevolgd door een tweede. Dit tweede seminar werd gehouden in Brest (Frankrijk) en georganiseerd door NERC Thematic Information Service te Swindon en EPSHOM (Etablissement Principal Service Hydrographique et Oceanographique de la Marine te Brest als onderdeel van het SHOM.

De samenkomsten vonden plaats in het Centre Océanologique de Bretagne (C.O.B.) te Brest. Het C.O.B., als onderdeel van het C.N.E.X.O. (Centre National pour l'Exploitation des Oceans), is sinds juni 1984 opgegaan in de organisatie IFREMER (Institut Francais de Recherche pour l'Exploitation de la MER). Van deze laatste organisatie en het onderdeel te Brest is in bijlage 1 enige informatie gegeven.

Van het eerste seminar uit 1982 zijn als bijlage 2 de titelbladen van de daar gehouden voordrachten bijgevoegd. De complete verslaglegging van het seminar is in Hellevoetsluis aanwezig.

ministerie van verkeer en waterstaat **rijkswaterstaat**

directie waterhuishouding en waterbeweging

aan: maria

van: Jerard

datum : 28/6

nr :

afd. :

toestel:

- ☐ ingevolge uw verzoek
- ☐ ter kennisneming
- ☐ met verzoek om medeparaaf
- ☐ ter (verdere) behandeling
- ☐ ter afdoening
- ☐ om bericht en raad, gaarne vóór
- ☐ voor de vergadering op
- ☐ gaarne bespreken op/vóór
- ☐ met verzoek om terugzending
- ☐ met dank voor inzage
- ☐ met verzoek voorgaande stukken bij te voegen
- ☐ archiveren s.v.p.

opmerkingen

bedankt

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308 10 000

Het seminar

Bijlage 3 geeft het oorspronkelijke en bijlage 4 het gewijzigde programma van het seminar. De lijst met deelnemers is als bijlage 5 toegevoegd. Het seminar vond plaats in de vorm van workshops; per dag waren de diverse programma-onderdelen als volgt:

- de eerste dag bestond uit een 10-tal voordrachten (8 beschikbare abstracts zijn bijgevoegd als bijlage 6); per groep voordrachten volgde een discussie;
- de tweede dag werd 's morgens gevuld met discussie in twee groepen: de eerste groep hield zich bezig met de "eisen van gebruikers en ontwikkelingen in de presentatie van de topografie van de bodem van de zee". De ter plaatse gemaakte "preliminary draft" is bijgevoegd als bijlage 7. De tweede groep hield zich bezig met de presentatie van stroom- en getij-informatie en tevens andere technieken. Van deze groep is nog geen verslag beschikbaar. Wel bleek dat de *dimensie tijd de methode van presentatie niet vergemakkelijkt* (animatietechnieken!) en dat de veelheid van doelstellingen niet simpel leidt tot standaardprestaties van de grootheden.
  's Middags werden bezoeken gebracht aan onderdelen van het C.O.B. en E.P.S.H.O.M. Een deel van het gepresenteerde is beschreven in een aantal lezingen (zie bijlage 8). Informatie over het "Bureau National des Donneés Océaniques", een databank van oceanische gegevens, is opgenomen als bijlage 9;
- de derde dag werd besteed aan een drietal "poster sessions", gevolgd door discussie.
  Hierna vond de afsluiting van het seminar plaats met een algemene discussie en de rapportage van de twee discussiegroepen. De algemene discussie is als bijlage 10 opgenomen. De rapportage van één der discussiegroepen is opgenomen als bijlage 7, zoals reeds is vermeld. Opgemerkt wordt dat slechts een beperkt aantal deelnemers deelgenomen heeft aan de discussiegroepen en de excursies.

Van het C.O.B. en S.H.O.M. is bij mij nog verdere informatie in de vorm van kleurenfolders aanwezig. De informatie betreft een beschrijving van het C.N.E.X.O. waarvan het C.O.B. deel uitmaakt en de aktiviteiten op het gebied van aquacultuur, visserij, biologische en fysische oceanografie, kustmanagement, geologie, geofysica en geochemie, onderwatertechniek en de databank van oceanografische gegevens. Van het S.H.O.M. is een beschrijving beschikbaar van aktiviteiten en van een veelheid van nautische informatie w.o. zeekaarten. Korte inhoud van de gehouden voordrachten is opgenomen in bijlage 8. Tenslotte zijn bijlage 11 en 12 reeds een tweetal "papers" van dit seminar, terwijl bijlage 13 verdere informatie geeft over processing en presentatie van gegevens van een Multi Beam Echo Sounder.

Evaluatie

Het gehalte van de bijdrage, de accommodatie en de excursies waren goed. Belangwekkend was vooral de bijdrage van Franse zijde. Hierbij kan in het bijzonder worden gedacht aan de Multi Beam Echo Sounder welke zeer gedetailleerde bodemkaarten kan opleveren. Voor bewaking van vaargeulen, bodemverdedigingen, onderzoekingen van beweging van zandgolven en -ribbels lijkt dit een veelbelovend middel. Daarnaast kan worden gewezen op de rasterplotmogelijkheid van standaard symbolen d.m.v. een kathodestraalbuis.
Veel aandacht van de Fransen gaat uit naar remote-sensing technieken m.b.v. satellieten, waarbij de manipulatie van de beelden op kleurendisplays bijzonder aanspreekt.

Gebleken is dat op het gebied van de verwerking van sonarbeelden veel gaande is doch dat (nog) geen geheel bevredigende werkwijzen beschikbaar zijn.

Over (vermoedelijk) twee jaar zal wederom een seminar betreffende hetzelfde onderwerp gehouden worden. Mogelijke bijdragen van Nederland zouden b.v. kunnen zijn:

- remote-sensing technieken in ontwikkeling bij het onderzoek in Nederland zowel t.b.v. fysisch als ecologisch onderzoek (m.n. gegevenspresentatie);

- opzet en werkwijze van een databank van Oceanografische gegevens en de (standaard)- presentatie van de gegevens.
  N.B. hiertoe zou i.s.m. diverse betrokken instanties en studie moeten worden verricht naar de opzet en werkwijze van een dergelijke databank;
- animatie (bv. video) van zich in de tijd afspelende processen (zoals bv. vertikale getijbeweging zuidelijke Noordzee.

Behoort bij: notitie WWKZ - 84.S226

OVERZICHT VAN BIJLAGEN

1. Beschrijving IFREMER
2. Titelbladen voordrachten Seminar 1982
3. Oorspronkelijk programma Seminar 1984
4. Gewijzigd programma Seminar 1984
5. Deelnemerslijst Seminar 1984
6. Abstracts voordrachten
7. Voorlopig verslag discussiegroep I
8. Verslag lezingen en excursies
9. Databank IFREMER
10. Verslag discussie
11. Paper J.C. Gaillard
12. Paper P. Goffinet
13. Beschrijving werkwijze Multi Beam Echo Sounder

Beschrijving IFREMER

MERGER OF CNEXO AND ISTPM : Creation of IFREMER

IFREMER ("Institut Français de Recherche pour l'Exploitation de la Mer") was founded on the 5th June 1984 as the result of the merger of CNEXO ("Centre National pour l'Exploitation des Océans") and ISTPM ("Institut Scientifique et Technique des Pêches Maritimes"). IFREMER is a Government agency with the status of an "Etablissement Public à caractère industriel et commercial".

IFREMER, responsable to the French Government for advancing scientific research, technological and industrial development related to oceanic resources and environmental Protection, is specially concerned with :

- The management of large projects requiring close co-operation of Universities and research institutions with industry,
- The conduct of research projects within its own fields of competence,
- The operation of a national oceanographic fleet and the development of new tools, techniques and facilities for the oceanographic community,
- International collaboration and the promotion of French industry abroad. In this rôle IFREMER is entitled to sign international cooperation agreements and acts as an industrial consultant.

Budget :	circa 600 MF per year.
Staff :	1150 (engineers, scientists and supporting staff).
Research Centres and Stations :	Four centres in France (Brest, Toulon, Nantes, Boulogne-sur-Mer ; a centre in the Pacific Ocean (Tahiti) and four overseas delegations (Antilles, Guyane, Réunion, Saint Pierre et Miquelon, New Caledonia).
Ships :	12 research vessels and 2 submersibles.
Fields of Activity :	. Living resources, . Engineering and technology, . Environment and ocean research . International cooperation and economic affairs.

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Direction des Ressources Vivantes *

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- Environnement Littoral — DERO/EL JL Mauvais
- Etudes Océaniques — DERO/EO A. Cavanié
- Applications de la Télédétection — DERO/AT L. Loubersac

Direction de l'Ingénierie et de la Technologie *

- SOUS-DIRECTION INGENIERIE ET TECHNOLOGIE — SDIT/CB JP de Loof
- Systèmes et Projets — DIT/SP M. Gauthier
- Instrumentation Equipements — DIT/IE JY Bervas
- Génie Océanique — DIT/GO B. Barnouin
- Qualification Essais — DIT/QE JF. Couchouron
- Informatique — DIT/DI F. Le Verge
- Données Océaniques — DIT/DO M. Melguen

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- Chargé de mission Aquaculture — CMA/CB A. Vaillant
- Chargé de mission Pêche — CMP/CB H. Didou

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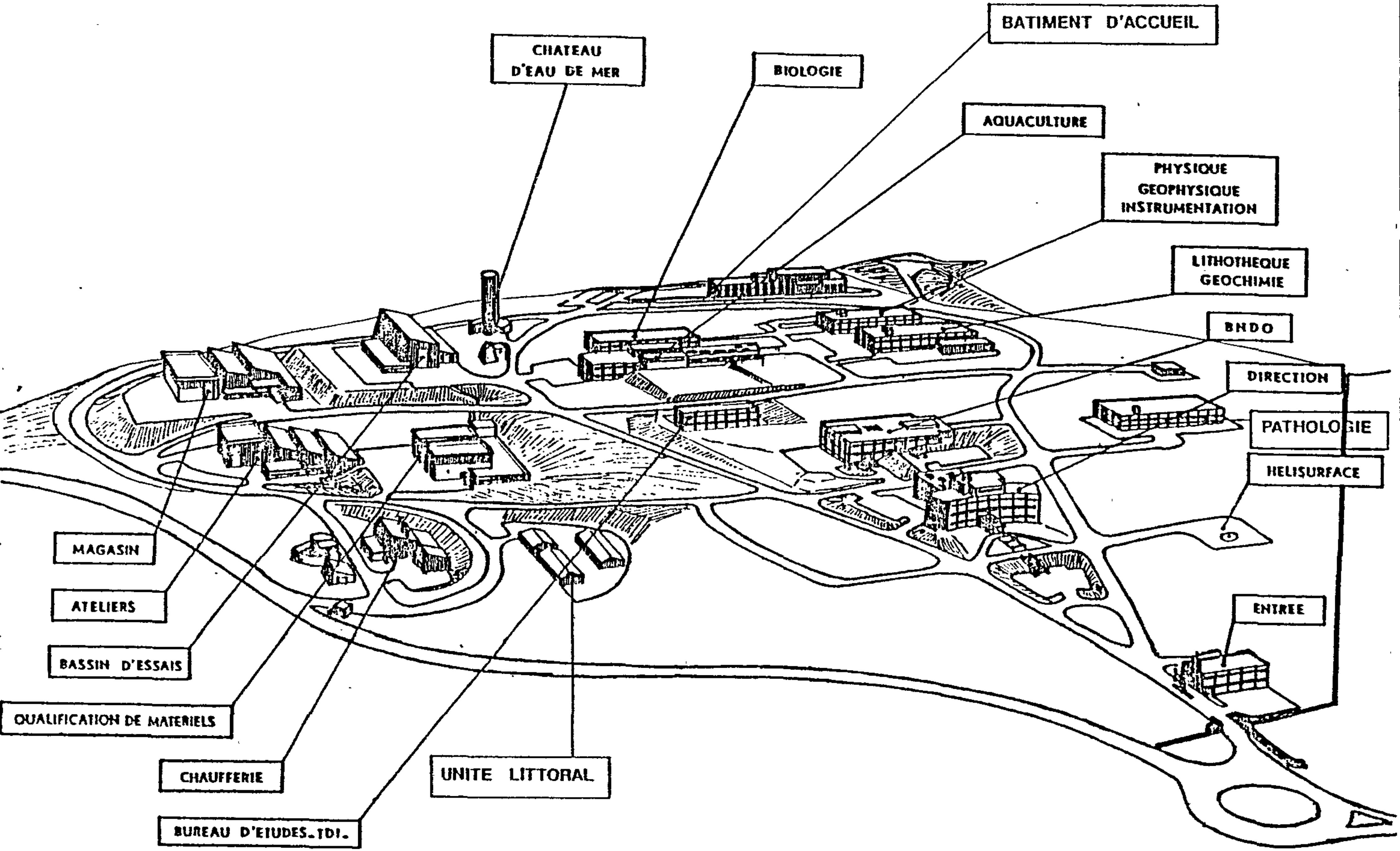

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AQUACULTURE
PHYSIQUE GEOPHYSIQUE INSTRUMENTATION
LITHOTHEQUE GEOCHIMIE
BNDO
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ENTREE
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ATELIERS
BASSIN D'ESSAIS
QUALIFICATION DE MATERIELS
CHAUFFERIE
UNITE LITTORAL
BUREAU D'ETUDES_TDI.

Titelbladen voordrachten Seminar 1982

NATURAL ENVIRONMENT RESEARCH COUNCIL

AND THE

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

METHODS OF DISPLAY OF OCEAN SURVEY DATA

EDITED BY RON LINTON

NERC THEMATIC INFORMATION SERVICE
UK

FOR PRESENTATION AS A REPORT OF THE MARINE CARTOGRAPHY COMMISSION TO THE 13TH ICA CONFERENCE, PERTH, AUSTRALIA 1984

FOREWORD

Adam J Kerr
Regional Director (Atlantic)
Canadian Hydrographic Service

The significance of graphic communications has been a factor of man's existance throughout history. Although differences of language inhibit communication, the properly presented graphic allows people of different nationalities, different social levels and different professions to communicate their ideas. It is the technique of graphic presentation that has been changing and in recent years the variety of techniques available have increased enormously. There has been a significant increase in the use of colour during this century and in recent years the kaleidoscope of fluorescent colours. Television has, of course, had the greatest impact. Not only has it allowed dynamic photographic graphics to be shown but it has entered directly into the life of almost every person in civilized countries. At present we are seeing the use of video displays extended into every facet of our lives. Coupled to small and powerful computers, the users can interactively call up and manipulate information from a very wide variety of sources.

Oceanographic instrumentation has been completely metamorphized during the last two decades. Mechanical devices have given way to electronic systems. There is extensive use of computers both ashore and afloat and many instruments are directly coupled to computers. The use of acoustics has been extended from the field of anti-submarine warfare and simple echo sounding to a wide variety of acoustic sensing and measuring devices of which side scan sonar is the best known. Much of the data is manipulated in mathematical form and there is extensive use of mathematical modelling. Yet, for some purposes, the graphic portrayal of oceanographic data is for conceptualizing processes, for communication with colleagues in the form of scientific papers and their illustrations and for describing oceanographic features and processes to the public at large.

CONTENTS

INTRODUCTION

Dr A S Laughton
Director, Institute of Oceanographic Sciences (NERC)
UK

Ocean Survey is an all- embracing phrase ranging from the acquisition of data on the depth of the sea in order to provide for the safe navigation of ships and submarines, to the measurement of parameters on an ocean wide or global scale in order to further our understanding of oceanic phenomena such as the transfer of heat by ocean currents. In all areas of ocean survey, the last decade has seen dramatic changes in the technology to obtain these data, both in the precision of the measurements and the positioning accuracy, and in the nature of the observations. Details of the ocean floor morphology can now be seen in the output from multi-beam swath sounding techniques, in the imagery given by short and long range side scan sonar (such as GLORIA) and in the globally analysed results of radar altimetry from satellites. Data on time-varying parameters in the ocean such as temperature, chemical constituents, ocean currents and waves have increased enormously especially with satellite observations and present oceanographers with problems of presentation and assimilation.

Marine Cartography needs to react to these changes and to provide the users of the oceans whether they be navigators, weather forecasters, mineral exploiters, policitians or scientists with a means of portraying these data in a convenient and digestible manner. The challenges are great, but at the same time the technologies of computer data handling, automatic cartography, image processing and holography are now available and new research in information technology will doubtless develop these further.

This Seminar brought together those who generate and use data with those who have the skills for its manipulation. It is the beginning but by no means the end of such collaboration.

A S Laughton
May 1983

CHAPTER 1

A BRIEF DESCRIPTION OF THE INVESTIGATION

Ron Linton
NERC Thematic Information Service
UK

At the meeting of the Marine Cartography Commission held during the 1980 Conference of the International Cartographic Association two additional tasks for the Commission to investigate were formulated for execution during the following 4 years, and these were approved by the Executive Committee of ICA at the end of the Tokyo Conference. Of the two tasks to be undertaken between 1980 and 84, the following is the investigation which the author has been leading, and which is the subject of this report.

'An Examination of the Cartographic methods of Depicting Data collected by new data collection methods. This is a study of how to portray on the map or chart face, Marine Data collected using instruments such as side scan sonar, and other forms of remotely-sensed data'.

Organisation of the Investigation

The investigation was organised along the following lines:-

Phase 1 - Correspondence with scientists and scientific organisations working in the Oceanographic Sciences, requesting information to establish their usage of new data collection methods, examining and collating the replies.

Phase 2 - Organisation of 1 or 2 workshop/seminar sessions to which the respondents to the initial enquiries as well as others involved in the work, were to be invited to present their work and any display methods used.

CHAPTER 2

THE USE OF MULTIBEAM SOUNDING SYSTEMS IN THE SEARCH FOR POLYMETALLIC SULFIDES

Lt Cdr Thomas W Richards, NOAA
Hydrographic Surveys Division
National Ocean Survey, NOAA
U.S.A.

Abstract

Multibeam sounding systems provide an integral part of the information necessary to conduct detailed research regarding the formation of polymetallic sulfide deposits. *Dr Alexander Malahoff, Chief Scientist of the National Ocean* Survey, has located significant deposits of polymetallic sulfides in the Pacific Ocean in the past through analysis and interpretation of detailed multibeam bathymetric data. Attempts to locate additional such deposits in similar situations using similar techniques are planned for the near future.

Introduction

This paper briefly describes the past methods that the National Ocean Survey has used in the search for polymetallic sulfides; the present surveying work that is taking place in this search, and the plans that the National Ocean Survey has for the use of multibeam data in the search for polymetallic sulfides in the future.

Past

The Galapagos Rift is an east-west trending rift valley located east of the East Pacific Rise and west of Ecuador. In 1970 the US Navy collected high resolution Sonar Array Survey System (SASS) bathymetric data in the vicinity of the Galapagos Rift. These SASS data were in the form of numerous non-over-

CHAPTE

WHERE HAVE ALL THE DATA GONE

R L Cloet
School of Physics
Bath University
UK

Knowledge of seabed morphology is still largely derived from hydrographic echo sounding surveys. Side scan sonar can be a powerful qualitative aid, but seldom has the positional precision of a depth survey, and in many cases requires a skilled interpreter.

The data obtained in depth surveys until very recently, was stored exclusively on 'fair sheets' or 'smooth sheets'. These are documents on which the surveyor has plotted, manually or automatically, the soundings corrected for tidal height variations. Typically they contain some tens of thousands of soundings.

Surveys are said to be carried out on a certain scale, and although this value obviously expresses the ratio of the paper dimensions to ground dimensions, the term survey scale has also an extended meaning.

It is considered that in order to write a two digit number legibly on paper a window of 2.5mm x 5mm is needed. If two lines of such numbers are written alongside each other, a clear space should then appear between them (Ref 1). This writing procedure produces a satisfying density of depth data, on paper, which inspires confidence. Hence a survey is planned to be carried out on a scale of 1:10,000 when a line spacing of the survey pattern of 50m interval is desired. In practice this is the line spacing which would be adopted for that part of the survey which is deeper than 5m to 6m (3fm), and shallower than 40m (20fm) because that is the navigationally sensitive zone. If on the other hand the depths in a survey area are all expected to be in excess of 40m, the on paper line spacing may revert to 5mm, but the survey will have been executed

CHAPTE[R]

MAPPING OF MORPHOLOGY AND OTHER PHYSICAL OCEANOGRAPHIC DATA

Adam J Kerr
Regional Director (Atlantic)
Canadian Hydrographic Service

As far back as 1970 a group of hydrographers and oceanographers meeting Stresa, Italy, decided that there was a need to discuss the cartograpr difficulties of presenting oceanographic information on a sheet of paper. Th subsequently led to a meeting in Ottawa in 1972 and the formation of a Commi sion on Oceanic Cartography of the International Cartographic Associatic Since then the Commission has met on several occasions and engendered ma discussions. However, the problem has remained of how to clearly depict infc mation that occupies a three dimensional space and often varies temporaril A variety of exotic electronic and computer aided equipment has become ava able to help the oceanographer and cartographer in his task but the major are expensive and do not replace the map or chart which is convenient a relatively inexpensive.

The search has therefore been directed at finding graphical methods to disp the information clearly. The traditional methods can be seen in all oceanographic atlases and map sheets. Time varying data is usually shown providing a separate diagram for each time interval and three dimensions portrayed by providing a series of sections. Several ingenious methods discussed in "The Dynamics of Oceanic Cartography"(1). These are mainly dir ted at the three dimensional problem and are typified by the Kitiro Tan principle(2) of shading by oblique illumination and the various computer g phics methods of showing vertical relief as discussed by Peucker(3). Tempo variations have proved more difficult to display and are typified in the of progressive vector diagrams and stick diagrams of a time series as disc sed by Duncan(4). While this work has been pursued in the display of oce graphic data the data collection process has been evolving at an even fa

TRANSFORMING BATHYMETRIC DATA TO THE 'SEASAT' PROJECTION

Erica Speak Kevin Becken
NERC Thematic Information Service
UK

Introduction

Synthetic Aperture Radar data is of particular interest to oceanographer because of its potential application in respect to parameters such as wav direction, length and height etc. The Institute of Oceanographic Sciences c the UK Natural Environment Research Council required to study Seasat SAR imag ery by direct comparison with bathymetric contour data obtained by traditiona survey methods. The Experimental Cartography Unit (now incorporated within th NERC Thematic Information Service) had previously digitised a considerabl area of the North East Atlantic for the NERC Institute of Oceanographic Sciences. As a result, TIS was requested to determine whether existing digita bathymetry (Figure 1) could be transformed to fit a Seasat swath (Figure 2 and produce plots of the transferred data to register with the optical imagery. After some experiments it was decided to carry out the transformatior described below to produce overlays for 3 Seasat swaths (Orbit 590, Sequences 3, 4 and 5 dated 7 August 1978). As a disproportionate length of time wa spent on this work, it was decided to introduce a more automated approach fo future use. The description of the later method is also given in this paper.

Transformation using 30 minute grid

The optical Seasat swaths image an area 100km wide on the ground and the area which was the subject of the first project extended from 18°W to 1°W and 48°N to 64°N, although the North limit was in fact determined by the extent of the existing digital bathymetry. The swaths had previously been marked with graticule intersections at 30 minutes of arc intervals using satellite orbit dat

CHAPTE

THE WORK OF THE CONTINENTAL SHELF UNIT OF THE INSTITUTE OF GEOLOGICAL SCIENCES

J E Wright
Assistant Director and Head,
Continental Shelf Division
Institute of Geological Sciences (NERC)
UK

The involvement of the Continental Shelf Division of IGS in the field of Of-shore Geological Surveys is outlined in this paper. It should be emphasis: that the results of the IGS surveys are published as colour printed maps in series at a scale of 1/250,000. These maps include editions showing soi geological, the distribution of superficial sediments and in some areas Qu: ternary geology. Black and white dyeline editions which show Bouguer Gravi: Anomalies and Magnetic Anomalies are also produced.

For geological mapping sonar records are useful in some areas, for delineati: bedrock geology, but more commonly they are used in the mapping of bed for relating to the distribution of superficial sediments.

There are a number of cartographic problems in indicating the trends ar distribution of bed forms at the publication scale of 1/250,000. In so instances it is only possible to use a diagramatic ornament which bears litt! graphic relationship to the bed forms indicated. In other areas, it may : possible to indicate clearly the position and trend of large bed forms such : major sand ridges or banks.

CHAPTER 7

CONSIDERATIONS IN THE DISPLAY OF SCALE-CORRECTED SIDE SCAN SONAR DATA

Charles H Mazel
Klein Associates, Inc
Salem, New Hampshire, USA

Introduction

When side scan sonar was first developed in the late 1950's, it introduced a new and powerful way of viewing the floor of the sea. Images which were in many ways similar to aerial photographs could be obtained rapidly and easily, permitting characterizations of the seabed which were previously unobtainable. As the quality of the available equipment improved, the range of applications to which it was put increased. Today, side scan sonar finds application in numerous disciplines, including hydrography, geology, engineering, search and salvage, and iceberg studies.

Until recently all commercial side scan sonar systems produced records which were distorted in scale. As a result side scan was long viewed as primarily a qualitative tool. Some users labored to extract more detailed information from the sonar records, often going to elaborate lengths in post-processing to remove the distortions inherent in the recording technique. The time and difficulty involved relegated these efforts mainly to research institutions for specialised purposes.

In the last few years, with the application of microprocessor technology, commercial side scan sonar systems have become available which will produce approximate 1:1 scale presentations of seafloor data in real time. The implication for cartographic purposes is clear, since measurements of sea floor data can easily be transferred to existing charts and large-area mosaics can

CHAPTER 8

DIGITAL PROCESSING FOR SIDE SCAN SONAR IMAGERY
- GEOMETRIC CORRECTION -

Shunji Murai
Associate Professor, Institute of Industrial Science
University of Tokyo
Japan

Toshiaki Ueki
Research Engineer, Sanyo Hydrographic Survey Co Ltd
Tokyo, Japan

and

Minoru Nagatani
Managing Director, Japan Hydrographic Association
Tokyo, Japan

Abstract

Geometric correction for digital image data taken by side scan sonar has been developed by the authors. The Computer program involves reformatting, slant range correction, radiometric correction, heading correction and mosaic generation.

Heading correction is based on the assumption that heading and movement of towfish will follow those of the tug boat. As compared with a manual mosaic of dot printed records, the digitally corrected mosaic has the greater merits of higher accuracy, continuous tone and smoother boundaries between adjacent tracks.

CHAPTER 9

DIGITAL ANALYSIS OF SEASAT SAR IMAGERY OVER THE JASIN AREA

Dr T D Allan
NERC Institute of Oceanographic Sciences
UK

Dr J R Baker
NERC Thematic Information Service
UK

Abstract

A synthetic aperture radar (SAR) determines the azimuthal position of a target in the image plane from its Doppler frequency. When the target is moving it will superpose a Doppler shift of its own and will as a consequence be mispositioned in the image plane. If, as in the case of ocean waves, many components of the target have different motions, then the resultant image will be distorted and incomplete. Some wavelengths will be enhanced and some suppressed to a degree determined by the wavelength itself and by the viewing geometry. This effect is being investigated for SAR images of the JASIN area in the North Atlantic taken on ascending and descending passes of the Seasat satellite.

Introduction

Seasat was launched on 27 June 1978 and operated for 100 days before a power failure brought its mission to an untimely end on 10 October. The other microwave sensors on board recorded data for later transmission to a convenient ground station. However the high telemetry rate of the Synthetic Aperture Radar (SAR) precluded data storage on the satellite so that the SAR could only operate for brief periods by transmitting its data immediately to a

CHAPTER 10

DISCUSSION GROUP REPORTS

Group 1 - Terms of Reference - The mapping of geological and superficial geological data

Group Members - Mr K Becken - NERC Thematic Information Services-Cartographer

Mr A Hayman - Hunting Services Marine Ltd - Geophysicist

Dr M Lovell - University of North Wales Marine Science Laboratories - Geophysicist

Mr M Loughridge - United States National Oceanic and Air Administration - Geophysicist

Lt Cdr T W Richards - United States National Oceanic and Air Administration - Hydrographer

Dr W G A Russell-Cargill - University of Cape Town, South Africa - Hydrographic Engineer (Chairman)

The problems involved in deciding which are the most appropriate methods to be used for the display of data collected by modern ocean survey techniques were discussed with respect to the Mapping of Geological and Superficial Geological Data collected by side scan sonar, echo-sounders, sub-bottom profiles, magnetometers, underwater photography, etc. The representation of data collected during hydrographic surveys and oceanographic studies depends on the parameters being presented. Due to the large variety of information available the type of map or chart required varies enormously. There are, however, fundamental requirements common to many presentations such as morphology, bathymetry, surface sediments, geomagnetism, gravity, etc. It was inevitable that in considering the cartographic problems that we face in the presentation or portrayal of new types of marine survey data on the map or chart surface that the group's discussion revolved around the question of what types of information are available at source and in what form.

Recommendations

1. Recommend that the ICA/MCC promote the interchange in cartographic techniques of displaying geological and seafloor morphological data through some agency, such as the TIS of NERC, by compiling an atlas of examples.

2. Formulate a keyword-oriented bibliography to identify the cartographic techniques used in presentations of data originating from different survey methodologies such as grab samples, vibrocoring, side scan sonar, sub-bottom profiling, underwater photography, sector scanning, submersible work, geotechnical information, etc.

3. Characterize the communities user and his needs.

4. Set up a list of colour standards to be used on charts.

Group 2 - Terms of Reference - The mapping of morphological and other physical oceanographic data

Group Members - R C Britton - North East London Polytechnic

Mr W E Frey - United States National Oceanic Air Administration - Hydrographer

Mr R B Gray - Racal-Decca Ltd - Cartographer

Mr A J Kerr - Canadian Hydrographic Service - Hydrographer

Mr D P D Scott - GEBCO Guiding Committee - Hydrographer

Mr J Walker - McMichael Ltd

The Group felt that the acquisition of data deserved initial attention and that it was important that data be stored in an uniform a format as possible. Furthermore that the format be arranged in a manner that data stored in other formats be readily transposed. More flexibility could be expected in the display of information.

Discussion Group 3 - Terms of Reference - Mapping of data collected by other forms of remote sensing

Group Members - Dr R Cloet - University of Bath - Marine Geologist (Chairman)

Miss B Ebden - NERC Thematic Information Service - Cartographer

Dr D Evans - NERC Institute of Geological Sciences - Geologist

Miss R Scrivener - Plymouth Polytechnic - Cartographer

Dr R Wingfield - NERC Institute of Geological Sciences - Geologist

The Group discussed a number of topics which reflected the interest of the Group members. Initially, the Group discussed the availability of marine data and decided that such data should be made available preferably on magnetic tape and that the various tape standards and formats should be advertised in order that a common standard would be obtained and made available to all users. This, it was felt, implied not only availability but also advertising the availability. The data should be supported by information indicating the type of navigation which has been used and should also include the dates and times of all the observations as well as their location. During the discussion an important point arose, for it was shown that there may be a need for the originator of the information to ensure that the data is not misused as there is a possibility that he may appear to be 'guilty by association' if he does not distance himself from the interpretations of other users which have been based on the data he provided. This is an important point as it can effect discussions as to whether scientists are prepared to participate or not in the provision of data. One suggested method was that the receivers of marine data may have to be asked to accept a disclaimer of responsibility on the part of the data owner or originator.

The discussion then turned to the distinction between a navigational chart and a morphological map. The Group felt that it was important that the distinction between the two types of map is maintained. In fact the Group were very much against any interference with the navigational chart, as it was felt that it

CHAPTER 11

GENERAL DISCUSSION

Dr D Evans (IGS) - I think it was the second Group who discussed the possibility of digitising geological interpretations, I think that is a very dangerous thing to do under any circumstances. Digitising geological data poses many problems and I am not sure that digitising interpretations is particularly worthwhile. In similar context we have heard once or twice of the digitisation of bathymetric contours. It must be remembered that a contour is an interpretation and it is very different from point source data.

Adam Kerr (Canadian Hydrographic Service) - If you agree with the concept that you shouldn't necessarily produce elaborate coloured maps; that you should provide information to your customers, whoever they may be, in the form of a quick map derived from digital data and covering a specific purpose. However, it seems pointless if you just give quick maps of the sample points and there has been a large amount of geological interpretation, say from shallow seismic data between the points, and potential users are informed that the interpretations would not be available whereas it is available on the printed coloured map. The fact that you draw sedimentary boundaries on the map is the result of sampling and then interpretation. In order to be able to reproduce some of the features of that map in a digital form and then produce the quick map the in-digital interpretations are necessary. I think that the production of the GEBCO series would be a similar situation - you have data from all over the world that has been collected by various means and over many years and you have a number of well qualified geophysicists who have carried out an interpretation. The result when the digitising is complete will be that you can really recall maps and put them out in a graphical form. I think I have to agree with you that there is some danger in digitising an interpretation when you do not know who has carried out the interpretation but, on the other hand, the interpretation was the result of someones work and they saw fit to produce it on a map. Therefore they are prepared to publicise it, so why shouldn't it be publicised in a digital form and then produce a quick map.

Dr D Evans (IGS) - I agree, but I know from my own experience of geological interpretation, I will rarely make the same interpretation twice, particularly

LIST OF SEMINAR PARTICIPANTS

Dr T Allan	NERC Institute of Oceanographic Sciences	UK
Dr J Baker	NERC Thematic Information Service	UK
K Becken	NERC Thematic Information Service	UK
D M Blake	Racal-Decca Ltd	UK
Dr R C Britton	North East London Polytechnic	UK
Capt P J E Cheshire	Hydrographic Department (Ministry of Defence)	UK
Dr R Cloet	University of Bath	UK
Dr D Evans	NERC Institute of Geological Sciences	UK
E Frey	Hydrographic Surveys Division, National Ocean Survey NOAA	USA
R B Gray	Racal-Decca Ltd	UK
G A Hayman	Hunting Surveys Ltd	UK
Dr M J Jackson	NERC Thematic Information Service	UK
Dr N Kenyon	NERC Institute of Oceanographic Sciences	UK
A J Kerr	Canadian Hydrographic Service	Canada
R H W Linton	NERC Thematic Information Service (Seminar Chairman)	UK
M S Loughridge	National Geophysical Data Centre/NOAA	USA
Dr M A Lovell	University College of North Wales	UK
Lt Cdr T W Richards	Hydrographic Surveys Division, National Ocean Survey NOAA	USA
Dr W G A Russell-Cargill	University of Cape Town	S Africa
D P D Scott	International Oceanographic Commission	
Miss R Scrivener	Plymouth Polytechnic	UK
Mrs E Speak	NERC Thematic Information Service	UK
Miss S M Squires	London School of Economics	UK
J Walker	McMichael Ltd	UK
Dr R T R Wingfield	NERC Institute of Geological Sciences	UK
J Wright	NERC Institute of Geological Sciences	UK

Oorspronkelijk programma Seminar 1984

TRAVEL ARRANGEMENTS

1. FROM UK – Brymon Airways are not operating the Plymouth/Brest or Plymouth Morlaix flights this year.

Because of this enquiries have been made about chartering an aircraft (Britten-Norman Trislander) from Bristol Airport to Brest. The cost of this will be £125.00 (return) per person for 17 passengers which is the maximum the aircraft can carry. If you wish to take advantage of this charter, please indicate on the registration form.

Alternative services are:

BY AIR:

TUESDAY 21 AUGUST

London Heathrow Airport	Depart 11.30	Flight AF. 811/IT5407
Paris Charles de Gaulle	Arrive 13.30)	Two hours minimum
Paris Orly	Depart 16.25)	connecting time
Brest	Arrive 17.25	between airports

SATURDAY 25 AUGUST

Brest	Depart 06.45	Flight IT. 5008
Paris Orly	Arrive 07.45	
Paris Charles de Gaulle	Depart 10.30	Flight AF. 810
London Heathrow	Arrive 10.30	

OR

Brest	Depart 13.15	Flight IT.5308
Paris Orly	Arrive 14.15	
Paris Charles de Gaulle	Depart 17.30	Flight BA.313
London Heathrow	Arrive 17.30	

FARE TO PARIS	Normal	Y	£136.00
	Club	C	£168.00
FARE PARIS/BREST	Approximately		£112.00 depending on exchange rate
TOTAL FARE – MINIMUM	£248.00		

BY RAIL

via PLYMOUTH/ROSCOFF Ferry

TUESDAY 21 AUGUST

Depart London. 00.50
Arrive Brest 19.00

Return journey not yet specified.

COST £88.00 2nd class
£108.00 1st class

Times and costs subject to modification during May 1984.

2. FROM OUTSIDE UK

It is assumed that participants from France and some European countries will make their own arrangements for travel. Participants from the United States [illegible] consider flying to London Heathrow and using the Bristol/Brest

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

Le Centre Oceanologique de Bretagne Brest, France

August 21st – 24th 1984

Programme

Seminar Organisation – UK

Ron Linton
NERC Thematic Information Service
Holbrook House
Station Road
Swindon SN1 1DE
Wilts., England
Tel. 0793 40101 ext 471

France

Etablissement Principal
Service Hydrographique
et Oceanographique de la Marine
13 rue du Chatellier
B.P. 426-29275 Brest Cedex
France
Tel. (98) 22.10.80

2nd SEMINAR ON METHODS OF DISPLAY OF OCEAN SURVEY DATA

Programme

Tuesday August 21st

19.30 Pre Seminar Dinner

Wednesday August 22nd

09.00 Registration
09.30 Introduction and Welcome

09.45 Keynote Address
EPSHOM

10.15 Coffee

SESSION 1 Methods used by Governmental and Inter-Governmental Organisations
10.30 - 12.30

D. Monahan & R. McNab, Canadian Hydrographic Survey, Canada
L. Loubersac, Centre National pour L'Exploitation des Oceans, France
Meirion Jones Chairman, IHO/IOC GEBCO Digital Sub-Committee
R. Perotte, Canadian Hydrographic Service, Canada

12.30 Lunch

SESSION 2 Methods used by Commercial Organisations
14.00 - 15.30

J. Graffe, Wimpol Ltd, UK
W. G. A. Russell Cargill, Underwater Surveys, South Africa
- - -

15.30 Tea

DISCUSSION SESSION 1
15.45 - 17.15

Thursday 23rd August

09.00 Keynote Address
Neil Anderson, Canadian Hydrographic Service, Canada

SESSION 3 Current Research and Future Proposals
09.30 - 12.00

J. Korhonen, Finnish Hydrographic Service, Finland
D. Colvin, MATSU & J.Walker, McMichael Ltd., UK
R. Linton, NERC Thematic Information Service UK
- - -

12.00 Lunch

14.00 Visits to EPSHOM/COB

Friday 24th August

POSTER SESSION
09.30 - 11.30

Centre National pour L'Exploitation des Oceans
NERC Thematic Information Service
- - -
- - -

DISCUSSION SESSION 2
11.30 - 13.00

13.00 Lunch

CLOSING SESSION
14.00 - 17.00

Discussion Group Reports
General Discussion
Formulation of Recommendations
Conclusion

COSTS

- No Registration Fee
- Lunches, etc will have to be charged for as required (approx 30 FF/day or £2.50).
- Hotel accommodation will be arranged. The hotels are in Brest and costs will be approximately 200-300 FF per night (£16-24). Transport will be provided between COB and the hotels.
- The costs of the pre-Seminar dinner are not included in the above, these will be advised later.

cont...

Gewijzigd programma Seminar 1984

AS ALL CANADIAN PARTICIPANTS WITHDRAWN FROM SEMINAR, REVISED PROGRAMME READS:

TUES AUGUST 21ST	19.30	PRE SEMINAR DINNER
WED AUGUST 22ND	09.00	REGISTRATION
	09.30	INTRODUCTION AND WELCOME
	09.45	KEYNOTE ADDRESS - EPSHOM
	10.15	COFFEE/TEA
	10.30	SESSION 1 - CURRENT METHODS AND RESEARCH BY HYDROGRAPHIC AND OCEANOGRAPHIC ORGANISATIONS L BOUBERSAC, FRANCE GAILLARD, FRANCE COFFINET, FRANCE KORHONEN, FINLAND
	12.30	LUNCH
	14.00	SESSION 2 - CURRENT METHODS AND RESEARCH BY UNIVERSITY CENTRES AND OTHERS G BENWELL, AUSTRALIA A WRIGHT, UK R LINTON, UK
	15.30	COFFEE/TEA
	15.45	SESSION 3 - CURRENT METHODS AND RESEARCH BY COMMERCIAL ORGANISATIONS POWELL, UK RUSSELL-CARGILL, SOUTH AFRICA EDY, FRANCE
THUR AUGUST 23RD	09.30	DISCUSSION GROUPS
	10.45	COFFEE/TEA
	11.00	DISCUSSION GROUPS
	12.00	LUNCH
	14.00	VISITS TO EPSHOM/CCD
FRI AUGUST 24TH	09.00	POSTER SESSION
	10.45	COFFEE/TEA
	11.00	CLOSING SESSION DISCUSSION GROUP REPORTS GENERAL DISCUSSION CLOSING REMARKS
	13.00	LUNCH

Deelnemerslijst Seminar 1984

NOM (NAME)	PAYS (COUNTRY)	ORGANISME (AFFILIATION)
AUGUSTIN Jean-Marie	FRANCE	IFREMER/CENTRE DE BREST
BENWELL George	AUSTRALIA	UNIVERSITY OF MELBROURNE
BESSERO Gilles	FRANCE	SHOM/EPSHOM
BEUZART Paul	FRANCE	IFREMER/COB
BORRE A. Johansen	NORWAY	NORSK HYDRO A/S
CAILLIAU Etienne	FRANCE	SHOM
CALLEN Susan	UNITED KINGDOM	NERC/TTS
DAVID Christine	FRANCE	IFREMER/CENTRE DE BREST
EDY Christian	FRANCE	IFREMER/CENTRE DE BREST
FERRERO-REGIS Antoine	MONACO	INTERNATIONAL HYDROGRAPHIC BUREAU
GAILLARD Jean-Claude	FRANCE	SHOM/EPSHOM
GOFFINET Patrick	FRANCE	SHOM/EPSHOM
KORHONEN Juha	FINLAND	HYDROGRAPHIC DEPARTMENT HELSINKI
LE GOUIC Michel	FRANCE	SHOM/EPSHOM
LINTON Ron	UNITED KINGDOM	NERC
LOUBERSAC Lionel	FRANCE	IFREMER/CENTRE DE BREST
MILARD François	FRANCE	SHOM/EPSHOM
MOUSSAT Eric	FRANCE	IFREMER/COB/DDO
PAUPULUS Jacques	FRANCE	IFREMER/COB/ELGMM
POWELL Rhoderick	UNITED KINGDOM	WIMPOL LTD
RUSSEL-CARGILL Bill	SOUTH AFRICA	UNDERWATER SURVEYS
TISSEAU Chantal	FRANCE	IFREMER/CENTRE DE BREST
TOULLEC Bernard	FRANCE	IFREMER/CENTRE DE BREST
VAN DE VELDE Chris.	NETHERLANDS	RISKWATERSTAAT NETH (Public Service)
WRIGHT A.	UNITED KINGDOM	UNIVERSITY OF LIVERPOOL

Abstracts voordrachten

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

Le Centre Oceanologique de Bretagne Brest, France

August 21st - 24th 1984

ABSTRACTS

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

- GAILLARD -

Ten years use of computers at the S.H.O.M. have led to the design of a new generation of modular equipment, which are together evolutive and flexible. During the survey itself, real time fully microprogrammed, data acquisition systems (HYDRAC) provide the hydrographer with efficient means of computation and of control. Various algorithms have been implemented to solve the numerous problems which the hydrographer encounters, such as position filtering, soundings selection, digital terrain modelling, and so on. There is still one difficulty with regard to heave compensation on launches, which impedes the full automation of some surveys.

Moreover, thanks to post-processing equipment 'HYTRAI', the hydrographer in charge is autonomous to process survey data.

The load of the data flow into the EPSHOM has led on the one hand to install a powerfull main frame computer, and on the other hand to develop interactive units for cartographic work. These data processing tools are supplemented with a MATRA stereo plotter and a satellite data processing unit.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

AUTOMATED CHART PRODUCTION

- COFFINET -

This document describes the actual and planned developments of automated procedures in the field of Cartography at the Service Hydrographique et Oceanographique de la Marine (SHOM).

Automated graphic procedures began about ten years ago with the rise of tried tools which allowed improvements in production. Meanwhile, manual techniques were more and more faced with the growth, variety and swiftness of numeric processing techniques and with the abundance of modern numeric data. This evolution involved first the creation and management of numeric basis files in order to satisfy the users needs. In a parallel some studies of cartographic applications were carried on. Recent investments concretized by the acquisition of an advanced plotter system and the central computer replacement allow new developments directly based on chart conception and elaboration using computer assisted techniques. These last applications join with a general organisation middle dated in cartography established to increase production.

The actual results confirm the advantages of this mutation and the adaptation of the personnel.

-=-=-=-=-

ABSTRACT

A METHOD FOR COMBINED

CONTOURING AND SOUNDING SELECTION

JURA KORHONEN

One method for combined sounding selection and contouring is introduced. With this method it is possible to do both sounding selection and contouring automatically so that the results will fit together.

Some preliminary test results are presented. Also future developments and other possibilities to use the system are discussed.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

DYNAMIC PRESENTATION OF 3-DIMENSIONAL DIGITAL TERRAIN MODELS

ITS APPLICATION AND MANAGEMENT IN MARINE SURVEYING

G. L. BENWELL *

At present, because of the magnitude of marine data collected, the lack of suitable hardware and the cost, there is a considerable delay between data collection and data presentation. Given that in most cases immediate turn around is not required (but nonetheless desirable), it is still not common place to find the traditional chart or map being replaced by a 'digital look alike'.

Currently at the University of Melbourne, Department of Surveying research is being undertaken into real time presentation of hydrographic information. The aim of the projects is to provide a system that will collect raw data (depth, positition, time, tide, etc.), have it processed and presented on the bridge of the dredger in ' real time ' (a matter of seconds).

In parallel, three discreet areas are under investigation:-

DIGITAL TERRAIN MODELS - Since 1978 triangular integrated networks (TIN's) have been developed and a suite of programs is now in full commercial use. There is still need for further development and their applications to marine surveying is a good example.

THREE DIMENSIONAL GRAPHICS - It is fair to say that true dynamic graphics is only the tool of the rich and/or the video operator. Unfortunately, the many packages available today that will produce good wire frame to solid model three dimensional graphics fall well short of a true dynamic system. MOVIE.BYU and INTERGRAPH are being adapted to and investigated as tools to produce dynamic graphics.

DATA TRANSMISSION - A special problem confronting any proposed sysem will have to be a study of the methods to rapidly transmit pictures and data. On the one hand television type data may be preferred to serial bit transmission, while on the other, onboard processing as against land based may be seen as decreasing update time. The department has just been awarded funds and is investigating high speed microwave data communication links.

All three of the above are undergoing massive worldwide changes and advancements. It should not be considered impossible, within the near future to collect hydrographic information, process it into a DTM and present the result in the form of a dynamic three dimensional graphical display.

* Department of Surveying, University of Melbourne, Australia.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

COMPUTER CREATED MICROFORM

AS A POSSIBLE ALTERNATIVE TO THE PAPER CHART

A J WRIGHT

Paper navigational charts have many advantages which include a stable paper base, high dimensional accuracy and the ability to be updated by the user. Equally well known disadvantages include the cost and effort needed to keep charts up to date throughout the system, the time and money needed to create a new edition and the small, but appreciable, number of charts unavailable at any one time. Information inputs into chart making establishments are increasing and further pressures are being created by metrication, the new IALA buoyage system and traffic routing schemes. It is thus timely to consider whether any possible alternatives exist to the paper charts which would have a better performance overall.

A research project in the Marine Transport Centre of the University of Liverpool is investigating such a possible alternative. The aim is to discover whether a combination of a mainframe computer to process the data and a microfilm system to handle the information distribution, display and updating can perform better than the paper navigational chart system. There would be no paper stage in the chart making establishment. Potentially such a system would exploit the strongest characteristics of computers and of microfilm. A fundamental point is that the new system would have to supply navigational data to all the current chart users and not just the top few hundred ships of each type who may be expected to benefit from onboard micro-electronic techniques for navigation information presentation.

cont..

Many aspects need to be considered in the design and assessment of the new system including technological, operational and economic factors. However, to consider simply the replacement of paper by microfilm is unlikely to create the best new system because the two mediums are not direct alternatives. Moving to microfilm, where updating is normally by frequent complete replacement and where large quantities of data can be quickly, cheaply and compactly moved around the world, opens up possibilities which must be explored to offset whatever disadvantages accompany the new system.

Such an alternative idea is 'banded contour charts' where each microfilm chart is designed to serve ships within a small range of draughts by representing depths around those draughts as a limited band of contours. Other depths are shown as spot depths in the usual way. Multiple charts of each area are impracticable on paper but computer driven laser plotters working directly onto microfilm should be able to handle this task. The navigational aid. Again, to judge this new approach purely on current navigational practices is potentially to miss the best solution. The move towards navigation by absolute position rather than by relative position needs to be taken into account. The future status of the chart, when many ships may use micro-electronic sources as the normal, primary, navigational data source, also may be relevant.

The research project will thus be investigating methods of presentation of survey data as a major part of the design and assessment of the new system.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

THE PROBLEMS OF REGISTERING

DIGITAL SIDE SCAN SONAR DATA WITH BATHYMETRIC DATA

R.H.W. LINTON

This paper is based on specific research which was undertaken into the problems that exist in the use of optical and digital side scan sonar. These problems investigated have been:-

1) Registration - due to the need to eliminate both along track and range distortions, it has not always been feasible to obtain more than a rough and ready registration of the optical imagery with the bathymetry of the same area.

2) Mosaicing - During the mosaicing of optical imagery a decision has to be made as to which parts of overlapping images are to be used and which are to be discarded. Decisions can be difficult if both images show interesting features.

3) Output - In the past when using digital imagery, users were forced into using only one image at a time and then using hard copy outputs to form the mosaic.

The paper discusses in detail the steps taken to achieve the mosaicing of the side scan sonar data, the creation of gridded bathymetry and the registration of the side scan sonar data, bathymetry contours and the gridded bathymetry data.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

DISPLAY OF COMPLEX INFORMATION OBTAINED FROM

OCEAN CURRENT MEASUREMENT SURVEYS

R Powell * and J Graff *

In recent years there has been a steady increase in the standard of information required by the offshore engineering industry regarding the behaviour of currents in the North Sea and Atlantic. These requirements have resulted in the need for commercial organisations involved in oceanographic surveys to make extensive use od advansed data analysis techniques to resolve the complex behaviour of currents in a precise way. This has created the challenge as to how best can these results be translated into information that is directly meaningful to design engineering and also acceptable to ocean scientists. WIMPOL who specialise in oceanographic surveys for the offshore engineering industry have made significant progress in developing new methods for the display of oceanographic information. This paper presents some of the data representations used for the display of information obtained from current measurement surveys. The displays have been based on the post processing of analysed data and are designed to illustrate features and information which clearly describe the potentially complex behaviour of currents. The results presented here are of special interest in that the standard display methods now used at WIMPOL have been applied to illustrate the behaviour of abnormal current events recently measured in the central North Sea.

* WIMPOL Limited, Hargreaves Road, Swindon. SN2 5AZ. England.

INTERNATIONAL CARTOGRAPHIC ASSOCIATION

MARINE CARTOGRAPHY COMMISSION

2nd Seminar on Methods of Display of Ocean Survey Data

ABSTRACT

THE USE OF SIDE SCAN SONAR DISPLAY TECHNIQUES

IN BATHYMETRIC SURVEYS

W.G.A. RUSSELL-CARGILL

Side Scan Sonar is a powerful qualitative aid to determine seabed morphology, but in order to obtain quantitative information on the seabed terrain, it is essential to have hydrographic echo sounding data. Some methods of processing and depicting side scan sonar imagery on a graphical record, CRT screen, map or chart face are reviewed along with techniques that can also incorporate the display of other remotely-sensed data, in particular bathymetry. The success of the methods used to portray side scan data depends on how well it is able to conceptualise processes and describe features of importance to the end user. This paper discusses the merits that can be accomplished by the use of a microcomputer CAD (computer aided draughting) system in displaying Side Scan Sonar imagery to complement a bathymetric survey.

Voorlopig verslag discussiegroep I

PRELIMINARY DRAFT

User's requirements and developments in the display of the sea-floor topography (including bathymetric data and nautical charts).

Group members :

J.M. Augustin	- IFREMER/CB - Computer Scientist	- France
G. Benwell	- University of Melbourne - Marine surveyor	- Australia
G. Bessero	- SHOM/EPSHOM - Hydrographer (coördinator)	- France
E. Cailliau	- SHOM - Hydrographer and Cartographer	- France
A. Ferrero	- BHI - Cartographer	- Monaco
P. Goffinet	- SHOM/EPSHOM - Cartographer	- France
J. Korhonen	- Hydrographic Department - Cartographer	- Finland
A. Wright	- University of Liverpool - Researcher	- United Kingdom

The group agreed to try to answer three basic questions :

1). Who are the users and what are their requirements (or what do we feel they are)?
2). What kind of data is available and what are the existing methods of display?
3). Do they meet the requirements and if not what actions should be *undertaken*?

The users can be divided amongst the following activities :

Navigation : it is mainly concerned with the safety of ships, submarines, RCV's or towed devices. The mariner wants to know the limit between safe and dangerous areas. This limit depends on the draught of the ship or on the depth of the vehicle. It refers to same "bottom" whose proper definition includes a notion of density. Some description of the bathymetry may also be useful as a navigation aid.

Scientific research : what is needed here is the "real" geometry of the sea floor. The precise knowledge of the shape of bottom structures, which is hardly relevant to mariners, is important for scientists.

Exploration and exploitation of ocean resources : the users are also concerned with the real geometry of the sea floor. The requirements in precision and scale vary with the zone (coastal areas, deep ocean) and the resource (living resources or mineral ones).

Military activities : the needs are similar to the mariners but they cover greater depths. The knowledge of parameters related to acoustic propagation is also necessary.

Recreational activities : again the requirements are similar to the mariners', but more importance should be given to the geometrical description of structures that cover and uncover, which may be used for visual navigation.

Besides these categories, the group also mentioned the special requirements for producers who exchange data : they want to be able to validate the data, according to their own standards.

Data types were identified as follows :

- direct measurements such as lead line dephts and bottom density profiles.
- echo sounders profiles (analog or digital ; wide beam or narrow beam ; single beam or multi beams): the measurement is direct nor pinpoint. The value of auxiliary parameters (speed of sound ; sensor attitude, ...) must be known to derive depth.
- sidescan sonar records : they mainly provide a qualitative description of the topography. They can also be used to indicate the positions of depth anomalies and derive estimate of their heigth and size.
- sectorscan sonar data : it consists of positions of targets that can possibly be related to depth anomalies.
- sweep data : it provides a minimum depth of the swept area.
- visual observations : used for detailed description of a small area. They are taken with divers, RCV's, submarines.
- remote sensing data : depth informations are divided -although not yet raitinely- from aerial photography, satellite passive scanners or radars, airborne laser sounders.

Of course all data must be linked with relevant position fixes.

Methods of display of the sea-floor topography derived from the above data were listed as follows :

- 1D graphical display : depth profiles
- 2D graphical display : nautical charts, thematic maps.
  The parameter which is shown is usually depth and sometimes slope. They can be shown through spot values, minimum or averaged values, contour lines, bands (in grey tones or colours), shading, special symbols or any combination.
- 2D stereoscopic models
- 2D perspective drawings
- 3D physical models
- computer products : they are derived from digital files which can be made of point-values, contours description, or parameters of a numerical model. The displays on CRT or videoscreens are sofar similar to classical paper displays with maybe less resolution but they allow for dynamic presentation. Displays which no longer are simple imitations of paper products remain to be invented.

The feeling of the group was that none of these products really meet the users requirements. The classical ones such as nautical charts do not because they are too generalized and try to meet too many conflicting requirements. Computer products do not because they have not yet been around for long enough and the hardware necessary to make them really useful (such as transmission links between producers and users) are not yet currently available.

The efforts needed to improve this situation should essentially be directed towards bringing together users and "chart" makers. This is all the more important for computer techniques can provide displays tailored to each individual users'whim and therefore require proper guidance from the producer so that the validity of the display is not ignored. The group thought that no great effort should be devoted to digitizing non digital data as new survey techniques will probably rapidly overtake it.

As a conclusion, the group recommends that appropriate actions be taken to initiate discussions between users and producers on the methods of display in sea-floor topography.

Verslag lezingen en excursies

Session (woensdag)

M. Gailliau (IFREMER, Parijs)

De bijdrage van spreker bestond uit een inleiding op het seminar. Brest is door de Gaulle een centrum van hydrografische activiteiten geworden door het C.O.B., E.P.S.H.O.M. en de Universiteit van Bretagne waar een opleiding "Hydrographic Scienses" bestaat.

Zijns inziens zouden presentaties van hydrografische gegevens de volgende eigenschappen moeten hebben:

- standaard;
- simpel zowel in kaart als in bv. video-beelden.
  M.b.t. standarisering is nog een lange weg te gaan bv. het gebruik van al dan niet-decimale graden en minuten vormt al een probleem.

L. Loubersac (C.O.B., Brest)

Vanuit zijn functie in de poot "coastal management" werd een beschrijving gegeven van het onderzoek dat is uitgevoerd naar de geschikheid van intergetijdegebieden in de tropische gebieden voor de cultuur van garnalen.

De productie van garnalen is de laatste jaren constant gebleven, terwijl daarentegen de vraag is toegenomen. In de tropische gebieden zijn in het intergetijdegebied grote mogelijkheden.

Aan de hand van gegevens verkregen met "Landsat" zijn onbegroeide gebieden geselecteerd door gebruikmaking van de "Vegetation-index" en de "Brightness-index". Er zijn kleurmanipulaties en digitalisering van gegevens toegepast. Daarnaast zijn andere factoren meegenomen zoals: transportmogelijkheden, chloridegehalten, temperatuur, kans op overstromingen, mogelijkheid van oesterteelt e.d.

Problematisch bij de satelliet-gegevens is het feit dat opnamen bij L.W. nodig zijn. Veelal zijn ook nog ter plaatse ingewonnen gegevens noodzakelijk, terwijl ook nog aanvullende informatie m.b.v. vliegtuigen ingewonnen moet worden.

<u>J.C. Gaillard</u> (EPSHOM, BREST)

De S.H.O.M. is belast met het inwinnen en presenteren van hydrografische en oceanografische gegevens. Enerzijds betreft dit bodem- en nautische kaarten, anderzijds betreft het gegevens over zwaartekracht, zoutgehalte, temperatuur, stroomsnelheden e.d.
In 10 jaar tijd heeft automatisereing een belangrijke plaats verkregen. Gegevens worden verkregen met vaar- en vliegtuigen en sinds kort met satellieten.

Wat betreft bodemtopografie bestaan er werkwijzen welke schaduwperspectiefbeelden geven, lijnbeelden [1, 2, 3 (schijn-) dimensies], dieptelijn- en cijferkaarten (versch. kleuren) welke alle automatisch getekend kunnen worden. Voor de gehele "paper" zie bijlage 11.

P. Goffinet (E.P.S.H.O.M., BREST)

Ten behoeve van het vervaardigen van kaarten is een bibliotheek van standaardsymbolen (wrakken, boeien, cijfers, letters) samengesteld. Via een digitize-tafel, een "key-board" en computerapparatuur kunnen m.b.v. de nodige software de symbolen worden geplot op film (in één keer) m.b.v. een kathodestraalbuis, welke 1024 x 1024 punten geeft. Dezelfde plotter heeft daarnaast een variabele lichtstraal voor het werken op films. De "paper" is bijgevoegd als bijlage 12.

J. Korhonen (Hydrografic Department, Helsinki)

Spreker geeft een beschrijving van gebruikte lodingswijzen b.v. 5 schepen in één lijn en een schip met armen waarbij zich ± 15 echoloden in één lijn bevinden.

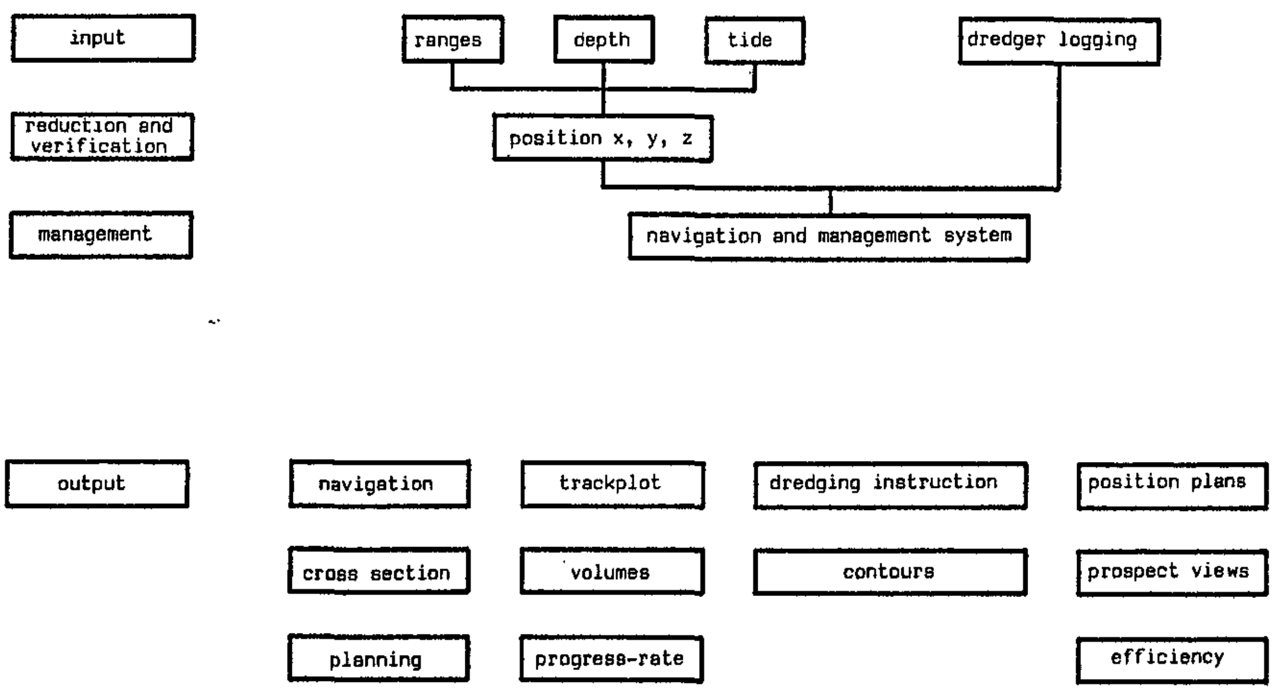
De gebruikte apparatuur voor het verwerken omvat:

- HP 3000/68
- Tektronix
- Calcomp 960 plotter
- Calcomp 9480 digitizer
- Kongsberg DC 300/1216

Het is mogelijk hiermee zowel dieptecijfers als dieptelijnenkaarten te maken. Er kunnen hierbij één- en tweédimensionale selecties van diepten worden toegepast. Presentatie kan plaats vinden in cijfers of contouren of in combinaties. Er zijn onvolkomnheden: conflicten tussen cijfers en dieptelijnen, extremen van bulten en troggen verschijnen niet automatisch, soms zitten cijfers dicht bij elkaar e.d.

G. Benwell (University of Melbourne)

Sinds 1978 is men in Australië bezig met de ontwikkeling van een systeem voor het optimaliseren van baggerwerk. Het is hierbij de bedoeling om met een survey-schip verkregen informatie (zonder tijdverlies) aan boord van het baggervaartuig gepresenteerd te krijgen. Het idee hiervoor werd opgedaan van nederlandse baggerfirma's.
Het systeem heeft globaal de volgende opbouw:



Het systeem bestaat uit hardware en software en heeft gedurende 3 jaar ontwikkelingstijd 5 à 6 man full-time bezig gehouden. De economische recessie vertraagt invoering van het systeem. Helaas was een video-film niet beschikbaar, daar deze in een koffer zat welke niet in Brest was aangekomen.

A. Wright (University of Liverpool)

Nautische kaarten hebben belangrijke nadelen (overigens naast de voordelen): de kosten en het "up-date" houden. Bij kosten horen tevens kosten van opslag, verzending enz.
"Microform" heeft het voordeel dat kaarten met een normale schaal (deels) vermeden kunnen worden maar het eindproduct is nog steeds papier.

Een micro-film welke rechtstreeks met een laser-plotter geproduceerd kan worden kan de volgende vorm hebben:

- microfiche
- aperture-card
- roll-film

De prijs hiervan is laag (± ƒ 0,50) en de voordelen zijn verder:

- gemak en snelheid van copiëren
- gemak van updating (simpelweg vervangen)
- verzendtijd en reductie volume
- veiligheid (duplicaat is eenvoudig weg te bergen)

Te lezen zijn de films met een leesapparaat (kosten ± ƒ 1000,=) of er kan op (eventueel goedkoop) papier worden geplot. Indien gegevens in een bestand zijn opgeslagen is een selectie van te presenteren gegevens mogelijk.

R. Linton (N.E.R.C. Swindon)

Spreker geeft een beeld van de werkwijze welke werd gevolgd en de manipulaties welke met sonar-plaatjes werden uitgevoerd om mozaïeken te verkrijgen welke een grote gelijkenis vertonen met dieptekaarten. Het beschreven project werd uitgevoerd in Portugal, de Nazare Canyon.

R. Powell (Wimpol Ltd, Swindon)

Beschreven werden een mogelijke presentatie en analyse van gemeten stromingen. De metingen vonden plaats m.b.v. een bodemstatief en vanaf vaartuigen gebruikte instrumenten (alle propeller-instrumenten).
Verschillende presentaties werden getoond zoals:

- scatter-plot; de grootte van de stroomsnelheid als punt geplot in een windroos;
- ellips-plot; in een windroos werden componenten van de stroomsnelheden geplot zoals deze volgden uit een harmonische analyse van de gemeten stroomsnelheden;
- tabellen met relaties tussen de stroomrichting en de reststroomsnelheid;
- het pad van de 10-minuut gemiddelde stroomvektor geplot in een stroomroos.

De geanalyseerde gegevens zijn gebruikt voor het beschrijven van gecompliceerde (en grote !) gemeten stroomsnelheden in de centrale Noordzee en zijn van bijzonder belang voor de platforms.

B. Russel-Cargill (Underwater Surveys Ltd.,Zuid Afrika)

Ten behoeve van het verkrijgen van inzicht in de samenstelling en topografie van de bodem is een combinatie van sonar- en lodinggegevens een goed middel. Nadeel van sonar zijn de vertekeningen zowel in lengte (a.g.v. variatie in vaarsnelheid) en in breedte (zg. "slant-range").
Spreker geeft een gebruikte methodiek om (o.a. m.b.v. een digitaliseertafel) te komen tot isometrisch betrouwbaarder informatie.

Als idee (?) werd nog besproken de mogelijkheid om de dwars-verstoring te elimineren m.b.v. een dicht boven het sonarbeeld aanwezige T.V.-camera.

C. Edy (C.O.B., Brest)

Bij het C.O.B. is sinds geruime tijd een Multi Beam Echo Sounder in gebruik. Dit type echolood geeft gedetailleerde informatie over de bodemligging in de strook waarin gevaren wordt.

Diverse programma's (gebaseerd op de HP 1000) zijn beschikbaar voor het verwerken van gegevens in dieptelijnenkaarten, blok-diagrammen en profielen. Probleem vormt nog de "positieve" en de "negatieve" overlap. Bij een positieve overlap zijn soms dezelfde "structuren" aanwezig op schijnbaar verschillende plaatsen. Bij een negatieve overlap is geen informatie aanwezig.
Thans worden beide problemen opgelost. Via een aan een VAX-computer verbonden Tektronix-kleurenbeeldscherm worden de dieptelijnen gepresenteerd. Met de beelden kan worden gemanipuleerd zodat structuren op elkaar vallen, terwijl men bezig is met programmatuur om "gaten" te vullen. Enige informatie is gegeven in bijlage 13.

Excursies (woensdag)

In het C.O.B. is getoond de werking van het zojuist beschreven manipulatiessysteem met de dieptelijnen. Daarnaast werd uitgebreid ingegaan op satellietbeelden en de mogelijke presentaties en manipulaties van de kleurbeelden ter herkenning en onderscheiding van vegetaties, temperaturen e.d. Tevens werd getoond een video-animatie van de ontwikkeling van de watertemperatuur in het Engelse Kanaal gedurende het jaar.

Uitgebreid werd verslag gedaan van de werkwijze en mogelijkheden van het data-centrum. Tevens werden getoond diverse mogelijkheden van presentaties van diepte- en sonarkaarten.

Bij E.P.S.H.O.M. werden de in de lezingen gepresenteerde systemen getoond zoals de wijze van digitalisering van (standaard)- symbolen en van contoeren. Bijzonder was de getoonde Bensonplotter welke, op fotografisch papier werkend, in één keer symbolen kon plotten (opgebouwd uit een raster van 1024 x 1024 punten) d.m.v. een kathodestraalbuis en daarnaast een in dikte variabele lichtstraal bezat. Tevens was bijzonder een simpel systeem voor fotogrammetrische x, y, z-bepaling welke werd verkregen d.m.v. een met twee wielen (één in het horizontale en één in het verticale vlak) beweegbaar assenkruis. Vermeld werd dat dieptebepaling in water d.m.v. opname door satelieten van het door de bodem teruggekaatste zonlicht in ontwikkeling was.

Poster sessions (vrijdag)

J.M. Augustin C.O.B., Brest

Het C.O.B. heeft diverse sonarvissen; een aantal voor ondiep water en recent één voor diep water (S.A.R.). De ontwikkeling van een algemene software voor de processing van de gegevens is juist gestart. De bedoeling van dit op een VAX-computer gebaseerd systeem (genaamd TRIAS) is de behandeling van de beelden van een accoustische sonar.
De onderdelen zullen zijn:

- selectie van de ruwe data;
- geometrische correctie;
- visualisatie in zwart/wit en in kleur;
- bijzondere behandelingen;
- manipulaties met de beelden;
- diverse.

De gegevensopslag van de sonarbeelden vindt thans plaats op magnetische tape; in de toekomst is optische disc voorzien.

S. Callen (NERC, Swindon)

In samenwerking met het Institute for Oceanographic Scienses wordt door het NERC gewerkt aan de "registry of digital bathymetry contours with Seasat optical imagery".

ir. C.P. v.d. Velde (R.W.S. Hellevoetsluis)

Besproken werden de systemen in Nederland in gebruik bij de veiligstelling bij stormvloeden. Alleerst werd zeer globaal de werking van de S.V.S.D. besproken, de rapportage en de gegevensopslag. Daarna werd besproken de bepaling van de veiligheid van de Nederlandse duinkust op basis van de (veelal) jaarlijkse fotogrammetrische opnamen en de lodingen en de uit research verkregen resultaten van duinafslagberekeningen. Hieruit kunnen d.m.v. een probabilistische benadering faalkansen van bepaalde duinprofielen worden berekend. Enige informatie werd gegeven over de werkwijze en presentatiemogelijkheden bij het bepalen van opgetreden kustontwikkelingen en de extrapolatie van de gegevens in de tijd.

Databank IFREMER

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RESPONSABLE : *Marthe MELGUEN*

SECRETARIAT : *Annie GUILLOU*, *Nicole KEREBEL*

B. N. D. O.

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BUREAU NATIONAL DES DONNEES OCEANIQUES
FRENCH NATIONAL OCEANIC DATA CENTRE

- SCIENTIFIC AND TECHNICAL INFORMATION
- TECHNICAL ASSISTANCE FOR COMPUTERIZED DATA PROCESSING AND MANAGEMENT.

December 1981

C.N.E.X.O.

CENTRE NATIONAL POUR
L'EXPLOITATION DES OCEANS

FRENCH NATIONAL CENTRE
FOR OCEANS EXPLOITATION

B.N.D.O.

BUREAU NATIONAL DES
DONNEES OCEANIQUES

FRENCH NATIONAL
OCEANIC DATA CENTRE

BNDO, the French National Oceanic Data Centre is first of all the french oceanic information centre : for scientific and technical information. There are in BNDO two types of information :

- numerical data
- bibliographic data.

On the other hand, a technical assistance in computer sciences can be brought by BNDO in the following fields :

- data acquisition at sea,
- analysis, storage and processing of numerical data,
- elaboration of documentary data bases and their on-line exploitation.

Some of BNDO competences such as data acquisition and processing at sea, are of direct interest for the CNEXO fleet, but as an oceanic information centre, BNDO can help any potential user, on the national or international levels.

I - BNDO NUMERICAL DATA BASE SERVICES

The data available in BNDO have been collected either from chief scientists responsible for the french oceanographic cruises (and especially the CNEXO cruises), either from foreign data bases, and especially the US data bases which supplied around 75 % of the data stored in BNDO (hydrography, climatology, geology and geophysics data).

I.1. SUPPLY OF DATA

I.1.1.) Oceanographic cruises inventory

Inventories are realized from the ROSCOP forms (detailed accounts of observations, samples collected during the oceanographic programs) filled by the chief scientists. These ROSCOP forms, elaborated from the International Oceanographic Commission (IOC) recommandations, are automatically managed in BNDO, where edition and selection programs have been elaborated. The file of oceanographic cruises now includes the results of 7,422 multidisciplinary cruises.

These oceanographic cruises accounts are distributed in the different sciences as follows :

. Hydrography : 6,084
. Dynamics : 335
. Pollution : 340 (360 of which concern the coastal environment (RNO))
. Geology, Geophysics : 817
. Biology : 1,373
. Routing measurements : 813
. Meteorology : 1,072

I.1.2.) Physical oceanography data

These include hydrographical data (and especially STD-CTD and bathythermy), current meter data and meteorological data. The following files are available in BNDO :

I.1.2.1. CLASSICAL HYDROGRAPHY DATA

This file consists of different physical, chemical and hydrobiological parameters measured at discrete levels, at a given station and at a given time : the resulting data are gathered by "hydrographical stations".

It is composed of about 400,000 stations, a part of which are original data processed in BNDO, the most important part was supplied by NODC (USA), and other data (provided by EPSHOM, ICES, ORSTOM) were transcoded to our storage format.

These stations are now stored by MARSDEN squares (10° side).

It must be noted that the density repartition is still very irregular.

By example :

- The MARSDEN square no. 145 corresponding to the Bay of Biscay has 4,918 stations.

- The Mediterranean Sea (several MARSDEN squares) : 17,250 stations.
- The MARSDEN square no. 215 in the North Sea has around 20,989 stations.
- But the MARSDEN square no. 505 (Southern Pacific Ocean) has only got 13 stations.

I.1.2.2. STD-CTD DATA

This file is composed of around 4,200 stations from 35 cruises. These data were produced by the STD-CTD hydrographical sounding measurements, and were stored in the classical hydrography data file after reducing the depth levels to 99.

I.1.2.3. BATHYTHERMY DATA

This file consists of data obtained by mechanical (MBT) or expendable (XBT, e.g. Sippican) bathythermographs.
The file contains 97,000 MBT's (in the Mediterranean Sea, the Northern and Southern Atlantic Ocean), and 17,000 XBT stations.

I.1.2.4. TEMPORAL MEASUREMENTS DATA

This file is composed of measurements done at a fixed point as a function of time : that is to say currents characteristics (velocity, direction), temperature characteristics ..., at a fixed point and at different depths levels. They are chronological series, obtained from Aanderaa and VACM current meters, or Aanderaa thermistances (with a sampling rythm of 2 to 15 minutes) ; they mainly concern the coastal waters of Bretagne (Brittany) and Provence-Côte d'Azur (the French Riviera). This file is now composed of more than 1,145 measurement series.

I.1.2.5. SAIC CURRENTS INVENTORY

This is another file, parallel to the current meter data file, which is an inventory of worldwide current measurements until 1973. This inventory is now composed of 2,009 stations.

In order to test and process these data, BNDO has elaborated several computer packages :

- for hydrology : edition of parameters measured at different depths ; calculation of other parameters at these depths ; plot of one parameter as a function of another, regression lines, etc...
- for bathythermy : edition of stations, plot of temperature versus depth

- for STD-CTD data : edition of stations and standard parameters ; plot of temperature, salinity, oxygen and sigma-T as a function of depth, and T-S diagrams.

- for currents data : edition of different parameters measured at a selected rate ; plot of histograms and other diagrams ; edition of statistics- etc...

BNDO can analyse currentmeters or bathysounding data for exterior users.

The list of packages for physical oceanography data processing, now available in BNDO, can be obtained on request.

I.1.3. Marine geological and geophysical data

I.1.3.1. GEOLOGICAL DATA

a) Subsurface geology

BNDO is working on five geological data files :

. Termal flux file (6,509 measurements)
. World ocean cores description file (30,000 stations)
. Epicenters file, including observations made on 150,000 seisms from 1638 to 1979.
. The Petros file : 25,000 chemical analyses of rocks.
. The Climap file : 4,270 analysis made on 535 samples collected in the Atlantic Ocean.

For the exploitation of these files, BNDO has elaborated selecti[illegible] and plotting report programs.

b) Deep geology (DSDP-IPOD drillings)

Most of the data collected since 1968 by the oceanographic vessel Glomar-Challenger are now available in BNDO.

9 files have been elaborated :

- the Glomar-Challenger shipping routes data,
- Site summary
- Age profile
- Carbon-carbonate
- Sediment smear slides
- Physical properties and lithology of sediments
- Drilling descriptive guide (data on the 32 main parameters describing the drilling)
- Chemistry Igneous Rocks
- Cores depth

Most of these files are composed of data from the first 45 legs of the Glomar-Challenger. Several of them though can include from 65 to 77 legs.

A catalogue describes the content of these files, as well as the BNDO data selection and processing programs. This catalogue is available on request.

I.I.3.2. GEOPHYSICAL DATA

This geophysical data file includes navigation, bathythermy, gravimetry and magnetism data located in two precise geographical areas :

1. Atlantic Ocean and Mediterranean Sea

   330 oceanographic cruises, and amongst those :

   - 265 with bathymetry data
   - 225 with gravimetry data
   - 225 with magnetism data.

2. The Pacific Ocean (at the East of W160 meridian line) : 240 cruises.

This file is exploited by several programs for data selection and results edition (listings, plots as a function of distance, mapping reports).

I.1.4. Cartographic files

BNDO currently works on several numerical cartographic files (coast lines and isobaths), at different scales ; they are :

- World coast lines, at $1/33.10^6$
- World coast lines, at $1/5.10^6$
- Eastern Atlantic, English Channel and Mediterranean coasts lines, at $1/10^6$
- France coast line at 1/300 000
- France coast line at 1/25 000 (in 1982)
- Isobaths 500 and 2,000 fathoms in the Atlantic Ocean
- Isobaths 200, 1,000, 2,000 and 3,000 metres in the Mediterranean Sea
- Isobaths 5, 10, 20, 50 and 100 metres in the English Channel.

These files can be exploited by an automatic plotting chain.

I.1.5. Bathymetric data / Sea Beam

BNDO developped a chain of Sea Beam data processing programs (the Sea Beam is a multibeam sounding : 16 narrow beams surveying on the sea bottom a channel, the width of which represent the 2/3 of the depth).

On November 1st, 1981, and since 1977 when the Sea Beam was placed on the french oceanographic vessel Jean Charcot, 500 days of measurements have been collected in different geographical areas (Mediterranean Sea, Atlantic Ocean, Pacific Ocean). That is 220,000 km. of profiles.

There are different possibilities of edition from these data : longitudinal profiles (as a function of distance, or time), outlining the route, sections and diagrams on several profiles.

I.1.6. Coastal environment data

The coastal environment data stored in BNDO have been collected during some CNEXO operations (RNO : Réseau National d'Observation, French National Pollution Survey ; RNO : Réseau National de Contrôle des Eaux Littorales, Coastal waters biological control survey ; EDF : studies on nuclear power plant impact in coastal areas, ...).

They consist of pollution and coastal ecology data collected and monitored in the French littoral waters.

Pollution analyses concern water, living organisms (shellfish, fish, ...), and sediment. Biological inventories have been made for phytoplankton, zooplankton and benthos.

There are now 500,000 items in our files, and some of them were collected in 1974. Computerized data processing programs have been elaborated :

- files updating
- data quality control, automatic validation
- data selection following criterias of date, geographical area, measured parameter, depth level, observed species, sediment fractio[n]
- edition of data with different format
- plot of the evolution of a parameter with time,
- report of observed or statistical values on a map of the studies area,
- calculation of statistics, correlations, ...
- edition ot the bacteriological situation of beaches (with an automatic classification per category).

The catalogue of BNDO computerized tools now available for hydrobiology and pollution data can be obtained on request.

I.2. DATA PROCESSING

The preceding paragraph presented the available data processing programs for coastal environmental data. For any other type of data, similar data processing programs are available for :

- selections and editions
- plotting of parameters as a function of time or distance,
- automatic plotting of coast lines at different scales,
- statistic calculations.

If you wish to know all the available data analysis and treatment programs and thus know if they can be adacted to your needs, please write to the BNDO Head of department.

*

* *

II - BNDO LIBRARY AND DODOCEAN BIBLIOGRAPHIC DATA BASE

Documentation services can also be found in BNDO :

- a specialized library in oceanology sciences
- a computerized bibliographic data base, with more than 300,000 citations : DOCOCEAN.

II.1. THE SPECIALIZED LIBRARY

The stock includes more than 17,000 books and more than 1,300 journals, collections of maps, aerial photographs and microforms. A librarian is always present ot help users, and organizes the intra-library lending.

II.2. DOCOCEAN DATA BASE

Automatic documentation is more and more efficient and useful for bibliographic searches. The data base includes approximately 300,000 references, sometimes as old as 1964, of the following sources :

. Oceanic Abstracts	116,454 references
. Pollution Abstracts	3,937 references
. "Pascal" (CNRS)	76,299 references
. ASFA	62,554 references
. CNEXO	19,398 references

The choice xas made to have only on line, including several bibliographic sources, and concerning oceanology and the freshwater environment.

DOCOCEAN services are of two types : retrospective searches and selective dissemination of information (SDI).

II.2.1. Retrospective searches

are a selection of bibliographic references on a given topic. They can be made on the whole file, or only on a period. This is to answer punctual questions of users who wish to know all the documents published in their field. Retrospective searches are specially useful for scientists who are at the beginning of their research work (thesis, operations, projects, grants, ...).

II.2.2. Selective dissemination of information (SDI)

on a biographical sketch is made for users who wish to be regularly informed of recently published documents on their research topics, their "profile" of interest. This SDI logically follows a retrospective search, for any scientist who is to work on the same subject for several years. The profile is defined when formulating the search question, and is improved by several searches ; when it is definitive, the profile is treated every two months, following the rythm of tapes arrivals and file updatings. A user is then informed six times a year on the new publications in his field.

The list of biographical sketches, or "profiles" now regularly followed in BNDO can be obtained as an example of our services, by writing to the department head.

*

* *

HOW CAN YOU ASK SOME INFORMATION FROM BNDO ?

If you wish to get some information from BNDO, please phone, or better write to :

BUREAU NATIONAL DES DONNEES OCEANIQUES
CENTRE OCEANOLOGIQUE DE BRETAGNE
B.P. 337 - 29273 BREST CEDEX

Tél. (98) 45. 80.55 - Télex :.Oceanex 940627 F

Bibliographic services (DOCOCEAN searches) are charged. Other services are now free of charge, but this will be changed in the near future.

III - TECHNICAL ASSISTANCE FOR DATA BASE CREATION AND EXPLOITATION

BNDO is now recognized as a center specialized in data accuisition, storage and processing. BNDO can thus bring you a technical assistance for the creation of data bases which can be searched online through the telecommunication networks (i.e. Transpac, Euronet).

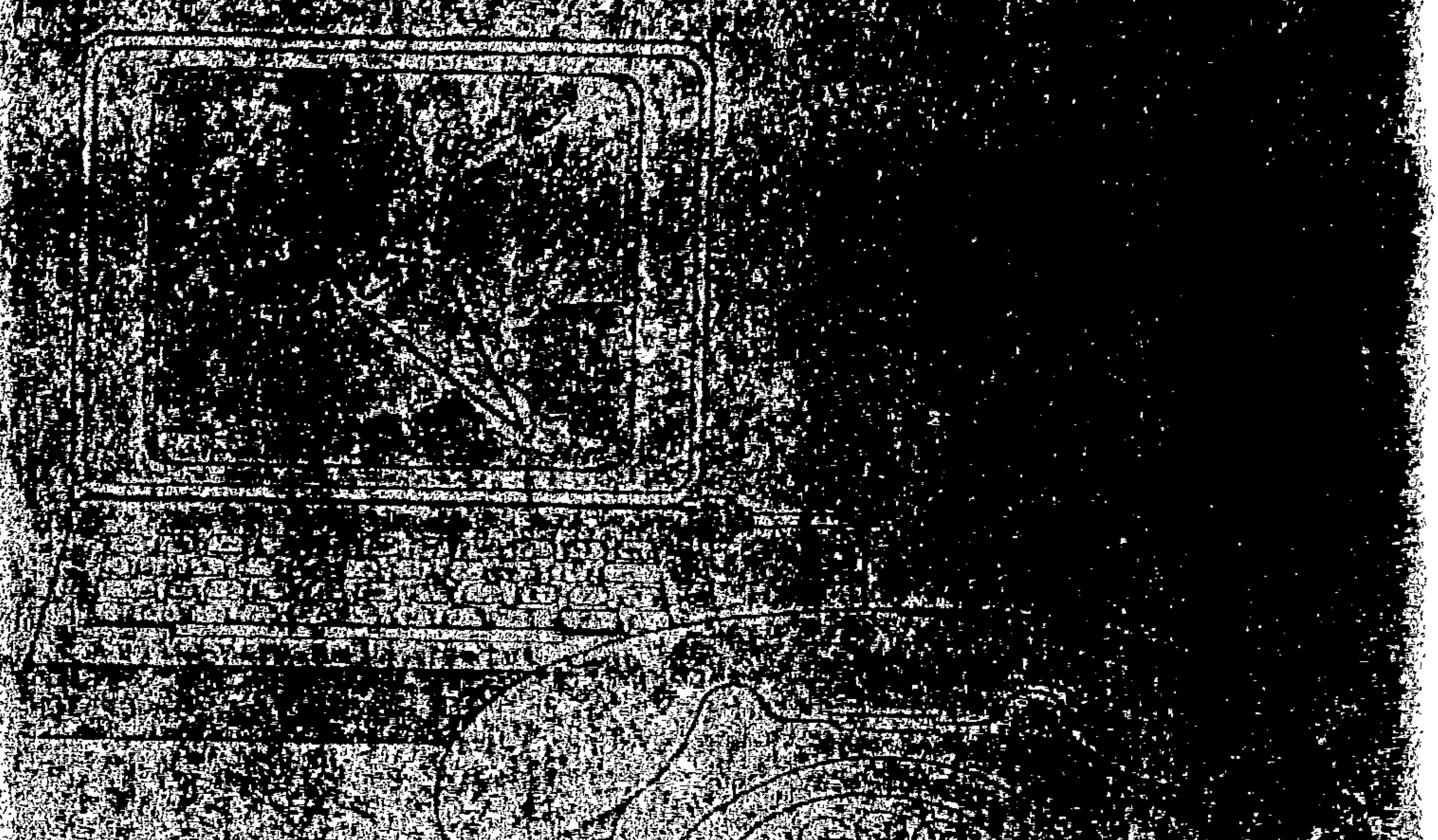
As an example of recent data bases in BNDO, we can cite :

- the "Pollumat" data base : repertory and inventory of equipments and products for pollution control.
- the "Aquadoc" data base : inventory of acuaculture equipment producers, with the detailed characteristics of their products.

BNDO can bring a technical assistance for the creation of this type of data bases, but cannot assume the responsibility of data collection.

*

* *



L'INFORMATION MARINE EN LIGNE
ON LINE MARINE INFORMATION

BUREAU NATIONAL DES DONNEES OCEANIQUES
CNEXO / COB (FRANCE)

DOCOCEAN - Question : L'elevage du bar

?..OP MS AU
?..RE GRPM

?SEA BASS+ OU BAR? OU LOUP OU ((ROCCUS OU MORONE OU DICCENTRARCHUS) ET LABRAX)

Terme multisens SEA BASS+: 2 — *Recherche sur les descripteurs*
Resultat 103

Terme multisens BAR?: 4
Resultat 228

*** 1*** Resultat 310 ← *310 références sur le Bar*

?/TI 1 OU ((ROCCUS OU MORONE OU DICENTRARCHUS) ET LABRAC)

*** 2*** Resultat 350 *On complète à l'aide du titre*

?TX /DE RCH CULTURE OU RCH ELEVAGE OU RCH FARMING OU RCH REARING

50 Documents traites * Resultat: 20. Continuer (O/N) ?

?0... etc. *Recherche des mots CULTURE ou ELEVAGE dans les descripteurs.*

3 resultat 84

?..VI 1 DE 80 MAX ↖ *84 réf. sur l'élevage du Bar*

AU : ROBERTS D.E.JR., HARPSTER B.V., HAVENS W.K.,ET AL.
AF : FLORIDA DEPT.OF NATURAL RESOURCES, MARINE RESEARCH LAB., 100 EIGHT AVE.SE,ST.PETERSBURG,FL 33701
TI : FACILITIES AND METHODOLOGY FOR THE CULTURE OF THE SOUTHERN SEA BASS(CENTROPRISTIS MELANA).
DT : 35 PP.P,ILLUS.,ABS.,REFS.,(N.D.)
SO : WORLD MARICULTURE SOCIETY:SEVENTH ANNUAL WORKSHOP:PROCEEDINGS.EDITED BY J.W.AVAULT,JR.,(N.P.)
DAT : 1978
LA : T-ENG
AB : A CLOSED SYSTEM WAS DESIGNED FOR MASS CULTURE OF MARINE FINFISH LARVAE.C.MELANA BROOD STOCK WERE COLLECTED IN THE GULF OF MEXICO DURING JAN.-MAR.1975, THEIR NATURAL SPAWNING SEASON.BROOD STOCK WERE MAINTAINED IN A SIMULATED SPAWNING ENVIRONMENT OF 17DEG-19DEGC TEMPERATURE AND 10 HR L: 14 HR D PHOTOPERIOD.VITELLOGENESIS OF OVARIAN OOCYTES REMAINED IN THE TERTIARY YOLK GLOBULE STAGE IN FEMALES HELD UNDER THESE CONDITIONS;MALES RELEASED MILT FREELY UPON MANUAL STIMULATION.FINAL OOCYTE MATURATION AND SPAWNING WERE INDUCED WITH HUMAN CHORIONIC GONADOTROPIN AND MANUAL SPAWNING TECHNIQUES.ABOUT 2, SOO LARVAE WERE REARED IN 3 TRIALS USING 2,000-L SILO TANKS WITH BIOLOGICAL FILTRATION.LABORATORY-REARED ROTIFERS(BRACHIONUS PLICATILIS) WERE USED AS FOOD THE FIRST 4 D AFTER FEEDING BEGAN.WILD PLANKTON,ROTIFERS,ARTEMIA NAUPLII,AND PREPARED FLAKE WERE ALSO USED AS LARVAE DEVELOPED.GREATEST LARVAL SURVIVAL FROM HATCHING WAS 10.0%.LARVAE GREW FROM 2.78 MM TO 9.0 MM IN 24 D;THE GREATEST GROWTH RATE OCCURRED AFTER DAY 14.PHYSIOLOGICAL EDEMA WAS OBSERVED IN 2 TRIALS AFFECTING 30-50%OF THE LARVAE.PHYSIOLOGICAL EDEMA APPARENTLY IS THE PRINCIPAL CONSTRAINT TO SUCCESSFUL REARING OF SEA BASS LARVAE.
DE : CENTROPRISTIS,SEA BASSES,AQUICULTURE,CULTURE METHODS,SPAWNING,DIET, GROWTH RATES,LABORATORY REARING,ANIMAL HORMONES, OOGENESIS, FISH LARVAE,BRACHIONUS,ARTEMIA,ROTIFERA,BRINE SHRIMPS
ML : C.MELANA,INDUCED SPAWNING,HUMAN CHORIONIC GONADOTROPIN,SIMULATED SPAWNING ENVIRONMENT,INDUCED OOCYTE MATURATION,B,PLICATILES ,PHYSIOLOGICAL EDEMA,VITELLODENESIS
NO : OCEANIC ABS,73-06674

BUREAU NATIONAL DES DONNEES OCEANIQUES

THE FRENCH OCEANIC DATA CENTER AND THE ON LINE MARINE INFORMATION

The French Oceanic Data Center, built by CNEXO and based at Brest within the Centre Océanologique de Bretagne, is a scientific and technical information center, in charge of collecting, stocking, processing and diffusing documentation and numerical data dealing with oceanology. In order to able to achieve its mission, BNDO has developped two tools :

- a data bank,
- a documentation center.

BNDO services are offered to the whole oceanic French scientific community, and can be accessed on-line via TRANSPAC and EURONET. These data bases are :

- DOCOCEAN

  Bibliographic data base, it covers the main fields of oceanology :

  . scientific fields of oceanological research,
  . marine activities : fisheries, aquaculture, shipping, exploitation of mineral ressources, diving, and all their technical aspects,
  . juridic, economic and sociologic aspects of oceans exploitation.

- AQUADOC

  Directory and index of the French specialists of aquaculture, created by the BNDO and FRANCE AQUACULTURE, it consists of three files of :

  . the French administrations, research centers and associations dealing with aquaculture,
  . the French producers of aquaculture, with information upon the cultivated species and the culture stages,
  . a catalog of materials, products and services available on the French market completes this information.

- POLUMAT

  This index, created by BNDO and CEDRE, inventories the means of abating accidental pollution of the sea.

- ROSCOP

  Index of the French and foreign oceanographic cruises carried on since the beginning of the century.

- IPOD

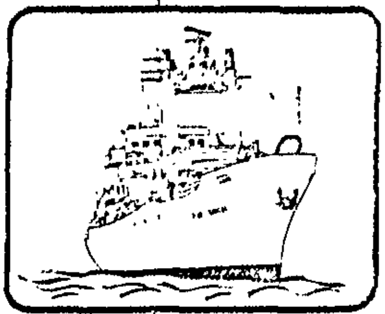
  Index and numerical data base, it covers around one thousand drillings done since 1968 by the US vessel GLOMAR CHALLENGER, it will also be on line on October 1982.

For further information, please contact :

BUREAU NATIONAL DES DONNEES OCEANIQUES - Centre Océanologique de Bretagne - BP n° 337 - 29273 BREST CEDEX

Tél. n° : (98) 45.80.55

Télex : OCEANEX 940627 F



R O S C O P

This data base is an inventory of measurements collected by french or foreign research vessels.

This data base was created and is managed and set on line by the French National Oceanographic Data Center :

> *Bureau National des Données Océaniques (BNDO)*
> *Centre Océanologique de Bretagne*
> *BP 337*
>
> *29273 BREST CEDEX*

ROSCOP is the name of the internationally recommended form for exchange of oceanographic data :

Report of Observations and Samples Collected by Oceanographic Programs

THE ROSCOP DATA BASE IS ORGANISED IN THREE DOMAINS :

- *CAMPAGNE* - *(cruise)*

  Almost 8000 french or foreign cruises are indexed.
  The structure of the data for each cruise is described on the other side.
  In each field MESF, a code (letter B or N) indicates if the data collected during the cruise are stored in the BNDO numerical data bank.

- *ORGANISME* - *(organization)*

  Contain the name, adress, call number, telex number of organism responsible of cruise.

- *PERSONNE* - *(scientist)*

  Name of chief scientist, responsible of measurement or owner of data, with name of their institution.

  There is a continuously updating : 200 new cruises are described every year.

PLANNED IMPROVEMENT :

- The list of papers describing the results of a cruise is progressively added to the corresponding cruise description.

- Further access to more detailled inventories or to synthetical data.

STRUCTURE OF THE DATA CONTAINED IN THE ROSCOP DATA BASE

Display of all the fields of a ROSCOP

```
REF : 0004707
CCAM: 72001211
CAMP: GEOGAS CH33
CNAV: FNOY
NAV : J.CHARCOT
BHI : GOLFE DE GASCOGNE
DDEB: 1972/10/05
DFIN: 1972/10/11
DATE: 1972/10
DET : INSTITUT DE GEOLOGIE DU BASSIN AQUITAINE ,CENTRE OCEANOLOGIQUE DE
      BRETAGNE BREST
LAT : 40,50
LONG: -010,-000
ORG : CENTRE OCEANOLOGIQUE DE BRETAGNE BREST
ORGC: 35060
PAYS: FRANCE
RCRC: BN72001211
RESM: PUJOS M ,PASTOURET L ,RENARD V ,AVEDIK F ,SIBUET M ,AUFFRET G
RESC: PUJOS M
PLF : NAVIRE DE RECHERCHE
ZONE: MARGE CONTINENTALE
MESF: STATION HYDROLOGIE CLASSIQUE MOINS DE 500M ,N22-004,TEMPERATURE
      SURFACE EN CONTINU ,N11,SALINITE SURFACE EN CONTINU ,N11,
      COURANTOMETRIE ,N61-002,CHAINE DE THERMISTANCE ,N11,DRAGUE ,N21-009,
      CAROTTIER FOND MEUBLE ,N12-024,PHOTOGRAPHIE DU FOND ,N21-008,ANALYSE
      PHYSIQUE DES SEDIMENTS ,N11,ANALYSE CHIMIQUE DES SEDIMENTS ,N11,
      PALEONTOLOGIE ,N11,LOCALISATION ,N51,SONDAGE FAISCEAU LARGE ,N51-073,
      SISMIQUE REFLEXION ,N51,SISMIQUE REFRACTION ,N51,GRAVIMETRIE ,
      N51-073,MAGNETISME ,N51-073,ZOOPLANCTON ,N22-0006
MESE: CLASSICAL STATION UP TO 500M ,N22-004,CONTINUOUS SURFACE TEMPERATURE
      RECORDING ,N11,CONTINUOUS SURFACE SALINITY RECORDING ,N11,
      CURRENTMETER ,N61-002,THERMISTOR CHAIN ,N11,DREDGE ,N21-009,SOFT
      BOTTOM CORER ,N12-024,BOTTOM PHOTOGRAPHY ,N21-008,PHYSICAL ANALYSIS
      OF SEDIMENT ,N11,CHEMICAL ANALYSIS OF SEDIMENT ,N11,PALEONTOLOGY ,
      N11,LOCALIZATION ,N51,WIDE-BEAM SOUNDING ,N51-073,SEISMIC REFLECTION
      ,N51,SEISMIC REFRACTION ,N51,GRAVIMETRY ,N51-073,MAGNETISM ,N51-073,
      ZOOPLANKTON ,N22-0006
 CM-B: 145
 CM-D: 145
 CM-G: 145
 CM-H: 145
 CM-M: 145
BIBL: BERTHOIS L ET COLL.,1973
      RESULTATS PRELIMINAIRES DE L'ETUDE EFFECTUEE PAR L'IGBA CONCERNANT LA
      MISSION GEOGAS AU N.W DU GOLFE DE GASCOGNE
      BULL.INST.GEOL.BASSIN D'AQUITAINE,BORDEAUX N.14 P143-177,7FIG,3 TABL
      ..
      GROUSSET F,1977
      ETUDE GEOLOGIQUE DU QUARTENAIRE TERMINAL DE LA ZONE
      MERIADZEK-TREVELYAN(GOLFE DE GASCOGNE)
      BULL.INST.GEOL.BASSIN D'AQUITAINE BORDEAUX,N.22,P75-122,36 FIG
DMAJ: 1983/06/17
```

Explanations on the field codes

```
  REF  : Internal reference
* CCAM : BNDO code of the cruise
* CAMP : Name of the cruise
* CNAV : Radio code of the vessel
* NAV  : Vessel name
* BHI  : Geographic areas (names of the International Hydrographic Bureau)
  DDEB : Date of the beginning of the cruise
  DFIN : Date of the end of the cruise
* DATE : Year and month of the cruise
  DET  : List of the owners of the data

  LAT  : Extrem latitudes  (here : 40 to 50° North)
  LONG : Extrem longitudes (here :  0 to 10° West)
  ORG  : Name of organism
* ORGC : BNDO code of the organism
* PAYS : Country
* RCRC : BNDO reference of the cruise report
* RESM : List of the research scientists responsible for the measurements
* RESC : List of the chief scientists of the cruise
  PLF  : Type of platform
  ZONE : Nature of the area of study
* MES  : Name and number of the measurements
         bilingual field. In French + MESF ; in English MESE
         The name of the measurement is followed by a code
         Ex : DREDGE,N21-009
              N   : data not available at BNDO
                    (B : when the data are present in the BNDO)
              2   : the responsible of the measurement is the second of the list
                    RESM (Pastouret L.)
              1   : the owner of the measurement is the first of the list
                    DET (I.G.B.A.)
              009 : number of dredges made during the cruise

         Number of the marsden squares where was made each type of measurements
* CM   : Here, the measurements of biology, dynamics, geology, hydrology and meteorolog
         were made in the marsden square 145

  BIBL : References of publications written by using the results of the cruise

  DMAJ : Date of the last updating of the ROSCOP in the base.
```

* The asterisk means that it is a field with an inversed file.

AQUADOC

THE AQUADOC DATA BASE IS A COMPUTERIZED DIRECTORY AND A CATALOGUE OF ALL THE FIRMS AND ORGANIZATIONS INVOLVED IN AQUACULTURE IN FRANCE.

The data base was created by the society "FRANCE AQUACULTURE". Management and on-line service are realized by B.N.D.O. (BUREAU NATIONAL DES DONNEES OCEANIQUES - French Oceanic Data Centre). Participants are the INRA information centre, the CEMAGREF in Bordeaux, and the professional organizations concerned.

There are two types of information in AQUADOC :

- an aquaculture directory, with the adresses and characteristics of :

  . the specialized research centers, associations (description of their activities, cultured species) and administrations.

  . the aquaculture producers (fish, oyster, and mussel culture) : indication of the cultured species, description of the culture techniques.

  . product suppliers on the French market : description of materials and products.

  More than on thousand adresses are searchable.

- a catalogue of the products available in France, with a description of their technical characteristics, their performances, the maintenance conditions and the commercialization.

  A few hundred products are thus presented. The data are produced and updated by the suppliers.

This data base can be useful for all the people involved in aquaculture, in traditional shellfish culture, and in pisciculture, as well as for the administrationsand associations interested.

AQUADOC will be regularly updated.

An extension to European countries is planned.

AQUADOC - directory

REF : 0000240
SOC : PONSELLE
ADR : 4 Boul. de la Republique
CPO : 78002
BUDI: VERSAILLES
TEL : 950-66-82
TYP : FOURNISSEUR
OBS : Appareils de mesure des parametres de la qualite des eaux
DAT : 20/12/81

AQUADOC - catalogue

REF : 0101271
NOM : PONSELLE
DIS : PONSELLE
NAT : FABRICANT
PROD: LABORATOIRE-MATERIEL
DESE: OXYMETERS,PH-METERS,CONDUCTIVITYMETERS,ELECTRO-THERMOMETERS,DEEPTHMETERS,CHANNEL-FLOWMETERS.INDICATORS AND REGULATOR DEVICES,ON BATTERY AND ON LOCAL SUPPLY CIRCUIT.
CAR : Oxymetre:0-200 mg.p.l. en 0,1 mg.p.l. ph-metre:0-14 ph en 0,01 ph
Conductimetre:
0-200 microsiemens en 1 microsiemens
0-2000 microsiemens en 10 microsiemens
0-20000 microsiemens en 100 microsiemens
0-200000 microsiemens en 1000 microsiemens
Thermometre:0-200 deg-c en 0,1 deg-c.A toutes profondeurs
UTIE: FRESH AND SEA WATER AT ALL DEEPTHS AND TEMPERATURES,IN SITU OR IN LABORATORY OR FIXED PLANT.
COND: Emballage carton
REFE: Cnexo,Degremont,Coca,Cge,Sobea,Jeumont Schneider,Franceaux,Cie des eaux et de l'ozone,Apave,Sept,Saur,Salmonides d'Aquitaine,l'Aquaculture marine francaise,Brgm,Ministere de l'agriculture,Equipement.
MTN : Un an pieces et main d'oeuvre

DATA RETRIEVAL SYSTEM ON WATER POLLUTION CONTROL MEANS

In order to fulfil its mission of preparation to the fight against an accidental pollution as requested by the governemental instruction of october 12 th 1978 the CEDRE (Documentation, Research and Experimentation Center on Water Accidental Pollution) : "Has to collect all pertinent information concerning equipment and products that exists in France and abroad in public services and privates companies".

This work has been carried on in two parallel and complementary direction

- an Inventory of all the equipement and products existing in France :
  . it gives informations about available stocks and their localization
  . it help to choice the type of products and equipment according to circumstances
- a Directory of french or foreign oil spill control products :
  . it gives detailed information concerning the technical caracteristics of use, performances, storage and conveyance conditions of fight equipment.

Only an electronic data processing system permits a complete seizure, a correct management and an effective interrogation.

So it was necessary to find and electronic data processing support reply to the objectives :

. a data base connected to a computer network open silmultaneously to several users

. a way of interrogation that only requires a minimum initiation on a conversational mode

. a guarantee that part of the data could remain confidential.

After a study, we have choice the software MISTRAL. The developments realized with the BNDO (Bureau National des Données Océaniques) from the CNEXO (Centre National pour l'Exploitation des Océans), allow the use of MISTRAL in assisted mode, that is to say without preliminary initiation. The Directory of water pollution control means will be commercialized under the name of POLUMAT by the BNDO.

INVENTAIRE ET REPERTOIRE
DES MOYENS DE LUTTE CONTRE LA POLLUTION

Pour répondre à sa mission de préparation à la lutte contre les pollutions accidentelles des eaux définie dans la circulaire du 12 octobre 1978, le CEDRE (Centre de Documentation de Recherche et d'Expérimentations sur les Pollutions Accidentelles des Eaux) doit "rassembler une documentation sur l'ensemble des matériels et produits disponibles en France et à l'étranger dans les administrations et les sociétés privées".

Nos travaux se sont poursuivis dans deux directions parallèles et complémentaires par la création :

- d'une part, d'un fichier <u>inventaire</u> des produits et matériels de lutte disponibles en France :
  . Il renseigne sur les stocks disponibles et leur localisation
  . Il constitue une aide à la décision quant au choix du type de produits ou de matériels en fonction des circonstances
- d'autre part, d'un fichier <u>répertoire</u> des produits et équipements de lutte français et étrangers
  . Il fournit des notices détaillées concernant les caractéristiques techniques d'utilisation, les performances, les conditions de stockage et de transport des équipements de lutte.

Seul un système informatique permettait une saisie, une gestion et un interrogation opérationnelle efficace. Encore fallait-il trouver un support informatique qui réponde aux objectifs à atteindre :

. Une base de données accessible à distance et simultanément par plusieurs utilisateurs
. Un mode d'interrogation ne nécéssitant qu'un apprentissage minimum et possible sans consultation de manuel d'utilisation de la base
. Une garantie de confidentialité d'une partie des données

Après étude de faisabilité, notre choix s'est porté sur le logiciel documentaire MISTRAL sur IRIS 80 du CII-HB.

Les développements réalisés avec le BNDO du CNEXO permettent une utilisation de MISTRAL en mode assisté, c'est-à-dire sans <u>apprentissage préalable</u>.

Le fichier répertoire sera commercialisé sous le nom de POLUMAT par l'intermédiaire du BNDO serveur spécialisé dans l'information marine.

cedre

CENTRE DE DOCUMENTATION DE RECHERCHE ET D'EXPERIMENTATIONS SUR LES POLLUTIONS ACCIDENTELLES DES EAUX

COB - PLOUZANE - B.P. 308 - F 29274 BREST Cedex Tél. (98) 49-12-66 Télex : 940 145 F

BIOCEAN

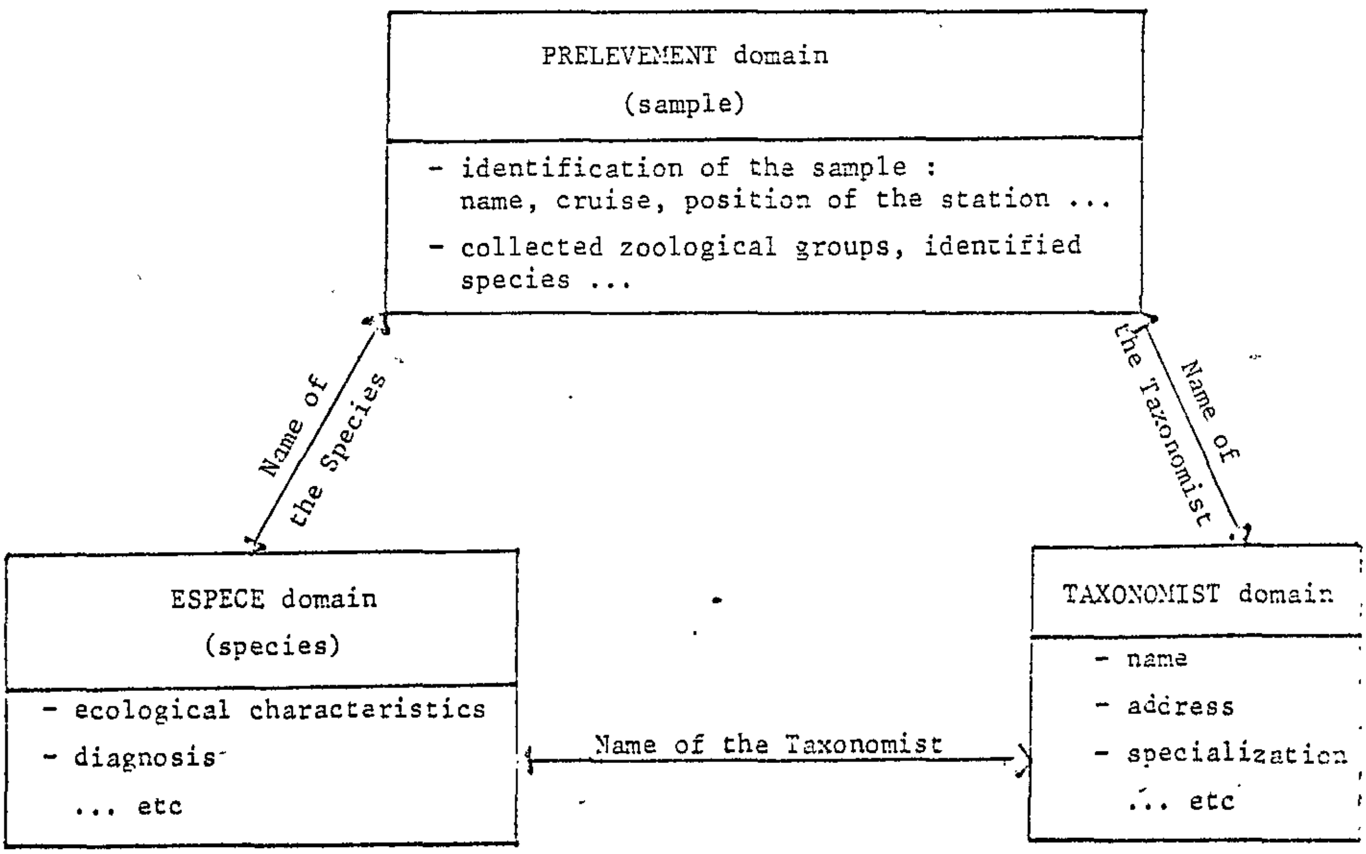
The "Centre National de Tri d'Océanographie Biologique" (CENTOB), created by CNEXO and the "Museum National d'Histoire Naturelle", has been charged to collect, sort and disseminate the different zoological groups which are collected by the french laboratories during the oceanographic cruises.

The sorted groups are sent to the concerned taxonomic specialists who identify the collected organisms for each sample of the cruise.

CENTOB has got an important amount of biological data about the Atlantic ocean and wishes them to be easily available for any marine biologist.

The BIOCEAN data base has been constituted by CENTOB, with BNDO help ; on-line access via the public data telecommunication networks will be possible from 1983.

The BIOCEAN data base is organised in three domains :



You can complete information contained in BIOCEAN with the help of DOCOCE. data base (bibliography) and ROSCOPS data base (inventory of oceanographic cruises).

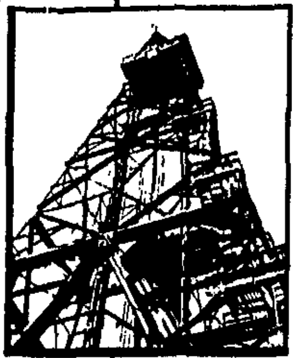
SAMPLES

Field	Description
REF : 0000203	Sample code
* PREL: D873	Name of the cruise
* CAMP: BIOGAS VI	Number of the station
* STAT: 4	Geographic area (following the standards of the International Hydrographic Bureau)
* BHI : ATLANTIQUE NORD EST	
LAT : 46.31	Latitude
LONG: -10.23	Longitude
* FOND: CALCAIRE 46	Nature of the sea bottom
PROF: 4706	Depth of the sample
* ENGI: DRAGUE SANDERS	Type of sampling equipment
* GROU: TUNICIERS	Zoologic group
* TAXO: MONNIOT C	Taxonomist's name
LGTR: 7[illegible]	Trawling length
* ESP : 00001 ABYSSASCIDIA MILLARI 00002 AGNESIA CELTICA NSP 00001 BICARPA PACIFICA 00004 BATHYSTYELOIDES ENDERBYANUS 00003 MINIPERA PAPILLOSA NSP 00004 MOLGULOIDES CRINATUM NSP	List of the sampled species
NBES: 6	Total number of the sampled species
TOT : 15	Total number of the sampled organisms
DET : 1976/12	Date of the determination
MAJ : 1982/07/01	

* the asterisk means that it is a field with an inversed file.

TAXONOMISTS

Field	Description
REF : 0030109	
* NTAX: MONNIOT CLAUDE/MONNIOT FRANCOISE	Taxonomist's name
* ORG : LABORATOIRE BIOLOGIE INVERTEBRES MARINS/MUSEUM NATIONAL HISTOIRE NATURELLE	Organization name
* CAM : POLYGAS/BIOGAS II/BIOGAS III/BIOGAS IV/BIOGAS V/BIOGAS VI/BIOGAS VII	List of the cruises
* GZOO: TUNICIERS	Zoologic group
ADR : MR ET MME MONNIOT CLAUDE LABORATOIRE BIOLOGIE INVERTEBRES MARINS 55 RUE BUFFON 75005,PARIS	Address
* MILI: BENTHOS	Living environment
* GEO: MONDE	Specialization in geographic zones
OBS : 3:TAXONOMIE/ECOLOGIE/HISTOLOGIE/ANATOMIE COMPAREE ASCIDIES F:FORMOL OU BOUIN C:FORMOL	Taxonomist's specialization
MAJ : 1982/09/01	



GéoIPOD

The geoIPOD data base is an inventory fo the main characteristics of the drillings made since 1968 by the "Glomar Challenger" vessel for the DSDP-IPOD international project.

This data base has been constituted from a selection of the information given by the file "site summary". This file is described in the publication :

> *"La Banque des Données DSDP-IPOD au Bureau National des Données Océaniques".*

This publication (it will be translated in English in the near future) may be obtained by writing to :

> *B.N.D.O.*
> *Centre Océanologique de Bretagne*
> *BP 337*
>
> *29273 BREST CEDEX*

AN EXAMPLE OF THE geoIPOD DATA IS PRESENTED ON THE BACK OF THIS SHEET

By searching geoIPOD you can quickly retrieve data like :

- The inventory and the main characteristics of the drillings of a precise geographic area

  search example

  . *Inventory and characteristics of the drillings in the Mediterranean sea*

- The inventory and the main characteristics of the drillings with common characteristics (one or more), other than the geographic criteria

  search example

  . *Inventory and characteristics of the drillings in the Mediterranean sea located on seamounts*

  . *Inventory and characteristics of the drillings in the Mediterranean sea which have reached an upper miocene represented either by halite either by gypsum either by anhydrite either by dolomite*

CHARACTERISTICS OF A DRILLING GIVEN BY THE geoIPOD DATA BASE

```
LEG : 42
HOLE: 373A
LAT : 39.7280
LONG: 12.9927
CM  : 143
PHYS: SEAMOUNT
DEPW: 3517
CRUS: OCEAN
PENE: 457 TOTAL(M),114 CORED(M)
RECO: 12 CORES,27 METERS
IGNE: 95 CORED(M),11 CORES,20 METERS
IGNL: BASALT BRECCIAS,FLOWS
DEPB: 270
OLDS: 270.0 SUB BOTTOM DEPTH(M),2 CORE NO
OLDA: LOWER PLIOCENE
OLDL: NANNO OOZE
```

DESCRIPTION OF THE DATA CONTAINED IN EVERY FIELD

LEG : 42	*Number of the leg*
HOLE : 373A	*Number of the hole*
LAT : 39.7280	*Latitude*
LONG : 12.9927	*Longitude*
CM : 143	*Marsden square*
PHYS : SEAMOUNT	*Physiographic features*
DEPW : 3517	*Water depth (meters)*
CRUS : OCEAN	*Type of the crust (oceanic or continental)*
PENE : 457 TOTAL(M),114 CORED(M)	*Penetration (total penetration in meter, cored penetration in meter)*
RECO : 12 CORES,27 METERS	*Recovery (number of cores, number of meters)*
IGNE : 95 CORED(M),11 CORES,20 METERS	*Coring of igneous rocks (cored length in meter, number of cores, number of meters recovered)*
IGNL : BASALT BRECCIAS,FLOWS	*Lithology of igneous rocks*
DEPB : 270	*Depth at which basement was reached (meters)*
OLDS : 270.0 SUB BOTTOM DEPTH(M),2 CORE NO	*Situation of the oldest sediment (sub bottom depth in meter, number of the core where it appears)*
OLDA : LOWER PLIOCENE	*Age of the oldest sediment*
OLDL : NANNO OOZE	*Lithology of the oldest sediment*

Verslag discussie

2nd SEMINAR ON 'METHODS OF DISPLAY OF OCEAN SURVEY DATA'

DISCUSSION SESSION

Alistair Wright (University of Liverpool, UK) - What is very apparent to me at this Seminar is that we come from many different backgrounds and many different specialities, and in talking as a group, I think we feel the lack of many other experts whose opinions and knowledge we need. I am fairly certain that in another field, people are working on display methods of information which could be extremely useful to us and searching for that display method is quite a useful thing to do. However, how to do it, I don't know. It requires a very wide reading and talking and generally we do not have the time. What we need is a technological awareness expert in display techniques.

Ron Linton (Natural Environment Research Council, UK) - You may be interested to know that one of the first points that was made in the Discussion Session 2 years ago was that that Seminar was attended by users of cartography rather than by what they described as a real Cartographers. In some ways, I feel that this Seminar is almost exactly the opposite. Thus, we have a large number of real cartographers, and a smaller number of users of cartographic products. In other words, there are more producers than users this time.

Alistair Wright (University of Liverpool) - Yes, true. I am thinking that had George Benwell not been here, would we have thought of computer models through which you can 'fly'. I doubt it. So first of all, contact must be made with other scientists but somehow, you have to do the reading as well. It is an information search problem, and I don't know how to deal with it.

George Benwell (University of Melbourne, Australia) - I think the concept, not only mine but also of others, of having dynamic 3-dimensional models, are where a lot of search is being carried out. For example, in the architectual, archieological and marine fields. I agree with Alistair that it is difficult to become Jacks of All Trades; to know sufficient information of the so many fields that are available to us. It is a monumental task.

Ron Linton (NERC) - This is, of course, one of the problems with having computer methods and of the acquisition of this vast amount of data.

Etienne Cailliau (Etablissement Principal Service Hydrographique et Oceanographique de la Marine, France) - *Taking up what Mr Wright was saying about the* lack of some expertise in the technical and scientific fields, I think that we have only to deal with general ideas because there is no way that we can constitute a team of researchers, because we have no time to undertake real research. I do not think it is possible to cover all the people in the world who are dealing with the display of data. However, I do not regret their absence. I would also like to make a general remark, although it is not an answer to the report. It is also not meant to be critical. According to the presentations that we have been listening to for the past 2 days, I am somewhat surprised to have heard so little about the scale of representation. It seems to me that the problem of the scale of the different practical displays which can be made from the data file is very important, especially in the case of the new electronic methods and perhaps even more with these new methods rather than the classical ones. This should be given more attention.

Ron Linton (NERC) - I agree with you, the problem of generalisation in digital cartography is very great. It is a problem that no one has yet solved, at least I do not think so, in digital terms. I mentioned earlier, in a geological context the original field sheets are digitised at 1/10k, the data is then plotted at 1/50k scale onto a manually produced topographic base. The situation then arises that roads and other topographic features have changed position due to manual generalisation. Many hundreds of amendments then have to be carried out to the original digitised data to correctly register with the smaller scale topo base. I have long felt that a lot of generalisation in that production is unnecessary, especially in the case of manually produced maps where, in my opinion, a lot of the generalisation that has taken place has been carried out to suit the cartographic draughtsmen. Thus, in many cases, the draughtsmen has slightly straightened lines or moved data so as to make it easier for him to draw particular features. I think that with modern digital techniques, the volume of generalisation should be far less. I often think that perhaps the best way to handle generalisation in digital cartography is to plot the digitised data at the require output scale and then to inspect it by eye and decide what generalisation is actually needed, rather than to incorporate the generalisation at the larger scale before digitising is commenced. An alternative method would be to employ some specialised computer software for cartographic generalisation. I should say, that this is just my own personal view.

Etienne Cailliau (EPSHOM) - I do not fully agree. Let me give you an example. In our establishment we set up files for the coastline. At the beginning we believed that one file would be sufficient for all cases. However, we discovered that we had in fact to create about 4 or 5 different files according to the scale of output for the coastline. Thus, we required a coastline for 1/25,000; one for 1/300,000 - 500,000 and one for the 1/2m scale and so on.

Ron Linton (NERC) - I agree that you cannot use the same digitised input data from 1/25,000 to 1/2½m. You have to create a series of files but the data should be derived from the original digitised data so that many of the positions such as the co-ordinates of straight sections of coastline are going to have the same co-ordinate references at all scales.

Etienne Cailliau (EPSHOM) - I must say that we were not able to create derived files from the basic one. We had to independently digitise all the files.

Goffinet (EPSHOM) - If I can add something. For our coastline we too have several files. World-wide files and for France, we digitised at a scale of 1/25,000. We used automatic software generalisation but we saw that for graphical representations the use of such software was limited to certain scales. That is to say, we could not use certain files. We were obliged to stop the iterisation and to start with a new coastline to create smaller scales. The generalisation programme works but for graphic presentation, it is not sufficient. There are always particular cases where it is not acceptable. It is the same for bathymetry. In the case of map features that show dangers to navigation, we are sometimes to obliged to modify curves to fit in a sounding, or something like that. That is why we make a great different between final maps and the source data. Generalisation is very important.

Gilles Bessero (EPSHOM) - I feel that if we look into the future regarding the scale problem, one thing we have to think of is how to prevent the user using your generalised products to derive other products at a larger scale than that for which the original data was intended. This is the reverse problem and I think it is more critical than generalisation, because once available, anybody can make anything of data.

Ron Linton (NERC) - The ECU produced, sometime ago, a series of bathymetry maps at 1/2.4m. We were asked later to produce maps at 1/250,000 of 3° x 2° sections and transform them to the UTM Projection. The original data was digitised at 1/1m. It was pointed out to the customer that the results were not going to be very good. However, they were not concerned about the graphic quality, all they wanted was a 1/250k base map and that was, as far as they were concerned, the quickest way of achieving this. These maps were to be used as base maps for the plotting of seismic data and they were not intending to include the bathymetry at all. As expected, when the 1/250k maps were produced, the graphic quality was very poor as it always is when stream digitised line data is enlarged, but as it was a working document and as we had made it clear that the bathymetry should not be published in that form, the request was carried out. It is also clear that many enquirers for digital data have no idea how the data is structured. Thus one enquiry, a short while ago, required a digital coastline of the United Kingdom at 1/10,000 scale to be held in no more than 100 co-ordinate pairs. It is totally impossible to hold such a large data set using such as small set of control points. Some users do seem to imagine that once you have a data set you can produce almost anything from it.

Etienne Cailliau (EPSHOM) - Yesterday, we spoke about the definition of the word Display, and it was concluded that it must indicate in some way all the processes and all the products you can get on the data. What do you think about this? Should be limit our considerations to the graphical display or perhaps only to maps or to the whole extent?

Ron Linton (NERC) - The original Terms of Reference for this research, which I have been carrying out for the past 4 years, was 'Methods of Display, on Maps and Charts of Data collected by Modern Methods of Ocean Survey'. As a title, this was shortened to 'Methods of Display of Ocean Survey Data'. As far as I am concerned, I am including computer displays, sidescan sonar displays, photographic output as well as maps and charts in the normal sense. They are all visual demonstrations of the data. I am not concerned whether the demonstration is on a piece of paper, a screen, whether it is printed in 6 colours or whether it is a one colour map suitable for dyeline printing.

Etienne Cailliau (EPSHOM) - Yes, it is graphical. For example, if the product is a single piece of information written on a piece of paper, do you consider that this is a display? Or should it be something like a flashing light on a screen?

Ron Linton (NERC) - I think that display should be defined in this context as a graphic representation of data. After all, the Commission is called the Marine Cartography Commission and it is the International Cartographic Association so what we are talking about is graphic representation. I am also including such devises as the harmonic representations of currents, and so on. Although this is not strictly a map or a cartographic out product, it is closely associated with it.

Alistair Wright (University of Liverpool) - That is interesting and perhaps should be expanded a bit more. In the talk, I mentioned the possibility of braille maps which are not useful to a sighted person although the texture could always be used. It occurs to me that one other way of multi-layering information of a map is to use a development of the input tablet. For the digitising system we saw where by touching a map at a certain place, you can get audio information from it. You could then have as much information as you wished. It could be a way of piling information onto a chart which is going to be one of the problems. By multi-layering you obtain the information without creating a mess. Of course, audio information can now be processed digitally to speed it up to a point where it can be understood even if cannot be spoken. This could be a compressed way of passing information.

Ron Linton (NERC) - Yes, tactual mapping has become quite an important area in the ICA. However, the idea of touching the map and the map 'talking' to you is something I have not considered.

Alistair Wright (University of Liverpool) - Well, we have touch sensitive screens on computers and synthetic voices. All we have to do is combine them.

George Benwell (University of Melbourne) - Taking that to the logical end, you must ask the question - why do we have maps and why do we display information? The answer to that is two-fold. First is to tell other people what we know, secondly we need to know information that other people know, say for guiding a vessel or getting a ship safely into port. A logical answer to all this is that we won't need any of them once we have automated the entire process, because at the moment we cannot guide a vessel by it looking at the map. We have to look at the map and then steer the helm port or starboard, fast or slow. Eventually, it will be all automatic and we will not need charts at all. I should say that though I am suggesting this, I don't necessarily agree with it.

Ron Linton (NERC) - I am sure there will be automatic guidance systems, perhaps for going into port. Crossing the middle of the Atlantic Ocean may well be another question. In any case, there will still be a need to display or provide information for other people who are not guiding ships into harbour, such as those interested in the distribution of fish stocks and other biological or environmental information. This is where we come into the area of real-time displays, rather than the situation where you press a button and the trawler itself follows the fish.

Chris Van de Velde (Netherlands) - The way of presentation of the data is so dependent on the purpose you have. So it is very difficult to have a standard way of presentation because it does not always serve the purpose you want. You have contour lines which can follow developments in time. You may need 20 contour lines each year. That is an easy way to follow developments in time, especially rivers.

When you think of cartography, you have to think of standard methods of presentation. I think that is the difficulty. We have being discussing standard methods and my need is special purpose presentation. May be we can co-operate in some way, but I do not think that we can always co-operate.

Rod Powell (Wimpol Limited, UK) - I think that is a very valid point. On the oceanographic side, I think we have a similar problem. We are always looking for ways to make non-standard data presentations which are meaningful to one person and not to everybody. I think that is why, in some ways, the presentation I was trying to make was a bit different. People were not aware of what I was trying to do. Because it was very different from the cartographic process, I think it was a valied attempt, but unfortunately people did not really have sufficient background.

Chris Van de Velde (Netherlands) - Because for the presentation of waves, you can give a huge map of the whole world with data concerning the rate of occurrence of wave exceedence or something like that. That's one presentation. Another presentation is to give the wave energy spectra. There are only a few people who need energy spectra of waves so you cannot give all the world all the energy spectra you know. I do not think that is useful because it is for only limited areas that you need energy spectra. For example, for design engineers to place a platform on the sea bottom. We do not place platforms in sea thousands of metres deep. For that kind of thing you need energy spectra. Possibly in a hundred years, I don't know.

Ron Linton (NERC) - But is not this the whole point of digital techniques; to be able to produce different requirements. Thus, you collect all your digital data and store it in a database and you then create a graphic product that you want for a specific point in time or for a specific purpose.

Chris Van de Velde (Netherlands) - There are many wave observations on ships. For example, a man looking at the sea from the bridge may say 'the waves are 20 metres high'. There are many such observations but these do not give the wave spectra.

Rod Powell (Wimpol Ltd) - It is difficult to display or store oceanographic data in digital form which is going to give you all the results. Take for example the wave again. One day the man may say 'that is a 20 metre wave', 2 days later there may be no wave. That is a very difficult thing to rationalise and to store digitally. It is a problem, but how do we solve it?

Alistair Wright (University of Liverpool) - I would guess you simply multi-layer it. In that case the presence of data, that is not comprehensive digital data, in an area should be indicated in some way, perhaps by going down another layer and finding it. I do not think it can all go into one level because that sort of observation cannot be compared with data collected from say a wave buoy. So you just have to have levels and spend your time going through them.

Ron Linton (NERC) - It comes down to the same thing. If you want information on waves or currents at different depths, you can put the data together as layers.

Alistair Wright (University of Liverpool) - These levels are levels of reliability or accuracy, although I cannot see how to display them.

Ron Linton (NERC) - Displaying reliability is something that has taxed cartographers for some time. Using image analysis techniques in land mapping, you can have an area that you have decided is woodland. The boundary of the woodland on a raster display is not always well defined as each pixel may be represented as woodland or something else. Some of the pixels may have a spectral value somewhere between that of woodland and that of the adjoining land use. In order to know definitely that an area is woodland, you use the technique of pixel shrinking to 'remove' the bounding 1, 2 or 3 'layers' of pixels to establish an area that can be more reliably described as woodland.

Alistair Wright (University of Liverpool) - At least you do have the potential that where information is vague, you can show it as vague. With modern techniques, you can let the user consciously what information he can and cannot rely on. So these are possibilities. This is one of the things that concerns me, always displaying the reliability to the uninformed user.

Ron Linton (NERC) - Yes, in fact one of the problems of maps is that many were so beautifully produced as to imply a high degree of liability. In this case, it is the skill of the cartographer which has created the problem.

Etienne Cailliau (EPSHOM) - May I come back into the problem of standardisation of display. We say it is because there are many different users that it is difficult to standardise. I think that is something we have to regret. Speaking of depths and the choice of contours which are selected, it is different when hydrographers or geologists carry out the process of selection. We know that the methods and results of one are often not acceptable to the other. I think it is normal and this problem is important because of the huge loss of money, time and effort. So it should be possible to find a compromise in that area. For example, I think that hydrographers should take into account the form of the bathymetric structures and the geological phenomena more than they do at present.

Ron Linton (NERC) - I agree that there are many occasions where one of a group of different organisations collecting the same sought of data indicate to a third party or to the user that the data collected by other members of the group are unreliable.

FUTURE WORK

Ron Linton (NERC) - As I have said to one or two people, the Commission is continuing for the next 3 years as the next General Assembly of the ICA will be in Mexico City in 1987. The 2 tasks that are proposed to be undertaken are:

1. The continuation of this investigation 'Methods of Display of Ocean Survey Data' - it was proposed to continue this investigation in order to attempt to include all methods and forms of display that in some cases have only been briefly touched upon during the past 4 years. It is intended to complete this research before 1987.

2. A review of Yachting and Small Craft Charts - These are being produced in a number of countries. In some cases by the official Hydrographic Service and in some cases by other organisations who are taking the basic Hydrographic Chart of an area and are adding to it a large amount of other information. This Review will be undertaken by the Deputy Chairman of the Commission, Bryce Biekoff from Queensland, Australia.

I would like to suggest that in perhaps 2 years time there should be another Seminar to complete the investigation of both areas and with the intention of producing a combined Report on both subjects in time for the 1987 Mexico City Conference.

Chris Van de Velde (Netherlands) - The first task seems much larger than the second. In the case of Yachting Charts the scale of presentation under the area you wish to present is rather limited, I think. In general you speak of coastal areas and that certain scales and there is not much difference.

Ron Linton (NERC) - What has become apparent is that there are differences in the way that the information is presented.

Chris Van de Velde (Netherlands) - There are some small craft charts at a scale of 1/100 and some at 1/1m. It is rather a limited difference in scale, I think.

Etienne Cailliau (EPSHOM) - I do not agree. For example, in France, there are special charts for boating up to 1/300,000 scale, but the methodology is not the same. In one, the first problem is to consider fundamental problems and the second subject is a review. I do not see how it would be possible to have a Seminar in which both problems are examined together and the people who will attend this Seminar will be different according to the problem which interests them.

Ron Linton (NERC) - I agree that the 2 subjects are different, and to confirm the second is a Review for the next 3 years, and the intention is for the people carrying out that Review to acquire copies of Yachting and Small Boat Charts from as many producers as possible and may be it would be a presentation of that Review and for the participants to assist in the creation of a set of recommendations for the portrayal of particular features. What became clear when this was discussed in Perth, was that a number of these charts are being produced to a variety of designs. In some ways, this may not be too important as many small craft do not venture out of their home waters.

Etienne Cailliau (EPSHOM) - So you think it would be possible to gather people who are interested in that Review and in the subject of Methods of Display? I think they are rather unhomogeneous.

Ron Linton (NERC) - You ask if I think it is possible? Yes, I do believe it is possible. Whether or not it actually happens, I do not know yet. We will have to see how the investigations work out.

Chris Van de Velde (Netherlands) - I think that the first object should be more narrow because it is too wide. May be it should be divided into 2 parts. The first part could be nautical charts, the other bottom topography while another subject might be a database of ocean data - not the presentation of it but the database containing it.

Ron Linton (NERC) - We have deliberately tried to make it fairly general, because whenever we have specifically mentioned Hydrographic Charts, the various Hydrographers who come to the ICA Conferences become rather concerned because they feel, probably with justification, that the design, content etc of nautical charts is their prerogative and not the prerogative of ICA. I have always included Hydrographers in the discussions, because we are talking about the general display of ocean survey data. This means that the subject does become very wise. We are, at the moment, simply examining the problem, although may be by 1987 it will be possible to arrive at recommendations for some aspects of the total area. At present, I am looking towards the database aspects as my own input. However, the sophisticated computer equipment which I have been using is not available to many marine cartographers and what I am concerned about is to include the whole area of the problem of trying to portray the large amount of electronically collect data, including using manual methods to do so.

Alistair Wright (University of Liverpool) - If there is another meeting in 2 years time, I think it would be fine if it could be based in a centre of excellence such as this (Britany Centre of Oceanography). I do not know how many centres there are. The stimulation I got from those tours we had yesterday were considerable. It woke me up with some ideas and so if you can base it in somewhere beautiful that happens to hospitable as well, so much the better. I think the excellence is perhaps the first criterion to wake people up and give them some input.

No doubt, our thanks will be recorded for the really excellent way we have been looked after. It has been one of the most pleasant Seminars I have ever been to. That is not for the record, it is just to say thank you.

Ron Linton (NERC) - Yes, I agree, it has been wonderful to have a Seminar in such a situation combined with, as Alistair said, in a Centre of Excellence. I would therefore like to formally say thank you to both COB and EPSHOM for allowing the Seminar to take place here and for showing us so much of what is going on at both establishments. Personally, I would also like to say thank you to Etienne Cailliau, Michel Le Gouic and Monsieur de Clarense for making all the necessary arrangements.

Etienne Cailliau (EPSHOM) - It is for us to say thank you for coming, and to have chosen Brest for the meeting, and to have been able to compare in your visits both COB and EPSHOM. Thank you once again.

Paper J.C. Gaillard

THE AUTOMATION OF SURVEYS AND CARTOGRAPHY AT SHOM

BY J.C. GAILLARD

SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MARINE (SHOM)

THE AUTOMATION OF SURVEYS AND THEIR EXPLOITATION

Since the beginning of the 70's computers have been used by the French Naval Hydrographic Office (SHOM) in order to perform the following tasks :

- the automation of hydrographic, oceanographic, and aerial surveys
- assistance to cartographic tasks
- the management of nautical information, and the automatic production of books
- numerical modelling in cartography and oceanography
- the evaluation of new techniques such as the use of satellite images, or analytical restitution of photogrammetric surveys

EQUIPMENT USED IN HYDROGRAPHIC AND AERIAL SURVEYS

One of the main features of the first generation of automated system for surveys which was used by SHOM in 1974 on board the oceanographic vessel D'Entrecasteaux was a centralized data-processing, which implied difficulties in later development.

Nevertheless, this trial system contributed to the determination of positionning methods, the development of echo tracking and digitizing techniques and the conception of heave compensation system for ships.

Real time equipment

The core of this equipment, called Hydrac, is the local network "Hydroboucle" which permits the interconnection and communication with a single transmission line-two-wire-cable- of all the instruments generally used on surveys.

The most commonly used sensors are the following :

- positionning receivers (Toran, Trident, Sylédis, Loran C, Omega, Transit acoustic systems and so on...)
- bathymetric sounders Deso 20 and Raytheon
- meteorological sensors
- KSS 30 Bodenseewerk gravimeter
- Thomson Doppler current meter
- Suber oceanographic instruments (tide gauges, current meter, sound velocimeter)
- the dead reckoning and timing unit "Hydest" which dispatches on the network the dead reckoning parameters (time, heading, speed), and marks the time on analog *recording devices.*
- the unit which records on a cassette the validated data from the instruments connected to the network
- one or more computing units
- bridge equipment :
  . a left-right indicator for the helmsman
  . a monitor giving the officer of the watch the data to steer the ship

The user can implement the system as needed, from the launch to the oceanographic vessel. The connection of a new instrument with the network is quickly done and does not disturb the existing layout.

An airborne version exists for radiometric or photogrammetric surveys, and for the evaluation of sensors which should be used on future satellites. This version consists in an "Hydroboucle" which acquires attitude and positionning data, a HP 9816 computer, which computes a fix every 0,3 s, monitors the opening and shutting of the camera, and delivers the across-track error to the pilot.

Post processing equipment

This equipment called Hytrai is in fact an autonomous computer system that can be taken on board. It consists in a desk top computer (Tektronix 4052 or HP 9816) and several peripherals such as : diskette reader, display screen, printer, high precision plotter, digitizer, magnetic tape unit.

For photogrammetric surveys, a land-based analytical stereo-plotter "Traster" from Matra allows now the restitution of topographic data and may permit in the future the restitution of bathymetric data in shallow waters.

REAL TIME PROCESSING

The aim of the real time processing system is to help the hydrographer in charge define the survey strategy. Two examples will show the use of such processing :

Track control during bathymetric soundings

The control of the ship track is of course essential during a survey.

First of all the track control software computes in real time the position of the ship, using the various devices available. It must be said that SHOM standard procedure is to obtain fixes from 3 or more LOPs, which may differ in nature and precision (such as Toran, Trident, Syledis ...)

Every LOP is :

- weighted in relation to its theorical precision or observed one from analog recorder,

- corrected for known calibration errors,

- smoothed if needed by a linear recursive filter.

Its evolution is controlled by computing the track.

Furthermore the various alarms, transmitted by the receivers are taken into account by the computer which can then beep and print a message.

After each fix, the system displays :

- for each LOP the interval between the corrected field value and the adjusted value

- the standard deviations σx and σy

- the track (which is used to control fluctuations or lane slips [Loran C, Toran])

- the across-track error and the distance left to go

Thus the choice of sounding lines is freed from LOP geometry, and may only depend on bottom morphology and sea state.

The acquisition of data from gyro-compass and electromagnetic log permits dead reckoning, current determination and some bias estimations.

The constant knowledge of an excellent track in necessary to get full precision from the satellite receiver and the gravimeter (manoeuvring compensation, EÖTVÖS effect)

Control of an oceanographic station

When a CTD probe is lowered, besides data recording, conductivity and temperature variations are plotted against depth.

From these curves the oceanographer in charge can choose the most favourable depths for calibration and the hauling-in velocity best adapted to the features that he wants to study.

POST PROCESSING

The hydrographer in charge disposes of powerful computing equipment, so that he is totally autonomous to process field data. Among those processing one can mention :

- geodetic calculations

- calibration control of position fixing systems

- filtering of data (positionning, gravimetry)

- transformation of coordinates for sounding lines plotting

- determination of drift currents

- computing of EÖTVÖS and drift corrections

- plotting of gravity anomalies

- selection of soundings along the lines

- tidal analysis, computation of high and low water, tidal correlation studies

- analysis of current meter data

- computation of tidal and sound velocity corrections for soundings

- selection and plotting of reduced soundings

Interactive softwares enable the operator to correct errors or to introduce manually acquired data.

On board SHOM vessels, soundings are supplied by digitizers from either Raytheon sounders, (oceanic depths), or Atlas Deso 20 soundings plus a Anschutz heave compensator (shallow waters). So as to avoid too cumbersome records, the real time processing retains a single sounding per second selecting the shallowest one, and its precise epoch.

When the survey is done aboard a launch (25 or 30 ft) without a heave sensor, the processing is such :

- the hydrographer manually smoothes out the heave effect on the analog trace and then selects a number of soundings compatible with the scale of the sheet.

- this choice of soundings is then digitized, and merged with fix data.

The processed data (fair sheets and magnetic tapes) approved of by the hydrographer in charge are sent to our main office in Brest (EPSHOM), to be used there by cartographers or oceanographers.

MAIN ALGORITHMS

Echo tracking and digitizing

An algorithm to track and select sounding echoes has been developed aboard the D'Entrecasteaux (1975-1978) for Atlas and EDO sounders. A microprocessor version could be developped if it were proved that commercial digitizers did not meet our requirements.

The digitizing principle is as follows :

- the superposition of the sounding trace with a validation gate is constantly monitored on an oscilloscope

- that gate is determined by an opening time, a shutting time and a threshold
- a 10 kHz sampling of the trace, within the gate and above the threshold gives for one to eight echoes the appearance time, the width, and the height above the threshold

- for each emission a selection routine chooses the most probable echo (generally the first one to appear in the gate) as well as other possible ones

- the size of the gate which is centered on the last most probable validated echo, is determined by the beam width, the supposed bottom slope and ship speed

- that size is doubled if no echo appears in it

- the threshold is modulated by the received energy (if there is no echo in the gate the threshold lowered).

The operator can step in at anytime to modify the gate parameters (trace shift, gate width, threshold). Moreover, the efficiency of the process can constantly be monitored through the marking of the selected echo above the analog trace.

Heave compensation

Principle :

The acceleration of a reference point aboard the ship is measured by an accelerometer whose axis is maintained vertical by a stabilized platform. A double integration of that acceleration, yields the altitude of the reference point.

Nevertheless the application of this principle raises a few difficulties :

- the existence of gravity which constantly "polarizes" the measure. The accelerometer yields the sum gravity and heave acceleration. Therefore it is necessary to use a high pass filter to minimize the effect of gravity

- the existence of slow drifts in the signal, due to temperature and voltage changes which after the integration gives errors in altitude. Those drifts are also eliminated by filtering

- such filtering inevitably introduces a phase difference specially high in the low frequencies. Taking into account those difficulties, 3 processing steps are necessary :

- high-pass filtering
- Double integration
- phase correction

The transfer function :

$$H(p) = \frac{p^2}{(p^2 + 2 S_0 \omega_0 p + \omega_0^2)}$$

where :

$p = j\omega$

$\omega = 2\pi f$

performs both the elimination of low frequencies and the double integration of high ones. The following transfer function is used afterwards to correct the phase difference.

$G(Z) = \Sigma A_k Z^k$

where :

$Z = e^{j\omega}$

So as to obtain a response closer than 2% in amplitude, for frequencies higher than 1/20 Hz regardless of phase difference, the following values have been adopted.

$S_0 = 0{,}656$

$F_0 = 0{,}029$ Hz

The best transfer function to cancel phase differences is $-\frac{1}{\omega^2}$. A function $G(\omega)$ has been obtained, so that the product of $G(\omega)$ by $H(\omega)$ might be as closes as possible to the ideal function, by minimizing the quadratic error :

$$E^2 = \Sigma \mid G(\omega i) - F(\omega i) \mid^2 \qquad (1)$$

where :

$$G(\omega i) = \sum_k A_k e^{jk\omega i}$$

and :

$$F(\omega i) = - \frac{1}{H(\omega i) \times \omega i^2}$$

for frequencies higher than 1/20 Hz. Due to periodicity and symmetry, in practice the minimization bears only upon the interval 1/20 to 1/2 Hz.

Let : $F(\omega i) = F_i = R_i + jI_i$
$F_c(\omega i) = F_{ci} = R_i - jI_i$ (conjugate of $F(\omega i)$)

Equation (1) becomes :

$$E^2 = \sum_i \left(\sum_k A_k e^{jk\omega i} - F_i\right)\left(\sum_k A_k e^{-jk\omega i} - F_{ci}\right)$$

Its minimum is found by deriving with respect to A_k, which gives a system of the first degree. Its solution gives A_k :

$$\Sigma i \left[e^{jl\omega i} \left(\sum_k A_k e^{-jk\omega i} - F_{ci}\right) + e^{-jl\omega i} \left(\sum_k A_k e^{jk\omega i} - F_i\right)\right] = 0 \qquad (2)$$

which leads to :

$$\sum_k A_k \sum_i \cos (k-1)\, \omega_i = \sum_i (R_i \cos l\omega_i + I_i \sin l\omega_i) \qquad (3)$$

The number of coefficients Ak has been determined by trial and error. The sought after result (relative error less than 3 % in the 1/20 - 1/2 Hz interval) has been obtained with a set of at least 22 coefficients, which corresponds to a 21 s time lag.

Fix computation

Assume n (≥ 3) observed LOP whose value is φ_i, after calibration corrections C_i are applied and let P_i be their precisions expressed in LOP unit.

Let Pa(Xa,Ya) be an approximate fix and φ'_i the values computed at that point.

Let A_i, B_i be the partial derivatives of φ_i with respect to X and Y at Pa. The equation for a LOP around Pa is :

$$\frac{1}{P_i} (\varphi_i - \varphi'_i) = \frac{1}{P_i} (A_i dX + B_i dy)$$

In matric form, we get for all LOP :

$$Y = C\,X \qquad X = (dX, dY)$$

The least squares solution is found by an iterative process : $X = (C^t C)^{-1} C^t Y$

Post control of calibration

Let be N stations evenly distributed in the area where the system is used, for which n LOP values have been observed. With the previous notations it is possible to write for each point j and each LOP i :

$$\frac{1}{P_i} = (\varphi_{ij} + C_i - \varphi'_{ij}) = \frac{1}{P_i} (A_i dx + B_i dy)$$

which gives a system of n x N equations.

If we consider -contrary to the previous case- both the calibration corrections C_i and the station coordinates as unknowns, we must solve a system of n x N equations in N+n unknowns. The least squares solution is found by an iterative process as soon as N is higher than $\frac{n}{n-2}$. In practice that condition is always satisfied.

Data smoothing

If it seems difficult to discuss in a few lines the validity of such or such filtering method, it is not without merit to differentiate the steps of the fix computation process.

The first difficulty to solve consists in determining for each LOP the biases i.e the calibration constants. They are generally obtained before any sounding through the use and control of a more accurate system. Post processing allows the calibration constants to be checked and the correction model to be refined if needed. In real time track control allows to check each LOP evolution and detect important fluctuations as well as lane slips in the case of Toran or Loran C. The phases or positions may be filtered according to the positionning systems and the survey objectives with Kalman filter (Syledis receiver for instance) or with linear recursive filters (Toran, Loran C) for track control for instance. The possibility of the hydrographer's instantaneous stepping in to modify the filter *parameters* and the LOP weights improves fix quality and makes the helmsman's work easier.

Non recursive filters may be used during post processing to determine the most probable fix.

A few years ago Kalman filters were studied at the SHOM to improve the accuracy of oceanic navigation. That filtering technique applies to linear or linearized systems and seems well adapted to *dynamical* situations and non stationnary statistical disturbances as well as to multi-dimensional systems. It is also an optimal technique because it minimizes the integral of the quadratic error and should give the best results.

Unfortunately there still is a serious difficulty in modelling the errors. Those models can only approach or reduce the complexity of physical phenomena <u>at the expense of optimization.</u>

Coastal position fixing systems are generally redundant and accurate enough to easily detect any anomaly and linear filtering is sufficient for positions smoothing.

Sounding selection along a line

The sounding selection algoritnm for a line satisfies the following conditions :

- all selected soundings are real, i.e. actually measured

- each selected sounding determines an influence area that is a 2 mm diameter circle (on the sheet) inside which <u>no</u> shallower sounding exists

- outside that area, linear interpolation satisfies the safety criterion.

Sounding selection on the fair sheet

A selection algorithm is available for the hydrographer to choose the values that will be written on the fair sheet in such cases as :

- areas with overlapping lines

- inking in of cross-check lines

- combination with lower scale surveys

Each sounding is written inside a "label" (a rectangular area surrounding the numbers) perpendicular to the line and such as the decimal point coincides exactly with the recorded position.

The software works as follows :

A label (dimensions, position, orientation) is defined for each value. Soundings falling inside a geographical area are ordered by increasing value. Once the first value has been written, an overlapping test on the already written labels leads to selec-

ting of rejecting the information.
The selection displayed on a monitor can of course be altered interactively by the surveyor.

Digital terrain modelling

A digital terrain model is a set of parameters determined at points (X_i, Y_i) and an interpolation formula which allows to compute anywhere the Z coordinate and possibly its partial derivatives with respect to X and Y.

The points can be distributed either randomly or evenly on a rectangular grid. The parameters are the coefficients of the interpolation function.

Althrough they are easily implemented grid models cannot be established directly. Furthermore, derived from an irregular distribution of points they do not abide exactly by the given values at those points.

Irregular distribution of points

The method used at EPSHOM is based upon Delaunay's triangles associated with Thiessen's polygons. The algorithm used to build a triangulation was derived by K.E. Brassel (Ref. 1). It consists in seeking all the neighbours of each point in the distribution. Thiessen's polygon related to V_i is the locus of points in the plane which are the closest to V_i. V_k et V_l are neighbours if their Thiessen's associated polygons have a side in common.

Let $b_i, i = 1,2,3$ be the barycentric coordinates. The interpolation law being linear inside each triangle, we get :

$$x = b_1 x_1 + b_2 x_2 + b_3 x_3$$

$$y = b_1 y_1 + b_2 y_2 + b_3 y_3$$

$$1 = b_1 + b_2 + b_3$$

with x_i, y_i the cartesian coordinates of the three vertices.

A point belongs to the triangle if and only if $b_i > 0 \ \forall \ i$. Thus, the interpolation formula simply is :

$$z = b_1 z_1 + b_2 z_2 + b_3 z_3$$

Other methods are being studied at the SHOM. Based upon polynomials of the third or fifth degree they ensure the continuity of respectively the first and the second order partial derivatives.

Presently a connecting algorithm joins the segments in a logical order and the polygonal lines appear either raw or smoothed by polygonal splines.

Grid models

The construction method is derived from G. de Masson d'Autume's (Ref. 2). First of all equations at the known points (interpolation formula) and equations at the nodes (null curvature for instance) are establisned. Then the system is solved by least squares through semi iterative techniques (conjugate gradients or conjugate residues).

The adopted interpolation law is a bicubic spline function written as the sum of B-splines whose coefficients at the grid nodes are the unknowns. B-splines have the property to be indentically zero outside the 4 x 4 meshes surrounding the studied node. Therefore the maximum number of unknowns in each equation cannot be higher than 16. The above-mentionned semi-iterative techniques lead to the solution with a reasonable amount of computation.

Contouring is supplemented with plotting high and low points :

$$\frac{\partial z}{\partial y} = \frac{\partial z}{\partial y} = 0 .$$

Representation in perspective

The software computes and plots a projection of the surface, defined by a grid model, on a plane that is normal to a parametrable direction, and fixed by a viewpoint.

The surface can be represented either by vertical sections along the grid axes or by horizontal sections. Only the visible parts are drawn and contouring is optionnal.

Automatic shading

The perspective is supplemented with automatic shading drawn on an electrostatic printer.

The process is based upon a reflectance model which computes the luminosity at any point as a function of :

- the line of sight
- the direction of a light source that illuminates the surface
- the orientation of the surface defined by the direction cosines of the normal to the surface at the given point.

The adopted model is :

R = k.Cos(i) Cos^[illegible](s)

where :

M is a point on the surface

MN the normal to the surface at that point

MS the direction of the light source

MV the line of sight

MS symmetrical of MV with respect to MN

i the (MS,MN) angle (incidence angle)

s the (MS,MV) angle

k normalization coefficient

The surface is scanned along vertical lines parallul to the line of sight. Each line is sampled along an axis perpendicular to the line of sight. The reflectance of each visible sample is computed and represented by a matrix of 4 x 4 black or white dots. Thus sixteen tones of grey are available.

ORGANIZATION - METHODOLOGY

It is obvious that organization and methodology depend on the type of survey (coastal or oceanic), and on the position fixing systems available to the hydrographer in charge (radio, satellite or acoustic positionning).

As indicated before the hydrographer in charge is totally autonomous with regard to staff and material to conduct the survey and process the data.

To illustrate the methods now set up at SHOM and based upon intensive use of computers the example of a survey by an hydrographic vessel and her three launches will be developped.

An advance party takes care of shore control, sets up shore transmitters and establishes tide gauges. On ship arrival several areas are usually set up, each with post-processing equipment (computer, disk unit, large size plotter, digitizer). Then preparation work consists in geodetic computation, plotting lattices for optical or electromagnetic position fixing systems, selecting the sounding lines for each session and calibrating the positionning systems and the echosounders.

During each session, the real time equipment is used to run the lines, compute the *fixes*, *record the* data and control the work as mentionned before.

After each session the fixes are validated and plotted. On board the vessel echo digitizing is controlled by comparing the analog trace and the indication given by the digitizer. Wrong values can be corrected afterwards, either on an interactive display unit or by digitizing the analog trace whenever the concerned area is large.

On board launches not equipped with heave sensor the trace is smoothed and soundings are selected by hand before digitizing.

Search areas are selected by hand.

Current data recorded on RAM with SUBER current meters are regularly transferred on *magnetic recording medium for immediate* processing. The same process applies to seabed tide gauges.

Final processing of bathymetric data is generally done only once tidal data are available and once sounding datum and calibration models are used according to the complexity of the surveyed area and the acquired knowledge of tide.

It is to be noted that digitizing tidal recordings is not a heavy task (only 2 days for 6 months recordings).

The last steps consist in applying tidal reductions, calibration and sound velocity corrections, selecting soundings to be inked in, plotting the fair sheet which includes data from regular survey and searches.

It is necessary to wait for the end of the campaign to complete the processing of gravimetric data (sensor drift is determined once back at the starting point) or hydrographic data (once calibration variations between the beginning and the end of the campaign have been established).

AUTOMATED CARTOGRAPHY

Like all the hydrographic offices, SHOM has been developping hardware and software for chart making since 1970.

A first equipment, called CARTAS, was installed in 1974. It could store and update all the data concerning the maritime part of a chart. Its originality lay in an automatic contour digitizer based upon a scanning gate driven by computer. In 1977 a second equipment was acquired to ensure mainly the updating function. It is composed of a computer, a high resolution monitor and a digitizer.

Simultaneously, a multi-file system was set up on the main frame computer in order *to manage such data as : coastline, strand,* bathymetry, floating and fixed navigational aids, land marks, submarine cables, area limits, and so on...

The limited performances of high precision plotters have quickly constrained the development of cartographic applications. So, around 1980 SHOM asked Benson Company to build a flat-bed plotter with two tools able to work on films :

- the first one composed of a cathode ray tube with an effective surface of 1cm x 1cm and a resolution of 1024 x 1024 dots can generate all chart symbols and characters with high accuracy.

- the second one is a tube which generates a light-spot of programmable size used *for contouring.*

For a maximum use of the possibilities of the plotter, units for digitizing, controlling and updating chart data have been acquired. They are composed of an ALTEC flat-bed digitizer a desk top computer connected will the main frame, a SECAPA graphic display unit (1024 x 1024) with zoom lens and panning, a Benson 1313 control plotter, a symbol keyboard with 256 positions. Softwares have been written for those units. They allow text setting (along straight or curved lines with justification on the right, on the left or in the middle), and the acquisition of symbol, contour and isolated information (soundings . Extracting information about a given theme, selecting data, positionning symbols and legends is made possible through the connection with the main frame.

Finally SHOM intends firmly to acquire in 1984 a cartographic scanner to satisfy the following objectives :

- production of fac simile charts

- chart updating

Prospecting is in process and trials have been conducted.

FUTURE DEVELOPMENTS

Powerful computers are necessary to manage the huge data bank about bathymetry, temperature structure, hydrography, currents, tides, and nautical informations.

In 1983, SHOM bought a new main frame computer. It is a Bull DPS 8/62 under Multics, which will permit the development of applications necessary for research and production purposes.

Important progresses are expected with regard to automated production of charts and nautical publication. Already production costs have been lowered and the re-issuing of books are more frequent thanks to computers. We plan in the near future to permit remote access to the EPSHOM data bank through the phone network, the Transpac network, and so on.

Moreover the new computation power available will give full scope to the research activities of EPSHOM such as tide, current and internal waves propagation modelling, acoustic studies, and so on. Finally the processing of satellite images which is now in the evaluation stage will be currently used. That processing concerns on the one hand Earth resources satellites (Landsat and later Spot) for a better knowledge of topography and shallow water areas where no recent surveys are available, on the other hand, oceanographic satellites for a better study of eddies, fronts, and any features which affect navigation and sound propagation conditions.

ACKNOWLEDGEMENTS

This paper summarises a part of the activities supervised by MM Chimot, Le Baron, Le Manchec and Fichant in the computer center of EPSHOM. In addition, thanks are due to Mr Gilles Bessero for his active participation to the preparation and the english translation of this paper.

Ref 1.

Kurt E. Brassel and Douglas Reif, geographic analysis - Vol. 11, n° 3 (July 1979)

REF 2.

G. de Masson d'Autumne, Bulletin, Société de photogrammétrie et de Télédétection, n° 71-72, 1978.

Paper P. Goffinet

P. COFFINET

June 1984

AUTOMATED CHART PRODUCTION AT

SERVICE HYDROGRAPHIQUE ET OCEANOGRAPHIQUE DE LA MARINE (SHOM)

During the last 5 years, important investments in automation have been realized by the SHOM, both in hardware and software. They cover a large domain of activities, as well in surveying as in post processing methods for data exploitation and production. The most significant improvements are essentially :

- implements of automated and semi-automated systems for elaboration, storing, and plot of numeric fair sheets in hydrographic surveys
- replacement of the batch processing main computer by a decentralized and more powerful system working on Multics configuration
- acquisition of a stereo analyser and restituter for photogrammetry techniques
- implantation of a new generation draughting prototype for high quality films output in cartography.

From now on, these enhancements constitute an important basis for a hoped and high-efficiency development in computer assisted techniques in cartography, prefigured by the first actual results.

1. - AUTOMATION IN HYDROGRAPHIC SURVEYING (APPENDICES 1, 2) *

Automatic real time and post processing systems for data acquisition and exploitation have been implemented aboard survey vessels. These systems, now operational, are considerably increasing possibilities and efficiency of surveys.

1.1 - Real time data acquisition : HYDRAC system

HYDRAC contents a local network system controlled by microprocessor "HYDRO-BOUCLE" on which several captors, receivers or recorders are connected.

It acquires most of the hydro-oceanographic data as :

- bathymetry
- bathythermy
- current measurements
- gravimetry
- tide analysis

Two versions of HYDRAC are developped :

- HYDRAC LAUNCH used in shallow waters on launch-vessels
- HYDRAC SHIP with expanded real time processing capacity aboard specialized ships.

1.2 - Post processing : HYTRAI system

Processing functions are realized by a micro computer system "HYTRAI" on board leader vessels. They lead principally to automatic elaboration of fair sheets but equally to intermediary documents as profiles and lattices sheets.

* Complete informations about surveying automation are given in the article "Automation of Hydrographic surveys and their processings at SHOM" presented by F. MILARD.

2. - MAIN COMPUTER (APPENDIX 3)

The main computer of Principal Etablisment of SHOM (EPSHOM) has been replaced since end 1983. The system is a CII DPS 8 HB turned to decentralized and interactive utilizations.

This system is used for several aspects of cartographic purposes :

- plotters exploitations
- automatic compilations trials : bathymetry lines, soundings choice
- terrain modelling trials : shading, perspective drawings
- storage and databases updating for the constitution of original numeric files (french zones)
  - . wrecks
  - . landmarks
  - . IALA buoyage
  - . lights
  - . coast lines at differents scales (France and world wide files)
  - . bathymetry
  - . limits and cables
  - . fileindex of map.

These files are updated by different sections of EPSHOM. They are stored in rectangular or geographic coordinates.

3. - DRAWING PLOTTERS

3.1 - Three off-line automatic drawing plotters are used for cartographic purposes

- BENSON 132 (tests drawing) : ink drawing on papers, transfers, or mylars
- KONGSBERG 1215 (production) : purchased since 1973, for ink drawing, scribing and photo-expositions using a lighthead disc
- BENSON 2532 (production) : since 1982, SHOM uses this new generation drawing plotter for high quality films production. This prototype was studied by the BENSON firm according SHOM specifications for the restitution of nearly all feature of seamaps.

  Its conception associates a flat bed plotter and a moving beam holding up a photo catnodic head capable of flashing electronically on 1 cm^2 surface any graphic elements onto films by means of an elementary spot of 50 µm diameter. A second head uses a common lighthead producing different sizes of lightspots.

  Drawn elements issue either from a digitized library or from graphic software applications.

3.2 - Applications in chart production

Three types of restitutions are concerned :

- databases extractions
- charts digitized details
- routine graphic softwares and terrain modellings

  Possibilities of the BENSON plotter (combination of photocathodic head and lighthead) enable the following reproductions

- letters (toponymy, titles, soundings, legends...)
- projections and chart borders with graduation and comments (letters, numbers,
- symbols
- lattices
- tides and current tables
- some symbolic curves (dangers, restricted areas, lights limits, coast lines, bathymetry)
- symbolism in buoys files and associated legends (not yet available for wrecks and landmarks)

Most of these productions are plotted, after test drawings on same positive films.

4. - DIGITIZING

Two workstations are employed in cartography for the library constitution and chart digitizing.

4.1 - Constitution of the library

- BENSON 6201 digitizing table
- TEKTRONIX screen 4010-1
- MITRA 125 computer and magnetic tape unit.

The software for digitizing and management of the library have been studied and achieved by BENSON and SOFRIG (société française d'informatique et de graphisme) firms.

Digitized elements on the workstations are delivered on magnetic tapes and integrated then on the library stored on the main computer.

Symbols creations are done in two steps :

- creation of primitive symbols on the table, by digitizing of symools contours with *software access to geometric features* :
  . straight lines
  . circles or part of circles
  . spline curves with fixed departure and/or arrival directions (or not)
- creation of evoluted symbols :
  this operation is done by using the tektronix keyboard to define :
  . hatchings in digitized contours : black fillings are then generated by jointing lines according to the diameter of the elementary spot on the Benson photocathodic head
  . association of several primitive symbols and hatchings by translation and rotation softwares.

The creation of the library began by digitalization of classic symbols commonly used in cartography. Adaptability of softwares allowed then elaboration, control, and digitizing of international symbols, and integration of several types of characters (universe series).

Softwares structure of evoluted symbols avoided repetitive tasks : i.e., association by software of buoys and topmarks, diacritic signs and letters for France and other countries, automatic elaboration of lower sizes of characters.

Appendixes 4 and 5 provide examples of parts of the library (symbols and texts).

4.2 - Chart digitizing

- ALTEK ACT 46-3 digitizing table
- HP 9845 micro computer and cassettes storage

Two types of works are implemented on this workstation by using programs and data cassettes. Data cassettes are then transferred on the Multics system, for storage and drawing.

4.2.1 - Compilation digitizing

Compilation is first hand drawn on a plastic sheet including automatic restitutions :

- charts borders, lattices
- file extractions

The task lies then in digitizing most of compilation contents specified in § 3.2.

Letters digitizing is executed with different programs which :

- square a file of characters on left or right side, center and justify them
- base the characters according
  - . straight lines, horizontal or oblique
  - . part of circles
  - . spline curves

To define these parameters, fixed points are plotted on the digitizing table. Texts are keyed on the micro computer

- Soundings are equally plotted and values are k eyed on the HP. Next developments will permit the use of the 16 keys of the cursor keyboard
- Symbols are identified from a functional independant keyboard (256 keys, handled on the table itself. This keyboard is personalized and intended for receiving original grids accorded to general thematics elements of the chart. Two grids are now operational for common and international symbols. Further applications will expand its utilization to texts and lines.

Examples of restitution are given in appendixes 6 and 7 (letters, symbols. curves, sectors, chart borders)

4.2.2 - **Digitizing of compiled data at scale of source documents**

Actual trials are developped to digitize hand-compiled data at large scale (bathymetric generalization, soundings choices...) from different fair sheets. Data of cassettes are then merged and stored in a work file on the main computer and draughted at scale of the final map.

5. - PURPOSES

5.1 - Terrain modelling :

Possibilities of the main computer, automation in surveying and carrying on terrain modelling studies enable short dated production of automated compilation for the benefit of cartographers. These production would facilitate taks of compilation and cont rols and improve chart creation efficiency.

5.2 - Photogrammetry

Evaluation of photogrammetry techniques issued last year in acquisition of a stereo analyser and restituter MATRA. Different investigations are carried on in shallow water bathymetry, precise coast line definition and landmarks indentifications.

5.3 - Digitizing

A third A0 digitizing table will be purchased in short time. Improvements in workstations hardware and software are expected to avoid blind digitizing and to increase possibilities of all contents chart digitizing in order to plot automatically all films required for each color. Further investments will concern raster screens applications and mini-computers equipping workstations which provide better approach and efficiency in real time processing, storage and data manipulations.

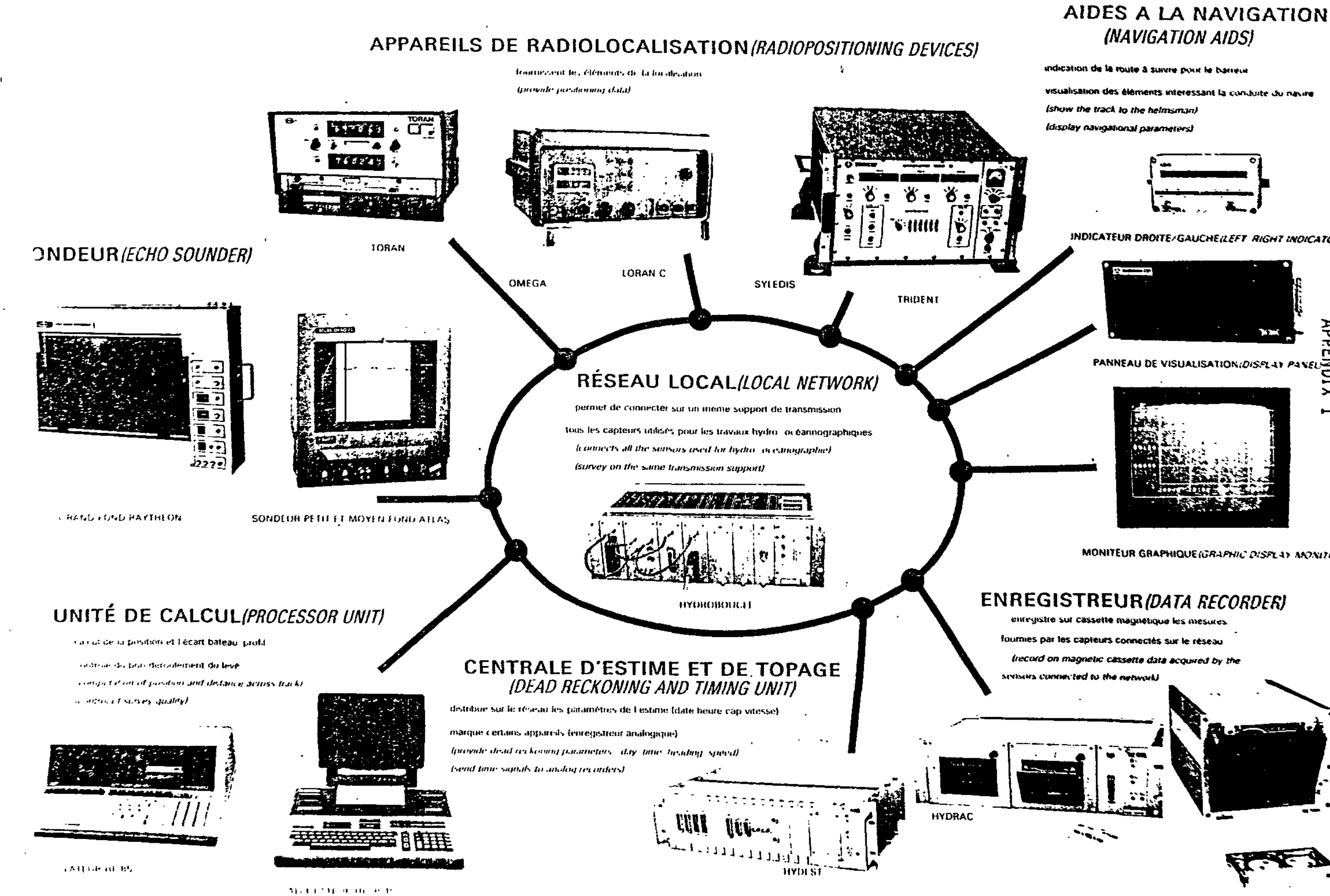
5.4 - Cartographic purposes

Actual improvements in chart digitizing involve possibilities of a continuous chart file creation progressively supplied by digitized compilations. Vindications of such a file are following :

- Avoid loss of compiled numeric cartographic data
- Storage of cartographic data :
  . for production drawings
  . for updating on workstations (according software performances), numeric files being quite adapted for overlapping areas updating and generalizations
  . as source for compilations (with raw data files)

Appendix 8 shows graphic and schematic examples of this file.

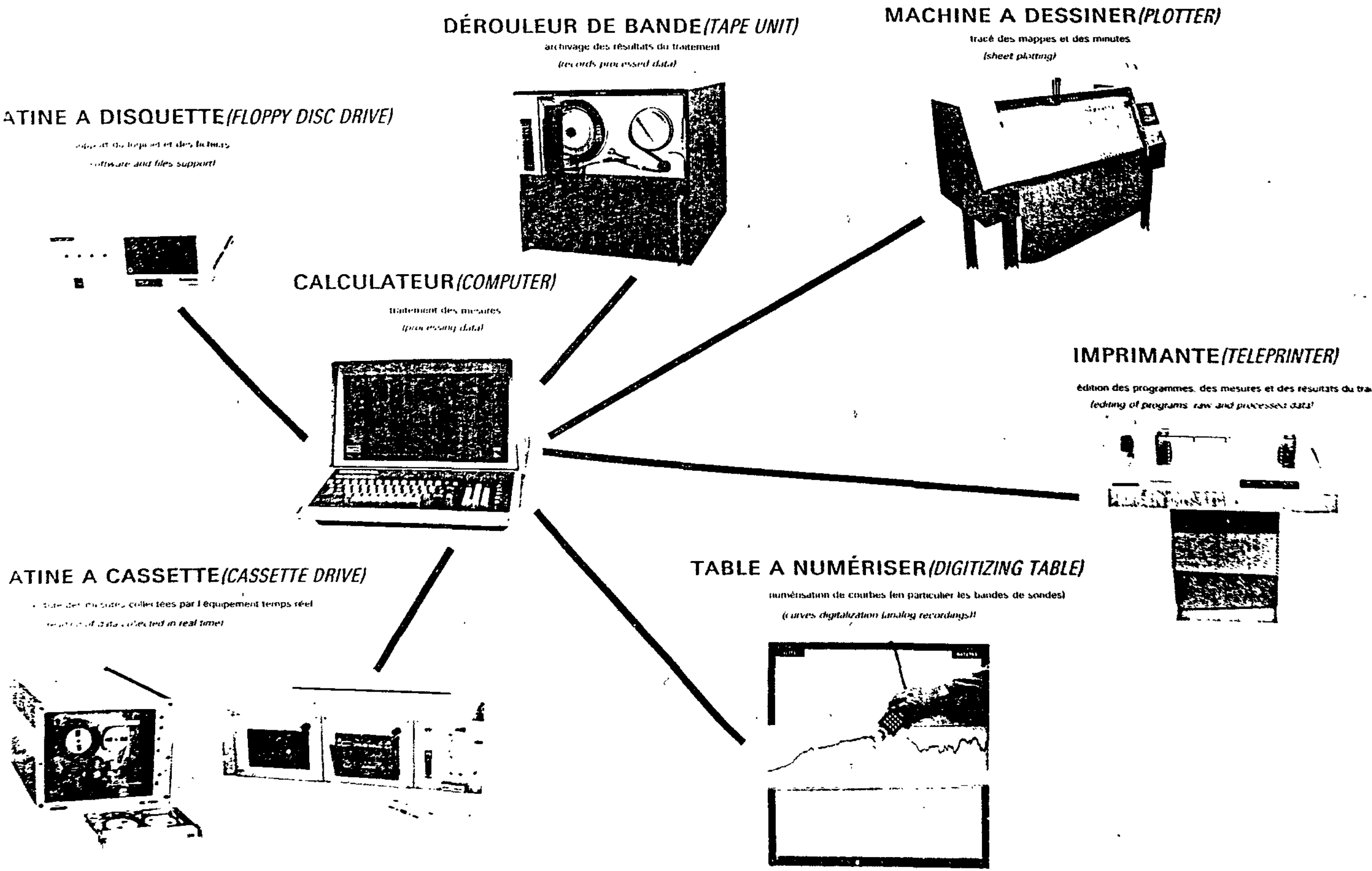
ÉQU[illegible]EM[illegible]MPS[illegible]ÉE [illegible]



APPENDIX 1

ÉQUIPEMENT TEMPS DIFFÉRÉ (POST PROCESSING EQUIPMENT)

SYSTÈME HYTRAI *(HYTRAI SYSTEM)*



Appendix 3

Main Computer (actual configuration)

I - Central unit DPS 8 /62 M . CII H.B.

Memory 6 MO

Power computation 1 M OPS

- Magnetic Discs units

  2 x 600 MO units

  4 x 160 MO units

- Magnetic tapes units

  3 units NTU 0431 density : 800, 1 600 BPI

  transfert speed : 75 IPS

- printer 1 100 l/mn

- card reader 600 c/mn

II - Frontal processor : DATANET DCU 6651

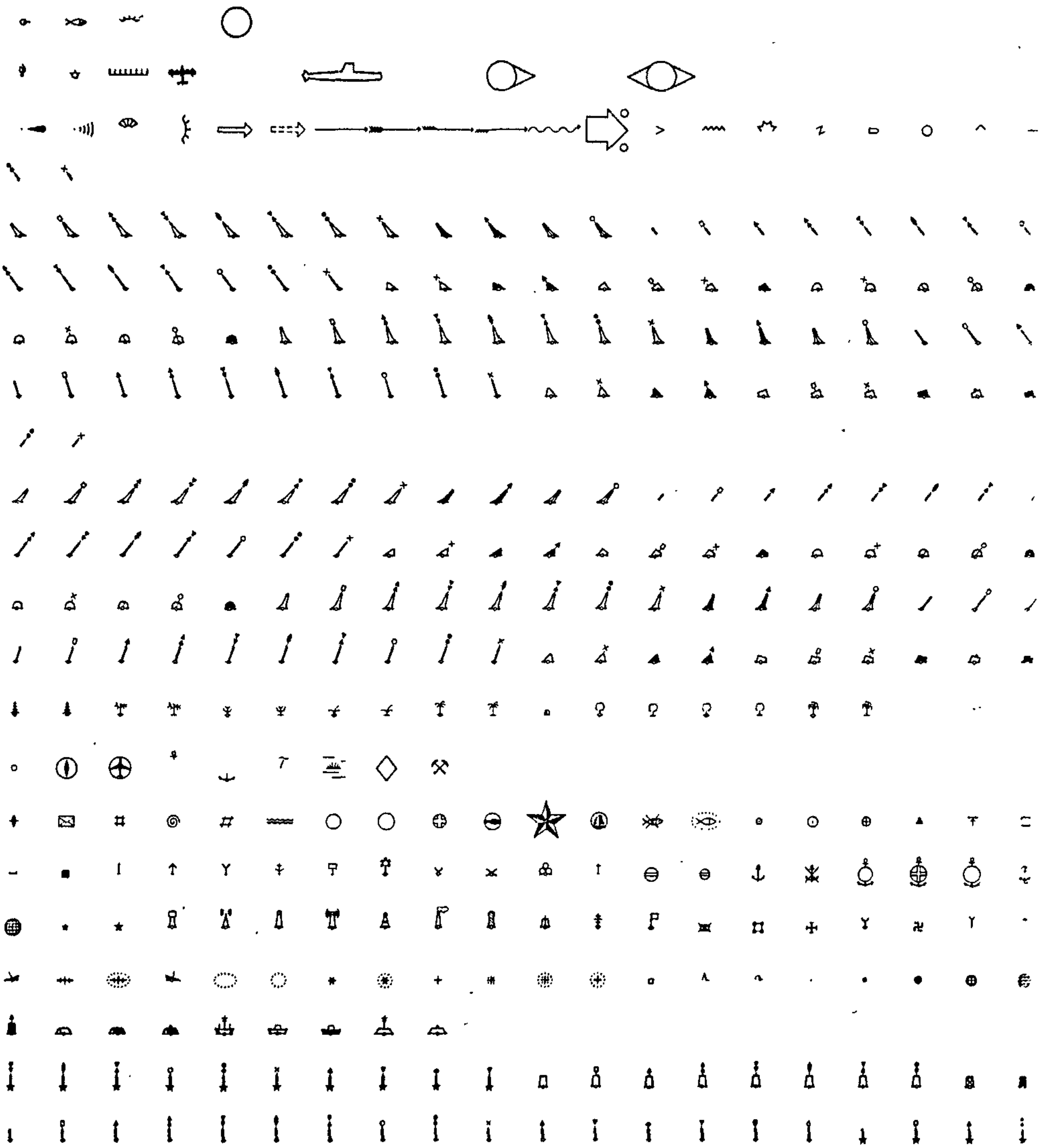
40 asynchronous lines 19 200 Bds

4 synchronous lines

24 QUESTAR stations

2 printers

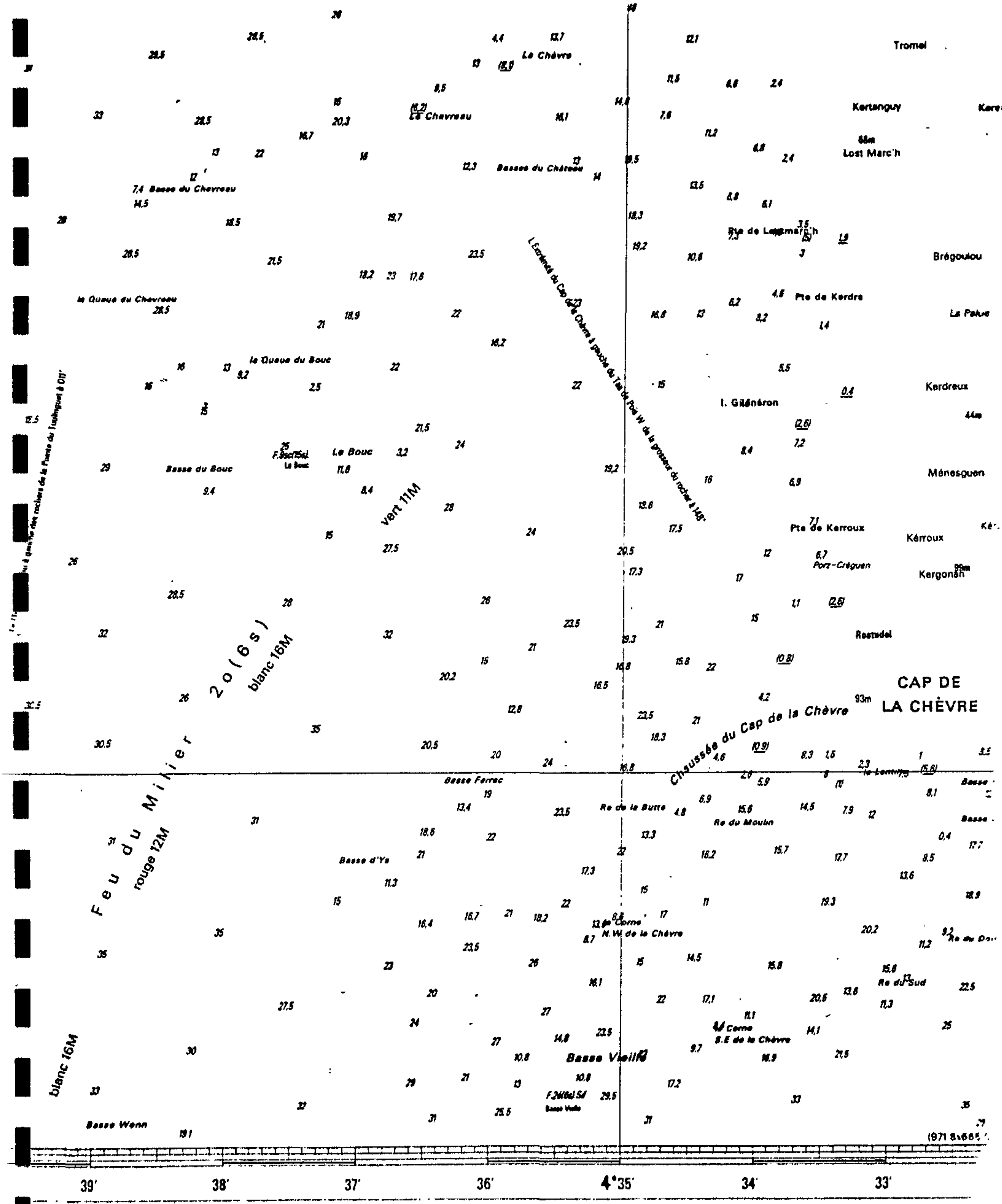
Appendix 4 Digital library international symbols

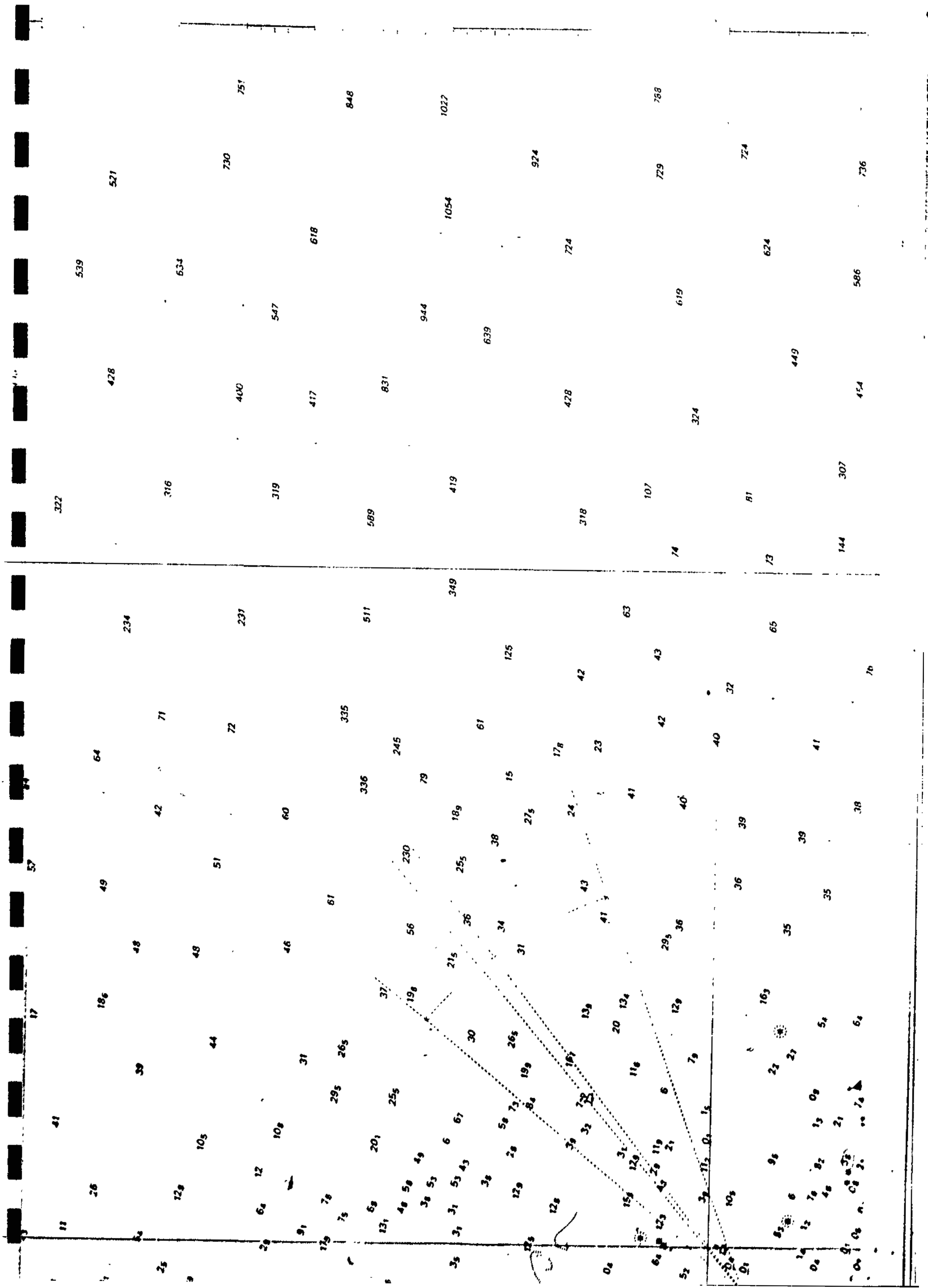


0	1	2	3	4	5	6	7	8	9	
A	B	C	D	E	F	G	H	I	J	55
K	L	M	N	O	P	Q	R	S	T	24
U	V	W	X	Y	Z	Æ	Œ		Ø	
a	b	c	d	e	f	g	h	i	j	
k	l	m	n	o	p	q	r	s	t	
u	v	w	x	y	z	æ	œ		ø	
,	.	:	;	—	-	«	»		ı	
		ß								
		±				(	)	[	]	
%	°	′	″			≤	≥	<	>	
$	&	?	!			§				
/	×	+	−	=	≠		*			

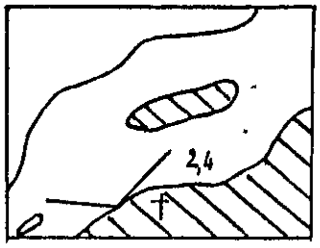
à	â	é	è	ê	ë	î	ï	ô	
ù	û	ü	ç	ñ	å	ă	á	ö	Î
Ă	Å	É	È	Ê	Ë	Ç	Ï	Ö	
Ô	Ñ	Á	À	Â	ä	Ä	ã	Ã	ā
Ā	ć	Ć	č	Č	ğ	Ğ	đ	Đ	ẽ
Ẽ	ḍ	Ḍ	ẖ	H̱	í	Í	ì	Ì	ī
Ī	ł	Ł	ń	Ń	ó	Ó	ò	Ò	õ
Ő	ō	Ō	ọ	Ọ	ś	Ś	s̄	S̄	š
Š	ş	Ş	ḥ	Ḥ	ţ	Ţ	ú	Ú	Ù
Û	ŭ	Ŭ	Ü	ũ	Ũ	ū	Ū	ý	Ý
ż	Ż	ź	Ź	z̄	Z̄	ž	Ž	ẓ	Ẓ
ƶ	Ƶ			ę	Ę	ą	ç	Ç	

Appendix 6
Restitution of digitized data (conventional)
example of letters

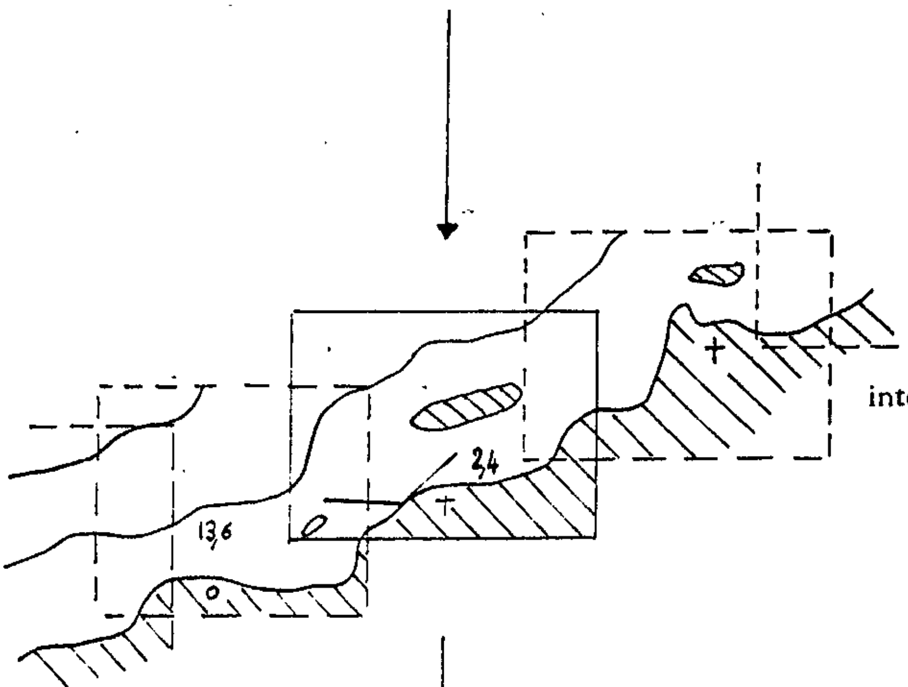




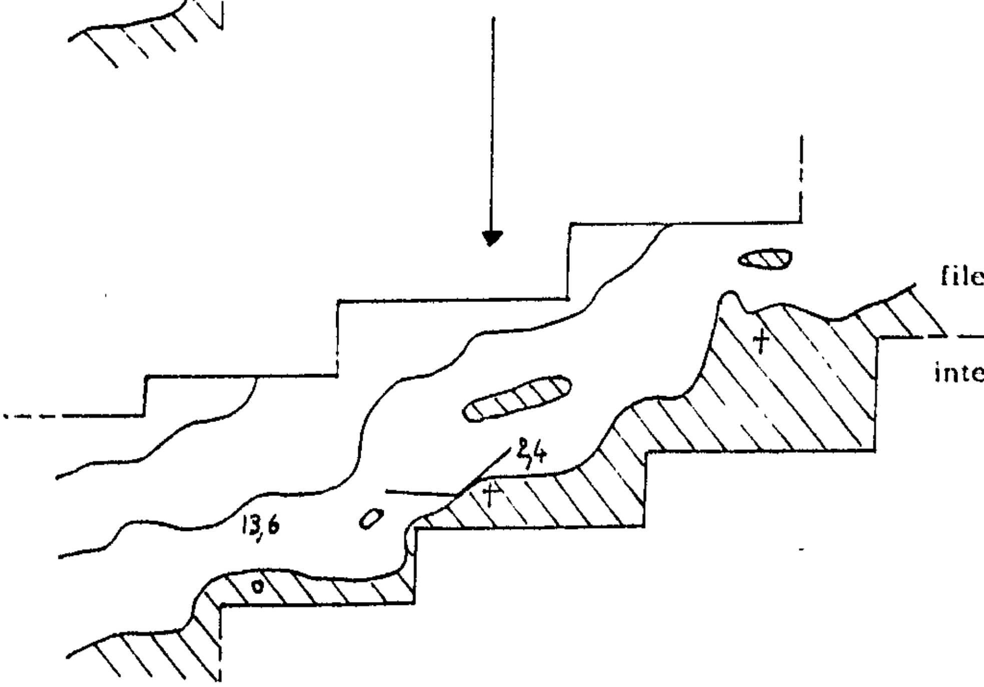
Appendix 8
Cartographic file
Graphic structure



digitized compilation



integration



file structure after integration

Beschrijving werkwijze Multi Beam Echo Sounder

Computer Processing and Presentation of Multi Narrow Beam Echo Sounding [SEABEAM] Data

Processing of SEABEAM data was undertaken at CNEXO (BNDO) in 1977 in collaboration with the C.O.B. Geology-Geophysics Department and with GENAVIR (CNEXO). Now at the beginning of 1980 the data is routinely replayed in the form of plots with geographic coordinates, the isobaths being traced along the route followed by the ship. Replays can also be made at sea, as can "real-time" plots.

Integration of navigation and bathymetry is clearly a key to successful SEABEAM mapping and, in this regard, the use of the bathymetric data to improve the "navigation" is under study.

1. OBJECTIVES

1.1. Definition of objectives

(a) Routine: replays of isobaths and archiving of data from a single cruise.

(b) Geographic syntheses of data from several cruises.

(c) Secondary products: profiles, slope measurements, tectonic directions, block diagrams and so forth.

1.2 Methods

The simplest efficient programs have been used to meet the requirements of the routine replays and simple geographic syntheses. More ambitious syntheses (automatized cartography) will inevitably involve supplementary studies, the problems being unavoidably complex. Some of the secondary products can (and have been) produced without particular difficulty. Others will be achieved by relatively simple adaptation of various existing programs and sub-programs. A few will require particular expertise and have not yet been tackled.

2. PROCESSING

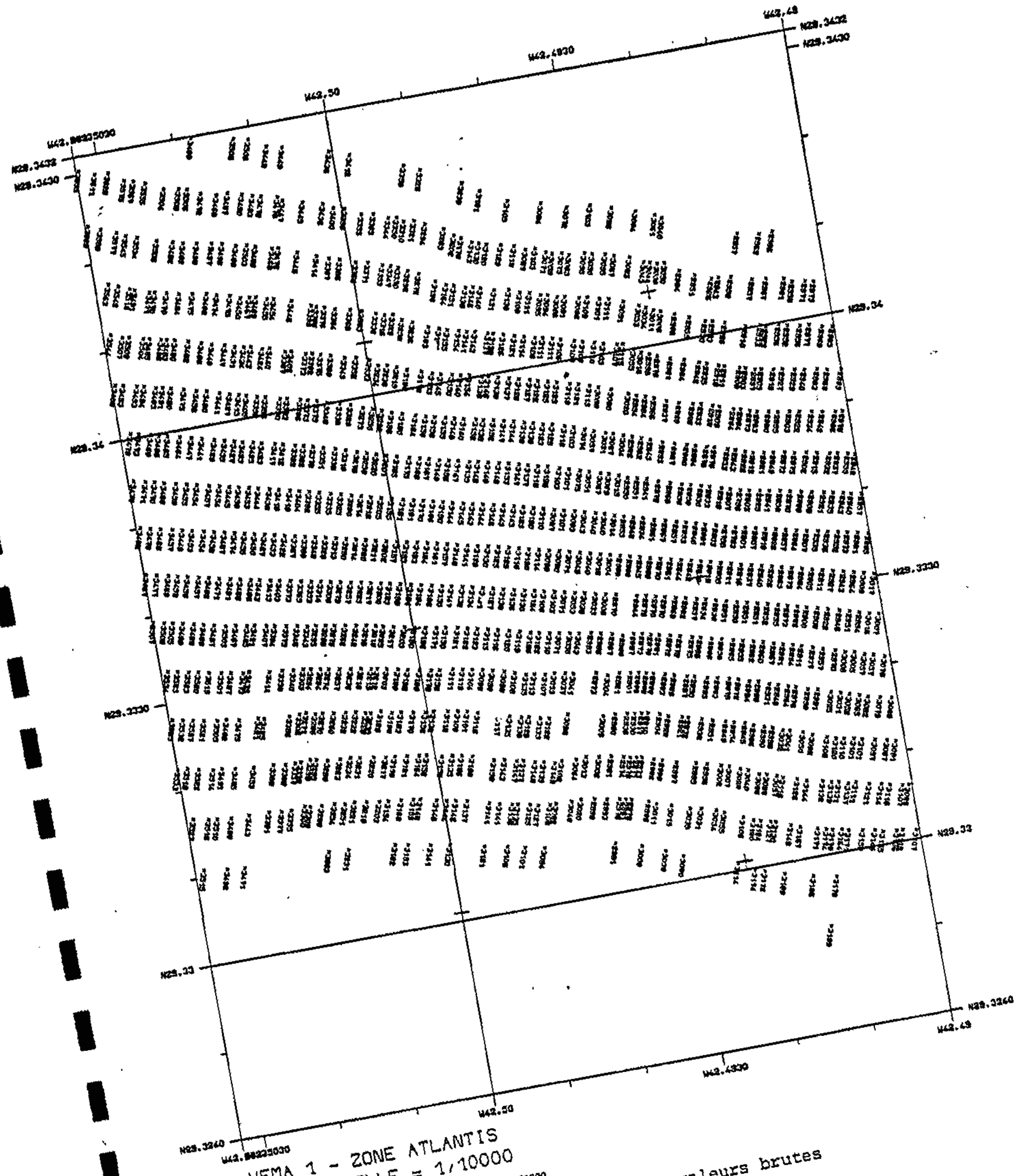
2.1 SEABEAM

2.1.1. Fusion with navigation

Initial steps include compacting the data and rendering it available in standard BNDO format. The next important step is the fusion of the SEABEAM data and the navigation. The end product for this step is a population of SEABEAM measurements in X, Y form for a given projection, which is kept as the basic reference for future outputs. The scale, of course, can be chosen at will.

2.1.2. Plotted discrete soundings (Fig. 1)

The "plotted soundings" program, useful for particular needs, is rarely used. The product obviously requires a great deal of time for exploitation by hand if a contoured map is the objective.



<u>FIGURE 1.</u> Report de valeurs brutes

2.1.3. Simple plotting of isobaths (Fig. 2)

The principle of this program is to focus successively on the individual quadrilaterals of the sounding network and to trace straight-line isobath segments between points of corresponding depth for each quadrilateral. The operation, applied to all the quadrilaterals within a given sonified strip of seafloor, leads to the standard isobath plot. Various complementary operations are used to render the product easier to read, and visually more pleasing and so forth; for example, by adding hachures to indicate the sense of slope directions, by thickening, or changing the colors of "master" isobaths and by selective numerical specification of depths. Sub-programs also enable depths to be interpolated and isobaths to be smoothed; and a special technique can be applied for maintaining the isobath plot during course changes.

2.1.4. More elaborate isobath plots (Fig. 3)

The relevant program includes, in addition to the possibilities of the simplified program, the tracing of the isobaths as joined segments of second-order tangents, and includes regular hachure-mark distribution.

2.1.5. Topographic profiles

Profiles for a given beam (depth versus time or distance) can be traced using a standard BNDO format or the X · Y format (2.1.1).

2.1.6. Archiving

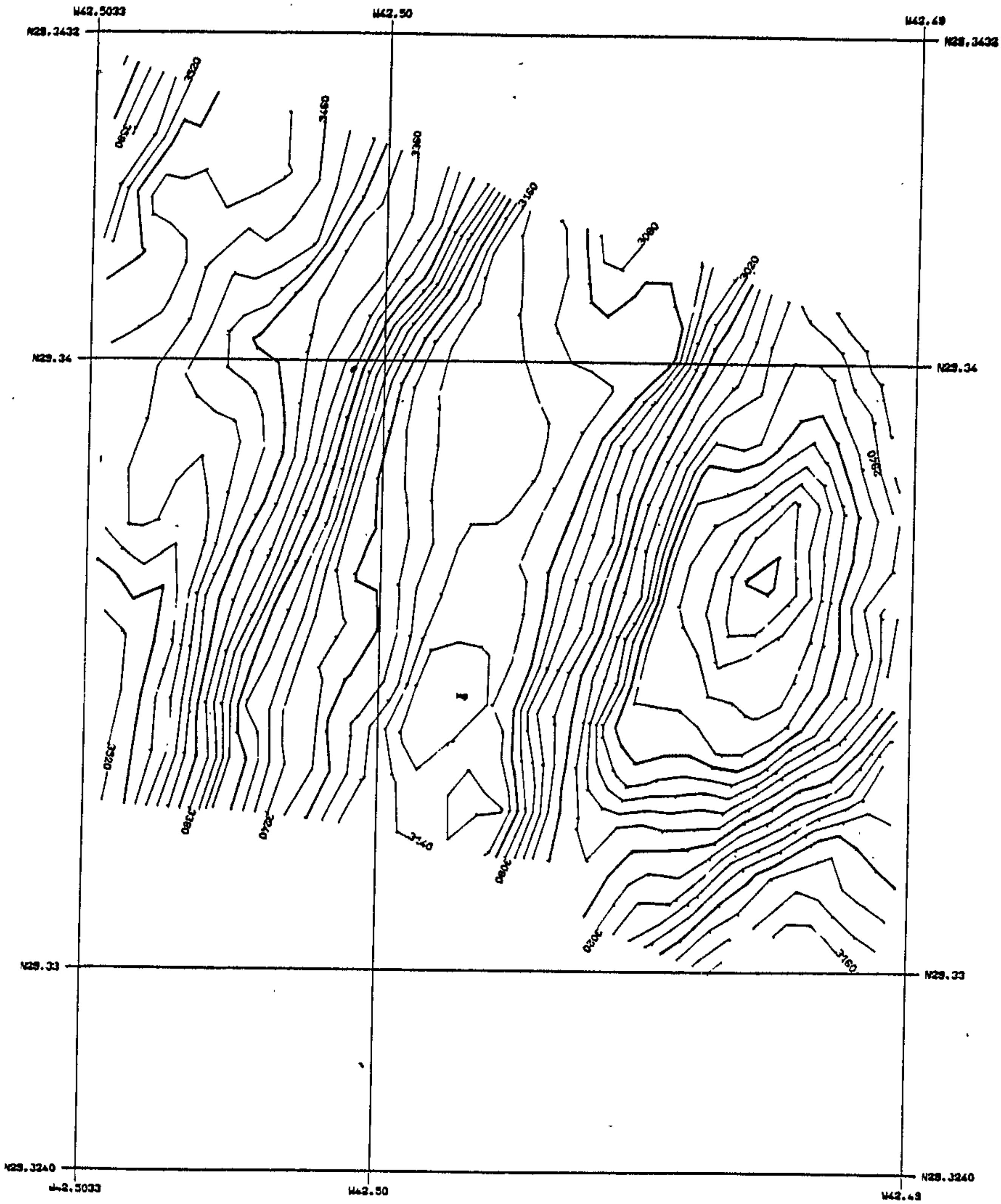
At present the data is stored in the form of magnetic tapes arranged on shelves, library-fashion. A more automatized system, with greater facility and rapidity of access to specific data, will be considered in the future.

2.2. On-board-ship processing of data

The simplicity of the SEABEAM replay programs has made it possible to transfer the routine work without particular difficulties to an HP21MX minicomputer suitable for use at sea, the more elaborate isobath plots (2.1.4) requiring a large memory bank excepted. In addition, at present, the system embarked on has a program for fusion of the SEABEAM data with radio-navigational fixes that is not available on the large C.O.B. Iris 80.

2.3. Navigation

The first concern has been to replay TRANSIT navigation, since the large majority of cruises make use of satellite fixes only.



VEMA1 - -ZONE ATLANTIS - NMOY=2;NTROU=5
BNDO - -PROJECTION MTU - ECH 1/10000

FIGURE 2. Report simple d'isobathes

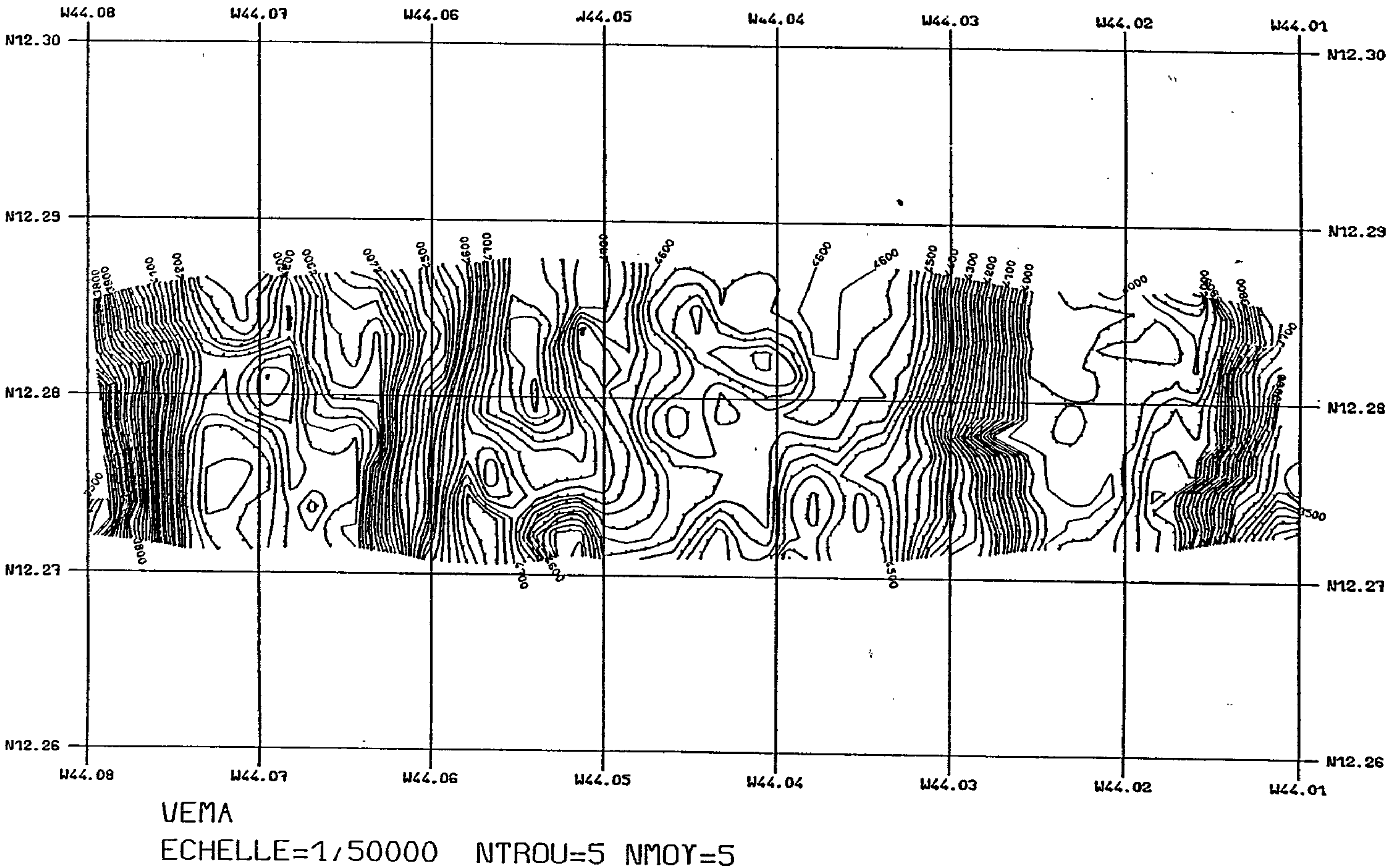


FIGURE 3. Report élaboré d'isobathes

2.3.1. Acquisition tapes

The basic navigational data is registered at sea on magnetic tapes (together with certain geophysical data). The exploitation of these tapes, with the navigational parameters plotted as a function of time or geographic coordinates, is now routine.

2.3.3. Processing

The first step is to reduce the number of "estimated" positions that will be involved in the calculations. The second step is to fuse fixes and "estimated positions", using either the program NAVIX, whereby drift is estimated in step functions, or the program NAVLIS, whereby it is estimated by second-order continuous functions. The latter program is potentially adaptable to other than satellite navigation and has already been used with differential OMEGA.

3. REAL TIME

The simple, routine SEABEAM isobath-plotting program (2.1.3), better suited for real-time plots than the G.I.C. product, has recently been used at sea, coupled with direct access to a Magnavox Satellite Navigator and manual intervention for finer control of drift. The real-time procedures will evolve largely in connection with changes in the navigational technique used.

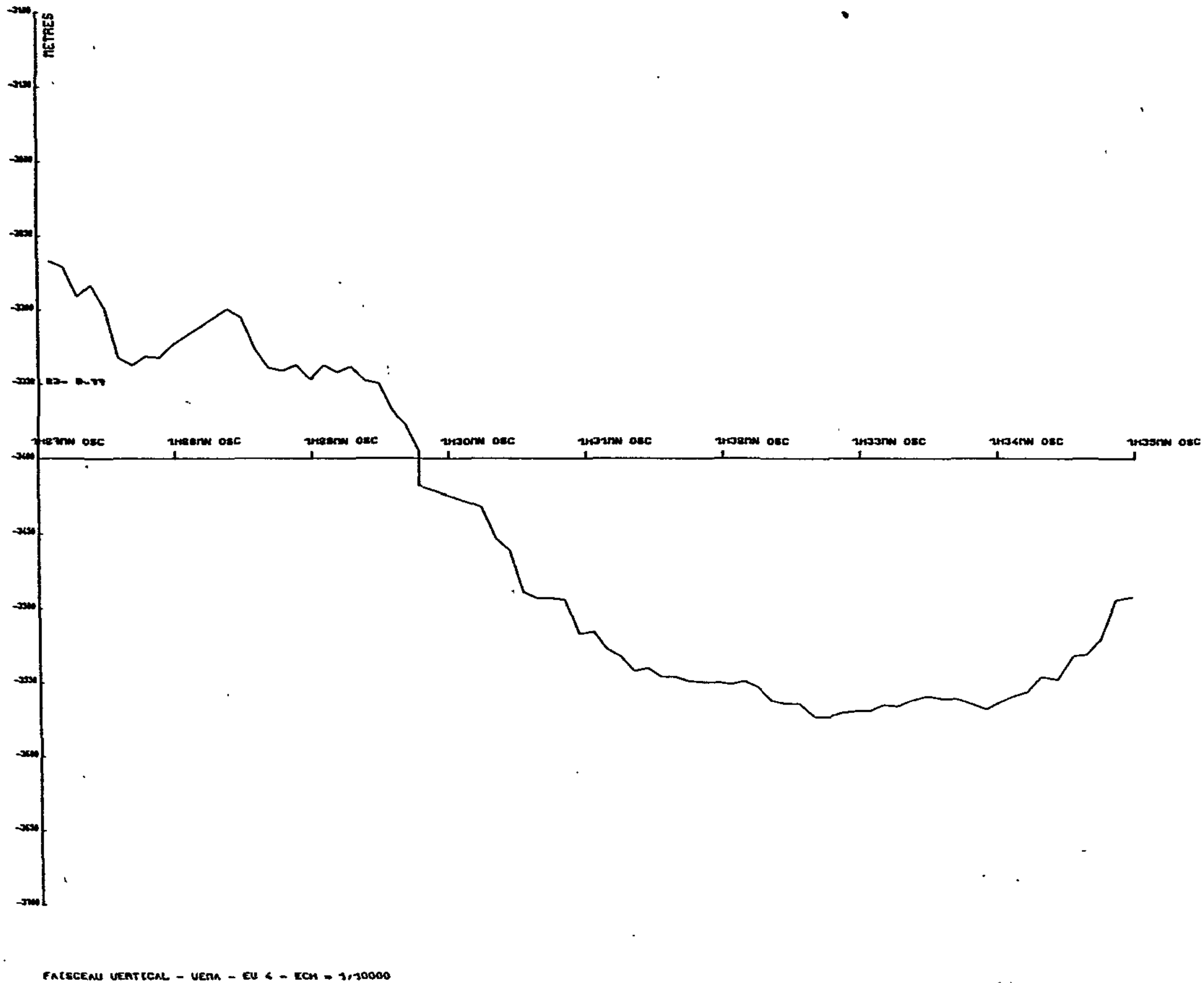


FIGURE 4. Tracé d'un faisceau vertical en fonction du temps

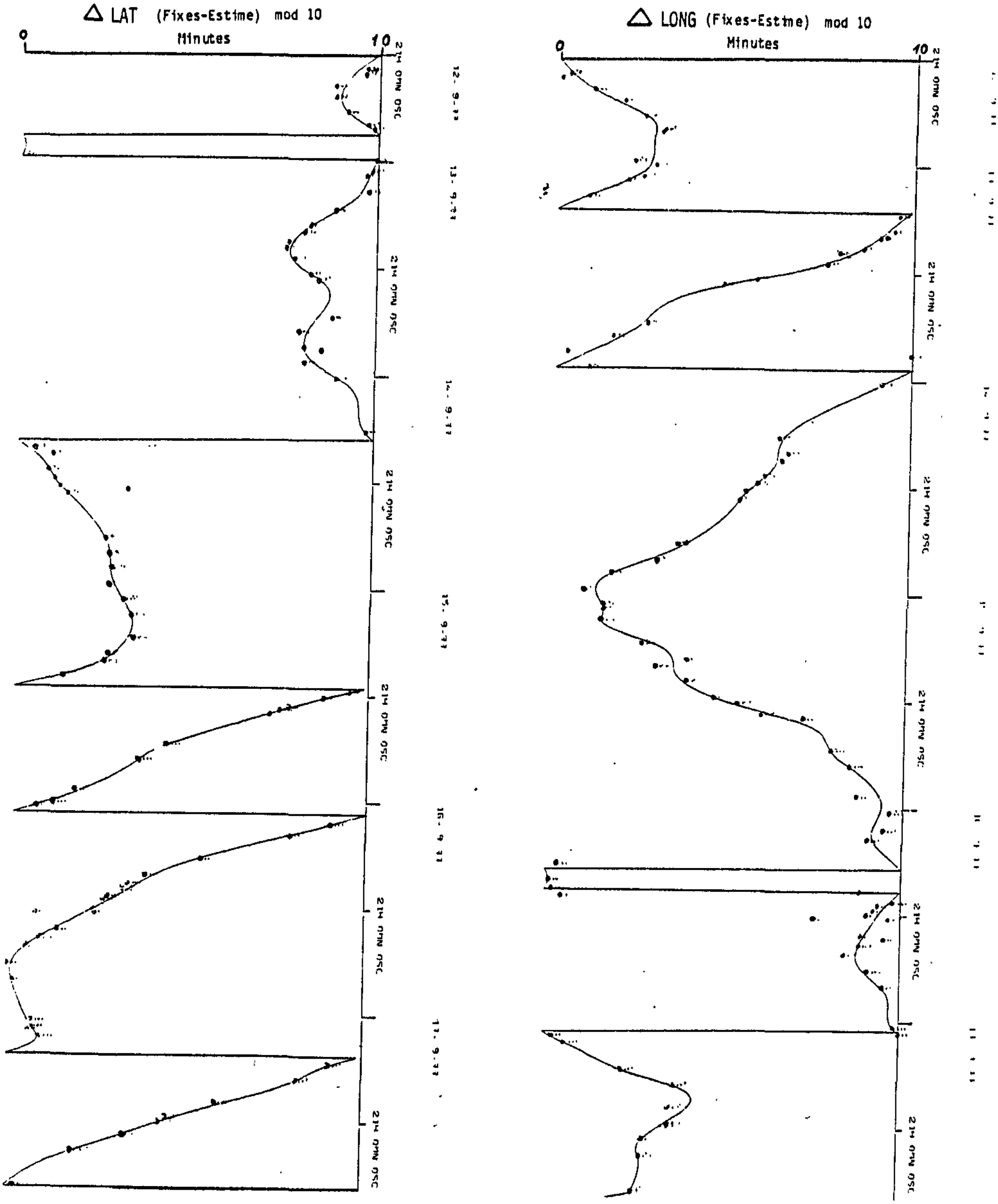


FIGURE 5. Tracé de deux composantes (latitude et longitude) de la différence de position entre les fixes et l'estime, et de la solution (ligne continue) choisie par le programme NAVLIS.