International Council of Scientific Unions

SPECIAL COMMITTEE
ON
SOLAR-TERRESTRIAL PHYSICS

77-8

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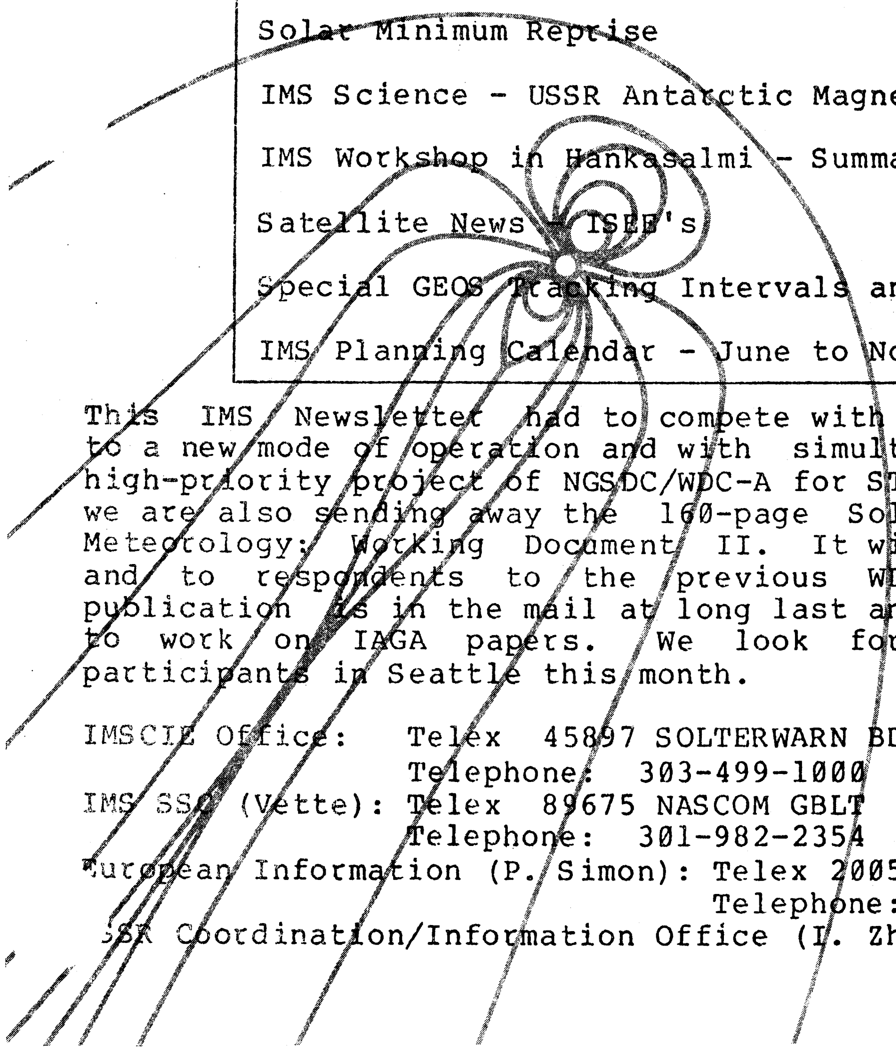
WORLD DATA CENTER-A FOR STP, D64, NOAA, BOULDER, COLORADO, 80302, USA

IMS NEWSLETTER



This IMS Newsletter had to compete with a conversion of our computer to a new mode of operation and with simultaneous demands of another high-priority project of NGSDC/WDC-A for STP. As this NL goes to press we are also sending away the 160-page Solar-Terrestrial Physics and Meteorology: Working Document II. It will be distributed on request and to respondents to the previous WD-I. The first IMS Data publication is in the mail at long last and it will be a relief to get to work on IAGA papers. We look forward to seeing many IMS participants in Seattle this month.

JHA 77/08/01

IMSCIE Office: Telex 45897 SOLTERWARN BDR
Telephone: 303-499-1000 x6501 (FTS 323-6501)
IMS SSC (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 AUGUST 1977 - OCTOBER 1977

SPECIAL IMS SATELLITE PERIODS

Tables giving details about satellite conjunctions for the second half of 1977 were given in NL's 77-6 (pg 3) and 77-7 (pg 5). Efforts will be made to obtain data from the high-altitude satellites of IMS interest during these intervals selected by the Satellite Situation Center. Special satellite intervals during the three months covered in detail by this NL are:

August 4, 1300 UT to August 5, 2000 UT
August 28, 0000 UT to August 29, 0700 UT
September 30, 2100 UT to October 4, 0900 UT
October 31, 1400 UT to November 2, 1300 UT
August 25, 1900 UT to August 26, 0700 UT
September 9, 0800 UT to September 10, 2400 UT
October 18, 1500 UT to October 20, 1000 UT

GBR Campaigns:

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

------ to Sep 30; Sagredo & Martelli; Arenosillo; ROCKET - Flamenco, explosive plasma injection, 77-7
------ to Aug 5; Christensen; FERRET-3; White Sands; ROCKET - 18.1009 UE, e- accel for EUV emissions
Aug 1 to Aug 15; S210JA27; CONJUGATE POINTS EXPERIMENT: Syowa; ROCKET - NO, O3, e- dens & temp
Aug 1 to Aug 31; Fitz; EQUATORIAL WIDEBAND; Kwajalein; ROCKETS (3)- scint meas coordinated with Wideband
Aug 8 to Aug 19; Smith; Wallops Isl; ROCKETS (2) - 14.533UE and 14.534UE, upper E-region
Aug 31 to Sep 14; Pongratz & Smith; LAGO PEDO; Kauai; ROCKETS (2) - see note below
Sep 1 to Sep 30; Rosenberg; Roberval; BALLOONS (6) - artifically induced e- precipitation effects, note
Sep 10 to Oct 20; Fremouw; WIDEBAND; Poker Flat; ROCKETS (2) - scint meas coordinated with Wideband
Sep 10 to Oct 20; Ulwick; WIDEBAND MULTI; Poker Flat; ROCKET - Wideband,e-dens.,energ. particles
Sep 10 to Oct 20; Ulwick; FIELD WIDENED INTERFEROMETER; Poker Flat; ROCKET - IR during aurora
Sep 10 to Oct 20; Ulwick; SPIRE I; Poker Flat; ROCKET - telescope spectrometers, daylight limb spectra
Oct 1 to Oct 31; Sheldon; White Sands; ROCKETS (2) - 23.009UE and 23.010UE
Oct 6 to Nov 19; Rees; 2ND HIGH LATITUDE CAMPAIGN; Andoya; ROCKET - F3, detailed note below
Oct 6 to Nov 19; Johnstone; 2ND HIGH LATITUDE CAMPAIGN; Andoya; ROCKETS (2) - SL1421 & SL1423
Oct 6 to Nov 19; Bryant; 2ND HIGH LATITUDE CAMPAIGN; Andoya; ROCKET - F1, note below
Oct 6 to Dec 6; Woolliscroft; 2ND HIGH LATITUDE CAMPAIGN; Andoya; ROCKETS (3) - SL1424, F4 & F6
Oct 6 to Dec 6; Wilhelm; SUBSTORM PHENOMENA; Andoya; ROCKETS (4) - T/NL 1-4, coord with 2ND HL CAMPAIGN

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

Aug 16-18; Sep 13-15; Oct 11-13; Bauer (0004), Evans (0171); IISN; SURFACE incoherent scatter radar net

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

------ to Aug 11; Perraut, Hirosawa; Conjugate Points; SURFACE - notes in NL's 77-3 and 77-7

Regional GBR IMS Program Details, Aug - Oct 1977

Program details for some of the brief listings given above have appeared in earlier IMS NL's. These will only be repeated below if there is new information.

ANDOYA

SUBSTORM PHENOMENA/2ND HIGH LATITUDE CAMPAIGN --- These sounding rocket campaigns of the FRG and UK will be conducted in coordination from the Andoya launch range of ESA (near Andenes, Norway) during the interval 6 October through 6 December 1977. The FRG portion of this joint campaign is described in detail in a handbook prepared by Dr. K. Wilhelm, MPI Lindau.

SUBSTORM PHENOMENA --- This campaign consists of 4 sounding rockets T/NL 1 through 4 of the Skylark 12 type. They carry identical payloads to a peak altitude of 600 km and will be launched in conjunction with rockets of the UK campaign described below. Experiments/investigators for the payloads are: TF-3 & TN-1: E-fields (DC & AC) by 2 boom-mounted double probe sensors with 0.1-1 mV/m and 50 Hz - 20 kHz resolution, Grabowski (IPW, Freiburg) and Pedersen; TS-1: DC B-field by 3-component fluxgate magnetometer with 0-200 Hz, 1 gamma resolution, Theile; TS-2: AE B-fields by 1-component search coil to measure B-component of wave fields from 100 Hz to 5.6 kHz, Dehmel; TF-4: Plasma experiment using retarding potential analyser to measure e- temperature, plasma density, ion wind, vehicle potential, e- flux 0-30 eV, Spenner (IPW, Freiburg); TL-7 & TZ-1: Particle Spectrometer I using hemispherical electrostatic analyser and open electron multipliers to measure e- and p+ fluxes $0.1(0.5) \leq Ee(Ep) \leq 25(35)$ keV, Wilhelm & Riedler; TL-6: Particle Spectrometer II using magnetic particle analyser and solid state detectors to measure e- and p+ fluxes $15(27) \leq Ee(Ep) \leq 200(3000)$ keV, Studemann; and TK-1: Particle Spectrometer III using solid state detector telescope to measure p+ fluxes of $0.07 \leq Ep \leq 4$ MeV, Fischer.

2ND HIGH LATITUDE CAMPAIGN --- Sounding rockets for this campaign are of the Fulmar (F) and Skylark 12 (SL) types. They will carry payloads to about 250 and 750 km, respectively, and will be launched in various combinations with the rockets T/NL 1-4 described above. Payloads and experimenters for the UK rockets are given below with information on combined campaign objectives, supporting programs, and campaign windows for each group of rockets.

F3, Rees, co-ordinated observations of energetic input to the thermosphere during a geomagnetic substorm and the subsequent thermal and dynamic response of the thermosphere. Payload: Interferometer to measure Oxygen lines, Ionospheric E-fields measurements and Photometer/Interferometer observations of airglow/auroral line and band profiles and intensities (Hα, Hβ, N2+, etc.). Launch will be in conjunction with SL1423 and T/NL 2. Windows are 6-20 Oct or 5-19 Nov 1977 and launch will be into clear night sky during stable diffuse aurora and new moon conditions.

SL1423, Johnstone, will investigate particle spectra and pitch angle distributions in diffuse aurora. Payload and experimenters are: e- and p+ from 5 eV to 500 eV, Johnstone; e- and p+ from 500 eV to 25 keV, Bryant; and ELF/VLF waves, E- and B-fields, and e- density and temperature, Bullough. See F3 and T/NL descriptions above. These launches will be in conjunction with GEOS around the time of apogee over the Scandinavian meridian.

F6, Woolliscroft, will launch in conjunction with T/NL's 3&4 during the interval from 6 Oct to 6 Dec 1977. Highest priority period will be from 21-28 Oct and conditions will be during long-lived discrete emissions (auroral chorus) at the ground, clear sky and coordinated with GEOS to study the main and recovery phases of substorms. Payload/experimenters: ELF/VLF E- and B-fields and DC E-fields, Woolliscroft; Ne, Gibbons. Groundbased observations will be supplemented by operation of a network of goniometers operated by

(Continued on pg 3)

(Continued from pg 2)
Southampton (Rycroft) and Sheffield Universities.

SL1424 and F4, Woolliscroft, will not launch in conjunction with any of the T/NL rockets. SL1424 payload/experimenters: e- and p+ > 500 eV, Bryant; e- < 500 eV, Maehlum; ELF/VLF E- and B-fields and DC E-fields, Woolliscroft; Ne, Gibbons; and Neutral wind (Na release from SL 2nd stage at 250 km), Rees and NDRE. F4 payload/experimenters: ELF/VLF E- and B-fields and DC E-fields, Woolliscroft; Ne, Gibbons. These two rockets will be launched during a time of long-lived discrete emissions (auroral chorus) on the ground, clear sky and coordinated with GEOS and other satellites to compare wave-particle phenomena at the magnetic equator and in the auroral zone. Launch windows are 21 Oct - 4 Nov and 20 Nov - 6 Dec with the highest priority period being from 29 Oct - 4 Nov 1977.

SL1421, Johnstone, to be launched in coordination with F1 and T/NL 1. Launch window is from 5 - 19 Nov 1977 and conditions are clear sky, low moon light and auroral breakup. Payload/experimenters: e- and p+ from 5 eV to 500 eV, Johnstone; e- and p+ from 500 eV to 25 keV, Bryant; Electrostatic Waves (High Frequency), Martelli; E-field (3 axes) DC-100 kHz, Maynard; and e- density and temperature, Johnstone. Supporting data will be requested, in particular, from the IMS magnetometer chain net.

F1, Bryant, will launch in coordination with SL1421 and T/NL 1 described above (5-19 Nov). Its objective will be to investigate the interaction between charged particles and electrostatic waves during auroral breakup. Special ground support will be provided by TV and still cameras. Payload and experimenters are: e- and p+ >500 eV, Bryant; electrostatic waves, Martelli.

This major cooperative IMS sounding rocket program involving international participation will be supported by the extensive network of instruments spaced in and around Scandinavia. Some particular instrumental programs were mentioned above, others include the auroral backscatter radar (STARE), photometer and all-sky camera nets, riometers and other instruments as described in the CCOG Handbook in detail. Also, this campaign will coordinate with satellite observations and, in particular, will attempt to use GEOS quick-look data in support of launch time determinations. The excellent campaign handbook for the "... Raketenprogramm 'TEILSTURMPHANOMENE'" (SUBSTORM PHENOMENA) is available from Dr. K. Wilhelm, MPI fur Aeronomie, D-4311 Katlenburg-Lindau 3, FRG. Most of the handbook is in German but the Forward, Introduction, statement of Scientific Objectives, Experiment description, and Launch Conditions information are also given in English. A second volume will be issued in the near future to describe the operational aspects of the campaign.

WHITE SANDS (USA)

FERRET-3, Christensen, is a plasma physics experiment carried by a Nike-Tomahawk (18.1009UE) to be launched during the period 25 July to 5 August 1977. The primary objective is daglow observations of EUV from 575-1375 A. Secondary objective is to measure EUV-emissions of the atmosphere when excited by on-board electron source. The principal instruments in the payload are an open-ended electron multiplier for EUV detection, Christensen; and an e- source (15-100 eV), Zipf (Univ. of Pittsburgh).

14.533UE & 14.534UE, L.G. Smith, are Nike-Apaches to be launched for an upper E-region study of effects of trapped energetic e- as an ionization source at night time in mid-latitudes. The region of principal interest will be from 80-200 km. Experiments carried are: e- density, energetic e- flux at several levels, and brightness at 3914 A. Launch will be near midnight and at a time when Kp>5. Details of this and other Univ. of Illinois sounding rocket programs are contained in the Progress Rpt. No. 76-2, "Research in Aeronomy", April 1 - September 30, 1976, Univ. of Illinois, Urbana Aeronomy Lab, Dept. of Electrical Engineering. This report also includes detailed descriptions of instruments, discussion of data analysis techniques, and preliminary results.

ROBERVAL (CANADA)

Matthews reports a joint campaign in September 1977 with participation by Univ. of Maryland and Stanford Research Institute staff. Six balloons will be launched from Roberval, Canada (the conjugate location to Siple, Antarctica) to observe e- precipitation triggered by the SRI transmitter at Siple. All 6 balloons will carry Univ. of Md. X-ray bremsstrahlung detectors (Rosenberg, Matthews and Siren) and 4 will also carry SRI's VLF receivers (Carpenter & Katsufrakis). Launch will be into post-storm quieting periods which seem favorable for artificial triggering of VLF emissions. Direct communication between Roberval and Siple via satellite ATS has enhanced Siple's ability to transmit at the optimum time to produce detectable results. SRI and other groups will operate additional ground based instruments in support of these launches.

KAUAI (USA)

LAGO PEDO (Ptarmigan), Pongratz and Smith, will launch a Terrier-Tomahawk from the Kauai Test Facility, Barking Sands, Kauai, Hawaii, USA (nominal coordinates: 22°N, 160°W) to a nominal altitude of 185 km. The objective will be F-layer ionospheric depletion studies using high explosive products carbon dioxide and water. Payload/experimenters: Phase-coherent transmitter, P. Bernhardt (Stanfor Univ.); Langmuir Probe, Winningham; Ion Detector, Whalen; and Mass Spectrometer, Szuszczewicz. Observations will be coordinated with two ground based Los Alamos Sci. Lab. observation programs for photometry, photography, spectrographs and TV from Haleakala and Kauai. Launch conditions will be into stable F-layer at dusk.

ACTUALITIES

SATELLITES

Geostationary Meteorological Satellite (GMS) --- This satellite of the Japanese National Space Development Agency (NASDA) was successfully launched at 1039 UT on 14 July 1977. Launch was accomplished using a Delta vehicle provided by NASA from the Eastern Test Range (Canaveral). The satellite, named "Himawari" ("Sunflower"), has been moved by NASDA into a geostationary orbit above the equator north of New Guinea (altitude 35,800 km, longitude 140°E). GMS is part of the GARP (Global Atmospheric Research Program) and is primarily a meteorological satellite. However its payload also includes a 16 channel solar energetic particle monitor (see NL 77-6, pg 2). Checking and adjustment of the satellite will be conducted by NASDA until about mid-October. After that (and possibly earlier), data will begin to be delivered routinely to the Meteorological Satellite Center and will be available directly or through the World Data Center C-2 for Rockets and Satellites. Data formats are expected to be similar to the SMS/GOES format for the same type of information. At least hourly mean values of each channel will be published monthly. Contact for further information is: Dr. N. Kodaira (Director) or Dr's. T. Kohno and Y. Yamashita (experimenters) Meteorological Satellite Center, 3-235 Nakakiyoto, Kiyose-city, Tokyo 180-04, Japan (please remember the IMSCIE Office will begin to omit from these NL's addresses published in the Supplement to NL 77-7).

ATS-6 --- Dr. Wende, NASA GSFC, has notified the IMSCIE Office that both the McIlwain "Auroral Particles" and Winckler Particle Detector experiments on ATS-6 are dead. Notice was received 8 June 1977. For details on these and other IMS satellite experiments consult the SSC Report No. 9, "IMS Directory of Spacecraft and Experiment Scientific Contacts", January 1977, and these NL's.
(Continued on pg 4)

(Continued from pg 3)

GEOS --- The following telex message was received at IMSCIE Office on 26 July 1977 from Dr. K. Knott, GEOS Project Scientist: "All 7 experiments on board GEOS have been operational during the month July 1977. Electron guns of experiment S-329 (see IMS NL 77-6, pg 7) could not be operated and therefore this experiment only obtained data in the passive background mode."

"No failure in any of the many CMOS components has been reported so far. The power situation is such that operation for another 6-9 months can be extrapolated. Data processing and distribution by ESOC is completed up to 21 June 1977 for the European passes. Daily summaries for most experiments have been generated up to 13 July."

"As soon as clearance has been obtained from experimenters, distribution to the IMS community will be started. The first NASA-recorded GEOS tapes have been received by ESOC and processing has just started."

"The first papers on GEOS data will probably be presented at IAGA meeting in Seattle. A more comprehensive presentation of the first GEOS data will take place at the European Geophysical Society (EGS) meeting (6-9 September in Munich). A whole session of this meeting (on 7 September) is devoted to GEOS and recent sounding rocket results."

ROCKETS

WALLOPS ISLAND (USA)

From the Univ. of Illinois Progress Report referenced above (pg 3) also came information about launches of Nike-Tomahawks 18.1006 (12 August 1976 @ 1554 UT) and 18.1008 (Jan 1977). Pages 9-57 of this report describe the program objectives, instrumentation data processing and analysis. Two more rockets may be launched on magnetically disturbed nights during 1977 and participation in a series of launches from Chilca, Peru is probable for 1978.

GROUND-BASED

CHATANIKA/STANFORD (USA)

Repairs on Chatanika's radar power supplies are now progressing smoothly. The best estimate for a date on which operation will be restored is the 1st week of October 1977. This is important because of the large number of rockets whose Poker Flat launch windows include this time and for which Chatanika support is desired (see planning calendar).

SRI Report "Atmospheric/Ionospheric/Magnetospheric Research using Chatanika Radar" covering the period 1 April to 31 May 1977 by M. Baron and O. de la Beaujardiere has just been received at the IMSCIE Office. Radar operation times (day/hours UT) and purpose given in this report are: April - 01/1837-1231 (Wideband and S3-3 satellites); 05/0619-1016 (AE-C); 05/2049-06/2155 (24-hr elevation scan run and Wideband support); 07/0523-1056 (auroral arc morphology); 08/0325-1202 (auroral arc morphology); 09/0559-1201 (transport (neutral winds)); 18/1935-2244 (polar cusp); 19/2148-20/2200 (synoptic 24-hr run, Wideband); 28/1015-1137 (Wideband). May - 08/2144-2322 (D-region study); 09/1813-1838 (polar cusp); 13/0944-1108 (Wideband); 15/1200-1405 (D-region); 15/1430-2138 (polar cusp); 16/0012-1814 (polar cusp); 17/1648-1735 (D-region); 17/1754-2104 (polar cusp, ionosonde comparison); 18/0112-0951 and 19/1051-1144, 1204-2025, and 2045-0114 (synoptic 24-hr run); 18/0954-1040 (Wideband); 18/1149-1200 (Wideband); and 18/2029-2040 (Wideband).

Images from the all-sky television camera at Poker Flat (about 3 km north of Chatanika) can now be monitored and recorded at the radar site and may be used for determining the need for changes in the radar operating mode in real-time.

BOULDER

C. Hornback is distributing a 2-weekly letter summarizing progress on checking and deploying the US IMS instrument platforms among the several experimenter groups in N. and S. America and the Pacific region. The Johnson Point, Eureka and Isachsen systems were shipped to the Univ. of Alaska and have been installed at their operating sites after testing in College. The Johnson Pt. system began working 4 July 1977 and data came in regularly for 90% to 98% of the time until 2013UT on July 18. Following a thermal generator failure, the system sent an indication that it was switching automatically to battery mode and then ran for 7 hours on batteries until power was exhausted.

There is a serious radio noise problem in the system electronics with the result that the riometer data is no good. Experiments are being set-up to determine the cause and a means of correcting this problem.

Problems with the radio transmitters for the College, Pelly Bay, Tungsten and Eusebio systems, have delayed shipment until isolated and corrected. Otherwise, these systems are ready to ship.

The SELDADS processing system is now able to begin learning to cope with the real data stream from the network of platforms in this program, thanks to the great help from the operation at Johnson Pt. Presently the incoming data is being recorded on magnetic tape until the system for processing and display is completed. SELDADS can now be used in checking the status of field installation of the platforms. However, it will be a few weeks until data are recorded in "1-min" and "raw" formats.

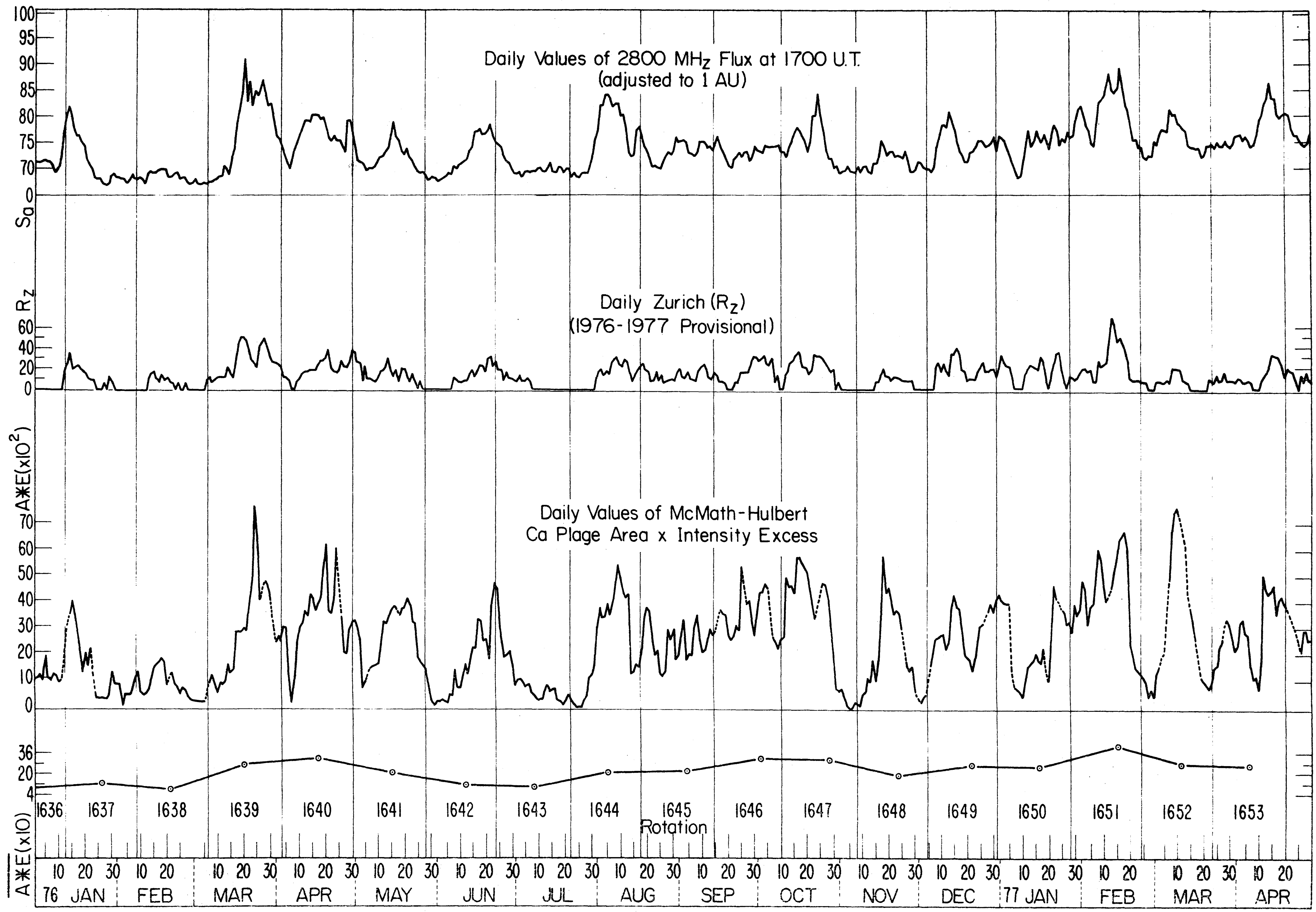
ANTARCTICA

USSR MAGNETOMETER CHAINS --- Nine provisional magnetograph stations for unattended operation have been started in the Antarctic from Feb 1975 through Feb 1977 as part of the USSR IMS Program. They are located along and at an angle to the meridian joining Mirny and Vostok (see Mansurov report under IMS SCIENCE in this Newsletter). From one to two years of 3-component magnetic variations have been recorded by these systems since their installation.

SOLAR-MINIMUM REPRISE

About one year ago the IMSCIE Office sent telexes to some 16 IMS contacts asking that they notify interested scientists about the possibility that we were then in solar minimum for cycle 20. Basis of the notification was information from the Stanford Solar Observatory that the mean solar magnetic field had maintained a unipolar state for some 26 days without the usual alternation of sector passages. The announcement of observational opportunity for low solar activity conditions was also given in IMS NL 76-8. Next month NL 76-9 carried information suggesting that the time of minimum had passed but without the extended period of only "Away" polarity anticipated.

On page 5 are given four curves summarizing several solar parameters since the beginning of the IMS. Given are smooth curves drawn through the daily values of: 2800 MHz radio flux @ 1700 UT and adjusted to 1AU (Sa), Provisional daily Zurich sunspot numbers (Rz), and McMath-Hulbert Ca Plage Area x Intensity Excess (A*E). The bottom curve is the average of daily A*E values for each solar rotation. These were sent to us by Dr. H. Dodson-Prince. Prolonged intervals of spotless days may be seen for much of 1976, especially the period in July for which notices were sent. Also seen are the gradually rising upper and lower envelopes of each curve as they extend into 1977. All seem to indicate that solar minimum is well past; however, the 13-month smoothed calculations of Rz give values of Rz=12.2 for both March and June 1976. The June 1977 issue of Solar-Geophysical Data prompt reports with final Zurich numbers for 1976, indicates the end of solar cycle 20 as March 1976.


Daily Values of 2800 MHz Flux at 1700 U.T.
(adjusted to 1 AU)
Sa
0 70 75 80 85 90 95 100
Daily Zurich (Rz)
(1976-1977 Provisional)
Rz
0 20 40 60
Daily Values of McMath-Hulbert
Ca Plage Area x Intensity Excess
A*E(x10²)
0 10 20 30 40 50 60 70
A*E(x10)
4 20 36
1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653
Rotation
76 JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC 77 JAN FEB MAR APR
10 20 30

IMS SCIENCE

The following report and figures by Mansurov were sent to the IMSCIE Office by Dr. I.A. Zhulin, Head, Soviet Information/Coordination Office for the IMS.

SOVIET MAGNETOGRAPH CHAINS IN THE ANTARCTIC INVOLVED IN IMS PROGRAM

Nine provisional stations, working unattended for a year, have been installed for ground-based support of the IMS program in the region of the southern polar cap. The stations register variations of 3 components of the geomagnetic field. The sensors are magnetostatic systems: permanent magnets suspended by quartz filaments. Data are recorded in analog form on 35mm film moving at 3 mm/hr. Subsequent enlargement of the microfilm by a factor of 6.7 gives a normal magnetogram with variometer scale values of about 7 to 15 gammas/mm (1 gamma = 1 nT). Location of the stations with respect to the permanent observatories at Mirny, Vostok and Casey as well as with respect to geomagnetic parallels (corrected according to Gustafson, 1970) is shown on the map (fig. 1). Coordinates of the stations, the time of installation and of the second visit for revision are given in the table.

Two chains of stations have been created, the first on the line Mirny-Vostok (S-1 through 5 and S-9) and the second in the direction of the corrected geomagnetic pole (S-3 and 6 through 8) from the former Pionerskaya station (S-3).

The stations S-1 - 5 (black circles) were installed in 1975. Two of them (S-2 and 4) operated continuously for a year. Stations 1, 3 and 5 had several breaks in registration of from 3 to 6 months length due to different reasons. After revision was realised in 1976, all 5 stations worked for a year without breaks.

In the course of daily rotation of the Earth, the region of location of the stations falls under the magnetospheric cusp during daytime. Comparison of magnetograms with satellite data is expected to give new information about the mechanisms of Sun-Earth magnetic fields interaction. Preliminary results obtained in 1975 confirm this suggestion. For example, fig. 2 shows the variations of hourly mean values of the vertical component Z at the observatory Vostok (Vo), stations S-5, 4, 2, 1 and observatory Mirny (Mi) versus the magnetic local time (MLT). Hourly means were obtained as a result of averaging the data for the five quietest days with the IMF directed towards the Sun (T=white circles). Since the satellite data for this period were not available, the days A and T were determined by Z variations at the observatory Vostok (see "Solar Geophysical Data", 1976, N 378, p. 19). When selecting A and T days, the level of geomagnetic activity was determined by Ap index. Average Ap activity for A and T days turned out to be 8.8 and 4.2, respectively.

This slight difference in activity level is unlikely to account for a significant difference in the zonal current structure on T and A days as seen from fig. 2. As shown by the shape of Z daily variation with latitude, the electrojet on T days was over the station S-2. It is confirmed by: (a) the absence at S-2 of regular Z variations with a pronounced midday minimum similar to those observed at S-4 and S-5; and (b) the appearance of a pronounced midday maximum at S-1 and Mi. On the contrary, on A days any signs of electrojet proximity are absent in the whole latitude range (83.6°-76.9°).

Interpretation of this interesting phenomenon requires a comparison of ground-based data from Antarctic and Arctic chains of stations with 3-component satellite data on the IMF. Preliminary results of analysis of magnetograms obtained at the Antarctic chain will be reported with more detail at the IAGA Assembly in Seattle and can be obtained from Dr. S.M. Mansurov, IZMIRAN, p/o Academgorodok, Moscow Region, USSR.

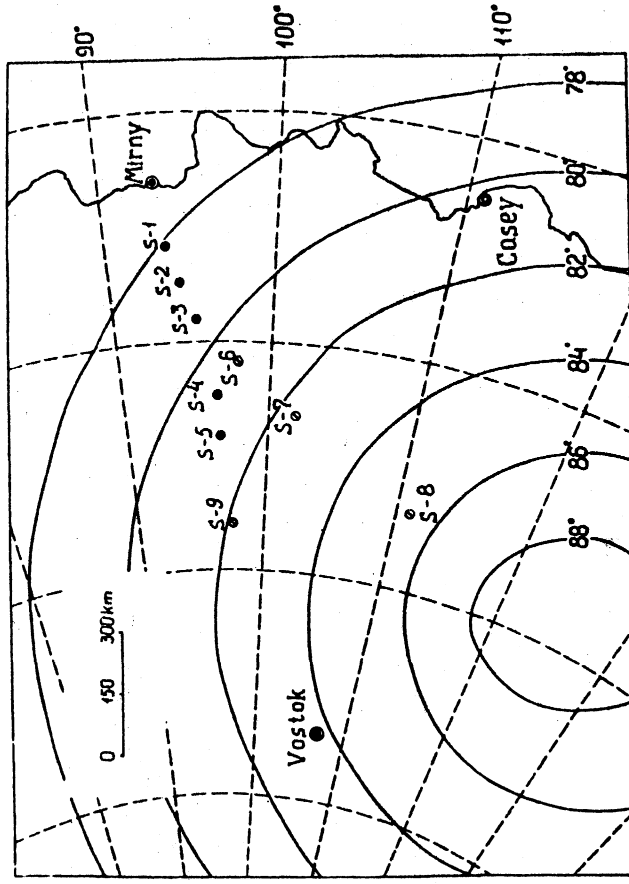


Table 1

Geomagnetic Stations	Coordinates: Geographical Lat.	Geographical Long.	Geomagnetical Lat.	Geomagnetical Long.	Installed	Revised	
Mirny	66°31'S	93°01'E	76.9°S	122.9°E			
S-1	67 52	93 47	78.1	120.0	1975 Feb 10	1976 Feb 1	1977 Jan 22
S-2	68 48	94 23	78.8	117.1	Feb 15	Feb 7	Mar 3
S-3	69 33	95 23	79.5	115.6	Mar 5	Feb 14	Jan 30
S-4	71 05	96 05	80.6	109.0	Feb 28	Feb 20	Feb 3
S-5	72 09	96 37	81.3	104.2	Feb 26	Feb 22	Feb 17
S-6	70 26	98 00	80.6	115.0	1977 Feb 4		
S-7	71 37	101 55	82.4	113.0	Feb 8		
S-8	73 15	111 00	85.3	111.5	Feb 12		
S-9	74 05	97 29	82.2	92.4	Feb 13		
Vostok	78 27	106 52	83.6	63.8			

Fig. 1: Location of Soviet Provisional IMS Magnetograph Stations S-1 to S-9, and regular Antarctic observatories Mirny and Vostok (Soviet) and Casey (Australian)

Table 1: Location of Soviet stations and dates of installation and revision

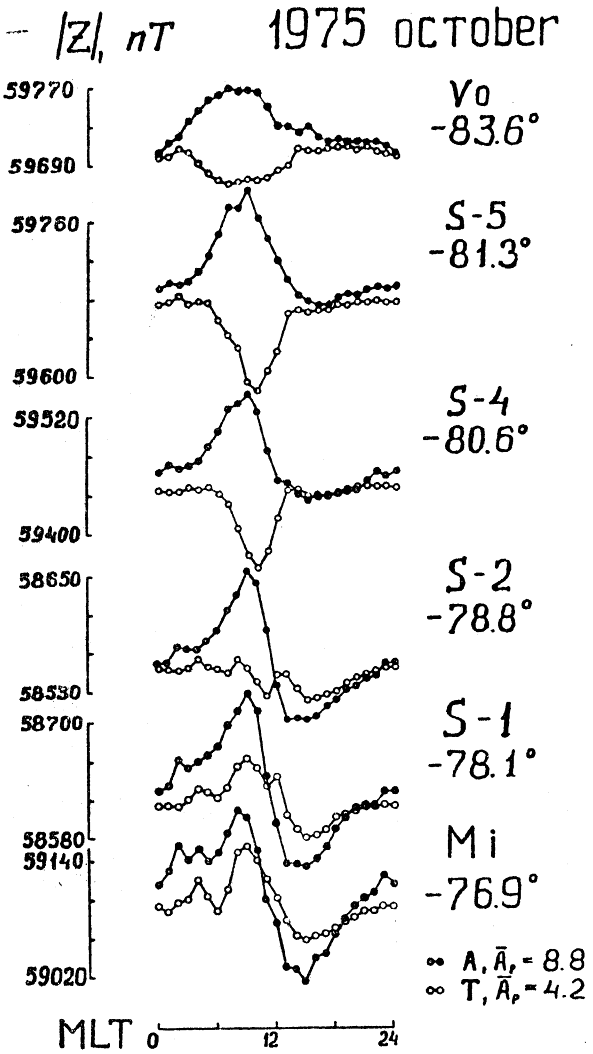


Figure 2

GENERAL IMS NEWS

IMS Workshop --- The Regional IMS Workshop at Hankasalmi, Finland was well-attended. Some 50 scientists from 9 countries gathered to discuss their IMS projects, compare data and interact about a selected group of events of special interest. Unfortunately, we were not able to participate in this Workshop as originally planned; however, the two documents from it are of possible interest for other IMS participants. They are: (1) COLLECTION OF MATERIAL which includes the final program, a list of participants, abstracts of invited and contributed papers, material for discussions about GEOS, a list of the special events to be studied at and after the Workshop and the third circular which described the local of the meeting and a general agenda. (2) Workshop Summary with an overview, a call for papers and late-arriving letters and abstracts.

The principal topics discussed were magnetic observations, including pulsations, optical auroral studies, and radio observations including radar auroral backscatter and riometry. Future plans for CCOG were considered as were IMS Information Exchange services and future GEOS cooperation. Survey papers were presented on ionospheric magnetic field models (Untiedt), model calculations on three dimensional current systems (Kisabeth), Short period pulsations (Kangas), Long period pulsations (Stuart) and Auroral radar studies (Greenwald). Contributed papers covered recent results from the Scandinavian magnetometer networks, magnetic pulsations, auroral radar and riometer observations combined satellite and ground based or balloon measurements and optical observations. Contributions on riometer networks were received from scientists unable to attend, a poster session was held for mostly instrumental papers and the STARE auroral radar facility nearby was visited. The Hankasalmi Workshop concluded with panel discussions and a summary session.

Interesting summary points made included: magnetometer chains are operational and results are coming from them. Preliminary analyses show clearly the presence of localized structure in the disturbance field with frequent occurrence of overlapping eastward and westward auroral electrojets in the late evening sector and eastward traveling double-loops of equivalent current in the morning sector during intense substorms. It was noted that 3-dimensional quantitative current models are needed to interpret magnetic data and must include provision for input of many other observed parameters. Induced currents do not appear to be a problem for Scandinavian magnetometers and it will be increasingly important for the future to have a sharing between Scandinavian and Russian scientists of data from their respective chains.

Pulsation studies are entering a new phase of study through use of digital recordings and sophisticated analytical methods. Current measurements should be able to test theories based on models and lead to their extension or revision. Recent reappraisal of PC 3 and 4 data has led to better understanding of giant pulsations and the modulation of parameters in the auroral zone ionosphere. For example, radar pulsation phenomena and visual auroral phenomena can be observed together and related. Programs already suggested for EISCAT look promising using the STARE system. The status of auroral radar and riometer observations in Scandinavia was summarized. With the inclusion of Russian auroral radar facility reported on by M. Uspensky, virtually complete auroral radar coverage is available ofr more than 2 hours of local time. This should provide opportunity for cooperative studies on the propagation of substorm effects away from the midnight sector. Joint analysis of STARE data with CW backscatter radar data would be useful to test assumption used in STARE data analysis. During main phase disturbances the STARE radar current indications and the equivalent current directions derived from the Munster magnetometer network are not in agreement. The discrepancy may be due to field-aligned currents and, if so, this strengthens the argument for including additional parameters in 3-dimensional current model derivations. Interesting spikes have been observed in riometer monitored absorption (only 71 in two years) and suggstions were made for installation of a riometer at Sodankyla.

Auroral pulsations observations were discussed from the optical viewpoint and related to magnetic variations recordings. Pulsations in the frequency range from 5 sec to 500 sec could be related to ionospheric conductivity changes or E-field changes. The expedition to Spitzbergen made Hb, 520 nm, and 630 nm observations. Hb observations could be explained by proton precipitation alone and some times large discrepancies were observed between the 520 and 630 nm observations. Another expedition is planned for next winter to include an array of photometers to measure 520 nm drift. Visual aurora is easy to measure and can provide a record of extremely rapid time variations and complicated spatial structure as an indication of energetic electron influx in the 1-20 KeV range. Less spatially sensitive techniques such as magnetometers and radars have difficulty corellating with the visual fine structure. Finally, weak diffuse auroral luminosity is almost always present and should be routinely monitored for the most important lines of 630,428 and 486 nm.

It was agreed that the Workshop was a success in that it provided an occassion for participants to gather data, compare it and share ideas while planning future cooperative programs. A similar workshop is to be organized next spring, tentatively suggested for the vicinity of Lindau.

SATELLITE NEWS

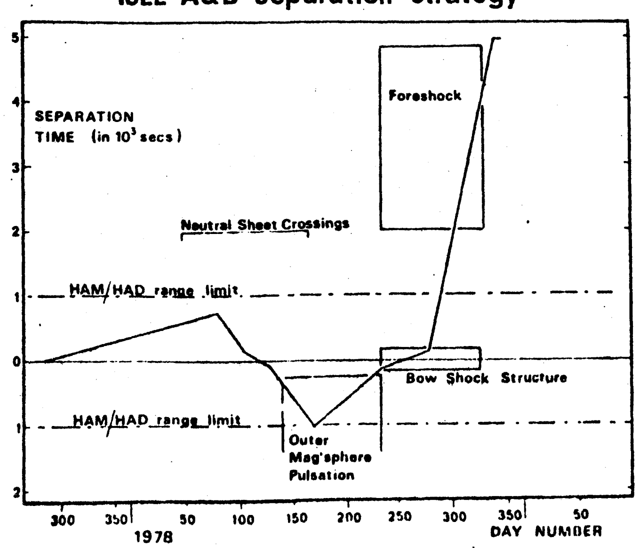
ISEE A, B, and C --- In recent months three new reports have been published concerning the joint NASA/ESA IMS satellite programs ISEE A, B, and C. These update and supplement the several reports on the same topic by Russell (see IMS NL 76-9, pg 6), Vette (ibid.) and Durney (77-2, pg 6). These latest reports are by: Durney (CCOG Handbook, Circular Ltr. No. 9, pgs 118-128), Ogilvie, von Rosenvinge and Durney (Summary Statement distributed at Spring AGU, June 1977), and Durney (in the new ESA JOURNAL 77/1). This brief overview has been abstracted from these sources. In particular, the figures and tables used in this and subsequent planned articles are taken from the ESA JOURNAL but updated according to telex information just received from the author.

Briefly stated, the International Sun Earth Explorer (ISEE) mission objectives are:
- to quantify the picture of the magnetosphere and of solar-wind/planetary interactions now held
- to identify how the solar-wind features affect the near-earth environment
- to exploit the natural presence of the plasmasphere and bow-shock magnetosheath regions in order to study plasma and particle physics for its own sake and for its application to astrophysics
- to measure the isotopic composition of solar and galactic cosmic rays
- to study diverse interplanetary and solar phenomena, providing a baseline support for deep-space probes.

Specific magnetospheric objectives include studies of the following: (1) The nature, structure, motion and stability of the boundaries inherent in the magnetosphere: bow shock, magnetopause, plasmapause and neutral sheet. (2) Effect of the interplanetary magnetic field on the topography and stability of the magnetopause ("Open" and "Closed" configurations). (3) Mechanism and extent of the entry of solar wind plasma into the magnetosphere at the magnetopause, the entry layer, the cleft and the boundary layer. (4) Energetic particle and plasma storage processes in the Earth's tail.

In order to realize the above goals it is especially necessary to resolve spatial from temporal variations. For the first time this will be made possible by the use of two satellites carrying complementary payloads and separated by only a small, controllable distance. They are ISEE-A ("Mother") and ISEE-B ("Daughter"). Both satellites are to be launched in tandem from NASA's Eastern Test Range on 13 October 1977 into an orbit having the approximately the initial elements: Apogee 23 Re, Perigee 280 km, Inclination 28.5 degrees, and Period 2.4d. The strategy selected for changing the separation between ISEE A & B is shown below from launch through the end of 1978. Note that separation is given in time units.

ISEE A&B Separation Strategy



A third spacecraft, ISEE-C, is to be placed upstream of the Earth in the solar wind to monitor passing features as they convect Earthward. This satellite is scheduled for launch on 24 July 1978. In addition to carrying experiments to support objectives of A and B, it will meat the added goals of: measuring the isotopic composition of solar and galactic energetic particles; will monitor plasma waves, shocks, particle spikes, acceleration in the solar wind, anisotropies, Forbush decreases, plasma composition and charge states, wave-particle interaction, co-rotating regions, quiet-time electron increases,solar modulation, solar X-rays and radio bursts, etc.; and gamma-ray bursts.

Project scientists for the three ISEE satellites are: Dr. Keith W. Ogilvie (ISEE-A), Dr. Alastair G. Durney (ISEE-B) and Dr. Tycho T. von Rosenvinge (ISEE-C). Listings of measurements to be performed by experiments in the ISEE-A&B payloads and the investigators associated with each are given on page 9 (facing). Most of them were listed among the addresses given in the IMS NL 77-7 Supplement distributed last month.

ISEE Data Processing and Distribution --- ISEE data will be collected in the conventional manner by NASA S-band tracking stations. This will not be generally available even in summary formats until some 6-7 weeks after acquisition. This is not a real-time operation. However, about 1/2-hr data from each satellite will be collected daily at the Goddard Space Flight Center. Since ISEE-C will be some 234 Re away on the Earth-Sun line (about an hour upstream in the solar-wind), it has obvious potential for use in a real-time mode during selected campaigns. Arrangements have been made for collection of such data for limited periods when scheduled well in advance (contact K.W. Ogilvie). It will be necessary for a user group to provide a representative to work at Goddard in the Multiple Satellite Operations Control Center (MSOCC). Every half-hour decommutated real-time data containing the IMF Z-component and solar-wind flux velocity would be provided so that a telex or telephone alert could be sent to warn campaigners about the pending arrival of solar emissions.

Routine data collection will be from the tracking stations to NASA within 24-hrs of acquisition. Some 21 days later corrected orbital parameters will be available for correcting ground reception time to spacecraft time. Processed decommutated data will be distributed to principal investigators some 35 days after original recording. These data tapes will contain spacecraft coordinates in GSE co-ordinates and may contain data from more than one experiment. They will be accompanied by Multiple Co-ordinate Ephemeris tapes.

Some 49 days after data acquisition, data pool tapes and 35 mm microfilm plots will be distributed to all ISEE principal investigators and to the World Data Center for Rockets & Satellites. Pool tapes will contain quantities stripped from the detailed tapes using algorithms supplied by the appropriate experimenter. Most will contain 5-min averages of the data. There will only be one pool tape for ISEE-A and one for ISEE-C. It is intended that these pool tapes provide "quick-look" low-time-resolution data for intercomparison and indexing. They are not intended for data reduction. Although data distribution will not begin until some 8 weeks following launch, there is no guarantee that the data on these pool tapes will be correct. Users may find them convenient for determining periods of special interest and they should then contact the experiment principal investigator to get cleaned-up high-time-resolution data for correlation and analysis.

The American part of the ISEE satellite program is NASA's major contribution to the IMS. Together with GEOS (and its possible successor), the Japanese and USSR IMS satellites and a variety of older satellites still carrying operating experiments, the ISEE A, B & C will make possible unparalleled opportunities for correlative studies between satellite, ground-based, rocket and balloon experimenters.

Code	Measurement	Investigators
GUM	Electric and magnetic waves (similar to ISEE-B experiment)	D. Gurnett R. Fredericks F. Scarf E. Smith
RUM	Magnetometer (identical to ISEE-B experiment)	C. Russell R. McPherron P. Hedgecock E. W. Greenstadt – M.G. Kivelson
FRM	1 eV–50keV protons 1 eV–250 keV electrons (identical to ISEE-B experiment)	L. Frank C. Kennel V. Vasyliunas
BAM	5 eV–40 keV protons 5 eV–20 keV electrons Solar-wind-ions (similar to ISEE-B experiment)	S. Bame J. Asbridge W. Feldman E. Hones M. Montgomery H. Miggenrieder G. Paschmann M. Rosenbauer K. Schindler H. Völk
HAM	Electron density (complementary to ISEE-B experiment)	C. Harvey R. Grard D. Jones J. Etcheto R. Gendrin M. Petit J. McAfee
ANM	8–380 keV protons 8–200 keV electrons (similar to ISEE-B experiment)	K. Anderson R. Lin C. Meng G. Parks F. Coroniti H. Rème J. Bosquet R. Pellat
WIM	25 keV–2 MeV protons 20–250 keV electrons (similar to ISEE-B experiment)	D. Williams T. Fritz E. Keppler B. Wilken I. Bostrom G. Wibberenz
HPM	Quasi-static and low-frequency electric field	J. Heppner L. Aggson N. Maynard D. Cauffman D. Gurnett
MOM	Quasi-static and low-frequency electric fields; electron gun	F. Mozer M. Kelley
HEM	VLF propagation	R. Helliwell T. Bell
OGM	6 eV–10 keV electrons	K. Ogilvie S. Scudder
SHM	Cold-plasma composition up to 40 keV q	R. Sharp E. Shelley R. Johnson H. Balsiger J. Geiss P. Eberhardt B. Haerendel H. Rosenbauer C. Chappell
HOM	Particle composition up to 20 MeV/N	D. Hovestadt M. Scholer C. Fan L. Fisk G. Gloeckler J. O'Gallagher

Code	Measurement	Investigators
AND	8–380 keV protons 8–200 keV electrons (high time resolution)	K. Anderson R. Lin C. Meng G. Parks F. Coroniti H. Rème J. Bosquet R. Pellat
EGD	10 eV/N – 10 keV/N solar-wind ions	G. Moreno A. Egidi S. Cantarano P. Cerulli V. Formisano S. Bame G. Paschmann
FRD	1 eV–50 keV protons 1 eV–250 keV electrons (high angular resolution)	L. Frank C. Kennell V. Vasyliunas
GUD	Electric waves: 10 Hz–2 MHz magnetic waves: 10 Hz–10 kHz	D. Gurnett F. Scarf R. Fredricks E. Smith
HAD	Integral electron density between ISEE-A and ISEE-B	C.C. Harvey R. Grard D. Jones J. Etcheto R. Gendrin M. Petit J. McAfee
KED	25 keV–2 MeV protons 20–250 keV electrons (high angular resolution)	D. Williams T. Fritz E. Keppler B. Wilken I. Bostrom G. Wibberenz
PAD	5 eV–40 keV protons 5 eV–20 keV electrons (high time resolution)	G. Paschmann H. Rosenbauer M. Montgomery K. Schindler H. Völk S. Bame J. Asbridge W. Feldman E. Hones
RUD	Magnetometer: range 8192 γ Max. sensitivity: 0.008 γ	C. Russell R. McPherron P. Hedgecock F. Mariani E.W. Greenstadt M.G. Kivelson

Left Column: (Mother)
ISEE-A Experiment/Investigator List

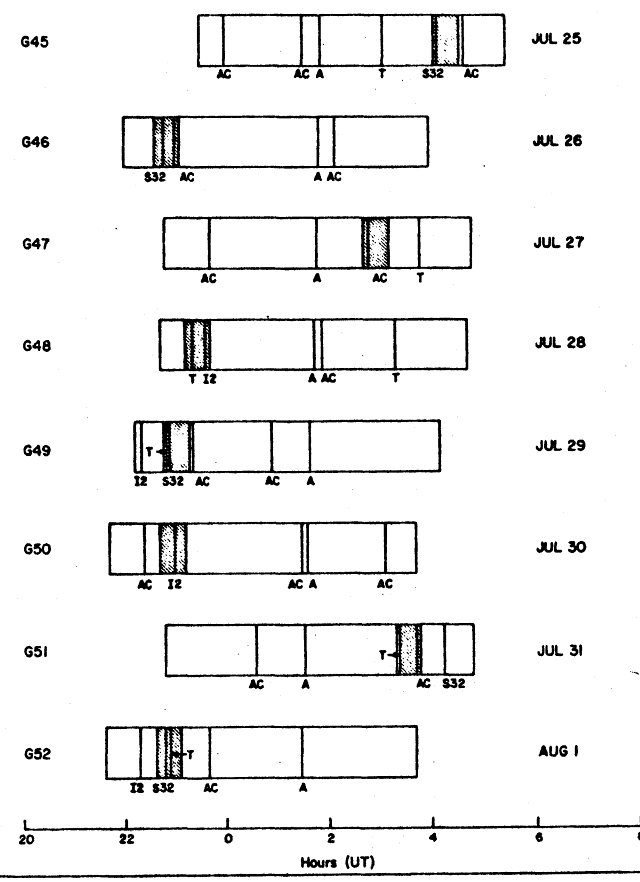
Right Column: (Daughter)
ISEE-B Experiment/Investigator List

GEOS --- During the month since publication of IMS NL 77-7, GEOS has completed a westward shift of apogee (begun June 27) with orbit consequences displayed in the maps on page 11. During this month four telexes were sent out by the IMSCIE Office on behalf of the IMS SSC to notify ground-based and satellite experimenters of observational intervals when one or more programs would lie on the same field line with GEOS while NASA was acquiring data over the W. Apogee. Such opportunities for cooperative data collection were assigned numbers by the SSC and the beginning and ending of the six-hour data acquisition windows (low data rate for 45 min and high & low data for 15 min each hour) and the special 30-min priority periods for combined high and low data rate acquisition were announced. Periods G1 through G17 were identified for orbits prior to the apogee shift and periods G45 through G52 we selected following stabilization. NASA continued tracking GEOS during the W. Apogee passes while it was drifting and these data collection intervals will be the basis for a retrospective assignment of periods G18 through G44 (generally based upon tracking for six hours each pass, centered upon the time of apogee and without respect to conjunctions with other satellites or ground based stations).

The US IMS Coordinator, Dr. R.H. Manka, has issued a request that any scientists acquiring data during the first 17 designated special periods for GEOS tracking (G1-G17, see IMS NL 77-7, pgs 8 and 9) please send a brief reply listing the intervals and times for which your experiment was acquiring data. Additional information about how well the instruments worked, particular energy ranges covered, etc. should also be included. Especially interesting would be any times already identified as containing events of interest. Please send such lists to Dr. Manka as quickly as possible with a copy to Dr. James Vette (IMS SSC). They will compile a table of observations for distribution to each contributor, to other European and American scientists involved, NASA, ESA, etc. A brief summary will be published in these NL's. Bob also sends his thanks to each scientist who cooperated in making coordinated measurements with GEOS.

Special GEOS Intervals G45-G52 --- On 21 July 1977, the IMSCIE Office sent the following list of suggested intervals for data acquisition based upon the indicated conjunctions. Repeated here are the start times of each six-hour tracking window (see diagram below) and, in parentheses, the beginning time of the 30-min high priority interval within each period. Also given are the satellites having conjunctions with GEOS during each of the tracking periods. Full descriptions of the selection criteria and codes are given in NL 77-7, pg 8. The NASA tracking intervals shown below are numbered G45-G52 and lasted for the six hours shown. The vertical lines with labels represent the time of passage of a low-altitude satellite in temporary field conjunction with GEOS. The shaded regions are for times of high priority, high-rate data acquisition for 30 minutes usually centered about the time of conjunction with one or more experiments. For data acquisition intervals G45-G52, the following symbols are used to represent conjunctions: AE-C = AC, TRIAD = T, S3-2 = S32, ISIS-2 = I2, and the time of apogee is indicated by an A. NASA tracking intervals for GEOS over the W. Apogee (July 25 is day number 206, all times are UT): G45 - 206/2330(0425) S3-2 and AE-C; G46 - 207/2200(2235) S3-2 AND AE-C; G47 - 208/2250(0240) AE-C AND TRIAD; G48 - 209/2240(2315) TRIAD AND S3-2; G49 - 210/2210(2245) TRIAD, S3-2 AND AE-C; G50 - 211/2140(2240) ISIS-2 AND AE-C; G51 - 212/2250(0315) TRIAD AND AE-C; AND G52 - 213/2140(2240) S3-2 AND TRIAD. During these periods it was known that data acquisition was planned for satellites AE-C, ISIS-2 and TRIAD. Results for these and other satellites will be reported when known.

GEOS W. APOGEE (NASA) TRACKING INTERVALS

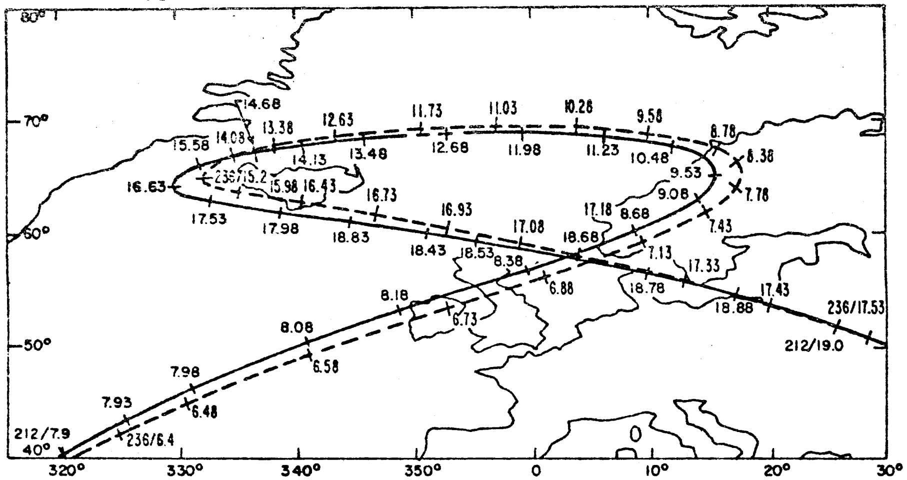


IMS SSC/GEOS Services --- By telex on 27 and 28 July the IMS SSC notified IMSCIE Office and contacts for GEOS and low-altitude N. American satellites of improved services. They have automated the identification of magnetic flux tube satellite conjunctions with gEOS and can now predict both Eastern and Western Apogee conjunctions at least two weeks in advance. They suggest the following interval selection/notification procedure: (1) IMS SSC will send predicted conjunctions to GEOS Project Scientist at earliest possible date. (2) GEOS Project Scientist will coordinate opportunities with GEOS experimenters and then contact NASA through D. Wilkins (ESOC) to request specific W. Apogee coverage from NASA/STDN with copy of request sent to the contact list of addressees requesting prompt notification. Unless there is some difficulty at GEOS station Michelstadt (Odenwald), complete GEOS coverage for Eastern Apogee passages will be acquired. (3) IMSCIE Office will send telexes notifying requestors of the SSC-selected "potential tracking intervals" and then the notification of selected intervals from ESOC will confirm the final choices. Recommended GEOS/NASA/STDN data acquisition periods G53-G69 are given here by interval with day number/starting time for the six-hour tracking window (start time for the 30-min high-priority period in parentheses) and codes for satellites having conjunctions with GEOS during the given tracking period.

G53 213/21.3(21.9) S2, T, AC, and I1; G54 214/21.1(0.7) I2, T, S2, I1, and AC; G55 215/23.8(1.3) I1, AC, T, and S3; G56 216/21.0(2.0) S2, T, and AC; G57 217/21.0(1.1) I2, S2, AC, and I1; G58 218/21.5(0.9) I2, S2, AC, I1, and T; G59 219/21.3(0.5) I2, S2, AC, and I1; G60 220/21.0(21.6) I2, T, S2, AC, and I1; G61 221/22.0(21.9) I2, T, S2, AC, and I1; G62 222/21.2(2.2) S2, AC, and T; G63 223/21.1(21.9) I2, T, S2, AC, and I1; G64 224/20.9(0.3) T, AC, and I1; G65 225/20.3(23.7) T, I2, S2, AC, and I1; G66 226/21.0(23.3) I2, S2, AC, I1, and T; G67 227/20.9(22.6)T, S2, and I1; G68 228/20.4(20.9) T, I2, S2, and AC; G69 229/21.0(21.7)AC, S2, I1 and T.

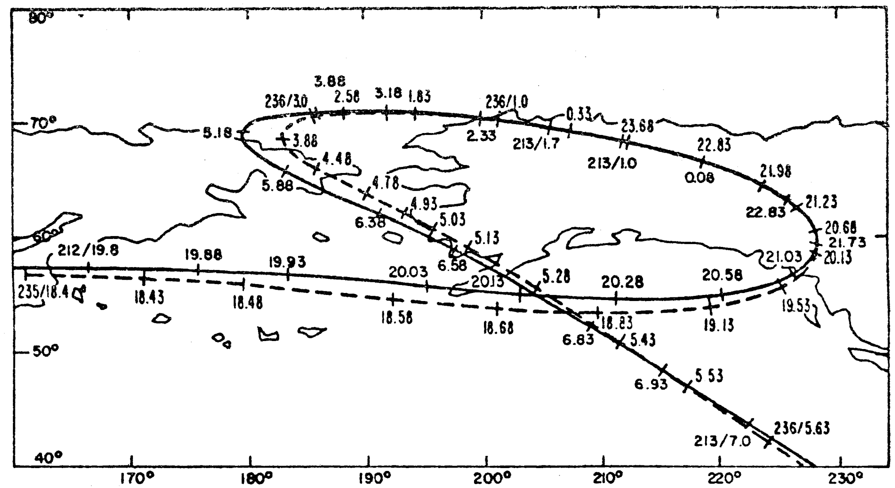
(Continued on page 12)

GEOS: NORTHERN HEMISPHERE - EASTERN APOGEE



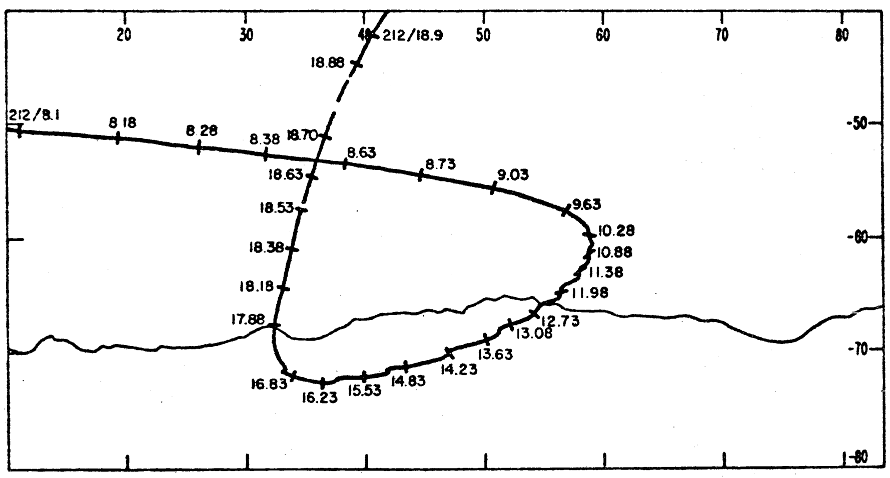
GEOS FOOTPRINT BEG. 31 JULY   GEOS FOOTPRINT BEG. 24 AUG

GEOS: NORTHERN HEMISPHERE - WESTERN APOGEE



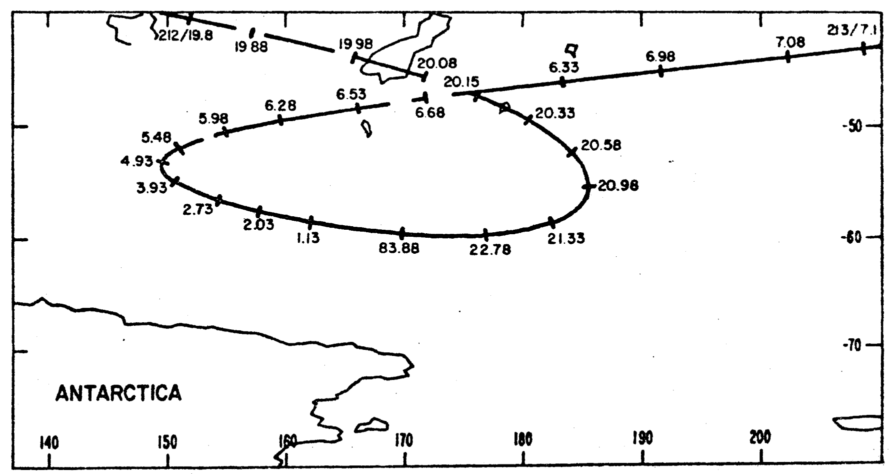
GEOS FOOTPRINT BEG. 31 JULY   GEOS FOOTPRINT BEG. 23 AUG

GEOS: SOUTHERN HEMISPHERE - EASTERN APOGEE



GEOS FOOTPRINT BEG. 31 JULY

GEOS: SOUTHERN HEMISPHERE - WESTERN APOGEE

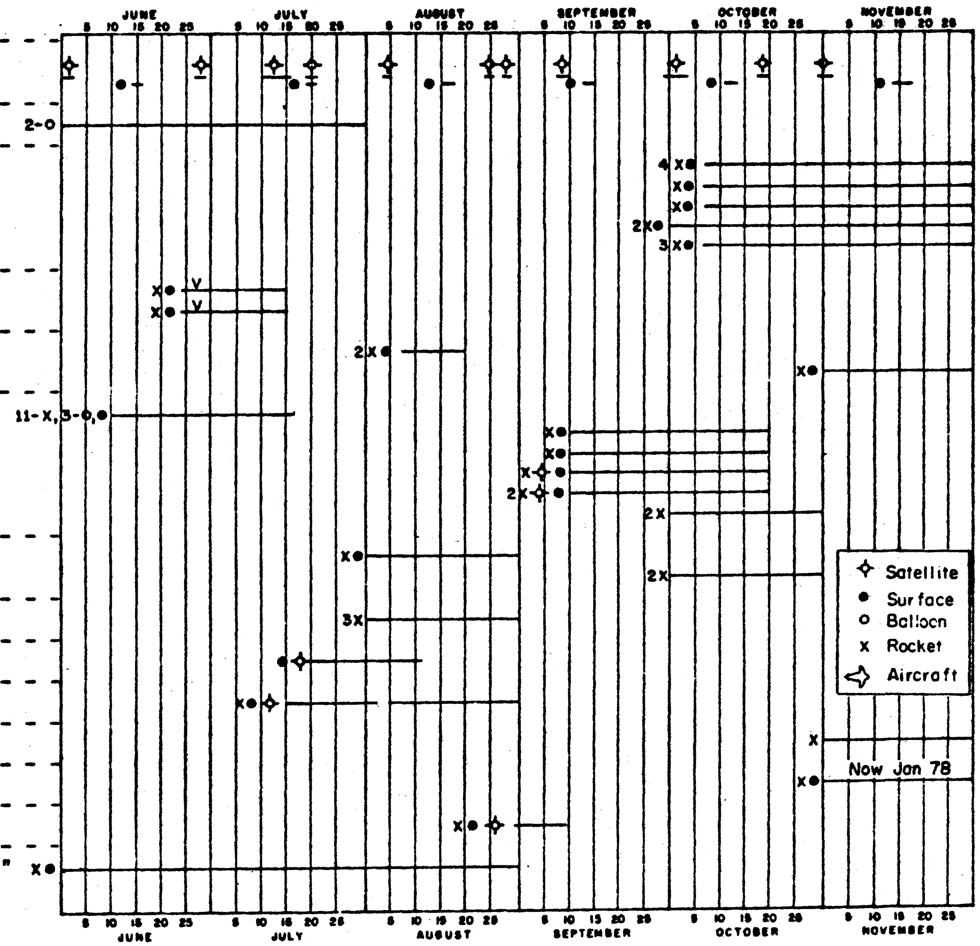


GEOS FOOTPRINT BEG. 31 JULY

GEOS MAGNETIC FOOTTRACKS --- Following the successful westward shift of the longitude of GEOS apogee, it was in position for conduct of experiments linking GEOS, Iceland and Syowa observational programs. The Northern hemisphere maps above display the orbit magnetic foottrack for two epochs, the first beginning July 31 (day 212) and the second beginning August 23 (day 235). Time marks along the foottrack chart the progress of GEOS across the field lines connecting to the regions shown. In the Southern hemisphere maps (lower), shown for the first epoch only, the oscillations during passage through the Syowa region are attributed to the internal field formulation. Similar results arise from the Barraclough 1975 and the IGRF75 models from the altitude range below 1200 km and probably reflect the lack of data in the Southern hemisphere. For the first epoch (July 31), GEOS traverses the maps for both hemispheres travelling from left to right. The Eastern Apogee is at 14.5 N and 5.3 E.

IMS CALENDAR OF GBR CAMPAIGNS JUNE - NOVEMBER 1977
(As of 28 July 1977)

WORLD-WIDE- -
  Special SSC-selected satellite periods
  IISN (Bauer, et al)
MULTIPLE SITES- -
  Berthellier; "VORTEX" Pretoria region
ANDOYA (ANDENES)- -
  Wilhelm; "SUBSTORM CAMPAIGN"
  Rees; "2nd U.K. HIGH LATITUDE CAMPAIGN"
  Bryant; "2nd U.K. HIGH LATITUDE CAMPAIGN"
  Johnstone; "2nd U.K. HIGH LATITUDE CAMPAIGN"
  Woolliscroft; "2nd U.K. HIGH LATITUDE CAMPAIGN"
SOUTH UIST- -
  Williams; "P190H"
  Dickinson; "P196H"
WALLOPS ISLAND- -
  Smith; "14.533UE", "14.534UE"
  Sharp; "MAP-2"
POKER FLAT- -
  Snider; "COSMEP V"
  Ulwick; "SPIRE I"
  Ulwick; "FIELD WIDENED INTERFEROMETER"
  Ulwick; "WIDEBAND MULTI"
  Fremow; "WIDEBAND"
  Goldberg; "18.214GM", "18.215GM"
WHITE SANDS -
  Christensen; "Ferret - 3"
  Sheldon; "23.009UE", "23.010UE"
KWAJALEIN -
  Fitz; "EQUATORIAL WIDEBAND"
ICELAND AND SYOWA -
  Perrault, Hirosawa; "CONJUGATE POINTS"
SYOWA -
  S210JA29, S310JA3, and S210JA27
SONDRE STROMFJORD -
  Kelley; "18.XXXUE"
FORT CHURCHILL- -
  Bernstein; "MONSTER"
KAUAI -
  Pongratz & Smith; "LAGO PEDO"
ARENOSILLO- -
  Sagredo, Martelli; "EXPLOSIVE INJECTION OF PLASMA"



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(Continued from page 10)

GEOS Eastern Apogee flux tube conjunctions have also been identified for potential opportunities for cooperation with the same experimenters. For E. Apogees, the special periods are numbered but without the prefix letter "G". These intervals are about 8-hours duration centered on apogee. Given are interval number, day number, UT time of apogee and codes for the satellite conjunctions occurring during the 8-hr interval.

53 214/13.42 I1, AC and T; 54 215/13.36 I1, S2, S3; 55 216/13.30 T, S2, S3; 56 217/13.24 I1, AC and S2; 57 218/13.18 S2, I1, AC and T; 58 219/13.12 AC, T, I1 and S2; 59 220/13.06 I1, AC and S2; 60 221/13.00 AC, S2 and T; 61 222/12.94 AC, S2, S3 and T; 62 223/12.88 T, AC, I1, S3 and S2; 63 224/12.82 AC, I1, S2, S3 and T; 64 225/12.76 AC, I1, S2 and T; 65 226/12.70 AC, I1, T and S2; 66 227/12.64 T, AC and S2; 67 228/12.58 AC and S2; 68 229/12.52 AC and I1; and 69 230/12.46 T, AC, I1, S2 and S3.