NASA/CR-97- 206174

SCIFER
"Sounding of the Cleft Ion Fountain Energization Region"
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FINAL TECHNICAL REPORT

NASA Contract No. NAG5-693.
SCIFER-Ground-Based Observations

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The objectives of the ground-based observations in support of the SCIFER launch were threefold:

1) Acquire and display ionospheric conditions prior to launch to aid in the establishment of launch criteria in real time.

- The Principal Investigator for the mission was positioned at the Auroral Station in Longyearbyen, Svalbard with real-time access to local magnetometer, all-sky imager and meridian-scanning photometer data and meridian-scanning photometer data from NYA by telephone.
- Observers at both stations participated in real-time visual interpretation.
- Solar wind data from IMP-8 and WIND were acquired and interpreted in real time.
- Telephonic and data links were established at the observatory for the launch window period.
- Ground-based observatory countdown and launch criteria were developed (Table One, attached).

2) Relate optical and magnetic ionospheric signatures observed from the ground to magnetospheric boundaries in the energetic particle flux measured at the payload.

• The energetic electron trapping boundary was found to correspond to the equatorward edge of the discrete auroral arcs forming the dayside aurora.

• The energetic electron trapping boundary was found to correspond to the poleward edge of pulsating aurora.

• The pulsating aurora was found to correspond to one second bursts of energy-dispersed electrons originating in the equatorial plane. Pulsations at larger intervals corresponded to travel times to the conjugate region and return.

• The pulsating aurora was also directly linked to the geomagnetic pulsations and traveling magnetic vortices, all occurring equatorward of the trapping boundary.

• 630 nm emission corresponding to <10 eV electron precipitation was observed equatorward of the trapping boundary (L=15) and ascribed to photoelectrons from the sunlit conjugate region.

3) Aid in the interpretation of time/space incongruities in the rocket data.

• In addition to the meridian-scanning photometer and magnetic records, a video tape was made of the all-sky camera record which includes the location of the geomagnetic conjugate point of the rocket payload for three different altitudes (120, 130 and 140 km altitude) for each second of flight time.

• The motion of the payload conjugate across the aurora showed that the payload passed over three distinct arc systems on the poleward side of the trapping boundary.

• There were at least two distinct types of energetic electron precipitation in this region.

1) One of these was a classic "inverted V" electron energy distribution, which was associated with the visible discrete arcs, in particular, a ray bundle or bundles which passed in and EW direction across the payload.

2) The other obvious type was much weaker and field-aligned, but not "inverted V". It was associated with the space between the observed arcs and with the transverse ion acceleration measured by the rocket.

• Height measurements of the descrete arcs showed them to be maximized in the 140 km altitude region. This supports the conclusions from pulsations data that the magnetic pulsations signatures were not associated with the discrete aurora on the poleward side, since aurora at such altitudes rarely develops a current system leading to a magnetic disturbance on the ground.

• The same conclusion was reached regarding a magnetic impulse event observed during the flight.

These results were reported in a series of articles to be printed in Geophysical Reserch Letters on June 15, 1996. Copies of the articles directly associated with the ground-based measurements are appended here.

SCIFER Campaign
Longyearbyen Auroral Station
Countdown Schedule
January/February 1995

Launch Criteria: (14.5 minutes to apogee from T-2.5 min hold)

1) Bz <5nT >20min
2) Green arcs in Red background
3) O900<MLT<1045
4) Magnetic pulsations present
5) By<+5nT

Local	UT	MLT	Schedule	Action	T
0230	0130	0500	Bus leaves town		
0300	0200	0530	On station	Call ARR hourly	T-2hr
0330	0230	0600	Instrument checks	Call NYA 1/2 hourly	
0400	0300	0630	Instrument checks	clocks,domes, recorders	
0430	0330	0700	Report Conditions	VIS,MSP,ASC, MAG, MSG,SPEC,	
0500	0400	0730	Launch window open		T-15m
0530	0430	0800			
0600	0500	0830	WIND on	Plot WIND data: Vx, Bz, By.	
0630	0530	0900	Prime window opens	EISCAT on	T-8m
0700	0600	0930	WIND obs. arrive at Earth		T-2.5m
0720	0620	1000	Launched IE 40.006	06h 24m 48s LOS @T+19m45s	
0800 0815	0700 0715	1030	WIND off Prime window end	End WIND dataplot	
0830 0845	0730 0745	1100 1115	Edge of Cusp	end of EISCAT 2hr window	
0900	0800	1130	end WIND at Earth		
0930	0830	1200		ASTV off	
1000	0900	1230	Launch window closes	EISCAT off	