International Council of Scientific Unions

78 - 6

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IMS NEWSLETTER

This month we welcome a new English - speaking IMSCIE associate from "Down Under" (he says). Peter Davies of the Ionosphere Prediction Service, Sydney, Australia, joins the IMSCIE office for 12 months. Joe and Maurizio have gone to Innsbruck (vaction?), and we expect a good report from them in the following NLs. The assistance provided by R.W. Buhmann (WDC-A) in the preparation of this NL is greatly appreciated.

T.K. 78/06/01

IMSCIE Office: Telex 45897 SOLTERWARN BDR
Telephone: 303-499-1000 x6501 (FTS 323-6501)
Satellite Situation Center (J. Vette): Telex 89675 NASCOM GBLT
Telephone: 301-982-2354
European Information (P. Simon): Telex 200590 CNET OBS B MEUDO
Telephone: 027-75-30 et 75-70
USSR Coordination/Information Office (I. Zhulin): Telex 7523 SOLTER SU

PROGRAM PLANS FOR JUNE 1978 - AUGUST 1978

SPECIAL IMS HIGH-ALTITUDE SATELLITE PERIODS - 1978

IMS Satellite Situation Center announced one new Special High-Altitude Satellite Interval #11. Detailed information and conjunctions for this interval and more intervals for the second half of 1978 will be announced in the next IMS NL. Approximate time for interval #11 is:

#11 29 Jul (day 210) 2300 UT to 2400 UT

Special IMS High-Altitude Satellite Intervals for June-July 1978 are given here. On page 4 of IMS NL78-2 details are given listing all the SSC-selected Special Satellite intervals for January-June 1978 and the configurations that were the basis for this designation by the IMS Satellite Situation Center. Times of the intervals given below were extended by six hours at start and end of each period from those given in the detailed table because the boundaries used in the exact model calculations may fluctuate during disturbances. Similar extended periods were announced for 1976 and 1977 in IMS/SSC Reports and IMS NLs.

28 Jun 179/0600 UT to 29 Jun 180/0300 UT 29 Jul 210/1700 to 30 Jul 211/0600 UT

SPECIAL LOW-ALTITUDE SATELLITE CONJUNCTIONS

See Program Details NL78-4 for special requests for coordinated satellite data acquisition intervals and copy of a typical recent satellite conjunction forecast telex sent to spacecraft experimenters and staff. Magnetic flux tube conjunction times have been forecast by the IMS SSC for GEOS, ISEE, and selected low - altitude satellites and ground-based arrays on a weekly basis. These forecasts have been distributed via telex from the IMSCIE Office to provide two or three week advance notice of opportunities for coordinated data acquisition. Generally, these messages are too numerous and lengthy to include in these NLs.

SATELLITE LAUNCHES:

Jul 14; K. Knott; "GEOS-2"; ETR; SATELLITE - update below
Aug 12; T.T. von Rosenvinge; "ISEE-C"; ETR; SATELLITE - details below
Aug 1 to Sep 30; T. Obayashi; "EXOS-B"; Uchinoura; SATELLITE - details below

GROUND-BASED, BALLOON AND ROCKET CAMPAIGNS:

----------Phenomena-related Campaigns----------

------ to Sep 30; Ejiri, Kimura, Oya, & Nakamura; "AUSTRAL WINTER CAMPAIGN"; Syowa; ROCKETS(4)- NL 78-3
Jun 1 to Jun 30; A. Christensen; "18.1023UE"; White Sands; Rocket - launch window updated
Jun 1 to Jun 30; Smith, Morse, Kelley; "JASPIC"; Wallops Is.; ROCKETS (4) - See below for update
Jun 1 to Jun 30; ????; "JASPIC"; Shipboard launches; ROCKETS (5) - See 78-4, pg 3 for details
XXXXXXXXXXXXXXXX; S. Ullaland; "SBARMO"; Scandinavia; BALLOONS (36) - update below
Jul 1 to Jul 31; G. Thomas; "31.xxxUE"; White Sands; ROCKET - Nike-Orion for plasma physics
Jul 7 to Aug 8; I.B. Iversen, M.M. Madson; "POLAR 78"; Ny-Alesund; BALLOONS (3) - see details below
Jul 27 to Aug 15; L. Bjorn; "D-Layer Campaign"; Kiruna, ESRANGE; ROCKETS (7) - update below
Aug 1 to Aug 31; W.R. Sheldon; "23.009UE & 23.010UE"; White Sands; ROCKET (2) - Plasma Physics
Aug 7 to Aug 14; R.H. Holzworth; "E-Field Summer 78"; Canada; BALLOONS (10) - see update below

------Quasi-synoptic Observations involving Balloons, Rockets, Aircraft, Selected Surface Campaigns------

Jun 1-14, Aug 1-2; Bauer, Evans; IISN; Global Network; SURFACE - See NL 78-2, pg 2 for details
Monthly; Wright & Hilsenrath; "OZONESONDE"; Various Sites; ROCKETS - See Actualities, NL 77-10, pg 3

----------Observing Plans for Temporary Surface Stations----------

Apr 20 to Oct 15; Siebert; "GEOMAGNETIC PULSATIONS"; N. Scandinavia; SURFACE - See actualities
May 1 to Nov 30; K. Wilhelm; "GEOMAGNETIC PULSATION CAMPAIGN"; 20 W to 40 E; SURFACE - NL 78-5 pg 3&11

REGIONAL IMS SAT/GBR PROGRAM DETAILS, JUNE - AUGUST

Program details for many brief listings given above appeared, as indicated, in earlier IMS NLs.

SATELLITES

GEOS-2 --- K. Knott, ESA-ESTEC, telephoned us about the delay of Delta launches at NASA Eastern Test Range (Canaveral). Mainly because of 3 weeks delay of OTS-2 launch, GEOS-2 is now rescheduled to be launched on July 14 from June 22.

This delay may affect some experiments coordinated with GEOS experiments and there will be discussions about such experiments at the Innsbruck meeting. We will notify decisions of the meeting in the coming NLs. Eleven experiments of GEOS-1 were briefly described in NL 77-6 pg 4&7, and modifications for GEOS-2 were reviewed in NL 78-3 pg 2 & 3.

GEOS-1 --- According as to the delay of GEOS-2 launch, GEOS-1 will be alive a little bit longer. GEOS-1 will be shut off at the end of data acquisition on June 23.

ISEE-C (HELIOCENTRIC) --- For the same reason as the delay of the GOES-2 launch, the launch date of this satellite is also rescheduled to August 12 from July 24.

This is the third satellite of the International Sun-Earth Explorer program undertaken jointly by NASA and ESA. A Thor-Delta will put this satellite into an elliptical halo orbit (heliocentric) about the libration or Lagrangian point 235 earth radii (1,500,000 km) from the Earth on the line between the Earth and the Sun where the gravitational forces of two and centrifugal force balance. Being upstream of the Earth in the solar wind, ISEE-C will be able to monitor solar wind parameters about 1 hour before the solar wind particles impinge upon the magnetosphere.

ESA Bulletin Feb. 78 has an article by A.C. Durney, ESA-ESTEC, describing ISEE project. A table showing experiments and principal experimenters of ISEE-C on the facing page is taken from this article.

IMS NL 77-8 pg 8 covers ISEE mission objectives, references to several published articles and details of data processing and distribution. Brief descriptions on each experiment and co-investigators are listed in NSSDC-WDC-A-R&S 77-03, September 1977 issue. SCIENCE Oct. 14, 1977, Vol 198 has an article about ISEE project written by K.W. Ogilvie (Project Scientist of ISEE-1), T.T. von Rosenvinge (PS of ISEE-C) and A.C. Durney (PS of ISEE-2).

Instrument Title	Principal Investigator
X-rays and electrons x-rays, 8 to 72 keV; electrons, 2 to 1000 keV	K.A. Anderson
Solar-wind plasma Ions, 150 eV to 7 keV, 4.2% FWHM; electrons, 5 eV to 2.5 keV, 10% FWHM Three-dimensional distribution function	S.J. Bame
High-energy cosmic rays Species H through Fe (resolution, 0.15 atomic mass unit, $1 < Z < 26$)	H.H. Heckman
Low-energy cosmic rays Particle composition; up to 20 MeV/nucleon	D. Hovestadt
Energetic protons Protons, 30 keV to 1.4 MeV; alpha-particles, 1.4 to 6 MeV	R.J. Hynds
Cosmic-ray electrons and nuclei Electrons, 5 to 400 MeV (DES); protons, 36 to 13 000 MeV (DES); 13 GeV (IES) Elements separated: helium-sulphur, 60 to 13 000 MeV/nucleon (DES); >13 GeV/nucleon (IES)	P. Meyer
Plasma composition 470 eV/Q to 10.5 keV/Q: M/Q 1.4 to 6.5; 3% FWHM resolution	K.W. Ogilvie
Plasma waves Magnetic field: 8 channels, 60-dB range, 20 Hz to 1 kHz Electric field: 16 channels, 80-dB range, 20 Hz to 100 kHz (continuous, no switching)	F.L. Scarf
Radio mapping Three-dimensional tracing of paths of type III bursts in band from 20 kHz to 3 MHz	J.L. Steinberg
Helium vector magnetometer Eight ranges (± 4, ± 14, ± 42, ± 640, ± 4000, $\pm 22\,000$, and $\pm 140\,000\,\gamma$); Frequency response 0 to 3 Hz with three bands (0.1 to 1, 1 to 3, and 3 to 10 Hz) for measurements of fluctuations parallel to the spacecraft spin axis	E.J. Smith
High-energy cosmic rays Ranges: $Z = 3$ to 28 (Li to Ni); $A = 6$ to 64 (^{6}Li to ^{64}Ni); energy = 2 to 200 MeV/nucleon Mass resolution: Li, 0.065 to 0.83 proton masses; Fe, 0.18 to 0.22 proton masses	E.C. Stone
Medium-energy cosmic rays Nuclei, $Z = 1$, 0.5 to 4 MeV/nucleon (SPA) and 4 to 500 MeV/nucleon (MPA); $2 \leqslant Z \leqslant 26$, 0.5 to 500 MeV/nucleon (MPA) Electrons, 0.7 to 0.2 and 0.3 to 12 MeV Isotopes, $Z = 1$ and 2, 4 to 80 MeV/nucleon; $3 \leqslant Z \leqslant 7$, 8 to 120 MeV/nucleon; $8 \leqslant Z \leqslant 16$, 10 to 200 MeV/nucleon	T. von Rosenvinge
Ground-based solar studies Solar spectral observations	J.W. Wilcox

EXOS-B --- T. Obayashi, ISAS, U. of Tokyo, is the project scientist of the second satellite of EXOS series. A M-3H rocket will be used to put the satellite into an orbit of apogee 30,000 km, perigee 300 km, inclination -30 deg. and period 8 hours in August or September from Kagoshima Space Flight Center. The objectives of this satellite are 1) Investigation of correlated mechanisms between the particles and fields and the plasma turbulence 2) Observations of detailed structure of the plasmasphere by the in-situ measurement techniques using the plasma wave phenomena and the electrostatic particle analysers.

The experiments and experimenters are:
1) SPW (Stimulated Plasma Wave) : A 300 Watt RF pulse will be fed into 120 m antenna to trigger plasma waves. - H. Oya, Tohoku U.
2) NPW (Natural Plasma Waves) : VLF EM & ES waves (100 - 100 kHz), plasma waves (100 kHz - 1 MHz) ion waves (100 Hz - 1 kHz) - H. Matsumoto, IRL, Kyoto U., S. Miyatake, U. of Electro-Communications.
3) DPL (electron density and temperature measurements by VLF Doppler technique) - I. Kimura, H. Hashimoto, Dep. of Electrical Engin., Kyoto U.
4) IEF-I (electron density measurement by Impedance probe) & 5) IEF-EF (Electric Field measurement) - T. Obayashi, M. Ejiri, K. Tsuruda, ISAS, U. of Tokyo, T. Ogawa, GI, Kyoto U.
6) MGF (Magnetic Field Measurement) - I. Aoyama, F. Toyama, T. Takahashi, Fac. of Engin., Tokai U.
7) ESP (Energy Spectrum of Particles) : 10 eV to 20 KeV electrons and protons & 8) CBE (Controlled electron Beam Emissions) - N. Kawashima, H. Kubo, S. Sasaki, T. Mukai, Y. Murasato, ISAS U. of Tokyo.

Correlated observations are planned with EXOS-A (Kyokko), Syowa-Iceland conjugate point experiments and Siple VLF station.

GROUND BASED, BALLOON AND ROCKET CAMPAIGNS

CANADA

E-Field campaign (WWB-78) --- At press time R.H. Holzworth sent us extensive updates on Balloon campaigns. From his letter;
"In view of delays in GEOS II launch and in spite of cancellation of SBARMO for 1978, Berkeley will go ahead with WWB 78. As earlier reported, we plan to launch up to 10 balloons total, from two sites: Thompson, Manitoba and Schefferville, Quebec during the week August 7-14, 1978. We expect auroral zone electric field measurements from Chatanika and STARE radars to be coordinated with this campaign and hope the Danish POLAR 78 will also be delayed to this time frame.

Since the number of simultaneous electric field measurements will be somewhat smaller than for the combined program, we will be concentrating more heavily on studying electrical coupling questions between ionosphere and equator with the best combinations of satellite electric field detectors yet available on S3-3, ISEE 1 and GEOS II."
(See NL 78-3 pg 4 & actualities in this NL)

NY-ALESUND(VEST SPITSBERGEN)

POLAR-78 --- The project scientists of this balloon campaign are I.B. Iversen and M. Mohl Madsen. Three balloons will be launched from Ny-Alesund (Vest Spitsbergen Island in the Arctic Ocean) between July 7 and August 8 to investigate the nature of cosmic radio noise absorption, the relation between electric fields and currents in the ionosphere and the worldwide electric field variations. These balloons are assumed to drift westwards along 79 deg. N to west of Greenland. The instruments are: Electric DC-field probes, Detector for aurora and X-rays and 3-axis fluxgate magnetometer. Two of these balloons will be equipped with a riometer for monitoring cosmic radio noise absorption. This program is in cooperation with SBARMO-78 and the E-Field campaign of U. of California, Berkeley.

SCANDINAVIA

SBARMO --- P. Simon of the IMS European Information office telexed us that the delay of GEOS-2 launch has caused possible cancellation of this program until 1979. The launch window of this campaign will be a subject of discussion at the Innsbruck meeting. (See NL 78-3 pg 4)

ESRANGE, KIRUNA

D-LAYER CAMPAIGN --- P. Simon corrected the announcement of this campaign in the last NL pg 11. VLF campaign by K. Bullough is scheduled in "Substorm GEOS Campaign" in Jan. to Mar. 1979. This campaign now has 5 sub-programs: S-26, S32, D-Layer, Atomic Oxygen and Aircraft.

WALLOPS ISLAND

JASPIC --- This Joint American Soviet Particle Intercalibration Project was described in NL 78-4 pg 3 & 4.

L.G. Smith , U. of Illinois, gave us the following information about his experiments on 2 Nike-Apaches: 1) measurement of electron density by Langmuir probe and propagation experiment. 2) particle (electrons & protons) measurement using electrostatic analyzer (1 KeV - 20 KeV), and an array of 6 solid-state detectors (10 KeV - 100 KeV), plus a sophisticated microprocesser data manipulation experiment. Launch window for his experiments is Jun 2 to 24 on fairly magnetically disturbed nights.

M. Kelley, Cornell U., informed us about his experiment on a Nike Apache (14.539UE): Neutral wind and electric field exploration using chemical releases (Tri-Methyl Aluminum trail and Barium cloud). Mikkelsen, Danish Meteorological Ins., is the co-experimenter for this program.

ACTUALITIES

SATELLITE

ISIS-1&2 --- IMSCIE office received another listing of data acquisition intervals at ISIS-GEOS conjunctions, similar to the listing described in NL 78-3 pg 3. This is for March 1978. This list has 21 intervals for ISIS-1 and 57 intervals for ISIS-2.

ESRANGE, KIRUNA

S27(Twilight) --- G. Witt, Department of Meteorology, U. of Stockholm, was the project scientist for this rocket (Nike Orion, 31.006UE) launched on Apr. 13 @ 1922.35 UT to 153 km altitude during expected auroral conditions. Experiments worked properly. Its objective was for a study of NO UV emissions in sunlit (twilight) aurora. Experiments and principal experimenters were:
UV polychromator with NO gas, Tilting-filter photometer & Filter radiometer for O2 - G. Witt,
UV scanning Ebert spectrometer - P. Feldman,
Ion and electron density probes - B. Holback.
(NL 78-2 pg 3). A second Twilight S27 experiment is planned in next Mar. to Apr.

POKER FLAT

Auroral Structure --- J.C. Ulwick, AFGL, launched Sergeant Hydac IC719.08-1 successfully on Feb. 28. The objective of this rocket was to support satellite wide band transmission program by providing the detailed electron structure during Wideband satellite pass. (NL 78-3 pg 3)

WS610.51-2 --- M. Baron, Stanford Res. Ins. successfully launched an Honest John Nike-Hydac, the second of two rockets in the Wideband program, the first being launched in Nov. 77 (NL 78-1). The objective was to make observations of electron density and energetic particles in coordination with the Wideband satellite radio beacon program. (See NL 78-2 pg 3)

18.101BUE --- T.N. Davis and E. Wescott, U. of Alaska, launched their second Nike Tomahawk on Mar. 10. The first rocket of this program was launched on Feb. 27. (NL 78-4 pg 4) Both rockets were successful. The purpose of this program was to study perpendicular and parallel E-fields up to several earth radii over discrete aurora to determine formation and dynamics of laminar V shocks. (See also NL 78-2 pg 3)

AUROROZONE --- R. Goldberg, GSFC, and J.R. Barcus, U. of Denver, launched 6 Super Arcas rockets (15.164GA thru 15.169GA). 15.167GA failed because the Gerdian condenser did not work and parachute did not deploy. The other 5 rockets were successful. Launch dates were: 15.165GA on Mar. 22, 15.169GA & 15.167GA (unsuccessful) on Mar. 27, 15.168GA, 15.164GA & 15.166GA on Mar. 29. The objective of these rockets was to study bremsstrahlung X-rays in coordination with the Chatanika radar and Alaskan Chain of all-sky cameras and other rocket campaigns.(NL 78-1 pg 3)

18.214GM --- R. Goldberg also launched a Nike Tomahawk on Mar. 29 @ 1650 UT. The first rocket of this program 18.213GM was launched on Mar. 27. (NL 78-4 pg 4) Both rockets were successful. The purpose of these rockets was to study energetics of high latitude phenomena associated with changes in stratosphere. These were part of AUROROZONE.

15.170UE & 15.171UE --- L.C. Hale, Penn. State U., successfully launched 2 Super Arcas 15.170UE & 15.171UE on Mar. 27 & Mar. 31 respectively. Each rocket had two antennas (deca- & decimetric) to measure induced E field. These rockets were also in coordination with AUROROZONE program. (NL 78-2 pg3)

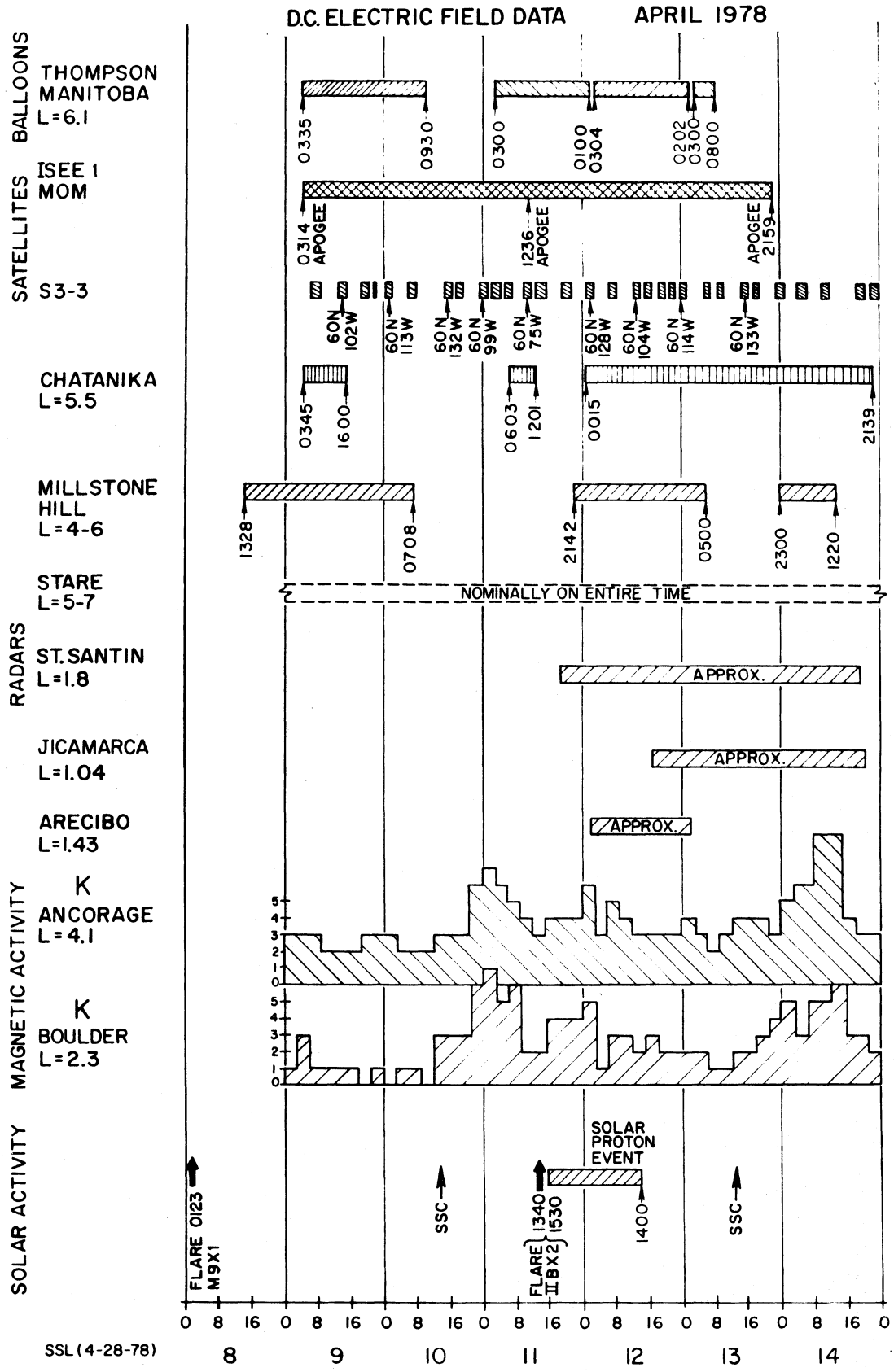
FORT CHURCHILL

E parallel B --- W. Bernstein, NOAA, was the project scientist of this partially successful Nike Black Brant rocket launched on Apr. 9 @ 0450 UT carrying 7 payloads. Two of 4 throwaway detection systems (TADs), ejected from the rocket to increase the detection footprint, were deployed properly, but the retarding potentiometer experiment failed. Three main objectives of this mission were: 1) Identification & characterization of B-field aligned potential drops. 2) Study of electron beam plasma discharge in the flight environment. 3) Study of the applicability of an electron beam as an antenna. (See NL 78-2 pg 3)

CANADA

Electric Field Campaign, Spring 78 --- R. H. Holzworth (NL 78-3) reports that the spring 1978 balloon electric field campaign was successful. Balloons were up for a total of over 80 hours between Apr. 9 (0330UT) and Apr. 13 (0800UT), covering the period of the major magnetic storm on Apr. 10-11 and the proton event following the flare of Apr. 11. (See graph on the facing page)

Full, active satellite coverage was obtained from the spherical double probe experiments on ISEE-1 (MOM) and from S3-3. Ionospheric electric field measurements were also made during much of this period by radar at Chatanika, Millstone Hill, STARE, Arecibo and Jicamarca.



Above is a coverage graph of the U. of California, Berkeley, "Electric Field Campaign - Spring 78", plus preliminary K indices and an indication of solar related activity. The data represent over 600 hours of electric field data from up to 9 simultaneously operating instruments, whose spatial coverage ranged from high latitude / high altitude magnetosphere to the equatorial ionosphere. R.H. Holzworth was the project scientist.

Auroral Breakup Campaign --- (AB-Campaign or ABC) 1978 Feb. 27- Mar. 13 (See NL 77-12). Fifteen replies were received from different scientists or research groups expressing their interest to contribute to the campaign. A circular has been sent to the contributing scientists summarizing the different instrument networks and giving general timetables for the operation.

Alaska

Electron Density Measurements --- A report by Vondrak, Smith, Hatfield, Tsunoda, Frank, and Perreault has been published, titled "Chatanika Model of the High-Latitude Ionosphere for Applicaton to HF Program Prediction". Here is an extract from the abstract:

Electron density measurements made with the incoherent-scatter radar at Chatanika, Alaska, have been used to obtain a synoptic model of the high-latitude ionosphere. This Chatanika model is a modification of the RADC-POLAR model developed by Elkins and co-workers for use in ray-tracing codes for HF propagation prediction. Because the existing RADC model was derived from a larger and more geographically extensive data base than that used in this study, many of its features have been retained in the new model. The major modificaton that we made was an improved specification of the auroral E-layer and the altitude interval between the E and F regions. This region sometimes acts as a duct in which HF signals may travel for great distances without traversing the D region, where most absorption occurs.

The data used in this work consists of 21 sets, each of 24-hours duration, and comprising approximately 5,000 profiles. Data were selected to give a representative distribution with season and geomagnetic activity. An examination of the data showed that, as expected, the ionization could be attributed to two sources: solar photoionization and particle precipitation. The dayside F-region profile appears to be consistent with production by solar ionization. However, the daytime E-region profile is often observed to have a dense E-layer that is evidently due to particle precipitation south of the dayside auroral oval. At night the auroral E-layer has spatial and temporal variations characteristic of diffuse and discrete auroral precipitation. Often the electron density decreases monotonically with altitude above the E-layer with no indication of an F-layer or valley.

From each of the electron density profiles, we extracted the fundamental parameters needed to specify the auroral E-layer and valley region. A statistical analysis of these parameters was made to determine their characteristic variation with solar-zenith angle and magnetic activity. Solar-zenith angle was chosen as a sorting parameter in order to combine diurnal and seasonal variations into a single index. We found that the profile parameters were only weakly correlated with the planetary geomagnetic index, Kp, and that a significantly stronger correlation exists with the local magnetic index, K. In order to retain Kp as the descriptor of magnetic activity, a relationship was found between the planetary index and the local K values at various latitudes and local times.

To demonstrate the compatibility of the new model with the RADC ray-tracing code, a number of rays were traced from a point in the northwestern U.S. toward Europe. Rays were launched at the same angles through the unmodified ionospheric model to illustrate the effect of differences between the two versions.

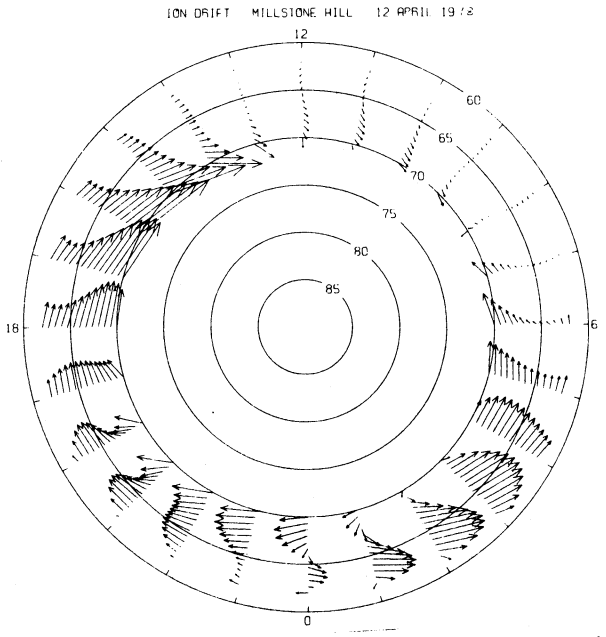
In addition to the model of the refracting regions, a model of auroral absorption was developed for possible incorporation into the RADC code at a later time. This model, developed from previously compiled riometer data, describes the variation of median auroral absorption as a function of corrected geomagnetic latitude, longitude, season, local time, solar activity, and magnetic activity.

Millstone Hill

Millstone Hill antenna becomes operational --- An important part of the U.S. IMS contribution (re U.S. plan*) for ground-based measurements in suport of the IMS was the upgrading of the Millstone Hill facility to a steerable antenna system. This exploits the enormous capabilities of the incoherent scatter technique** for auroral studies. Two radars are located at sufficiently high latitudes to be suited to these studies and, with partial support from the National Science Foundation, can be used for this purpose. These are the radars at Chatanika, Alaska (L = 5.7), and Millstone Hill, Massachusetts (L = 3.3). Owing to the fact that the radar at Millstone Hill that is employed for incoherent scatter studies is directed vertically, its utility for IMS studies has been somewhat limited. This now has been remedied by providing the radar with an antenna that is fully steerable in place of the older fixed model. The new antenna is 150 ft. in diameter and was secured by moving an existing antenna declared surplus by the Air Force. The antenna was dismantled and transported piecemeal 50 miles by road to Millstone where it was reassembled. This work began in the spring of 1976 and was completed late in 1977. The work of coupling the radar to the new antenna was completed in January 1978. While a variety of new measurements are now possible, one of the most obvious uses is that of measuring auroral and sub-auroral electric fields by directing the antenna northwards at low elevations. In the measurements conducted to date, four beam positions are used permitting fields to be measured over the region between 60 and 70 degrees. Results on a rather disturbed magnetic day are shown in the figure below. Enquiries concerning the availability of these data and possible cooperative experiments should be addressed to Dr. John V. Evans, Assistant Director, M.I.T. Lincoln Laboratory, Post Office Box 73, Lexington, Massachusetts 02173.

* Science Advisor for the Office of Management and Budget "Government-Wide Plan for the International Magnetospheric Study [IMS]" U.S. Government, Washington, D.C., (August 1974).

** Evans, J. V., "Theory and Practice of Ionosphere Study by Thomson Scatter Radar", Proc. IEEE 57, 496-530 (1969).



The above figure shows plasma drifts observed from Millstone Hill on 12 April 1978. The time variation has been smoothed by a Fourier fit, while the dependence on latitude has been matched by a third order polynomial.

Network News

Readers are reminded that many of the ground based networks, e.g. ionospheric, magnetometer and riometer chains which collect data on a routine basis, and whose data are usually available free or at nominal cost are operated at considerable expense by the proprietary organization. Funding for these networks may be easier to obtain if due recognition was made to their role when results of experiments are published. Collaboration on problems of mutual interest would be welcomed.

Finland

Auroral Data --- Risto Pellinen, Finnish Meteorological Institute has sent us auroral quick look tables which include all-sky film data from Jan. 1, 1975 to Dec. 31, 1977, and auroral radar data from Jan. 1, 1975 to Oct 31, 1975. For more details write to Dr. R. Pellinen, Finnish Meteorological Institute, Division of Geomagnetism, Postbox 503, SF-00101 Helsinki 10, Finland.

Alaska

Abisko Riometer --- J. M. Penman has listed six of the most interesting events during the special period Dec 1-15 1977 observed by the ABISKO riometer. Times (U.T.) and dates are 1600 (1. 12. 77) - 1200 (2.12.77)*, 1510(2.12.77) - 0140(3.12.77)*, 1400(4.12.77) - 1400(5.12.77), 1350(11.12.77), 0800(12.12.77)*, 1420(13.12.77) - 2100(13.12.77), 1130(15.12.77) - 2000(15.12.77). *These periods are covered by the Common Scale Magnetograms intervals mentioned in NL 78-3.

Scanning Photometers --- Professor Romick, Geophysical Institute of the University of Alaska has sent current lists of available data from 23 Sep. 1977 to 15 Mar. 1978 from the IMS meridian scanning photometer at Poker Flat and Fort Yukon, Alaska. The last observing period this northern spring was Mar. 28 - Apr. 12. The stations only operate during moonless periods with clear skies at solar depression angles greater than 12 degrees, although some data were taken on partially cloudy nights which can be eliminated upon request by individuals for particular dates.

Each tape contains up to 6 hours of data with one record every four seconds. Each record has the intensity in the geomagnetic meridian plane (1 degree field of view for 5577, 4228, and 6300, 1.5 degree field of view for H Beta.) every 1/2 degree increment of sky starting at the northern horizon through 230 degrees. The day number and UT time are on each record. Absolute calibration lamp deflections and relative deflections are on each reel of tape.

Below are typical plots which can be used as data review plots and for general morphological studies.

New Zealand

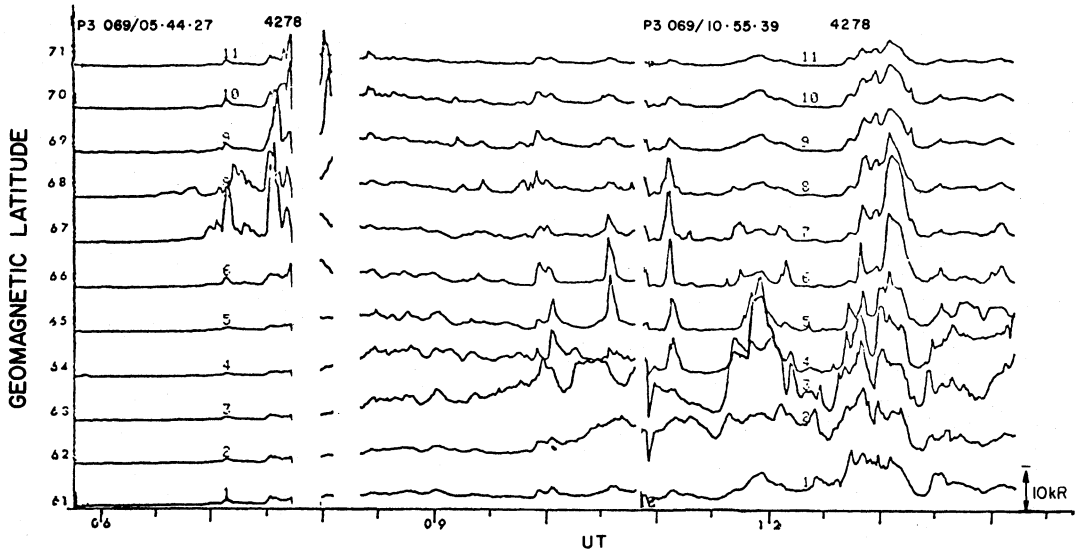
Doppler Auroral Radar --- G. McK. Allcock, National IMS contact for New Zealand has sent us an announcement of a new doppler auroral radar system on the south coast of New Zealand (46.7 degrees S, 161.9 degrees E) which began operating on 1 Feb. 1978. The Southern portion of the radar coverage is magnetically conjugate to the College/Chatanika area. The system runs continuously, recording auroral echo mean amplitude and doppler information on 35mm film. System details are operating frequency 53.5MHz, Antenna bearing 180 degrees geographic, Antenna beamwidth approx. 1.4 degrees one way, Pulse length 67 micro sec, Peak power approx. 10 kw, Integration time 5 or 10 sec, Doppler full scale +/- 1,000 m/sec, L-shell coverage 3.5 to 6.0. Contact is: J. G. Keys, Physics and Engineering Laboratory, Auroral Station, Private Bag, OMAKAU, N.Z.

N. America

IMS Platform Status Report --- A. Gray and C. Hornback have sent an update on the status of the IMS magnetometer network operations covering the period 19 Dec. 1977 to 24 Feb. 1978 (see NL 77-11). All platform systems have been shipped except for San Juan, Tucson, and Talkeetna. Fourteen stations are recording data. A potential problem in the power distribution of the magnetometer system has been uncovered and action is being taken to rectify the problem. Frost build-up on antennas at College and Sachs Harbour caused some loss of data. Johnson Pt. platform began transmitting almost continuously on Feb. 17, causing considerable loss of data from Ft. Yukon, College, Norman Wells, and Ft. Simpson. Hopefully, the system would be working by the week of March 1.

(continued on pg 8)

SAMPLE MERIDIAN SCANNING PHOTOMETER (4278 N_2^+) PLOT, MARCH 10.



Geomagnetic Latitude-Time-Intensity stack plot of the aurora on U.T. day 069 (March 10) 1978. Obtained from the Poker Flat, Alaska, Meridian Scanning Photometer (4278 N_2^+).

(Network News continued from pg 7)
The SELDADS data base system programming is still under development, but one-minute data base tapes are now being made routinely. Programs allowing user access to the data should be operational soon.

Overall, the system is performing near planned expectations. For approximately 14 stations, data losses had dropped as low as 3.6 percent by February. IMS archival data systems are slowly becoming operational. Samples of archival data, as well as real-time stack plots were enclosed. There are some noise spikes on the archival data, but a program is being developed to filter out these spikes without affecting data. One-minute data base tapes are being made from the real-time system as from the end of January. The World Data Center will receive these tapes and all future tapes.

It was reported at the DSC Users Meeting that the data acquisition equipments on both SMS-2 and GOES-2 are in good health. Some of the commanding on the SMS-2 system will be limited during the summer months because of low-power problems on board the SMS-2 satellite. During the eclipse season Feb. 21 through Apr. 13, eclipse periods for the east satellite were covered as much as possible with the GOES 1 satellite (97 degrees W), and for the SMS 2 satellite by the SMS 1 satellite (105 degrees W).

UCLA Magnetometer Installations --- C. R. Clauer, UCLA, has sent us the following update on UCLA's chain of mid and low latitude IMS magnetometer installations.

Equipment has been installed at three of the five mid latitude IMS sites for which UCLA has responsibility. These are EUSEBIO, TAHITI, and HONOLULU. The WAKE and MIDWAY systems are operating satisfactorily in the labs, and should be installed onsite in May. The Eusebio power supply has failed, but it is hoped to install a new one in June.

Noise problems in the equipment have been rectified, but some other problems remain unsolved. Occasionally the mid latitude magnetometer outputs respond to data transmissions in the form of a D.C. offset. Also, the EDA sensors occasionally become permanently magnetized.

United Kingdom

IGS Rubidium Magnetometers --- The list below shows the locations of the IGS Rubidium magnetometers deployed for the IMS since 1975 and the expected locations in use for the next two years. Data are recorded digitally at 2.5 second samples. Enquires for copies of data or proposals for co-operative research projects using the data from this array should be addressed to: Dr. W. F. Stuart, Geomagnetism Unit, Institute of Geological Sciences Murchison House, West Mains Road, Edinburgh, EH9 3LA. (See NL 77-11)

Station	Geographic Lat	Long	Operating From	Until
St Anthony	51.4	-55.6	8 Jul 1976	1979
Halley Bay	-75.5	-36.5	10 Jul 1976	1979
South Georgia	-54.3	-36.5	11 Jul 1976	1979
Leirvogour	64.2	-21.7	26 Apr 1977	1979
Eidar	65.4	-19.0	30 Apr 1977	doubtful
Faeroes	62.0	- 6.8	5 Aug 1977	1979
Lerwick	60.1	- 1.1	17 Apr 1975	1979
Durness	58.6	- 4.8	1 Oct 1977	1979
Loch Laggan	57	- 4.4	12 Feb 1976	29 Apr 1976
			5 Aug 1977	1979
Earlyburn	55.7	- 3.2	17 Feb 1975	1979
York	54	- 1.0	2 Oct 1975	1979
Valentia	51.9	-10.2	27 May 1975	24 Feb 1977
Cambridge	52.0	- 0.1	31 Aug 1977	1979
Hartland	51	- 4.5	18 Jun 1975	4 May 1977
TromsØ	69.7	19	17 Sep 1976	1979
Kiruna	67.8	20.4	11 Sep 1976	1979
Oulu	65.1	25.5	11 Jun 1977	1979
Nurmijarvi	60.5	24.7	16 Sep 1976	1979
Kvistaberg	58.5	8.6	10 Sep 1976	4 Jun 1977
Arendal	59.5	17.6	3 Sep 1976	17 May 1977

Canada

Churchill Array --- Dr. John Walker, Division of Geomagnetism, Department of Energy, Mines and Resources, Canada has provided the following list of stations which are part of the Churchill array as of late 1977.

Station		Equipment: Recorder	Geogr Lat	Long E	Geomag Lat	Long E
Alert		V:A	82.50	297.50	85.9	168.2
Resolute Bay		O:ADT,I:A PR:AD,1L	74.70	265.10	83.1	287.7
Pelly Bay		V:DS	68.53	270.49	78.6	320.4
Baker Lake		O:ADT	64.33	263.97	73.9	314.8
Rankin Inlet		V:ADS,M:DS	62.63	268.08	72.9	321.9
Eskimo Point		V:ADS	61.10	265.93	71.1	321.8
Ft Churchill		O:ADT,I:A,M:D R:AD,AS,5L	58.80	265.90	68.8	322.5
Back		V:DS,P:DS	57.69	265.77	67.8	323.0
Great Whale River	x	O:ADT,AS	55.27	282.22	66.8	347.2
Ft Severn	x	V:D	55.98	272.35	66.8	333.0
Gillam	x	V:ADS,P:DS	56.35	265.32	66.2	323.4
Thompson	x	V:AD,R:AD	55.72	262.12	65.4	319.3
Island Lake		V:ADS,M:DS,P:D	53.88	265.32	64.0	324.4
Kenora		I:A - Closed	49.80	265.60	60.0	326.4
White Shell		O:ADT	49.75	264.75	59.9	325.3

Equipment	Equipment(con't)	Recorders
AS = All Sky Cam	P = Zenith Phot	A = Analog
I = Ionosonde	PR = Partial Rfl	D = Digit tape
L = Rocket Laun	R = Auroral Rad	S = Satellite
M = Mer Scan Ph	RI = Riometer	T = Telephone
O = Mag Obs	V = Mag Variometer	

x denotes East-West Chain

ALASKA

For those concerned with ground recordings of magnetic field pulsations and ELF emmissions, R.R. Heacock, Geophysical Institute, University of Alaska has listed recordings taken at Alaska sites since June 1, 1977. (See NL 77-1 for a list of N. American Magnetometer Network Stations for IMS.)

Induction magnetometer recordings have been taken nearly continuously at College, 0.001 to 20 Hz, H and D components. Some Z component data were taken in certain intervals. These data were recorded on magnetic tape in fm mode, and digitized copies can be made. Also, an induction magnetometer has been in operation at Sachs Harbour, NWT, H and D components, 0.001 to 5 Hz, data recorded in fm mode on magnetic tape. That magnetometer has been in operation most of the time since April 1977. The equipment was, however, inoperative from Oct. 24 to Dec. 1. Since Sep. 14, Fort Yukon magnetic field pulsations, H and D, 0.005 to 1 Hz, have been telemetered to College, and recorded in fm mode.

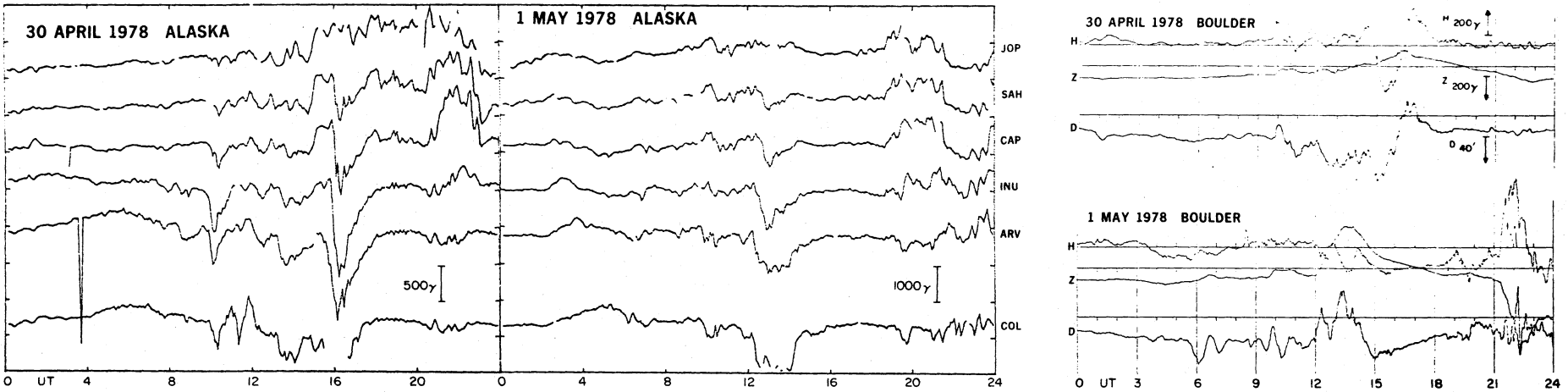
Precipitation pulsations as detected by the riometer technique have been recorded on magnetic tape for most of 1977 for the College site and since Sep 14 from Fort Yukon. The pulsations are from d.c. to about 0.2 Hz. These data vary considerably in quality from time to time.

IMSCIE has a list of the times of magnetic tape recordings made of CARIB Peak ELF data. Interested users may request a copy from IMSCIE or direct from R.R. Heacock. Many of the intervals for which ELF data were obtained contain outstanding examples of chorus and/or ELF hiss. A good ELF recording was obtained of the outstanding magnetic storm sudden commencement that occurred at 0027 UT on Jul. 29. Good records were obtained from all of the induction magnetometers. The ELF tape ran out at 0235 UT on Jul. 29.

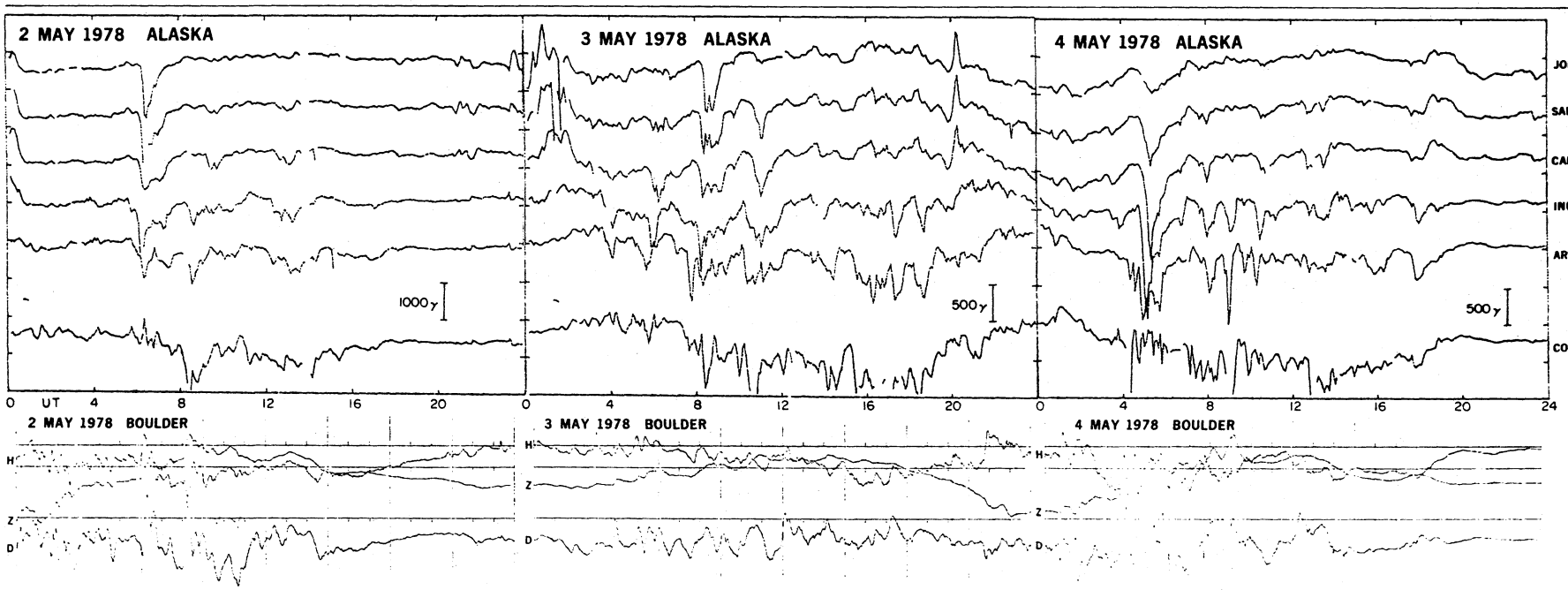
On page 9 are stack-plots of 5 minute average magnetic variations in H recorded at ground sites of the present Alaskan Meridian Chain (see NL 77-1), plus mid-latitude magnetograms from the Boulder magnetic observatory. The records cover the period of storm activity, 30 April - 4 May, resulting from the major solar flares of 28 April - 2 May, and apparent enlargement of a coronal hole on 28 April.

GEOMAGNETIC ACTIVITY FOR STORMS 30 APRIL TO 4 MAY 1978

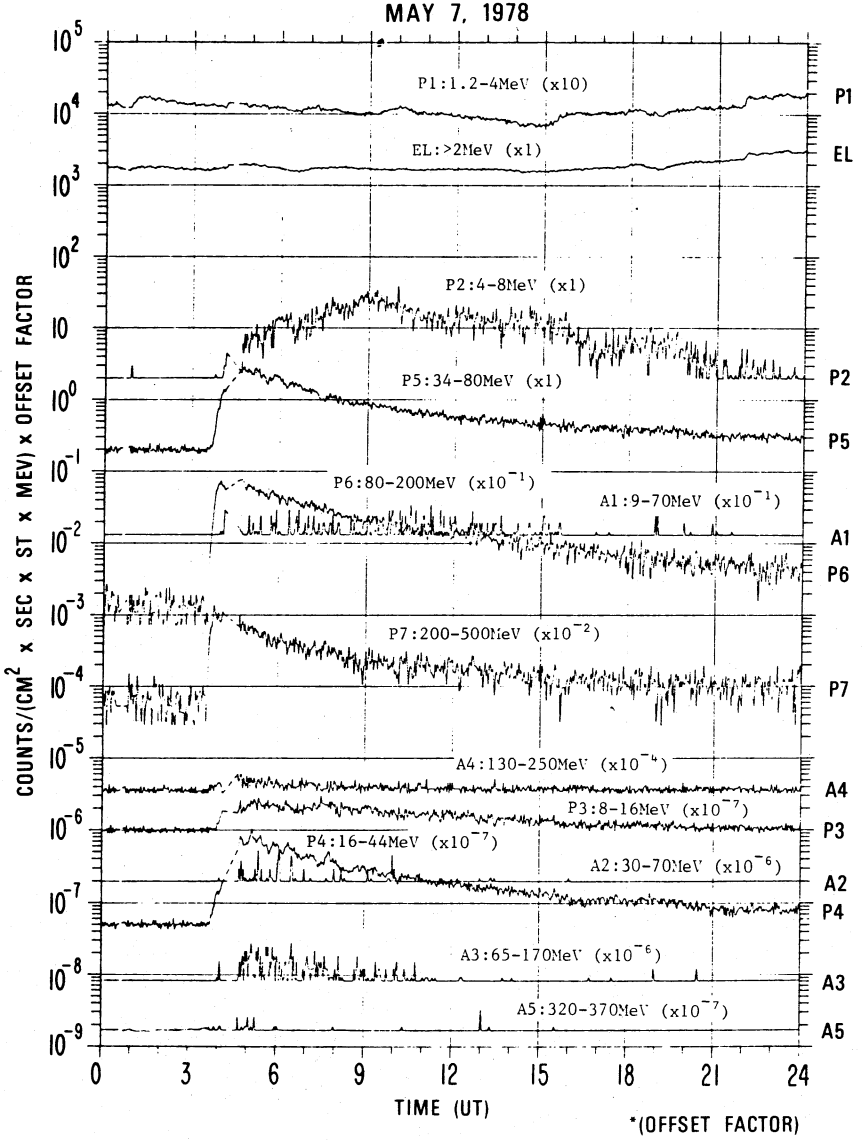
H-TRACES



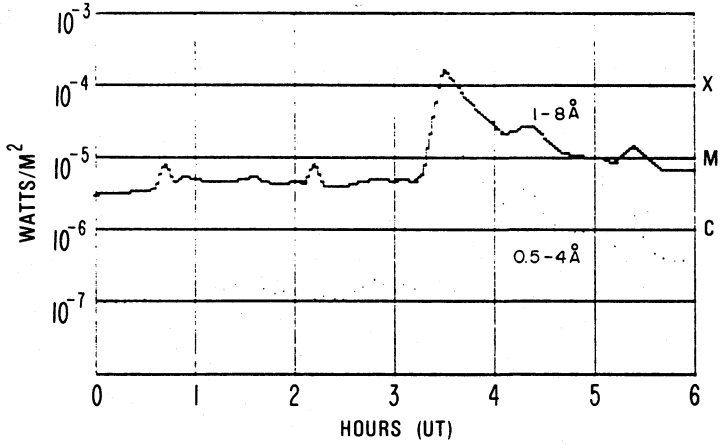
5-MINUTE AVERAGES



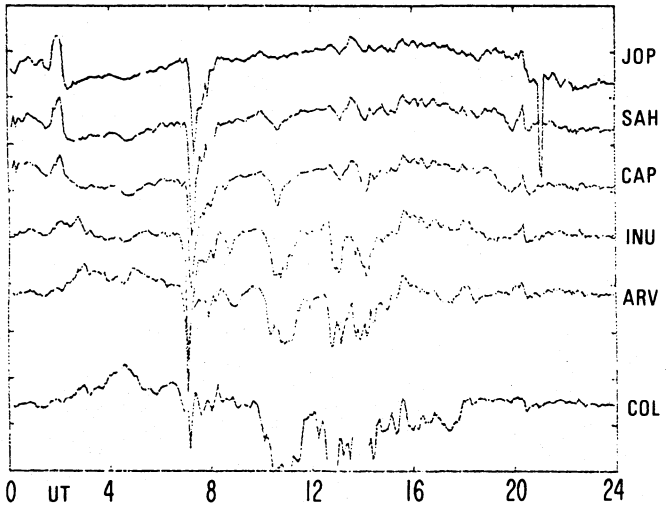
GMS/SEM TWO-MIN. AVERAGES
MAY 7, 1978



GOES-1 X-RAYS
MAY 7, 1978



ALASKA MERIDIAN MAGNETOMETER CHAIN
MAY 9, 1978 H-TRACE

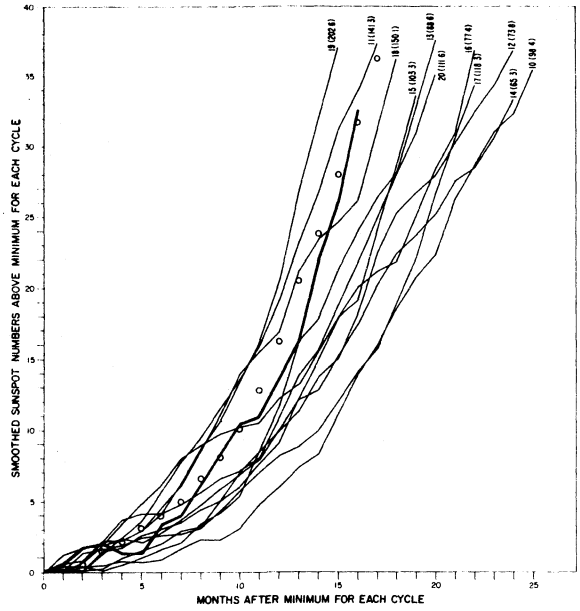


5-MINUTE AVERAGES -- TICS AT 500 GAMMA INTERVALS

On the back page of this month's newsletter, in addition to the IMS Calendar of GBR Campaigns, we publish the planetary magnetic three-hour-range indices Kp (Gottingen), preliminary solar radio flux at 2800 MHz from Ottawa ARO, and the daily sunspot number from Boulder (uncorrected).

Current Solar Activity

Comparison of Solar Cycles --- The figure below is an update of a figure published in an article by H. H. Sargent in the Proceedings of the IEEE Vehicular Technology Conference Held in Denver, Colorado, in March 1978. Predicted values date from 15 September 1977. Two other papers published by Sargent on predictions for solar cycle 21 are: "A Prediction of the Next Sunspot Maximum" Transactions, American Geophysical Union, Vol. 58, No. 12, p. 1220, 1977 and "A Prediction for the Next Sunspot Cycle" Proceedings, 28th IEEE Vehicular Technology Conference. p. 490-496, 1978.



Each cycle is identified as follows: 19(202.6) where 19 is the cycle number and 202.6 is the cycle maximum. The heavy line shows the current progress of the smoothed sunspot number and the small circles show the predicted curve due to H.H. Sargent in "A Prediction for the Next Sunspot Cycle".

SESC WEEKLY REPORT

The SESC weekly Preliminary Report and Forecast of Solar Geophysical Data includes a summary of activity indices and event data for the preceeding week and a prediction for the next seven and 27 days. This report is available upon request from the NOAA Space Environment Services Center, Boulder, Colorado 80303, USA.

On page 10, are GMS (Himawari) 2 minute average particle flux values for all channels (T. Kohno), GOES-1 x-ray plots for the May 7 proton event (via SELDADS), and stack plots for May 9. Although the flare which caused this event was not large in comparison with the April 28 flare, GMS high-energy proton channels show very clearly that the higher energy channels display a greater relative increase. Kohno noted that the noise level of the P2 channel is reduced and that this channel shows an interesting variation during the April - May events. The IMSCIE office has the GMS-SEM plots and hourly average tables for the April 28 - May 9 period. (See NLs 78-4 pg 5, 78-5 pg 5 for GMS, NL 78-5 pg 9 for GOES-1, NL 78-3 pg 11 and pg 9 of this issue for Alaskan Magnetometer Chain stack-plots).

Solar Flare Data --- In response to several requests, below is a summary of solar X-ray flares class M1 and higher, extracted from "Preliminary Report and Forecast of Solar Geophysical Data" published weekly by the SESC in Boulder (see IMS NL 78-5).

Date	Begin	Max	End	Location		Imp	Reg	CL
Apr 7	2016	2017	2033	N19	W07	1B	1057	M1
8	0115	0201		N19	W02	-B	1057	X1
10	1609	1612	1629	N15	E60	-B	1070	M2
11	1340	1426	1724	N10	W51	2B	1057	X2
	2053	2122	2127	N18	E57	-N	1073	M1
12	0648	0650	0655	N22	W65	1B	1057	M2
13	0450	0455	0516			1B	1057	M2
14	2243	2250	A2330	N20	W90	1N	1057	M2
15	B0815	0816	0820	N14	W10	-B	1070	M1
16	0919	0921	0931	N13	W22	-B	1070	M1
18	0109	0114	0136	N15	W46	1B	1070	M2
23	B0658		A0728	N25	E90	2N	1092	M8
	B0724		A0728	N30	W30	2F	1080	
	2016	2023	2025	N14	W08	-N	1083	M5
	2043	2059	2149	N17	W42	1B	1090	
25	1552	1553	1656	N20	E72	1N	1092	M2
26	1919	1939	2050	N20	E58	2B	1092	M2
28	1308	1329	2313	N22	E41	4B	1092	X5
29	1837	1925	2330	N16	E16	3B	1092	X3
30	B1437	1508	A1748	N24	E11	3B	1092	X2
May 1	1928	1959	A2159	N21	W04	3B	1092	M6
2	B0118	0120	A0209	N26	E03	-N	1092	M2
	B0616	0616	0623	S27	E76	-N	1099	M1
3	1654	1706	1729	N19	W34	1B	1092	M1
	1949	2021	2055	N19	W31	1B	1092	M2
4	0150	0152	0158	N25	W23	-N	1092	M1
	0257	0302	0320	N21	W34	1B	1092	M1
7	0053	0056	0108	N22	W60	-F	1095	M2
	0333		0420	N22	W68	2B	1095	X2
	B0630	0633	A0635	N20	W90	-F	1092	M1
	1544	1612	1627	N18	W66	1B	1095	M4
8	0035	0037	0043	N22	W75	-F	1095	M5
	1212	1248	1312	N22	W76	1B	1095	M6
9	1442	1443	1508	N22	W90	1B	1095	M9

More Actualities

Scandinavia

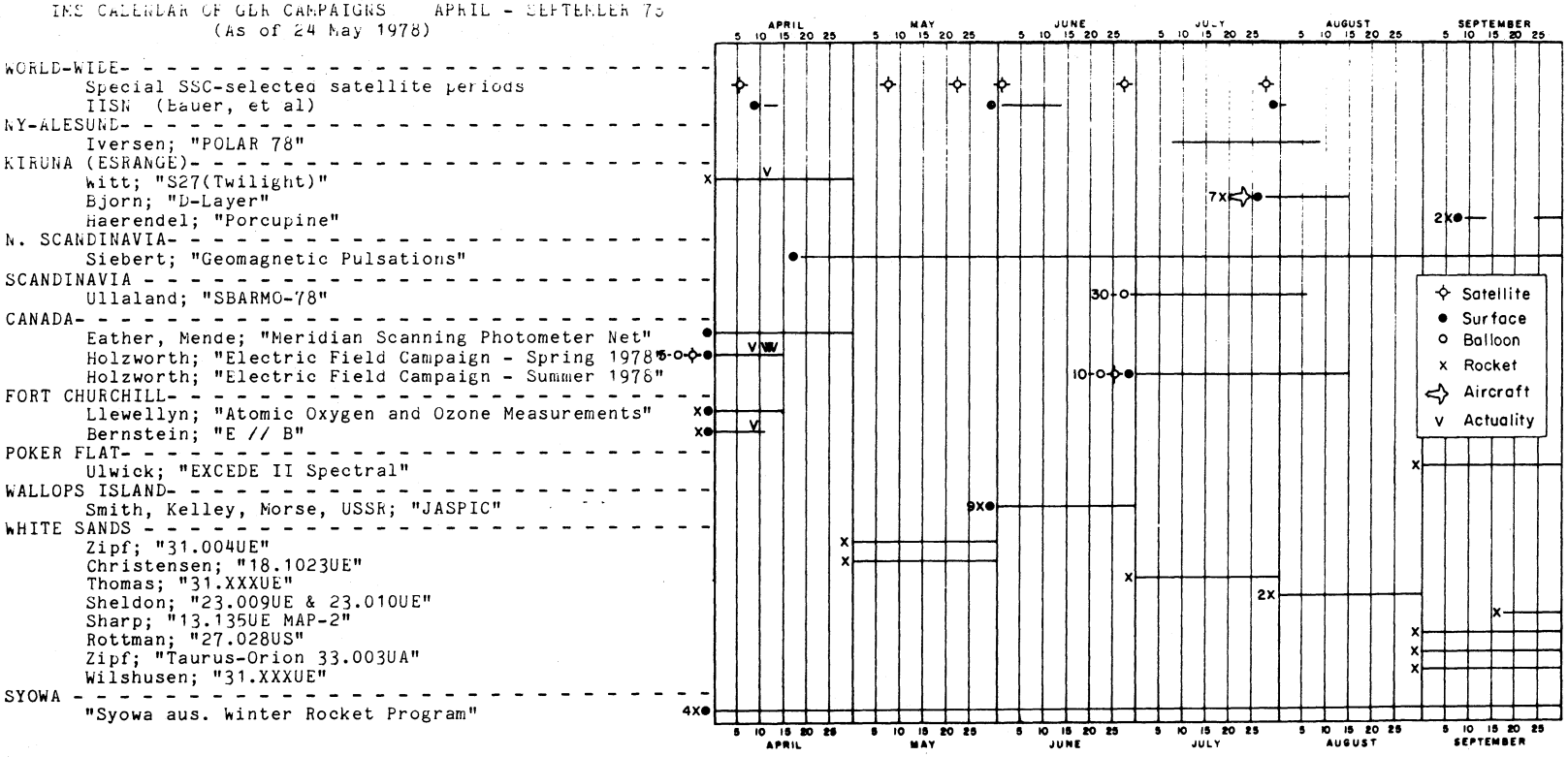
Geomagnetic Pulsations --- O. Hillebrand and U. Wedeken (see #0066, Siebert) have listed the geomagnetic pulsations recorded in Northern Scandinavia by the six pulsation stations of the Geophysical Institute Gottingen between Sep. 6 and Dec. 21, 1977. Data for the IMS special interval Dec. 1-15 will be presented at the Innsbruck IMS Working conference, Jun. 9-10, 1978. See NLs 77-1 and 77-2 for details of the six sites.

Copies of the digital tapes are available upon request, but the FM data can only be digitized on a special request basis at the present time. Equipment using an automatic micro-processor-controlled digitizing technique is under construction. Possibly during this summer the digitized FM data will exist in the same format as the data from other stations. Write to Institut fur Geophysik, der Universitat, Herzberger Landstr. 180, 3400 Gottingen.

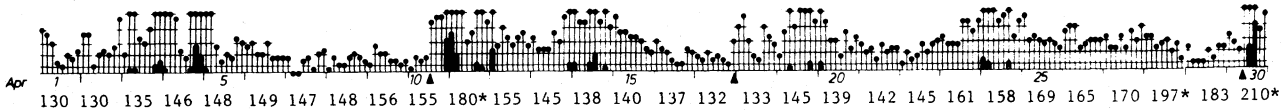
A new campaign was planned in 1978. From Feb. 27 - Mar. 13 the magnetometer at KEVO operated as part of the special campaign "Auroral Breakup" by Pellinen. From Apr. 20 approximately until mid October all six stations will be active again. This period includes the "SBARMO" balloon campaign and the "PORCUPINE" experiments and, hopefully, GEOS-2 data will also be available.

Pulsations --- Siebert, Hillebrand and Wedeken's major summer campaign (NL 78-2) in Scandianavia is operating, and will certainly last until mid-October, including the Porcupine Experiment. Dr. O. Hillebrand reports that he is leaving the Geophysical Institute at Gottingen to start work at the computer center of the Gesamthochshule Siegen (near Koln), but will still be interested in the IMS activities and will continue analyzing the data from Finland. His new mailing address is: O. Hillebrand, Rechenzentrum der Gesamthochschule, Holderlinstrasse 3, 5900 Siegen 21.

IMS CALENDAR OF GDR CAMPAIGNS APRIL - SEPTEMBER 78
(As of 24 May 1978)



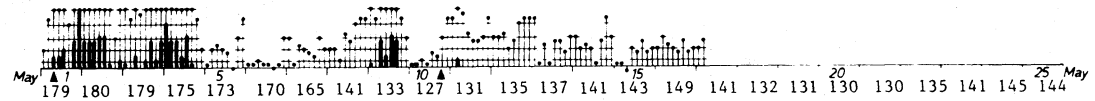
SOLAR AND GEOMAGNETIC ACTIVITY APRIL 1978 (PRELIMINARY) SEE PAGE 11



2800 MHZ FLUX OTTAWA	130	130	135	146	148	149	147	148	156	155	180*	155	145	138	140	137	132	133	145	139	142	145	161	158	169	165	170	197*	183	210*
SS NO. BOULDER	70	80	77	114	150	130	140	99	140	114	115	127	123	136	128	122	135	100	155	154	154	121	167	119	137	132	108	71	62	98

*FLARE ENHANCEMENT

SOLAR AND GEOMAGNETIC ACTIVITY MAY 1978 (PRELIMINARY)



2800 MHZ FLUX OTTAWA	179	180	179	175	173	170	165	141	133	127	131	135	137	141	143	149	141	132	131	130	130	135	141	145	144					
SS NO. BOULDER	109	121	77	106	90	-	-	55	81	77	85	96	116	154	146	131	94	102	105	109	105	89	120	101						