International Council of Scientific Unions

SPECIAL COMMITTEE
ON
SOLAR-TERRESTRIAL PHYSICS

77 - 6

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INTERNATIONAL MAGNETOSPHERIC STUDY

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

IMS NEWSLETTER

GEOS is in a safe orbit and final adjustments are completed. Experiments appear to be working and data are being collected during some 8-hrs/day by the European Space Agency's Space Operations Center at Darmstadt. Discussions are in progress about the possibility of NASA collecting GEOS data over the Western Apogee. IMS Workshops are in progress or scheduled for summer and IAGA Working Groups concerned with IMS are planning meetings for the Seattle Assembly. The IMS SSC has defined special satellite intervals for Jul-Sept 1977, based on interesting conjunctions of 10 high-altitude satellites. The IMS SCIENCE section of this NL contains a list of satellite data from one project collected during the 1976 special IMS intervals. We apologize for filling 10 pages but trust the contents justify the space. 5/30 JHA

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PROGRAM PLANS FOR JUNE 1977 - AUGUST 1977

SPECIAL IMS SATELLITE PERIODS

A table of satellite conjunctions from June to September 1977 is included in the current issue of the NL. The October to December period will be published as soon as it is made available from the IMS Satellite Situation Center (probably in NL 77-7). SSC designated special intervals for the months covered in detail in this newsletter (see also tables on page 3) are:

July 11, 2200 UT to July 16, 2000 UT
July 19, 2200 UT to July 21, 2000 UT
August 4, 1300 UT to August 5, 2000 UT
August 25, 1900 UT to August 26, 0700 UT
August 28, 0000 UT to August 29, 0700 UT

GBR Campaigns:

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

------ to Jul 31; #0139; Berthellier; Pretoria; BALLOONS (2) - long flights, E-field experiments
Jun 1 to Jun 30; Snider; Poker Flat; COSMEP V; BALLOONS (3), ROCKETS (11) - stratosphere - magnetosphere
Jun 1 to Jun 30; A-32; Smith; Wallops Isl; ROCKETS (2) - 14.533UE and 14.534UE; upper E-region
Jun 27 to Jul 15; A-18; Wooliscroft; South Uist; ROCKETS (2) - positive ion mass spectrometer
Jun 27 to Jul 15; A-19; Williams; South Uist; ROCKETS (2) - Lyman alpha, electron density
Jun 27 to Jul 15; #0085; Dickinson; South Uist; ROCKET - neutral atomic oxygen, electron density
Jul 25 to Aug 5; #0328; Christensen; White Sands; ROCKET - 18.1009 UE, e- accel for EUV emissions
Aug 1 to Aug 31; #0400; Fitz; Kwajalein; ROCKETS (3) - scint. meas. with Wideband

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

Jun 14-16; July 19-21; Aug 16-18; Bauer (0004), Evans (0171); IISN; SURFACE incoherent scatter radar net

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

June 1, 77 to July 31, 78; #0252; Munch (Proj. Sci. is Wilhelm); Various Sites; SURFACE - induc magnet.
Jun 1 to Sep 30; #0011, #0429; Perrault, Hirosawa; Conjugate Points; SURFACE - note in NL 77-3, pg 4

Regional GBR IMS Program Details, Jun - Aug 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.

DISTRIBUTED SITES: S. ATLANTIC

#0139, Berthellier - "Vortex Polaire" (Test) - 2 long-duration balloons will be launched from Pretoria in preparation for the planned Vortex Polaire program in 1978. The test balloons will carry instrumeots to provide vector electric field measurements, 1 component every 3 minutes.

JAPAN

The Japan Meteorological Agency will orbit a Geostationary Meteorological Satellite (GMS) on 15 July 1977. It will be launched by NASA for the National Space Department Agency of Japan (NASDA) from the Eastern Test Range and will be placed into a geostationary orbit at 140 deg. E. longitude. Although this is not an IMS satellite, it will carry an Energetic Particle Monitor with seven proton channels (1.2-4, 4-8, 8-16, 16-40, 40-80, 80-200 and 200-500 MeV), five Alpha channmls (9-70, 30-70, 6-15, 130-200 and 320-390 MeV), and one electron channel (>2 MeV) with a time resolution of 16-seconds. The experimenters are Tsuyoshi Kohno and Yoshihiro Yamashita. Original data starting three months after launch will be available directly from the experimenters who would be happy to share it on request. The contact for this satellite is Dr. Nobuhiko Kodaira, Director, Meteorological Agency, 3-235 Nakakiyoto, Kiyose-city, Tokyo 180-04, Japan.

SPAIN - El Arenosillo

J. Sagredo (INTA, Madrid) and G. Martelli (U. Sussex) will study electrostatic and electromagnetic perturbation created by an explosive injection of plasma into the ionosphere at about 30 km. The project is scheduled for the summer of 1977 and will involve a Flamenco rocket launch.

ALASKA - Poker Flat

COSMEP V (Combined Stratosphere Measurement Program) is a campaign whose scientific objective is to relate IR emissions observed from balloon altitudes to processes that simultaneously take place in the magnetosphere at high altitude and to understand the mechanism responsible for the relationship. There will be three launches of 5.7×10^4 m^3 balloons carrying a filter radiometer in the 5-12 micrometer range, looking upwards at 45°. Each balloon launch will be accompanied by three rocket launches (2 Super Loki and 1 Super Arcas) carrying Ozone sensors, blunt probes to measure electric conductivity at 30-70 km, a temperature measuring system and sensors to measure the wind field. The purpose of the rockets is to provide background measurements. In addition, 2 rockets (Super Arcas) will be launched at a later time. The balloon launches are planned, one for disturbed magnetic conditions, one for quiet magnetic conditions and one currently unassigned. The project scientist is Donald Snider, Atmospheric Science Laboratory, U.S. Army Electronics Command. The launches are planned for June 1977.

ACTUALITIES

USSR - Heiss Island

"IPOCAMP 2" --- Joint French-Soviet campaign to study polar E-region instabilities by measurement of the gradients and fluctuations of electron density and in situ electric fields to about 170 km altitude. Project scientists were: S.I. Avdyushin, C. Beghin and C. Renard. The campaign consisted of three rocket programs (6 Soviet MR-12 rockets) launched from Heiss Island.

(1) "ISOPROBE 1 & 2": carried packages to study thermal plasma (Beghin), electric fields (Berthellier) and magnetometers (Gidromet). Isoprobe 1 was launched at 0500 UT, 28 March but was unsuccessful. Isoprobe 2 on 17 March at 0400 UT worked well although the self-oscillating probe appears not to have oscillated.

(2) "ZIG-ZAG 1, 2 & 3": carried 4 experiments on three payloads. Instruments recorded: electron density and fluctuations (Renard probe); electric field (Renard); energetic electrons < 10 kev (T.V. Kazatschevskaya, on 1 & 2 only); spectral analysis (Tulinov, on 3 only); and magnetometers (Gidromet). No measurements were possible on Zig-Zag 1, launched 11 March at 1300 UT. Zig-Zag 2, launched 24 March at 0522 UT under quiet magnetic conditions, worked normally. Zig-Zag 3, launched 6 April at 0156 UT during disturbed conditions, also

(Continued on pg 3)

(Continued from pg 2)

worked well.

(3) "LISSA": carried 4 experiments to measure: electron density and fluctuations (Renard probe); electron density (2 probes, Y.K. Chasovitine); mass spectrometer (A.A. Pokhunkov); and energetic electrons < 10 kev (integrated flux, Kasatschevskaya). Technical problems prevented completion of the initial experiment objective. The Renard probe was not ejected from the rocket but performed on-board measurements and worked well. Analysis will be difficult because of the time-shared nature of the data. Lissa was launched, in coordination with Zig-Zag 3, at 0300 UT on 6 April 1977.

IMS/SSC Special Satellite Intervals --- The tables below give the dates and beginning and ending times (extended by 6 hours) of the IMS/SSC Special Satellite Intervals based upon interesting configurations predicted for the 10 high-altitude satellites listed. The standard codes used to indicate the satellite orbital regions during each interval are explained in detail in Table 8, SSC Report No. 7. Briefly, HT=High-latitude Magnetotail; MT=Midlatitude Magnetotail; Sh=Neutral Sheet; DM=Dayside Magnetosphere; NM=Nightside Magnetosphere; DS=Dayside Magnetosheath; NS=Nightside Magnetosheath; I=Interplanetary medium; C=Dayside access region (Cusp); S=Bow Shock wave; and P=Magnetopause. An underlined symbol indicates that the given satellite being in that region was critical in selecting the special interval.

EXTENDED IMS/SSC SPECIAL PERIODS FOR HIGH-ALTITUDE SATELLITES JULY - SEPTEMBER 1977

Period Number	Period: Day/hr UT	Period: Date/hr UT	Duration (hr)
10	192/22 - 197/20	July 11th/22 - July 16th/20	118
11	200/22 - 202/20	July 19th/22 - July 21st/20	46
12	216/13 - 217/20	Aug 4th/13 - Aug 5th/20	31
13	237/19 - 238/07	Aug 25th/19 - Aug 26th/07	12
14	240/00 - 241/07	Aug 28th/00 - Aug 29th/07	31
15	252/08 - 253/24	Sept 9th/08 - Sept 10th/24	40

IMS/SSC SPECIAL PERIODS FOR HIGH-ALTITUDE SATELLITES JULY - SEPTEMBER 1977

Period Number	Time Day/Hr	Vela 5A	Vela 5B	Vela 6A	Vela 6B	IMP-H	IMP-J	Solrad 11A	Solrad 11B	Hawkeye 1	Prognoz 5	Comment
10	193/4	I	Sh	MT	S	S	I	S	Sh	C	NS	1½h cusp pass
	193/20	DS	HT	P	I	I	I	P	S	NM	P	3 P and 1 S within 2 hours
	196/8	NS	DS	DS	Sh	I	I	DS	NS	NS	I	
	197/14	I	Sh	Sh → MT	NS	I	I	I	HT	C	NS	½h cusp pass
11	201/4	DS	DS	NS	Sh	NS	MT	NS	DS	NS	NS	8 in sheath for 6 hours
	202/14	I	HT	HT	I	HT	S → I	I	HT	P → NS	P → DS	4 in HT for 7 hours
12	216/19	I	HT	HT	I	HT	I	DS	DS	NM	I	3 in sheath for 14 hours
	217/14	P	P	DS	I	P	I	I	HT	P	P	5 in pause within 4 hours
13	238/1	HT	I	I	Sh	I	HT	I	MT	DM	NM	For 1 hour
14	240/6	I	HT	HT	I	NS	I	NS	NS	C	I	½h cusp pass
	241/1	P	P	DS	I	P	I	MT	I	P	NS	4 in pause within 3 hours
15	252/14	NS	DS	DS	HT	NS	I	P	S	P	I → S	Within 5 hours
	252/21	NS	DS	DS	HT	NS	I	NS	DS	NM	NS	7 in sheath for 9 hours
	253/18	I	HT	HT	NS	HT	I	I	HT	NM	NM	4 in HT for 18 hours

IMS SATELLITE INFORMATION

GEOS -- On pages 5 & 6 of this IMS Newsletter are the latest GEOS orbit magnetic footprint maps for the N. Hemisphere during hours around the times of Eastern and Western Apogees (requests have been relayed to the IMS SSC for similar S. Hemisphere maps). Using the Olson-Pfitzer Model, they show the footprint for the actual orbit achieved on May 12, 1977 (solid line between timing points) and the footprint for the orbit predicted for 120 days later (broken line between timing points). The numbered points along each footprint give the hours before (negative values) and after (unsigned, positive values) apogee for that point on the GEOS orbit. Selected ground stations are indicated to provide a reference to footprint and GBR sites. The Eastern (Scandinavian) Apogee map is from the recent CCOG Handbook for the IMS - GEOS (Period 1976-79), pg. 32. The Western Apogee (N. American) map is from an SSC source and the stations shown are selected N. American magnetometer sites either now operating or planned for the IMS (see IMS NL 77-1, pages 4-7). The station codes used on this map are from the new 3-letter listing to be presented by Dr. van Sabben for discussion at the IAGA meeting in Seattle (extended list for selected IMS magnetometer sites given on pg _ of this NL).

A comprehensive recap of the GEOS launch and efforts to salvage a useful orbit are to be given in the next issue of the SPACEWARN BULLETIN (possibly already distributed by this time). Here, we will summarize only those events since publication, about 3-weeks ago, of IMS NL 77-5 with its extended coverage of the GEOS launch. Incremental adjustments to the elliptical, about 12-hr GEOS orbit period were made on May 6, 7 and 8 with a final burn of the station-keeping motor on May 11 to achieve a westward drift of the satellite ground track of about 0.12°/day. This drift compensates for nodal and apsidal precessions which induce an equal eastward drift of the longitude of apogee. Consequently, the final orbit will maintain the longitudes of apogee at 37.3°E and 142.7°W. The final orbit has a nominal perigee height of 2103 km and apogee height of 38,276 km. Other orbital elements provided by the SSC from Dr. Kummer at ESOC are, Epoch 12 May 1977, 0400 13.905 UT: a=26567.3 km; e=0.680773; i=26.37°; ω=185.83° M=180°; T=718.246 min (from this period, the longitude of GEOS apogee will drift 0.0015°E/day). In this final orbit, GEOS spends about 12 hours/day between L-values of 6 and 7.1. Both apogees occur at local times of 19.1h and the time of apogee decreases about 0.06 hours/day.

The only spacecraft anomalies so far experienced have been the failure of one axial boom to lock in place and the extension of one radial boom that stopped at 1.9 m instead of the planned 2.5 m. The long 20-m radial booms were extended to full length on May 10. GEOS spin rate is 10 rpm and initial oscillations have been damped. Power from the solar panel was 91 watts on May 13 (98 watts at 90° solar aspect) and 74 watts are needed to power all experiments.

Because of possible damage to CMOS components of the GEOS experiments, the operating lifetime is currently estimated between 75 and 120 days based on standard trapped radiation model environments. A special model was prepared for GEOS which will allow the Project to estimate accumulated dosage daily using electron flux above 2 Mev as measured by the SMS/GOES experiments of the NOAA Space Environment Laboratory in Boulder. From orbit integrated fluences indicated by the SSC standard models, it was determined that 2% of the GEOS radiation exposure will be due to inner zone electrons which are stable and 98% will be due to outer zone electrons which are highly time variable. Radiation dose rates behind equivalents of different thicknesses of aluminum were calculated using inner and outer zone integrated spectra. Outer zone daily dose rates were divided by model flux above 2 Mev at 1900 hrs local time.

Using the computed radiation dose in the transfer orbit as D_t, the inner zone daily dose C_1 and the outer zone daily dose normalized to model flux above 2 Mev at 1900 LT, C_2, the cumulative dose after T days in the 12-hr orbit can be obtained from: $D(T)=D_t+C_1T+C_2\sum_{i=1,T}$ (SMS/GOES Average Flux at 1900 LT for day i).

Dr. H. Sauer (SEL, Boulder) is performing this computation daily so that accumulated GEOS radiation dose estimates will be readily available and he will notify the Project any time a daily dose exceeds 100 rads. Time averages of the outer zone model suggest a nominal 115 rad dose per day. Dose coefficients for 2 mm of aluminum shielding from the above equation and information from SMS/GOES instruments suggest that exposure through May 9 (T=15 days) was approximately 260 rads (geometric factor revision may change this value). Total dose range before the GEOS experiment devices are expected to show failure are 9,120-13,700 rads. Annealing effects may extend this range.

GEOS Scientific Experiments -- The seven experiments aboard GEOS have been described by Project Scientist K. Knott in "Payload of the 'GEOS' Scientific Geostationary Satellite", ESA Scientific & Technical Review, Vol. 1, No. 3, (173-196), 1975, and are listed in the NSSDC/WDC-A-R&S IMS SSC Report No. 9, 1977. A brief listing is given below of the eleven principal instrumental units, their objectives and the team leader for each package.

S-300: 1. Wave Field Impedance - VLF antennas to measure self- and mutual-impedance between DC field and electric wave field probes from 0.2 to 76 kHz. Dr. C. Beghin, CRPE/CNRS, Ave de la Recherche Scientifique, 45045 Orleans-Cedex, France.

2. Magnetic Wave Fields - Six search-coil magnetometers to measure AC magnetic fluctuations in two band widths (3 sensors each) from 0.1 Hz to 30 kHz. Dr. R. Gendrin, CNET/CRPE, 38-40 Rue de General Leclerc, 92131 Issy-les-Moulineaux, France.

3. DC Fields by Double Probe - Dipolar floating antenna to measure plasma electric fields. Dr. A. Pedersen, Ionospheric Physics Division, Space Science Dept, ESA-ESTEC, Domeinweg 1, Noordwijk, The Netherlands.

4. VLF Plasma Resonances - Dipolar floating antenna to detect AC waves from DC to 80 kHz. Dr. M. Petit, CNET/CRPE, (same as 2).

5. Electric Wave Fields - Four mesh sensors deployed on short booms to measure AC electric waves in a range of 50 Hz to 80 kHz. Dr. E. Ungstrup, Danish Space Research Inst, Lundtoftvy 7, DK-2800 Lyngby, Denmark.

S-302: 6. Thermal Plasma Flow - Two electrostatic analyzers to study very low energy electrons and protons. Dr. R.L.F. Boyd, Dept of Physics & Astronomy, Mullard Space Science Lab, Univ College London, Holmbury Saint Mary, Dorking, Surry RH5 6NS, England.

S-303: 7. Low-Energy Ion Composition - Combined electrostatic and magnetic analyzer to study ion composition, energy spectra and angular distribution of low-energy particles and plasma. Dr. J. Geiss, Physikalisches Institut, Univ Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland.

S-310: 8. Low-Energy Electron and Proton Pitch Angle Distribution - Ten electrostatic analyzers to measure the energy spectrum of electrons and protons in the energy range of 0.2 to 20 keV. Dr. B.K.C. Hultqvist, Kiruna Geophysical Inst, S-98101 Kiruna 1, Sweden.

S-321: 9. Electron and Proton Pitch Angle Distribution - Magnetic deflection system followed by solid-state detectors to study the acceleration and precipitation process of electrons in the 20 to 250 keV range and protons in the 40 keV to 2 MeV

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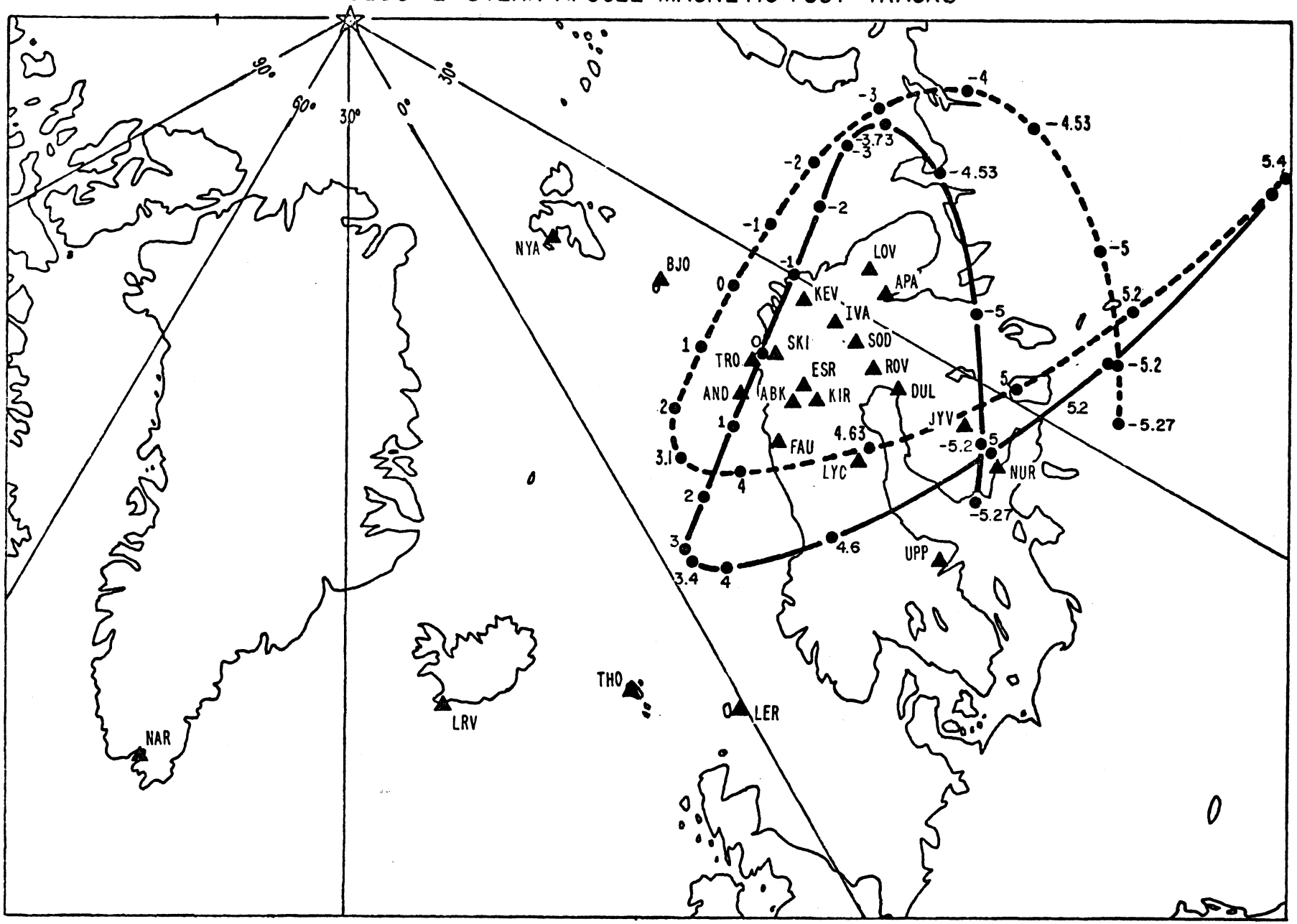
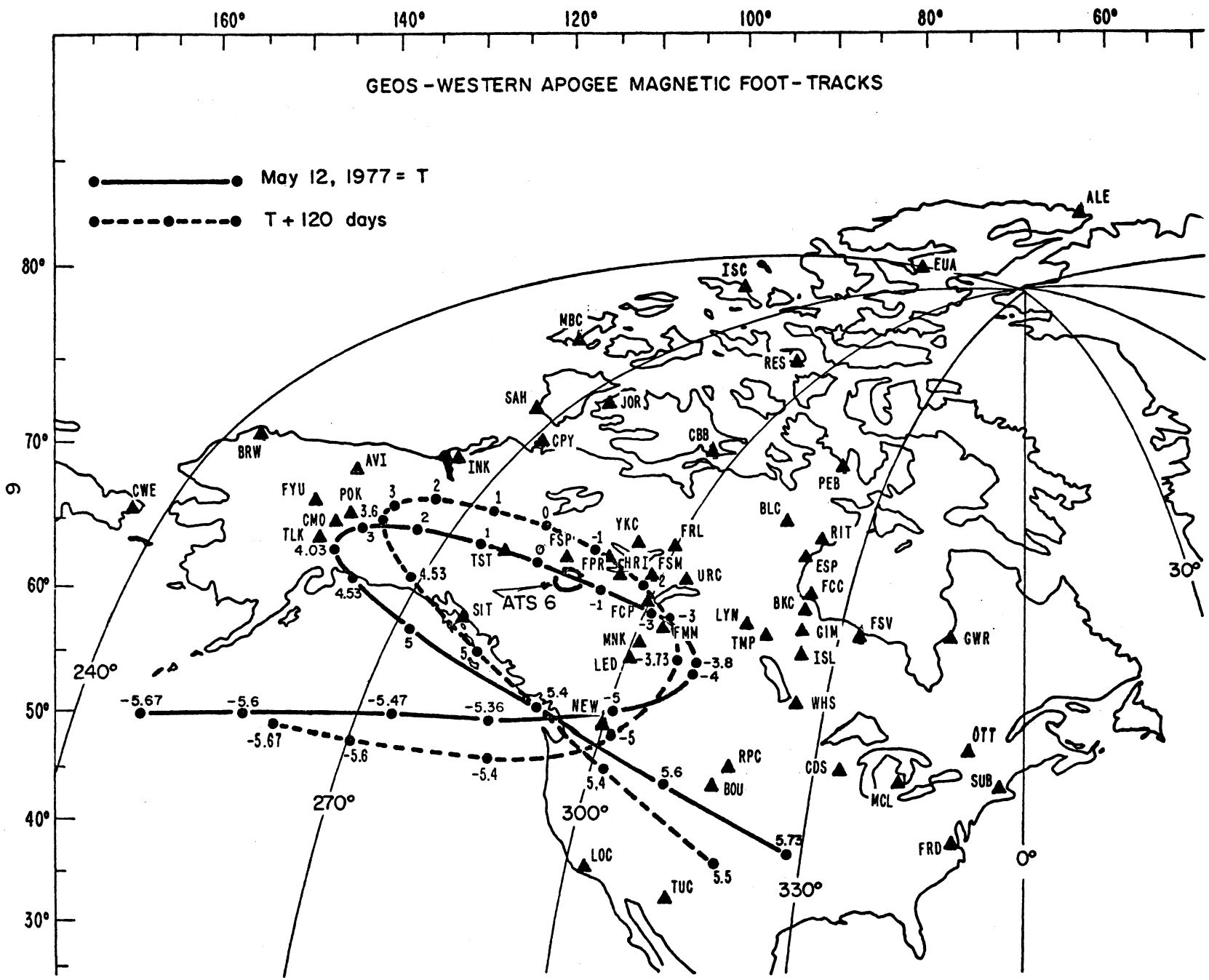
GEOS-EASTERN APOGEE MAGNETIC FOOT-TRACKS




GEOS - WESTERN APOGEE MAGNETIC FOOT - TRACKS
May 12, 1977 = T
T + 120 days
160°
140°
120°
100°
80°
60°
80°
70°
60°
50°
40°
30°
240°
270°
300°
330°
0°
30°
ALE
EUA
ISC
MBC
RES
SAH
JOR
CPY
CBB
BRW
AVI
INK
PEB
CWE
FYU
POK
CMO
TLK
4.03
3.6
BLC
RIT
YKC
FRL
FSP
TST
FPR
CHR
FSM
URC
ESP
FCC
BKC
SIT
ATS 6
FCP
LYN
TMP
GIM
FSV
GWR
MNK
FMM
LED
-3.73
-3.8
ISL
NEW
-5.67
-5.6
-5.47
-5.36
WHS
OTT
RPC
BOU
CDS
SUB
MCL
FRD
LOC
TUC
5.73
5.5
5.6
5.4
4.53

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range. Dr. B. Wilken, MPI fur Aeronomie, Postfach 20, D-3411 Katlenberg-Lindau 3, FRG.

S-329: 10. DC Electric Field and Gradient B by Electron Beam Deflection - Four electron guns on booms and a satellite mounted detector to measure the electric field component perpendicular to the magnetic field vector B and to derive the DC magnetic field vector and gradient. Dr. F. Melzner, MPI fur Extraterrestrische Physik, 8046 Garching bei Munchen, FRG.

S-331: 11. Triaxial Fluxgate Magnetometer - Fluxgate magnetometer to simultaneously measure the three components of the magnetic field to 5 Hz. Prof. F. Mariani, Lab Instituto de Fisica Universita Piazza Annunziata, 67100 L'Aguila, Frascati, Italy.

REGIONAL IMS NEWS

France

P. Simon sends word that a satellite tracking station at Kerguelen (49°S, 70°E) has been operational since 26 March 1976. Telemetry frequency is 136 MHz and telecommand on 148 MHz band. For information about use of this facility, contact: TAAF, 27 Rue Oudinot, 75007 Paris, France, Telex 200369.

By telex from CNET, Paris, Gendrin informs the IMSCIE Office via Simon that "The French National IMS Committee has decided to go on with the Iceland Campaign, taking into account: - The good functionning of the onboard experiments - The number of institutes in France and in foreign countries which are involved in these conjugate experiments and for which it is still interesting to have coverage in the noon/afternoon sector." This message refers to the "CONJUGATE POINTS" program of Perraut & Hirosawa which is scheduled to begin in June 1977, combining GBR observations on Iceland and at Syowa (Antarctica) with measurements by experiments on GEOS. This complex international program of coordinated ground-based and satellite observations is described in detail by S. Perraut in the contribution "Southern Hemisphere and Conjugate Point Experiments" in the CCOG Handbook, pages 72-81. Presumably, the reference to "noon/afternoon" means for those times near apogee, twice each day, when it is possible to track GEOS (currently about 8-hours per day from near Darmstadt).

Federal Republic of Germany

The 4th European Geophysical Society (EGS) Meeting is scheduled for Munich, 6-9 September 1977. A magnetospheric session is being organized by Paschmann and Haerendel. "In view of the great many ground-based, balloon and sounding rocket activities during the past winter in northern Scandinavia and of the successful operation of all GEOS instrumentation (although in the wrong orbit), it appears to be timely to organize in Europe a platform for presentation and discussion of the initial results and to convey a little of the excitement to the European geophysical community." Exact date and location of this session is to be announced later, after abstracts of contributions have been received. Contributions are encouraged in spite of the lateness of the announcement and the fact that many experimenters now only know that they have good data but have not yet analyzed it. Contact G. Haerendel, MPI fur Physik und Astrophysik, Inst fur extraterrestrische Physik, 8046 Garching b. Munchen, Germany, Telephone (089) 3299-516, Telex 05-215845.

United States

GEOS Opportunity - R.H. Manka, US National IMS Coordinator, has written to NASA Headquarters staff a broadly-distributed letter describing the result of the GEOS launch and the opportunity for previously unplanned cooperative studies between N. American GBR experimenters, ATS-6 and other US or Canadian satellite experimenters and GEOS. In particular, he asks that NASA consider: (1) Providing GEOS data acquisition for the some 10 hours/day when it is near the Western Apogee. Hopefully in such a way that data handling by ESA/NASA will permit preparing the planned daily summaries so that they can be made quickly available to the IMS Community. (2) That efforts be made to collect data from ATS-5 and ATS-6 during times of near conjunction with GEOS and that the possibilities of later orbital position adjustments for the ATS spacecraft be examined to take optimum advantage of the new opportunities for coordinated multi-spacecraft measurements.

IMS Meeting at AGU - An IMS Review Session is scheduled for Thursday morning, 2 June, 8:30-10:30 am, in the Assembly Room, Sheraton Park Hotel during the Spring AGU Meeting. It will cover world-wide and US IMS programs and science and the ISEE spacecraft. Representatives of ESA and the IMS SSC will present talks about GEOS and the scientific programs planned around the new orbit.

GEOS and IMS Scientists' Discussion - Thursday afternoon, 2 June, 3:00-6:00 pm, in the Marshall Room of the Sheraton Park there will be an informal meeting to provide an opportunity for scientists associated with spacecraft, ground-based arrays and theory and modeling groups to talk with the GEOS Project Scientist about possibilities for coordinated measurements. This meeting was quickly arranged in conjunction with B. Currie, Canadian IMS Coordinator, to include as many as possible potentially interested scientists. Everyone is welcome and particularly those having to do with: GEOS, ATS, ISIS, IMP, AE, Hawkeye, ISEE; European GBR facilities, magnetometer chains, photometers, all-sky cameras, incoherent scatter radars, auroral radars, rocket experimenters and range staff, ionosondes, riometers, whistlers, micropulsations; and IMS SSC and IMSCIE Office representatives. Bring appropriate slides or Vu-graphs summarizing the status of your experiment, measurement parameters, location of array, etc. Data samples, especially if taken since GEOS launch, would be interesting.

Summary/Schedule N. American IMS Magnetometers - The following information was received from Dr. F. Frischknecht, Geological Survey, Box 25046, Denver Federal Center, Denver, Colorado 80225, USA. The N. American magnetometer systems for IMS (see IMS NL 77-1) are being assembled by the US Geological Survey in Denver. Major components are: triaxial fluxgate magnetometer, interface controller and either an on-site digital tape recorder or a radio/antenna system for data relay to the SELDADS collection center in Boulder (via the SMS/GOES satellites). As of 5 May, 8 radios had been delivered to the USGS and the remaining 18 sets were to be received by 3 June. 15 antennas were on-hand and the remainder are now due. Unresolved problems with antenna gain on the receive frequency (469 MHz) may lead to problems at high latitudes. Modified interface controllers are in assembly and testing stages. Calibration of the magnetometers and assembly of the complete systems will be matched to completion schedules for the interface controllers. Plans are now firm to have a magnetometer training session during the week 6-10 June 1977. At that time, fourteen systems (including 2 with on-site tape units) will be ready for delivery to the principal scientists or their representatives. Documentation on all components will be available for the training session although some information on the radios may consist of brief instructions and "blue-line schematics". Complete information on the interface controller hardware will be available then and additional information on system software for interested persons. The training session will include a review of the SELDADS data processing equipment and plans for near-real time data availability and standard data products. Also, a visit is scheduled to WDC-A for STP to view equipment for archiving and retrieving this IMS data set. This meeting will give principal investigators an opportunity to discuss

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their needs for data copies on a regular or non-routine basis during IMS.

CANADA

Canadian IMS Newsletter for May 1977 - The most recent Canadian NL contains details of some seven balloon and/or rocket programs of interest to IMS participants. These planned programs have been entered into the IMSCIE Office file and summaries will be published in appropriate issues of these NL's.

Information on station closures is given from a letter by Mr. D.B. Ross, Propagation Research Lab, CRC. He stated that the riometer station at Resolute will be dismantled in mid-May and that riometer recording at Churchill will be discontinued. If resources permit, a monitor may be maintained at CRC, Ottawa. Charts recorded since the end of 1975 will not be processed although copies will be made available upon request. Currie adds that presumably the riometer at Great Whale River, which is operated by the SRFB-NRC, will continue in operation.

SEATTLE IAGA MEETINGS

Working Group on Data Collection and Dissemination - H. Maeda has written to announce a meeting during the first week of the Seattle Assembly of this WG for which he is Co-chairman. With many IMS programs now in progress or soon to begin, he writes that is the urgent that we discuss topics such as: 1. Collection of IMS data, especially those of temporary or personal observations or experiments. 2. Collection and dissemination of scattered data on geomagnetism and aeronomy. 3. Digitization of analogue data. 4. Medium change from microfilm to microfiche. 5. Conversion of digital data on magnetic tape of any format to a standard format. Those having information or ideas on these problems are invited to correspond with Dr. Maeda, Geophysical Institute, Kyoto University, Kyoto, Japan.

Dr. Maeda also informs us that the Japanese WDC-C2 (Geomagnetism) now has a permanent base for data services and studies. From April 1977, it has become part of the Data Analysis Center for Geomagnetism and Space Magnetism of the Faculty of Science, Kyoto University.

Working Group on Quantitative Magnetospheric Models - This W.G. of Division III is scheduled to meet on a day near the scheduled meeting of the Workshop on the International Geomagnetic Reference Field. W.G. Chairman, Dr. W.P. Olson, has circulated a letter inviting all WG members and corresponding members to attend both this meeting and the IGRF Workshop. The QMM WG will concentrate on reviewing the status of all current quantitative magnetospheric models and of model testing and verification. Those interested in contributing a formal presentation should send the title and a brief abstract in the standard IAGA format. From these the agenda will be prepared. Papers should be limited to discussions and descriptions of quantitative models, input data sets and model tests. Those interested in these or other possible topics should correspond with Dr. W.P. Olson, McDonnell Douglas Astronautics Co., 5301 Bolsa Ave., Huntington Beach, CA 92647, telephone number (714) 896-3311. Meeting details should be distributed to respondents in June.

New 3-Letter Station Codes - Dr. D. van Sabben has shared part of a draft list of new 3-letter station codes for magnetic observatories, to be considered at the Seattle Assembly. Consideration has been given to using symbols already adopted for seismological stations having the same names (but not always the same coordinates).

AE(12) Network Stations: Leirvogur, LRV; Narssarssuaq, NAQ; Great Whale River, GWC; Fort Churchill, FCC; Yellowknife, YKC; College, CMO; Barrow, BRW; Cape Wellen, CWE; Tiksi Bay, TIK; Cape Chelyuskin, CCS; Dikson Island, DIK; Abisko, ABK; Sodankyla, SOD.

N. American Networks: Alaska Chain - Eureka, EUA; Isachsen, ISC; Johnson Point, JOP; Mould Bay, MBC; Sachs Harbor, SAH; Cape Parry, CPY; Inuvik, INK; Arctic Village, AVI; Fort Yukon, FYU; Poker Flat, POK; College, CMO; Talkeetna, TLK. Alberta Chain - Fort Reliance, FRL; Fort Smith, FSM; Fort Providence, FPR; Hay River, HRI; Uranium City, URC; Fort Chipewyan, FCP; Fort McMurray, FMM; Meanook, MNK; Leduc, LED. Fort Churchill Chain - Alert, ALE; Resolute Bay, RES; Pelly Bay, PEB; Baker Lake, BLC; Rankin Inlet, RIT; Eskimo Point, EKP; Fort Churchill, FCC; Back, BKC; Gillam, GIM; Island Lake, ISL; White Shell, WHS. East-West Chain - Tungsten, TST; Fort Simpson, FSP; Lynn Lake, LYN; Fort Severn, FSV; Thompson, TMP; Great Whale River, GWC. Mid-latitude Chain - Eusebio, EUS; Tahiti, PPT; Midway Island, MDY; Wake Island, WKE. AFGL Network - Newport, NEW; Rapid City, RPC; Camp Douglas, CDS; Mt. Clemens, MCL; Sudbury, SUB; Lompoc, LOC; Tampa, TPA. Other Magnetic Observatories - Sitka, SIT; Fredericksburg, FRD; Boulder, BOU; Tucson, SUC; San Juan, SJG; Guam, GUA; Honolulu, HON; Cambridge Bay, CBB; Ottawa, OTT; St. John's, STJ; Victoria, VIC.

IMS SCIENCE

Terrestrial Kilometric Radiation Studies - The following list of observation dates for TKR and description of this satellite experiment was contributed by Dr. J.K. Alexander, Head Planetary Sciences Branch, Code 695, Goddard Space Flight Center, Greenbelt, Maryland 20771, USA. He invites interested IMS participants to contact him directly at that address or by telephone (301-982-5461).

The lunar orbiting Radio Astronomy Explorer-2 satellite (RAE-2) has been used to obtain synoptic observations of substorm-associated terrestrial kilometric radiation (TKR) activity since June 1973. Data collected during most of the special IMS satellite periods of 1976 have now been processed and are available in summary form from the National Space Science Data Center (WDC-A for Rockets & Satellites/IMS SSC), see table on page 9. Those interested in detailed data for some specific time should contact Dr. Alexander directly.

A comprehensive description of the RAE-2 spacecraft was published in Astronomy and Astrophysics, 40, (365-371), 1975 by Alexander, et al. Reprints of this and other papers are available. These show that TKR is often observed by RAE-2 in conjunction with magnetospheric substorms, especially when the satellite is situated above the hemisphere centered on the pre-midnight local time sector. In addition to providing an index of substorm activity that is independent of and complementary to Auroral Electrojet (AE) magnetic activity indices, the RAE-2 experiments also provide estimates of the radio source location on those occasions when earth occultations occur during each 222-min orbit.

In their preprint abstract to "Relationship between Auroral Substorms and the Occurrence of Terrestrial Kilometric Radiation", Kaiser and Alexander state: "We have examined the correlation between magnetospheric substorms as inferred from the AE(11) index and the occurrence of terrestrial kilometric radiation (TKR) as observed by the Goddard radio astronomy experiment onboard the IMP-6 spacecraft. In general, we find that AE and TKR are well-correlated when observations are made from above the 15-03 hr local time zone and are rather poorly correlated over the 03-15 hr zone. High-resolution dynamic spectra obtained during periods of isolated substorms indicate that low-intensity, high-frequency TKR commences at about the same time as the substorm growth phase. The substorm expansion phase corresponds to a rapid intensification and bandwidth increase of TKR. When combined with our previous results, these new observations imply that many TKR events begin at low altitudes and high frequencies (~400-500 kHz) and spread to higher altitudes and lower frequencies as the substorm expands.

RADIO ASTRONOMY EXPLORER-2 SATELLITE -- TERRESTRIAL KILOMETRIC RADIATION RECORDINGS FOR 1976 IMS PERIODS

PERIOD #	DATE Mo/Day	SUB-SATELLITE LOCAL TIME	EARTH OCCULTATION	COVERAGE	COMMENTS
1	1/2-4	12.9-14.5	No	Good	
2	1/13	20.5-20.8	Yes	01-11 UT	Emission from N. Hemisphere
3	1/25-26	7.3-8.6	No	Good	
4	1/27-28	9.4-9.9	No	Good	
5	2/8-9	18.1-19.0	Yes	Good	Occultation data show emission from N. Hemisphere cusp
6	2/21-23	5.6-6.6	Yes	Good	Occultation data poor
7	3/2-4	13.0-14.2	Yes	Good	Occultations indicate emission from dusk hemisphere
8	3/6-7	15.7-16.8	Yes	Good	Occultations indicate emission from S. Hemisphere cusp and tail region
9	3/18-19	2.3-3.6	Yes	Fair	Occultations indicate emission from S. Hemisphere tail
10	6/23-26	8.9-11.3	No	Good	
11	7/7-8	19.9-21.5	No	Poor	
12	7/9-10	22.5-23.0	No	Good	
13	7/22	8.0-8.5	No	Good	
14	7/31-8/3	16.1-18.0	Yes	Fair	Interference due to solar emissions
15	11/26	16.0-16.8	No	Good	
16	12/3	21.3-22.1	No	Poor	
17	12/6-8	23.3-1.7	No	Fair	
18	12/30-31	19.1-20.2	No	Fair	

GENERAL NEWS

Chatanika Radar Advisory Committee Meeting - On 4-5 Feb 1977, the CRAC met with users of the Chatanika incoherent scatter radar facility for a series of presentations describing research applications of this facility and to consider future plans and funding status. A summary of this meeting has been compiled and distributed by the Stanford Research Institute, Menlo Park, California 94025, USA. The agenda for the meeting forms a practical table of contents for the summary report.

M. Baron (SRI) reported on facility status and the summary contains lists from his paper of: Measureable and derivable quantities from Chatanika observations; Recent experimental advances; Geophysical instrumentation for coordinated observations; Non-SRI users from Sept 1975 - Jan 1977; Services provided by SRI; A tabular listing of project software; Chatanika usage summary (Nov 1972 - Oct 1976); SRI operations of the Chatanika radar; Listing of cumulative facility use (hours) by organization from Nov 1975 - Oct 1976; Ph D dissertations based on Chatanika work; and Chatanika-related publications since 1972 (some 70 papers published or pending to this time).

R.D. Hunsucker, Geophysical Institute, Univ of Alaska, Fairbanks, Alaska 99701, USA, reported on Alaskan Instrumentation. Copies of this report are available and IMSCIE Office has asked for one in view of the possible importance for GEOS cooperative studies for W. Apogee observations. The report contains information on support services for Chatanika including: Sheep Creek Ionosonde, 30 MHz Riometers, Optical Equipment, Other Data and Real-Time Geophysical Data. Also included are lists of Geophysical Institute field sites in Alaska, Special IMS Instrumentation sites, an excerpt from INAG Bulletin #24 ("Selected Ionograms for College with Interpretive Comment"), Comments on plans for a research sounder near Chatanika and plans for Faraday rotation measurements using the ATS-6 beacon.

The meeting summary report further contains technical abstracts of papers presented, surveying Chatanika research conducted by Stanford Research Institute, University of Alaska, Utah State University and Coordinated Experiments. The latter group of papers covered results from coordinated observations between Chatanika and satellites (Wideband and TRIAD), rocket and balloon launches nearby, optical observations, magnetospheric and ionospheric coupling studies and comparison of simultaneous electric field measurements with the Anchorage backscatter radar. Also covered were tropospheric studies.

The final session covered future plans, a review of past funding and possibilities for the future. Although DNA (Defense Nuclear Agency) support is scheduled to decrease in fiscal-78, present NSF (National Science Foundation) initiatives should adequately cover the anticipated reduction if they are successful. This information is reported in a final section covering science related to the DNA, support of Chatanika, response to the support and recommendations of the committee. As an outcome of this meeting planning groups have been established for long- and short-range facility development, a hardware/software study is in progress and a small radar scheduling advisory group has been established to advise the SRI project leader on the allocation and scheduling of radar time and to help resolve potential disputes.

Alberta Meridian Chain - In May, WDC-A for STP received computer tapes from the Univ of Alberta containing digital magnetometer values averaged for each 1-min from the eight sites operated by G. Rostoker and associates for the Canadian IMS Program. The cruciform array of stations is located roughly along the 300°E geomagnetic meridian. Recordings began in mid-August 1976.

IMS CALENDAR OF GBR CAMPAIGNS APRIL - SEPTEMBER 1977
(As of 20 May 1977)

WORLD-WIDE- -
Special SSC-selected satellite periods
GEOS (K. Knott, et al)
IISN (Bauer, et al) (preliminary)
MULTIPLE SITES- - - - - - - - - - - - - - - - - - - -
#0139 (Berthellier; "Vortex") Pretoria region
ANDOYA (ANDENES)- - - - - - - - - - - - - - - - - - -
B-7 (Matthews; 18.211 UE/IE)
SOUTH UIST- -
A-18 (Woolliscroft; P73H)
A-19 (Williams; P190H)
#0085 (Dickinson; P196H)
WALLOPS ISLAND- - - - - - - - - - - - - - - - - - - -
A-32 (Smith; 14.533UE, 14.534UE)
FORT CHURCHILL - - - - - - - - - - - - - - - - - - -
B-10 (Gentieu/Mentall; 18.1013GA)
POKER FLAT -
Snider;"COSMEP V"
#0400 (Fitz; "SPIRE")
Ulwick; "EXCEDE II"
Ulwick; "Field Widened Interferometer"
Ulwick; "Wideband Multi"
Fremow; "Wideband"
WHITE SANDS -
Christensen; "Ferret - 3"
KWAJELEN -
#0400 (Fitz; "Equatorial Wideband")
CONJUGATE POINTS- - - - - - - - - - - - - - - - - - -
#0011, 0429 (Perrault, Hirosawa)