Barker, M. D. 1975. A study of geomagnetic micropulsations recorded at SANAE. *Ph.D. thesis.* Durban, Natal, South Africa, University of Natal.

Greenstadt, E. W. 1973. Field-determined oscillations in the magnetosheath as possible source of medium period daytime micropulsations. In: *Proceedings of the Symposium on Solar-Terrestrial Relations.* University of Calgary. 515p.

Gul'elmi, A. V. 1974. Diagnostics of the magnetosphere and the interplanetary medium by means of pulsations. *Space Science Review,* 16: 331.

Lanzerotti, L. J., A. Hasegawa, and N. A. Tartaglia. 1972. Morphology and interpretation of magnetospheric plasma waves at conjugate points during December solstice. *Journal of Geophysical Research,* 77: 6731.

Lanzerotti, L. J., H. Fukunishi, and L. Chen. 1974. ULF pulsation evidence of the plasmapause. 3, interpretation of polarization and spectral amplitude studies of Pc3 and Pc4 pulsations near L=4. *Journal of Geophysical Research,* 79: 4648.

Rostoker, G. 1967. The polarization characteristic of Pi2 micropulsations and their relation to the determination of possible source mechanisms for the production of nighttime impulsive micropulsation activity. *Canadian Journal of Physics,* 45: 1319.

Troitskaya, V. A. 1967. Micropulsations and the state of the magnetosphere. In: *Solar-Terrestrial Physics.* New York, Academic Press. 213p.

Troitskaya, V. A., N. G. Kleimenova, M. B. Gokhberg, A. V. Gul'elmi, D. N. Chetalev, and O. M. Barsukov. 1974. A study of variations of the earth's electromagnetic field. *Earth Physics,* 10: 46.

Webb, D., and D. Orr. 1976. Geomagnetic pulsations (5-50 mHz) and the interplanetary magnetic field. *Journal of Geophysical Research,* 81.

High-latitude ionospheric absorption

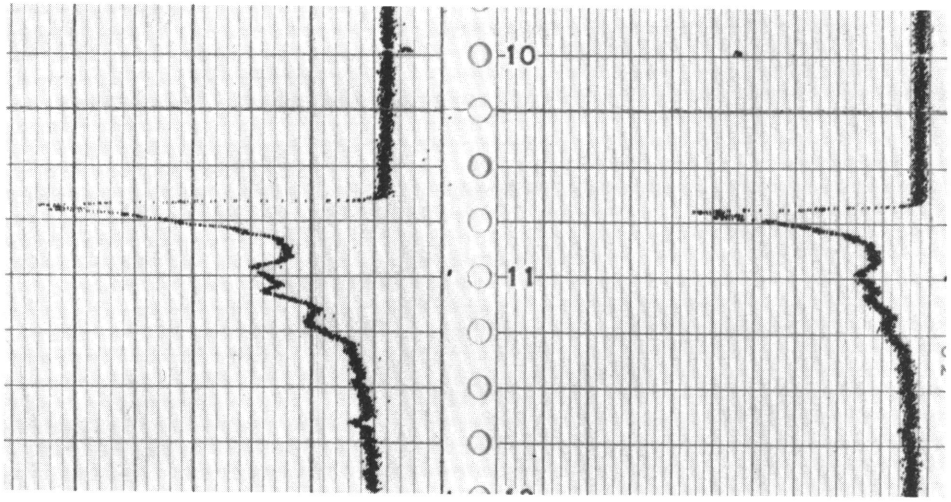
H. J. A. Chivers
Department of Applied Physics and Information Science
University of California, San Diego
La Jolla, California 92093

Various riometer (relative ionospheric opacity meter) systems with new fast-response units were operated in Antarctica in 1975. All had wide-beam antennas directed vertically to record overhead ionospheric absorption caused by entry of energetic particles into the earth's atmosphere under disturbed conditions.

At Siple Station, a 30-megahertz riometer was operated as part of the coordinated observations being made there and at the conjugate station near Roberval, Quebec, Canada, to investigate the magnetosphere. Previous investigation of analog recordings made at the site already has illustrated complex relationships among absorption, magnetic field changes, and very-low-frequency phenomena. Emphasis now is on detailed analysis of the simple isolated events that occur at Siple. Digital magnetic tape records made in parallel with the analog records are being used for this analysis. Riometer observations made with both wide-beam and narrow-beam systems at Roberval now are available and will be compared with simultaneous recordings made during 1975 at Siple.

With the cooperation of personnel of the National Oceanic and Atmospheric Administration (NOAA), wide-beam riometer observations at 30 and 51.4 megahertz were made continuously at Amundsen-Scott South Pole Station throughout 1975. The station intersects the auroral oval daily, so absorption occurs frequently. At the South Pole, there is no confusion of the riometer records by either daily solar elevation changes or variations in sky background; thus analysis of the records is straightforward. Although a digital magnetic tape recording was not made, high quality analog records were obtained. We find that the onset of absorption for events occurring when the station is in the night sector is faster than expected from previous observations. The figure shows an example. Although the chart speed is only 2.5 centimeters per hour, since the recorder operated by making impulses every 2 seconds, it is possible to measure the onset duration accurately. In the figure, absorption reaches a maximum of 7.1 decibels at 30 megahertz and 3.2 decibels at 51.4 megahertz in about 150 seconds. Detailed analysis of events like this shows that they are caused by absorbing ionization that initially occupies a narrow strip above the station. This strip of ionization is quickly replaced by broad ionization filling the beam. The mechanism for this rapid change is either expansion of the original strip or movement across the beam of an absorbing region that has a narrow band of intense ionization at its leading edge. Although the latter explanation is attractive because of the similarity to westward surges observed optically in satellite auroral pictures, a firm explanation cannot be made until spaced-station, narrow-beam riometer observations are possible. Only in this way can dynamic analysis of the auroral ionization be made for comparison with magnetospheric phenomena.

Operation of a 30-megahertz wide-beam riometer near McMurdo was made possible through the cooperation of the N.Z. personnel at Scott Base and at Lauder, New Zealand. The instrument operated successfully until September 1975, when an external cable broke. Operations were restored in January 1976. Initial analysis of the records shows no significant polar cap absorption during the operating period, although observing conditions were good. Several small events of short duration were observed. The facilities at Arrival Heights were expanded during the 1975-1976 austral sum-



Absorption event recorded on 30 and 51.4 megahertz at South Pole, 2240 Greenwich Mean Time, 14 March 1975.

mer so that 30- and 51.4-megahertz riometers are now operated there. Ratio analysis of these records will make possible a determination of whether the polar cap absorption events change in size as do those observed in the auroral oval.

This research was supported by National Science Foundation grant DPP 72-00459.

Electron precipitation and associated phenomena near the plasmapause

T. J. ROSENBERG
Institute for Physical Science and Technology
University of Maryland
College Park, Maryland 20742

During July 1975 the University of Maryland, in collaboration with the University of Houston and the Norwegian Institute of Cosmic Physics, conducted high-altitude measurements from balloons of X-rays, direct-current electric fields, and very low frequency (VLF) radiowave emissions. These measurements were made in the vicinity of Roberval, Quebec, Canada (48°N. 72°W.) and formed part of a cooperative program that included groundbased VLF direction-finding measurements in the Roberval area by groups from Stanford University, the University of Southampton, England, and the University of Tokyo, Japan.

The scientific purposes were (a) to investigate particle precipitation phenomena induced by natural VLF radio waves in the magnetosphere and by signals from the VLF transmitter at Siple Station (76°S. 84°W.), (b) to make direction-finding measurements on the magnetospherically propagated signals from the Siple transmitter in order to evaluate various types of direction-finding systems, and (c) to study the positions, movements, and relation to the plasmapause of particle precipitation regions and transmitter signal paths.

This report deals primarily with the balloon program. Six successful launches were made from 5 through 22 July. The table summarizes these flights. All flights carried an uncollimated sodium iodide scintillation counter provided by the University of Maryland. X-rays from precipitating electrons were detected and sorted into two integral energy channels (greater than 25,000 and greater than 500,000 electron volts) and seven differential energy channels between 25,000 and 500,000 electron volts. Four of the flights carried three-axis direct-current electric field probes provided by the University of Houston. The other two flights carried broadband (0 to 5,000 cycles per second) VLF radio receivers provided by the University of Oslo.

Measurements were made during both quiet conditions and geomagnetically disturbed periods. Rapid time variations of the enhanced X-ray flux and VLF emission intensity were evident during the disturbed periods. The E-field measurements also indicated the possibility of interesting correlative features with the X-ray flux. Two flights (on 15 and 22 July) were aloft when signals from the Siple transmitter were received at Roberval. Data from these flights are being examined for evidence of artificially stimulated effects in the particle precipitation. For the most part, however, the enhanced X-ray fluxes apparently resulted from