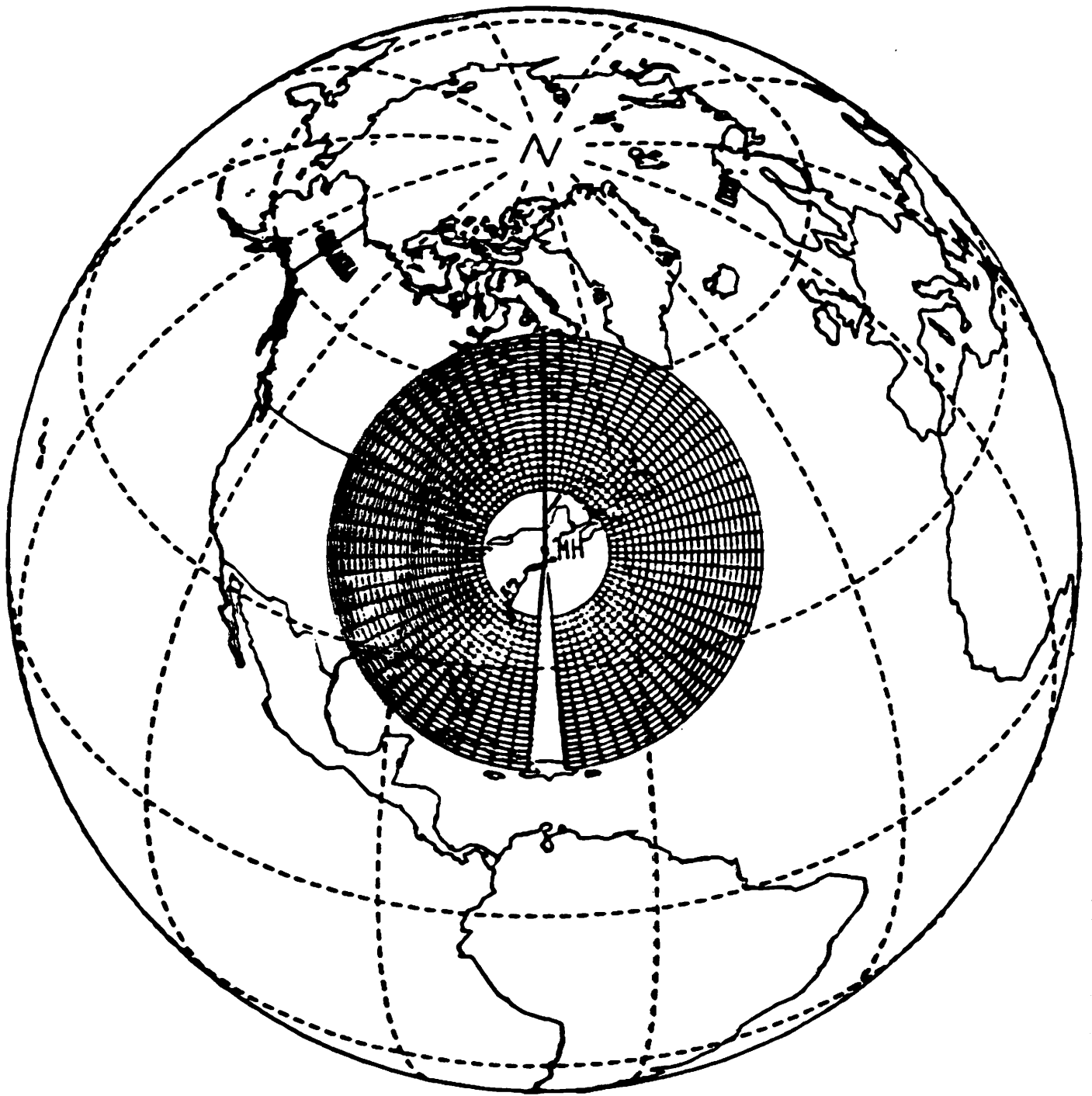


Millstone Hill
Michael Buonsanto
MIT Haystack Observatory



MILLSTONE/HAYSTACK RADAR CHARACTERISTICS

	Millstone UHF <u>Steerable</u>	Millstone <u>L-Band</u>	Haystack <u>X-Band</u>
Frequency (MHz)	440	1295	10,000
Wavelength (cm)	68	23	3
Antenna Diameter (m)	45.7	25.6	36.6
Antenna Gain (dB)	46.5	47.1	67.2
Antenna Efficiency (%)	43	42	38
Antenna Beamwidth (deg)	1.0	0.6	0.06
Peak Power (MW)	5	2.5	0.3
Average Power (kW)	300	125	120
Max. Duty Cycle(%)	6	6	35
Pulse Length:			
Operational	10 μ s - 2 ms	40 μ s - 2 ms	256 μ s - 35 ms
Developmental	1 μ s - 2 μ s	1 μ s - 2 μ s	1 μ s - 2 μ s
PRF (pps)	1000 - 20	1000 - 15	2000 - 10
Bandwidth	1 - 500 kHz	10 MHz (max)	5 - 1000 kHz
System Temperature ($^{\circ}$ K)	150	150	250
Polarization	LC	LC&RC	LC&RC
CAT Sensitivity (dB) (10 μ s pulse @ 10 km range)	26	19	10

440 MHz IONOSPHERIC BACKSCATTER

1) Incoherent Scatter

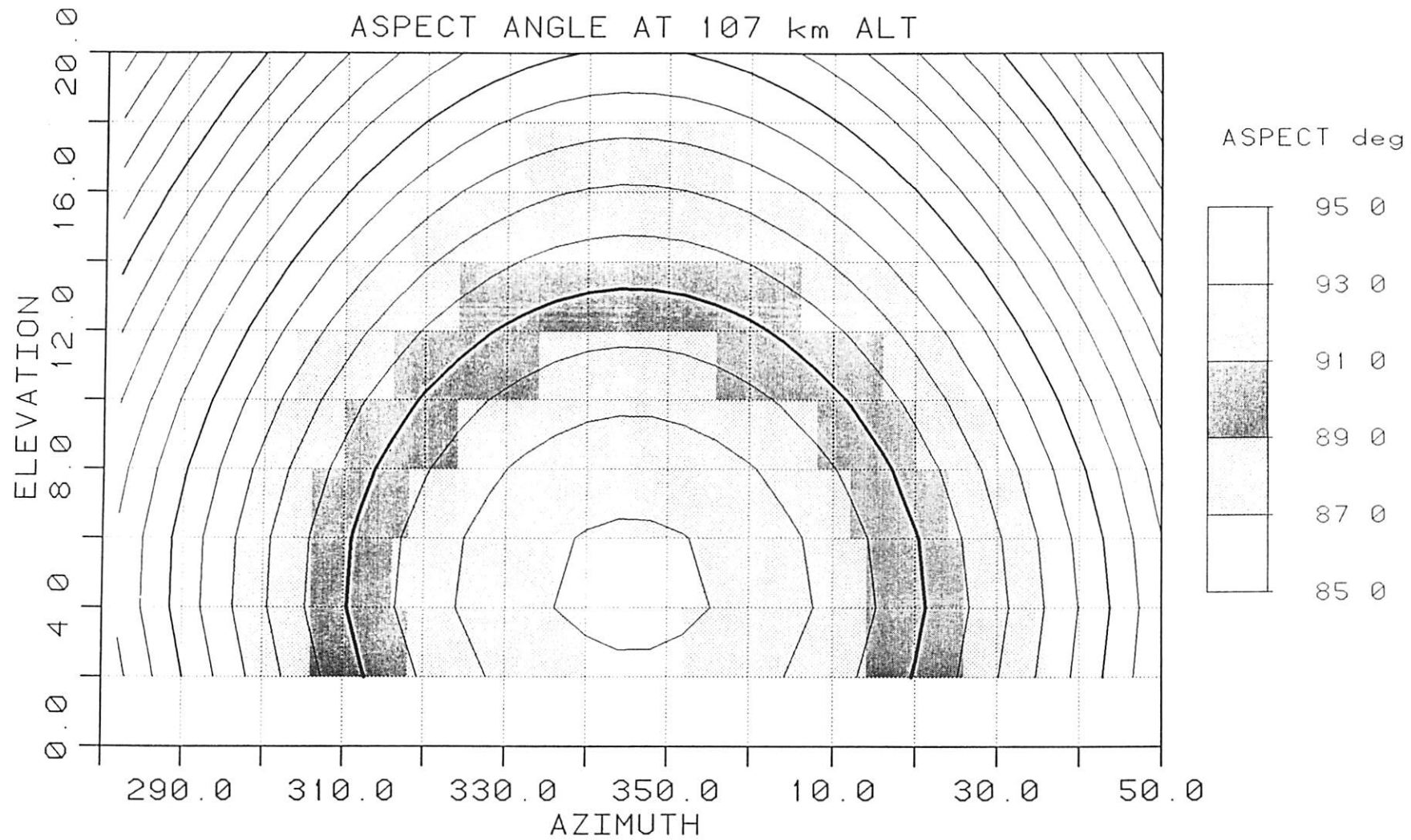
σ_e	-280 dbsm	(Electron Cross Section)
N_e	10^{11} m^{-3}	(Electron Density)
σ_v	10^{-17} m^{-1}	(Volume Reflectivity)
V	10^{12} m^3	(Scattering Volume)
σ_{IS}	-40 to -50 dbsm	(Total Cross Section)
V_{Dop}	100 to 1000 m/s	(V_{Ion})

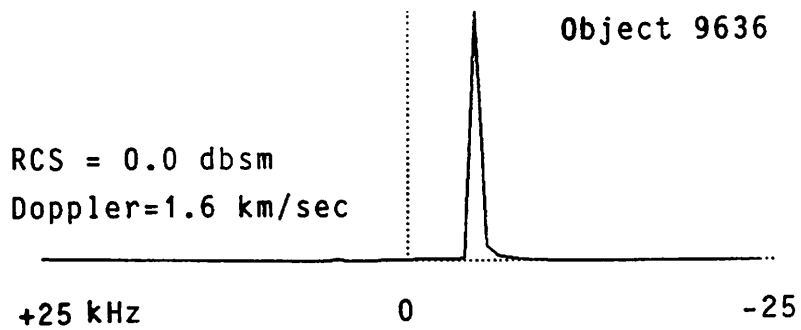
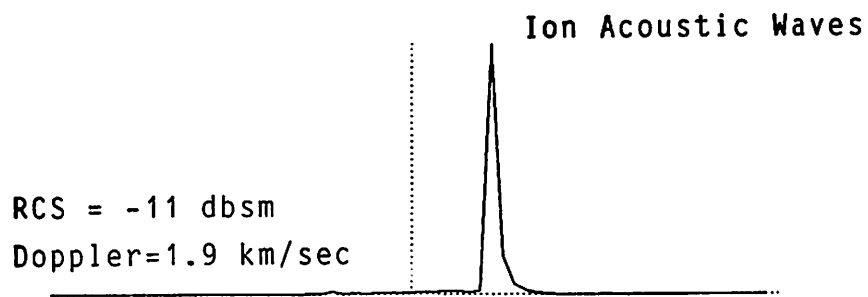
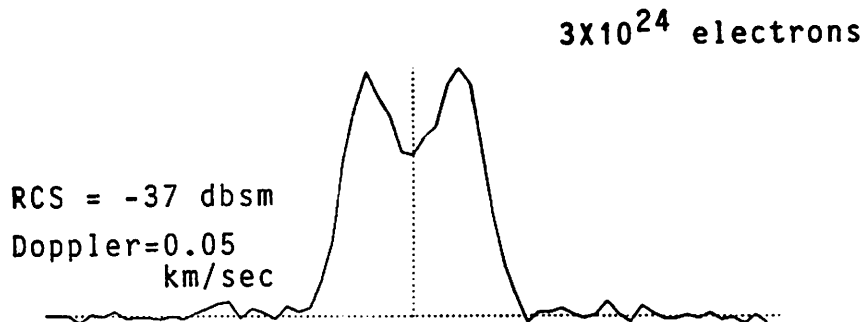
2) E Region Clutter (110 km Altitude)

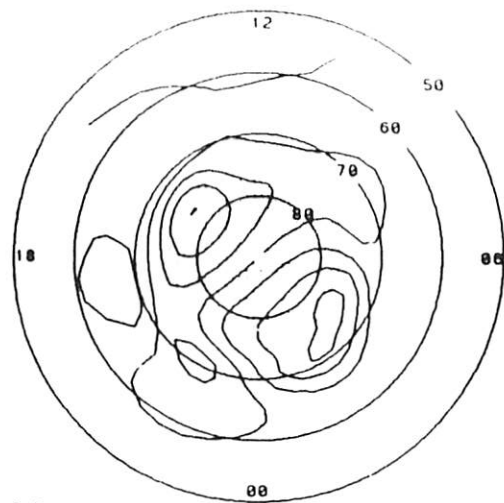
σ_v	10^{-9} m^{-1}	(Volume Reflectivity)
σ_E	+30 dbsm	(Total Cross Section)
V_{Dop}	500 m/s	(C_S)

3) F Region Clutter (500 km Altitude)

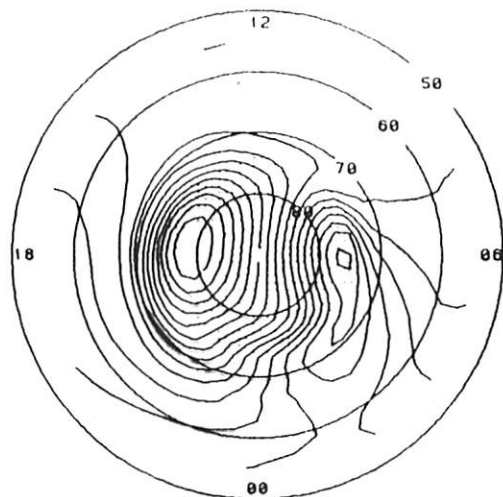
σ_v	? m^{-1}	(Volume Reflectivity)
σ_F	-10 to 0 dbsm	(Total Cross Section)
V_{Dop}	2 to 10 km/s	(C_S or f_{pi})



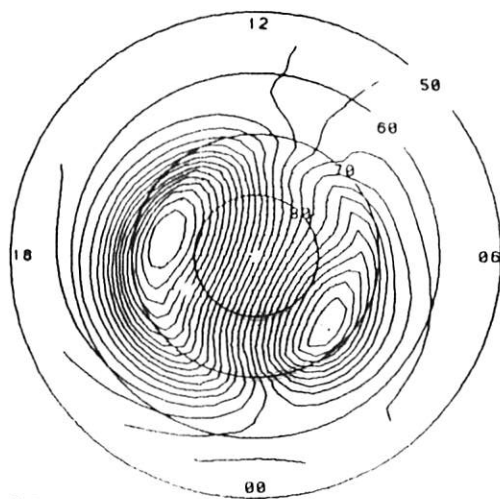




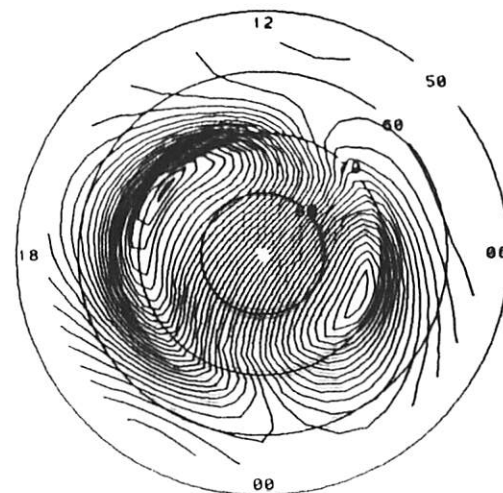
LEVEL 1



LEVEL 4

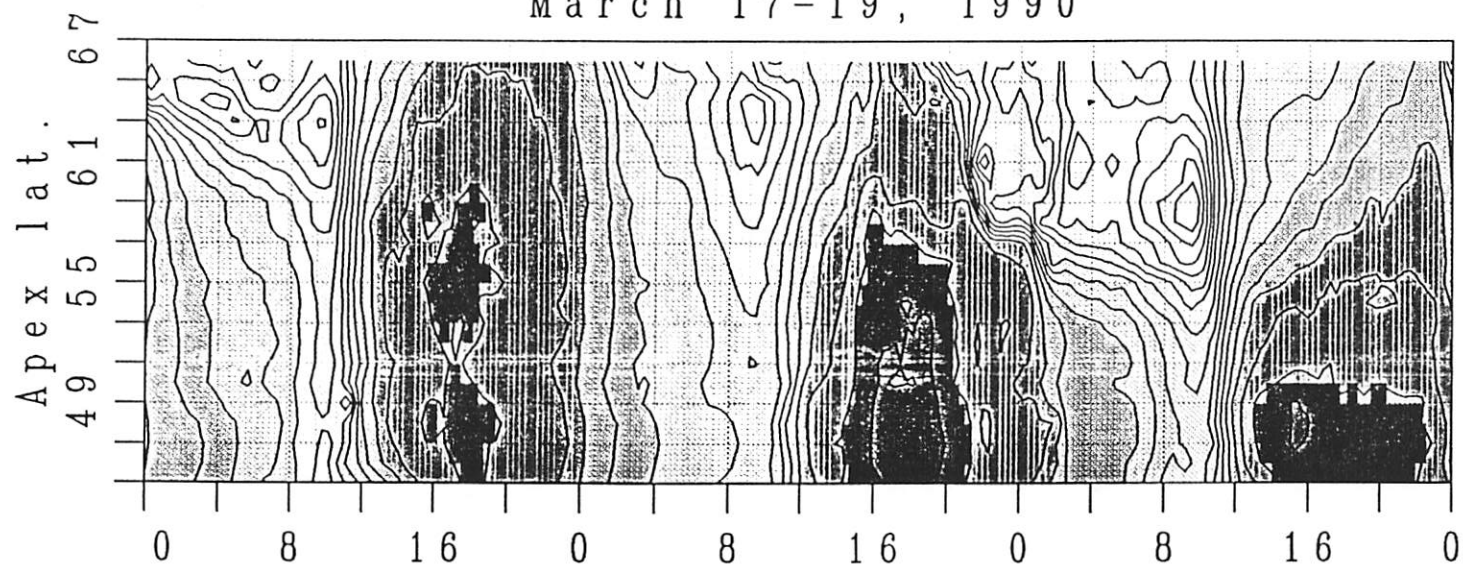


LEVEL 7

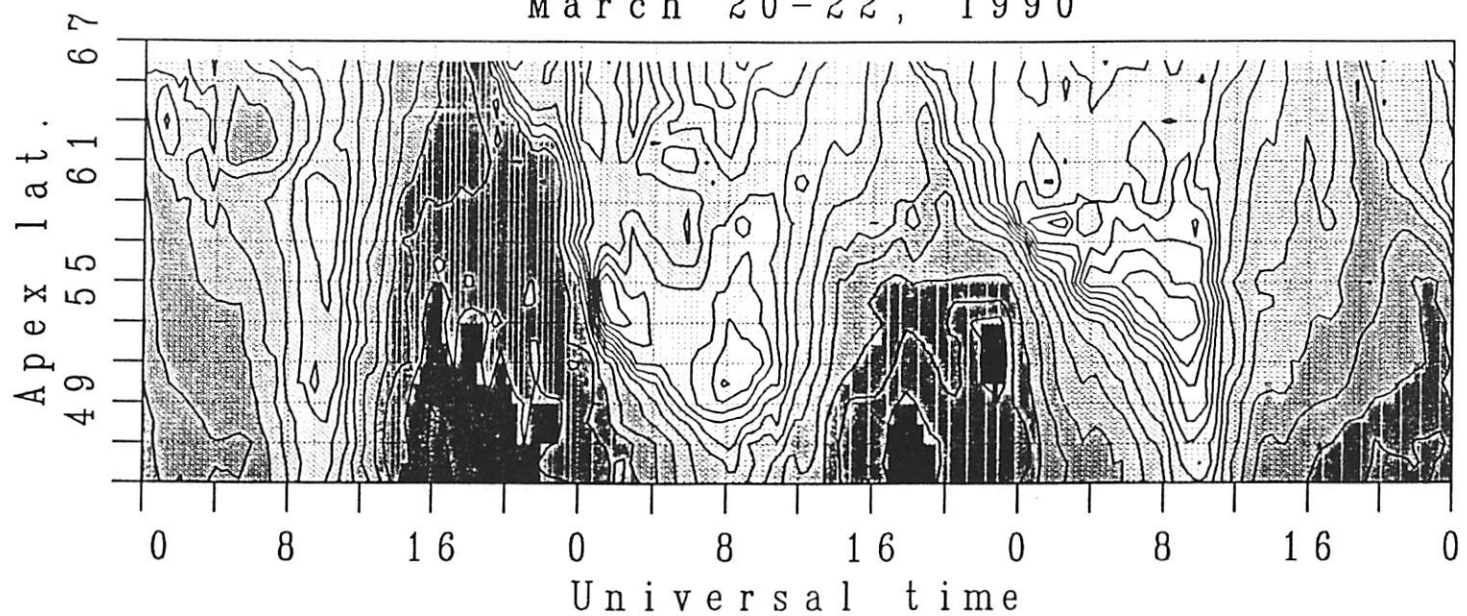


LEVEL 9

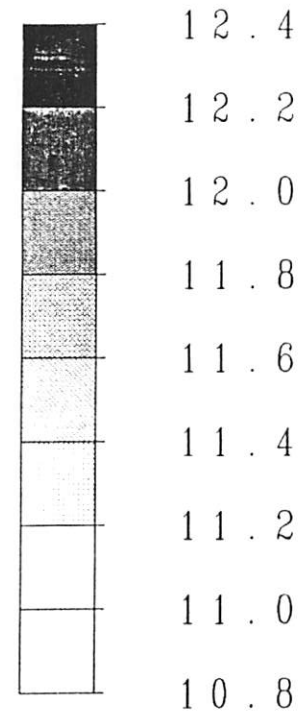
March 17-19, 1990



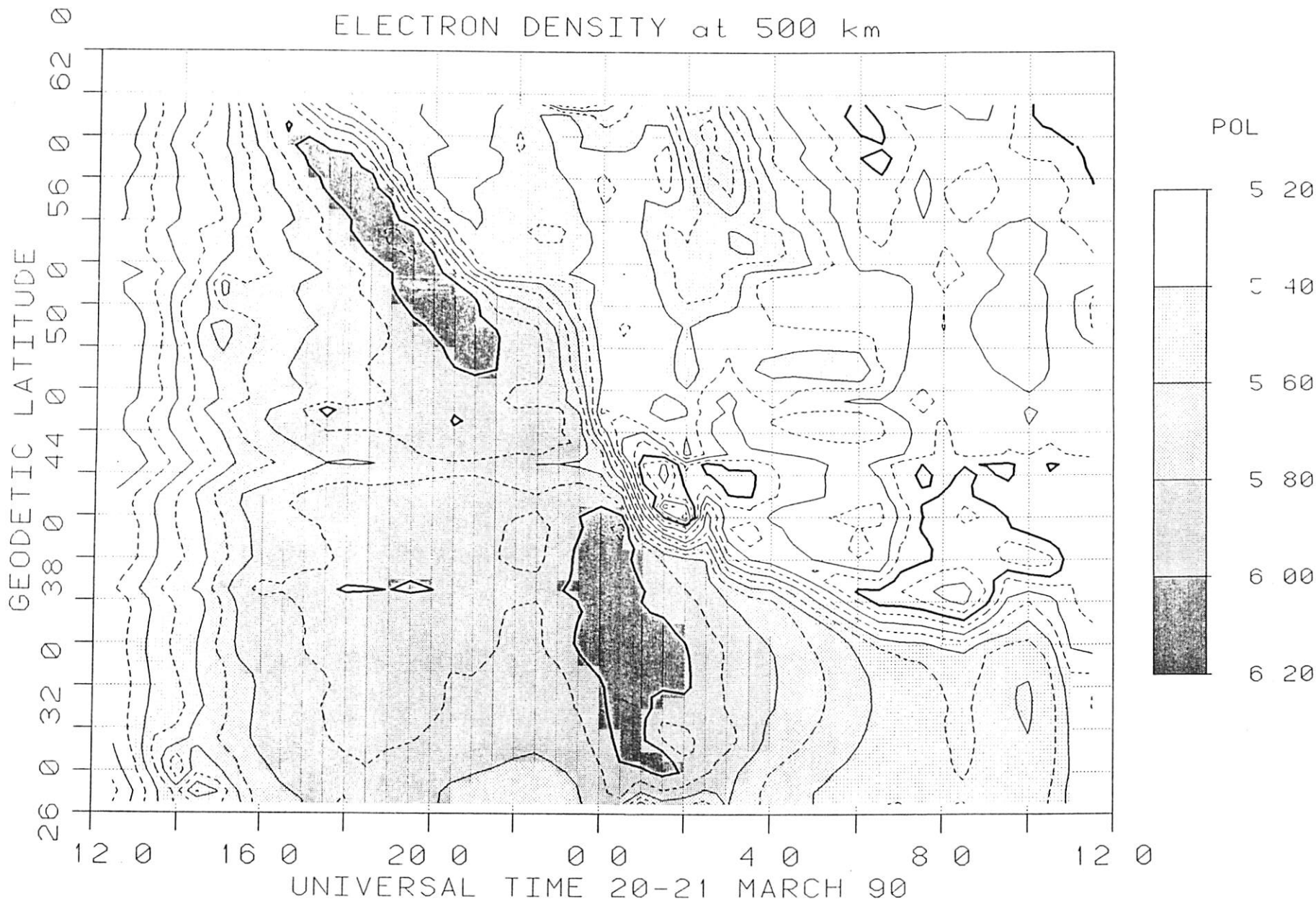
March 20-22, 1990



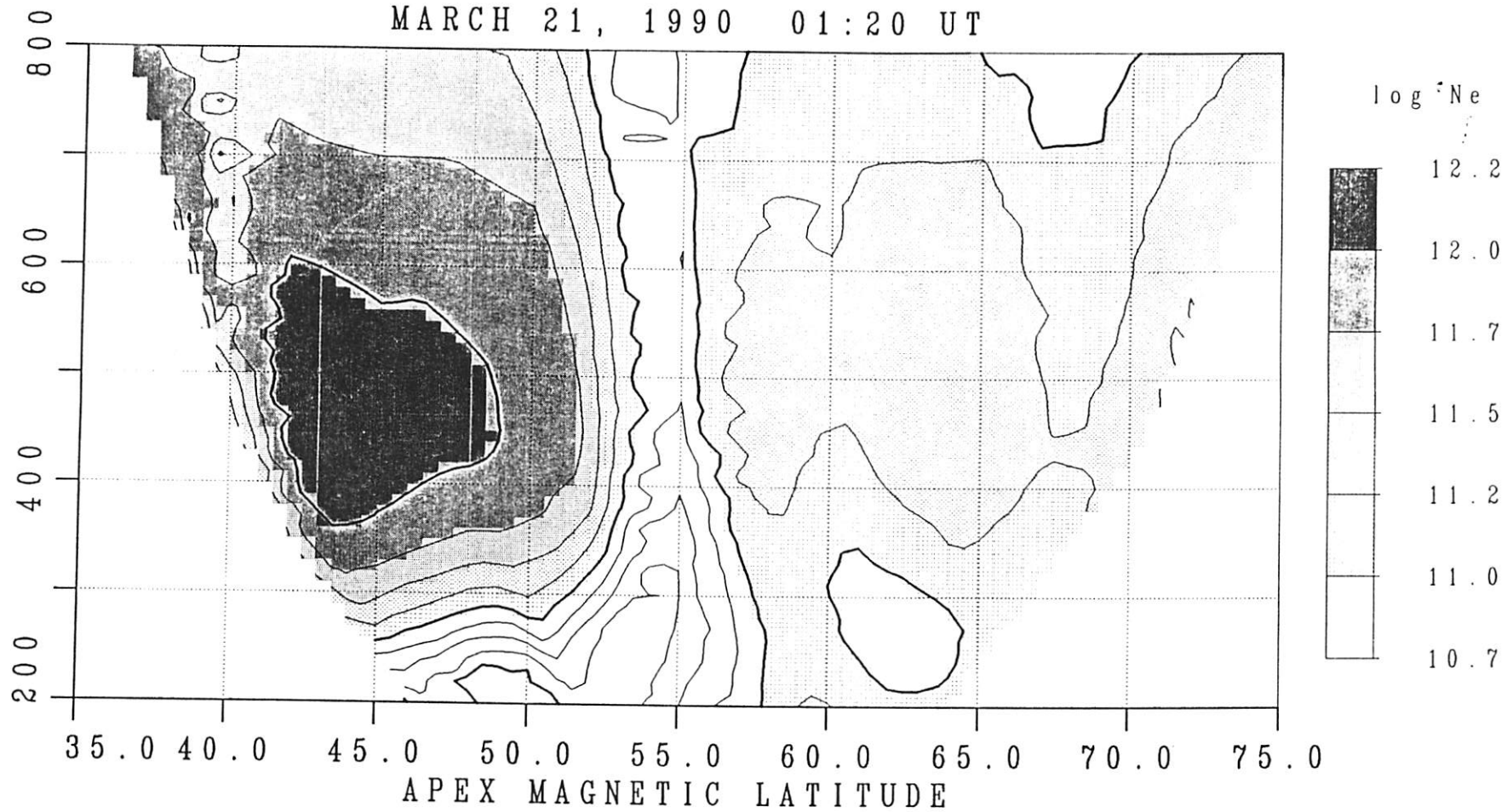
NmF 2

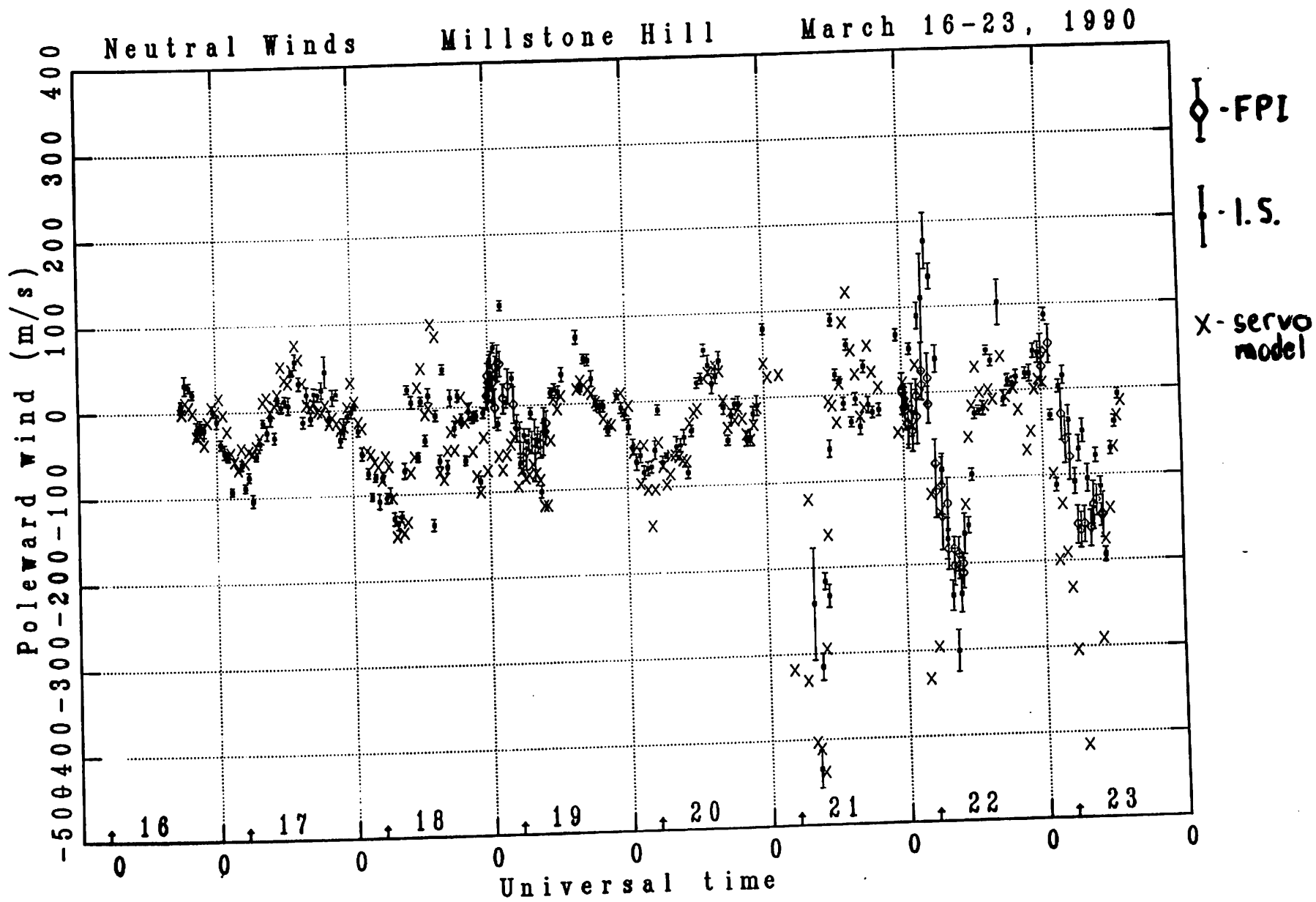


ELECTRON DENSITY at 500 km



MARCH 21, 1990 01:20 UT

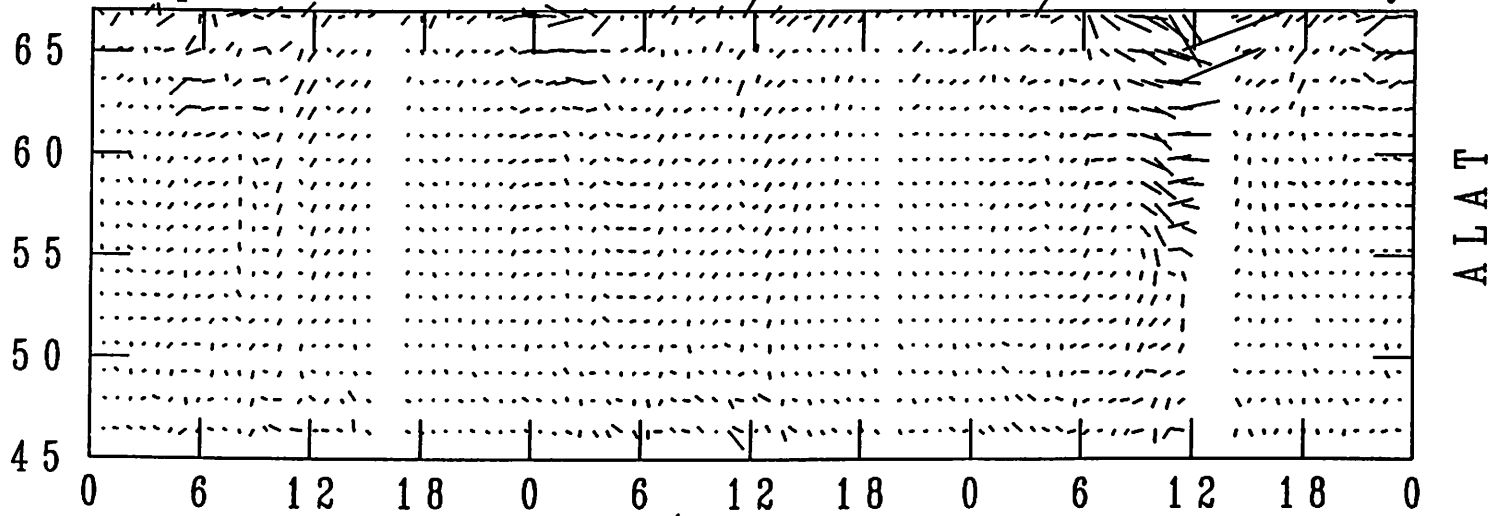




Winds are in the magnetic meridional northward direction.

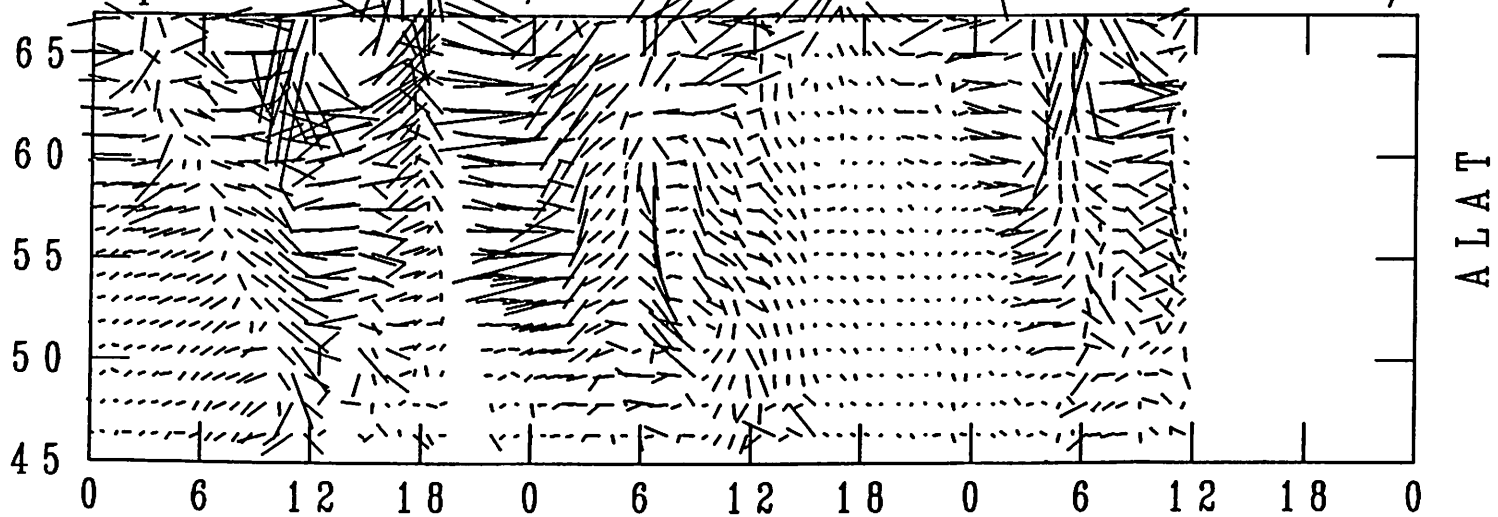
April 7-9, 1990

Ion velocity



April 10-12, 1990

1 cm = 1680 m/s



Universal time

