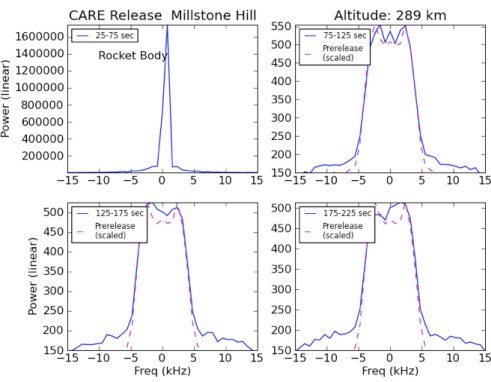
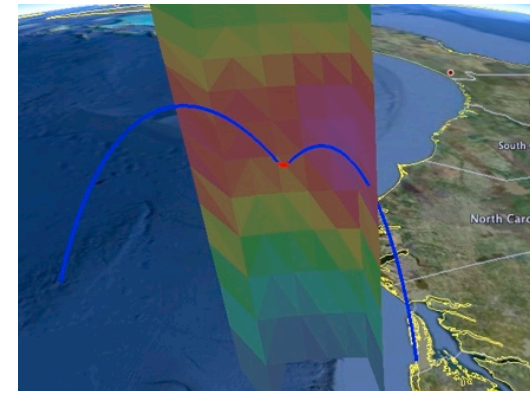


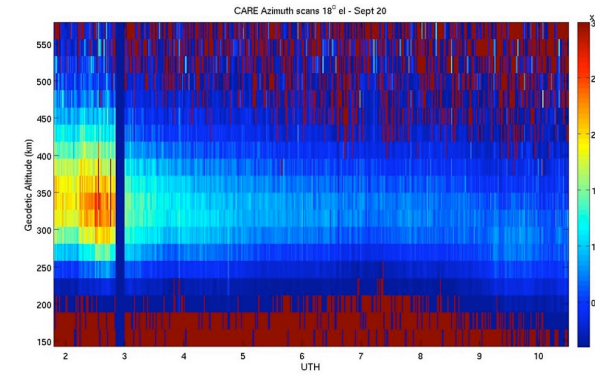


# Millstone Hill UHF Radar Observations During CARE Release



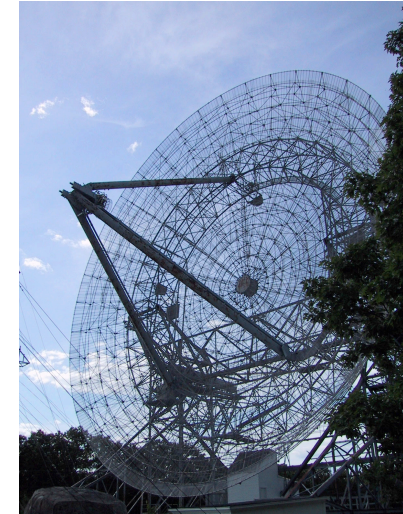
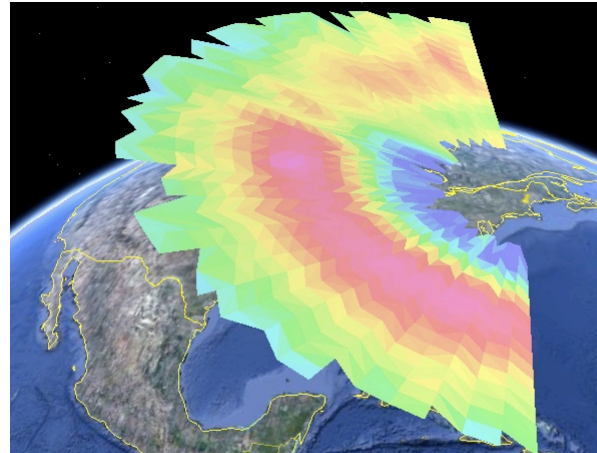
P. J. Erickson, A. N. Bhatt  
MIT Haystack Observatory  
Westford, MA USA

CARE Data Workshop Oct 20, 2009



# Millstone Hill UHF Incoherent Scatter Radar

- Measure enhanced backscatter and electron density during sounding rocket chemical release
- Provide line-of-sight profile ionospheric hole
- UHF radar probe using incoherent scatter technique
  - Calibration provided by ground ionosonde, system constants
  - Yields both background and modified electron densities
- UHF coherent scatter from irregularities

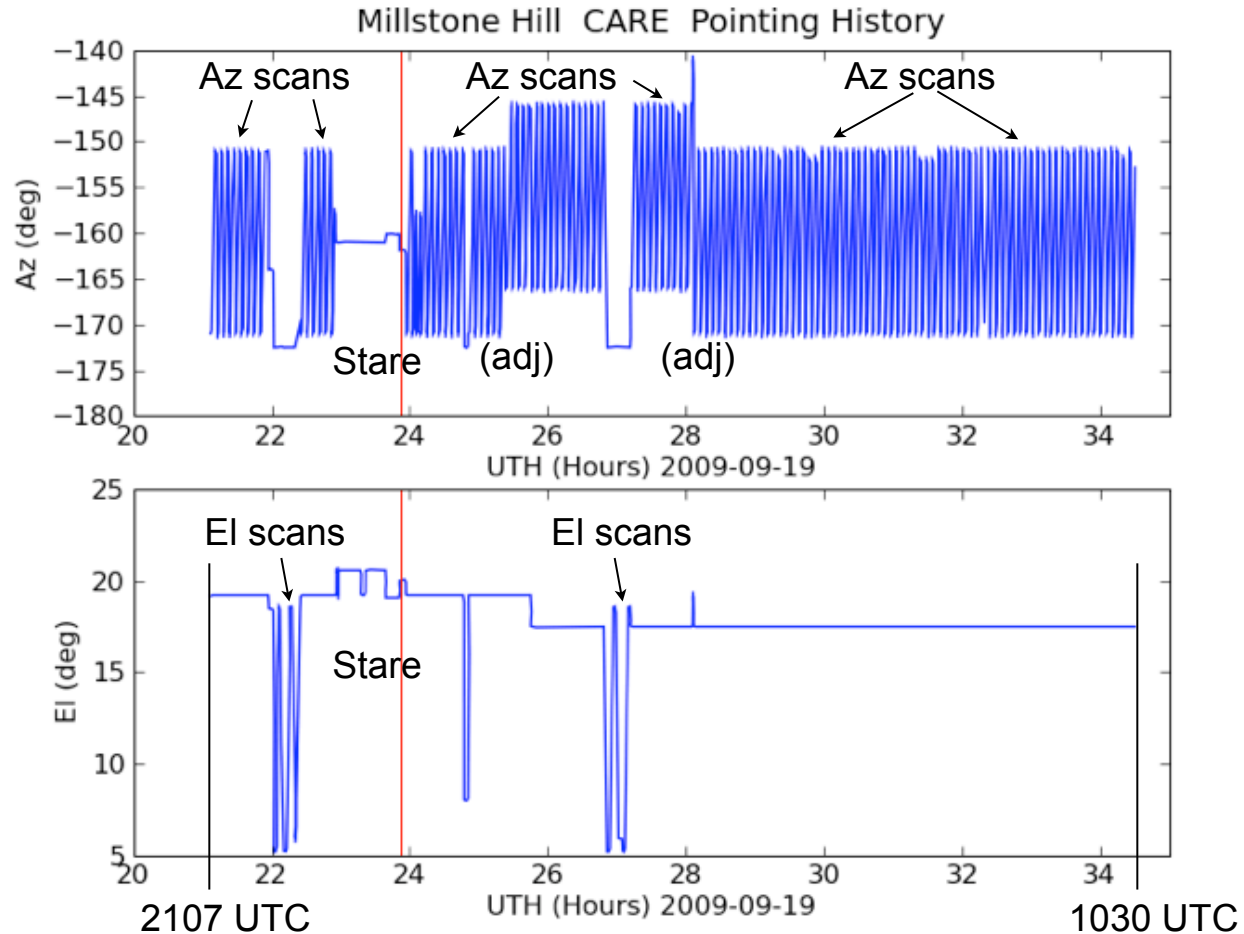


## Physical Description

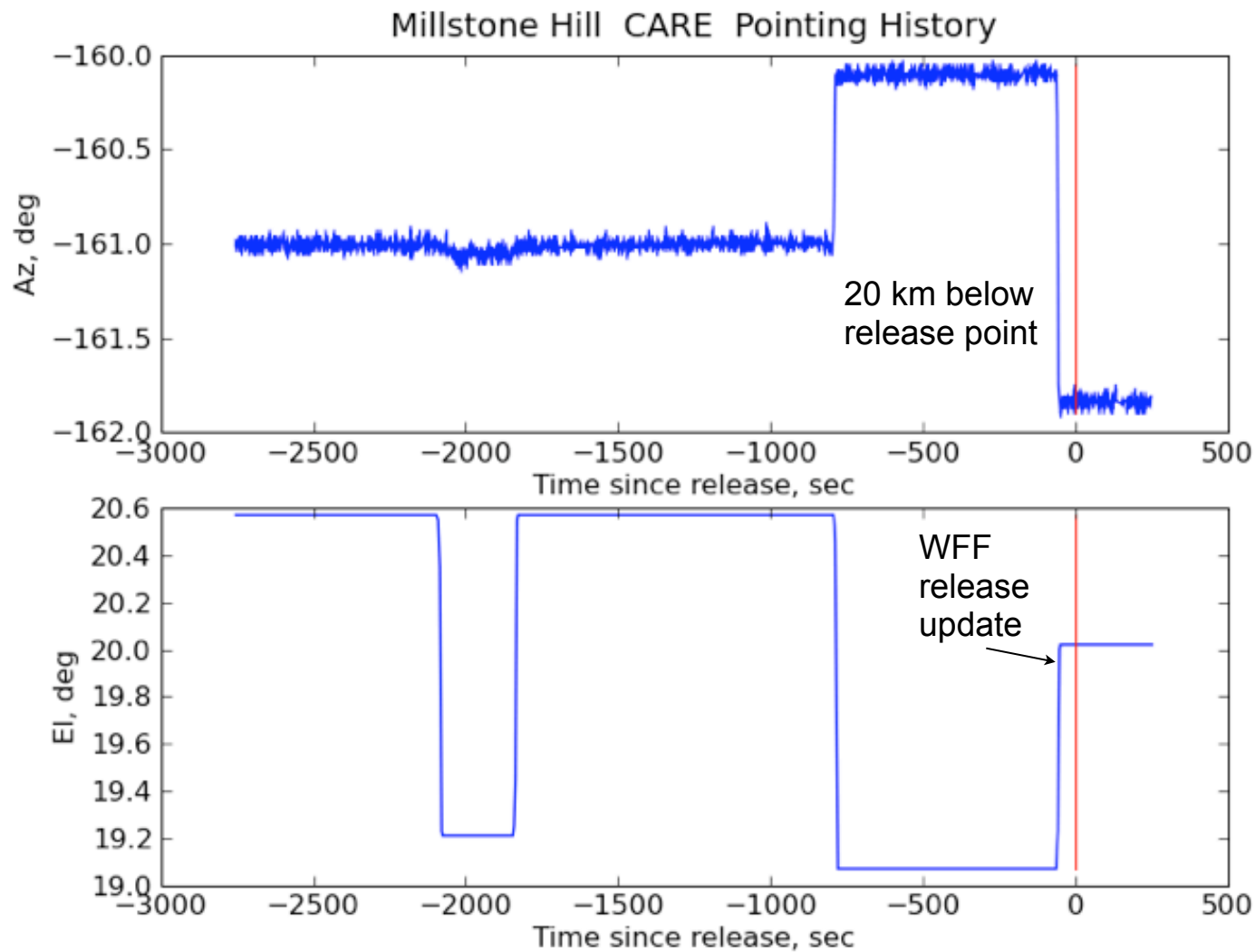
- 2.5 MW peak power UHF Transmitter
- 46 m steerable, 68 m zenith antennas
- Realtime and batch processing through MADRIGAL distributed database
- Access to eastern CONUS (including WFF range)
- Westford, Massachusetts (42.6 N / 288.5 E geodetic)

- Operation
  - Scheduled measurements
    - Start one hour before launch
    - Continues until electron cloud no longer detectable
  - High speed measurements
    - 1 to 4 km range resolution depending on waveform
    - Electron densities
    - Plasma drifts
    - Electron, ion temperatures

# Millstone Hill UHF Radar Support Overview



# Millstone Hill Stare Mode

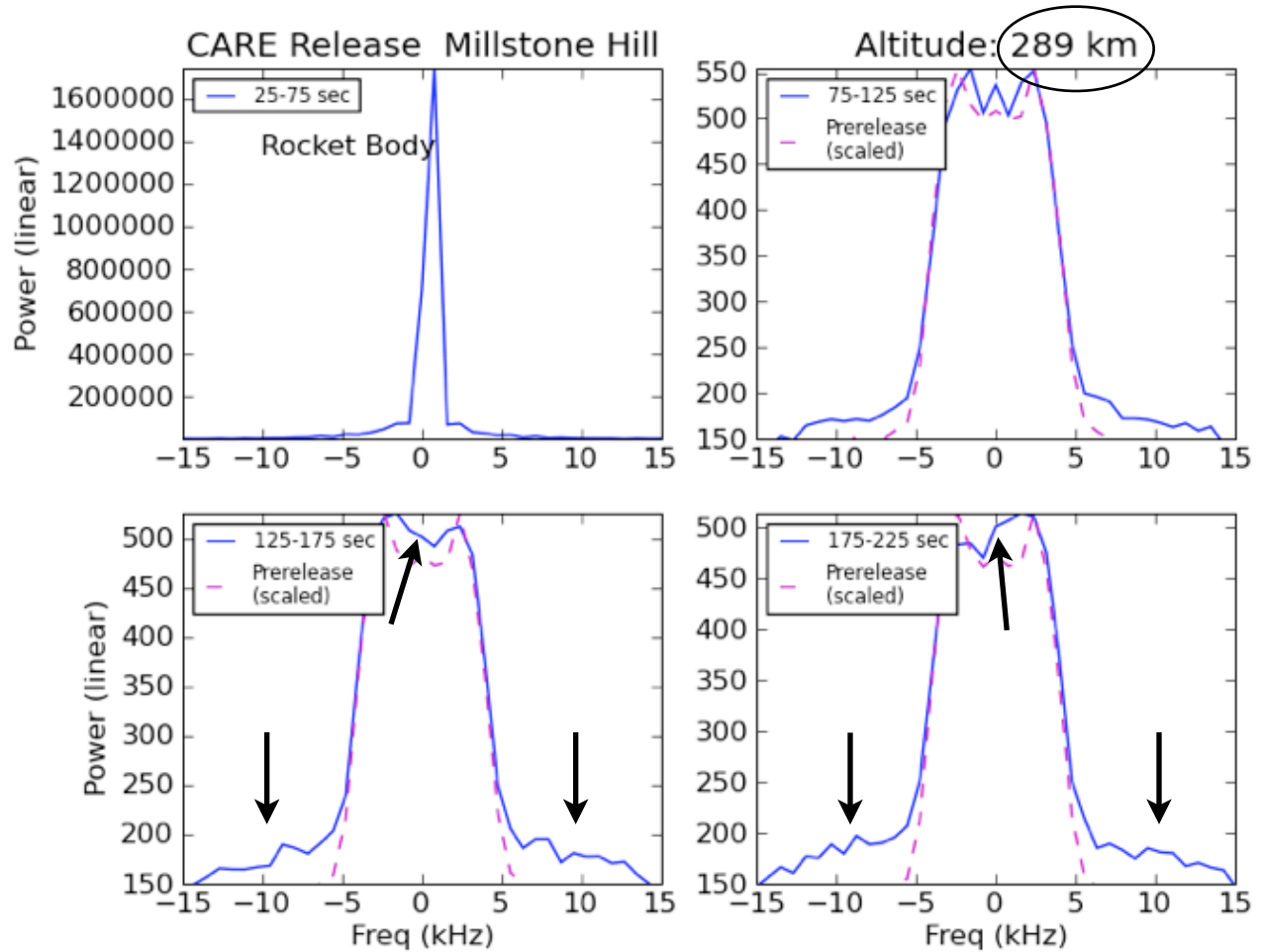


# Millstone Hill Spectra: Short Time Effects

Blinded for T=0 to 30-40 sec  
by rocket body

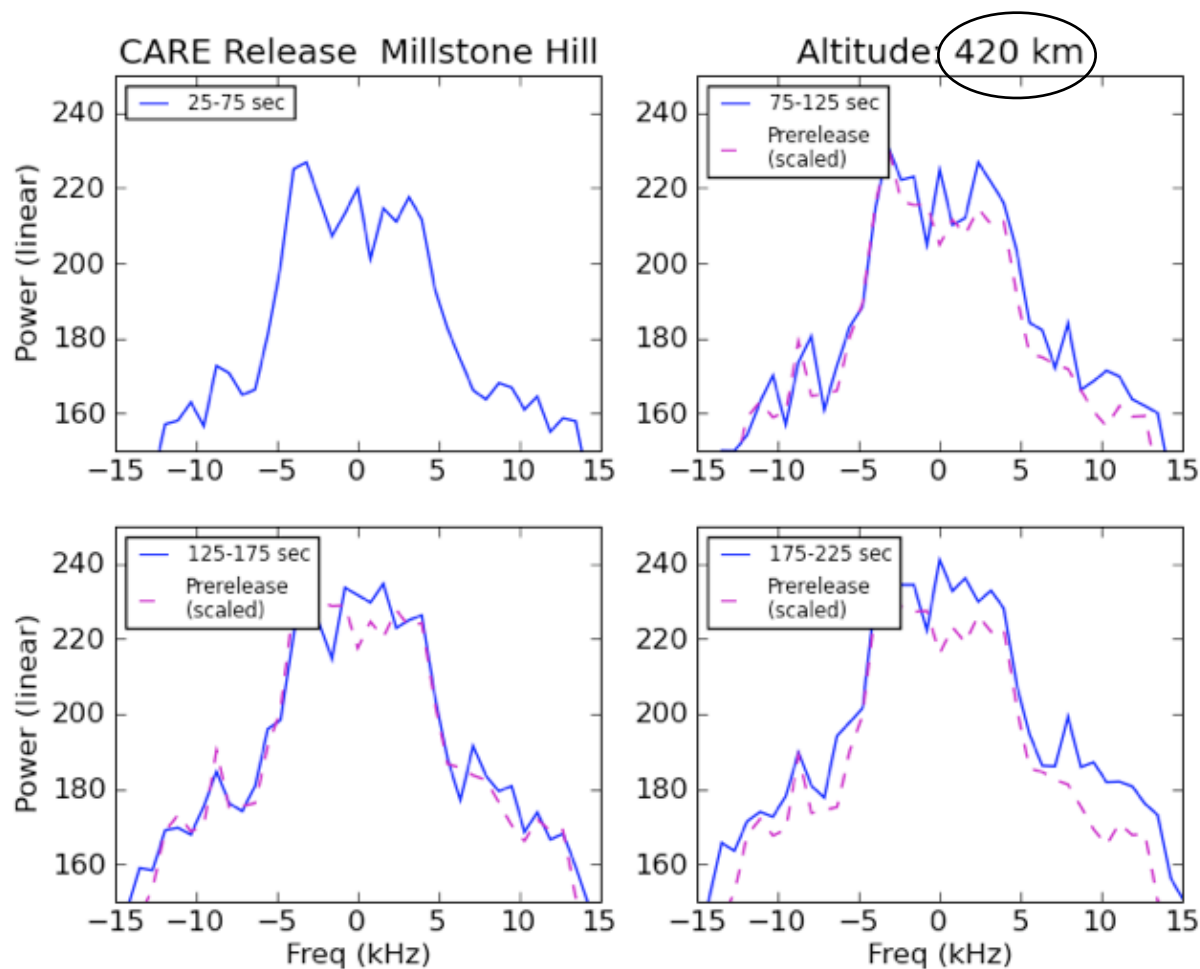
Added to conventional double  
IS peak:

- Low frequency peak (dust? see R. Varney)
- Steadily growing spectral 'wings' (+/- 5-15 kHz)



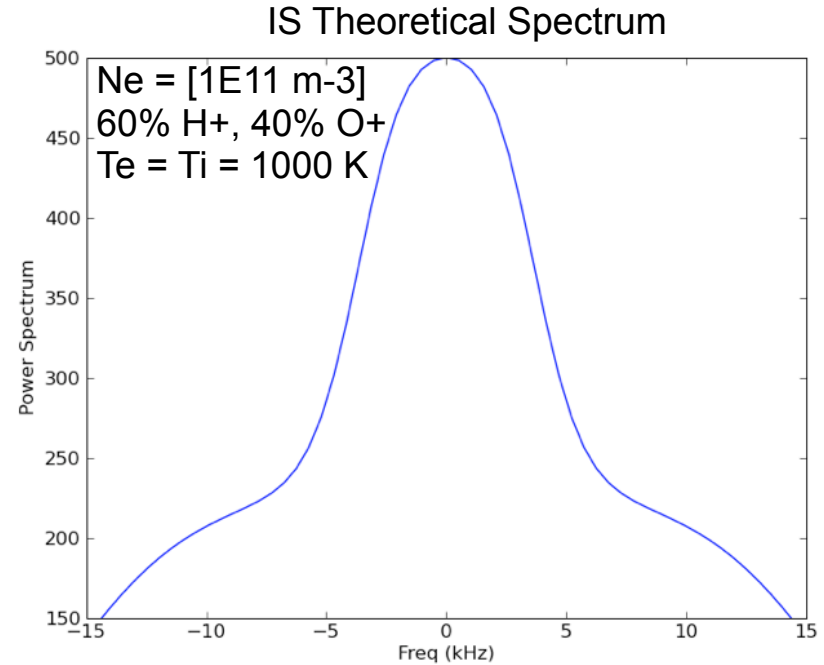
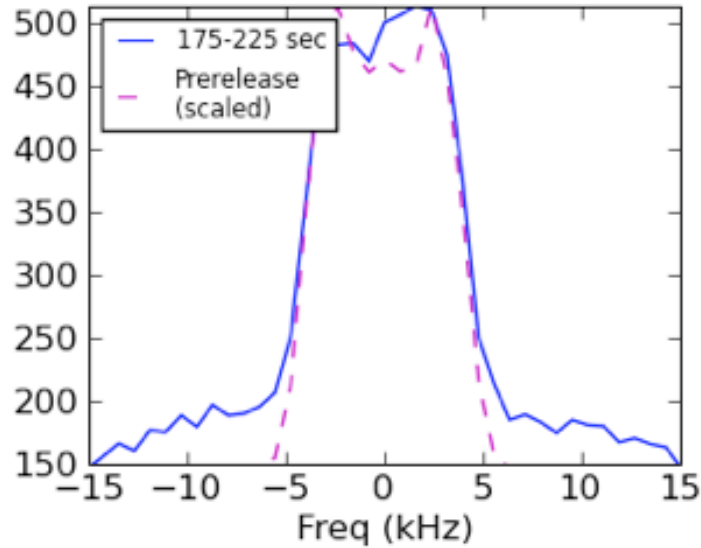
# Millstone Hill Spectra: Short Time Effects

Effect is gone in near topside  
(noisier spectra as well due to SNR effects)





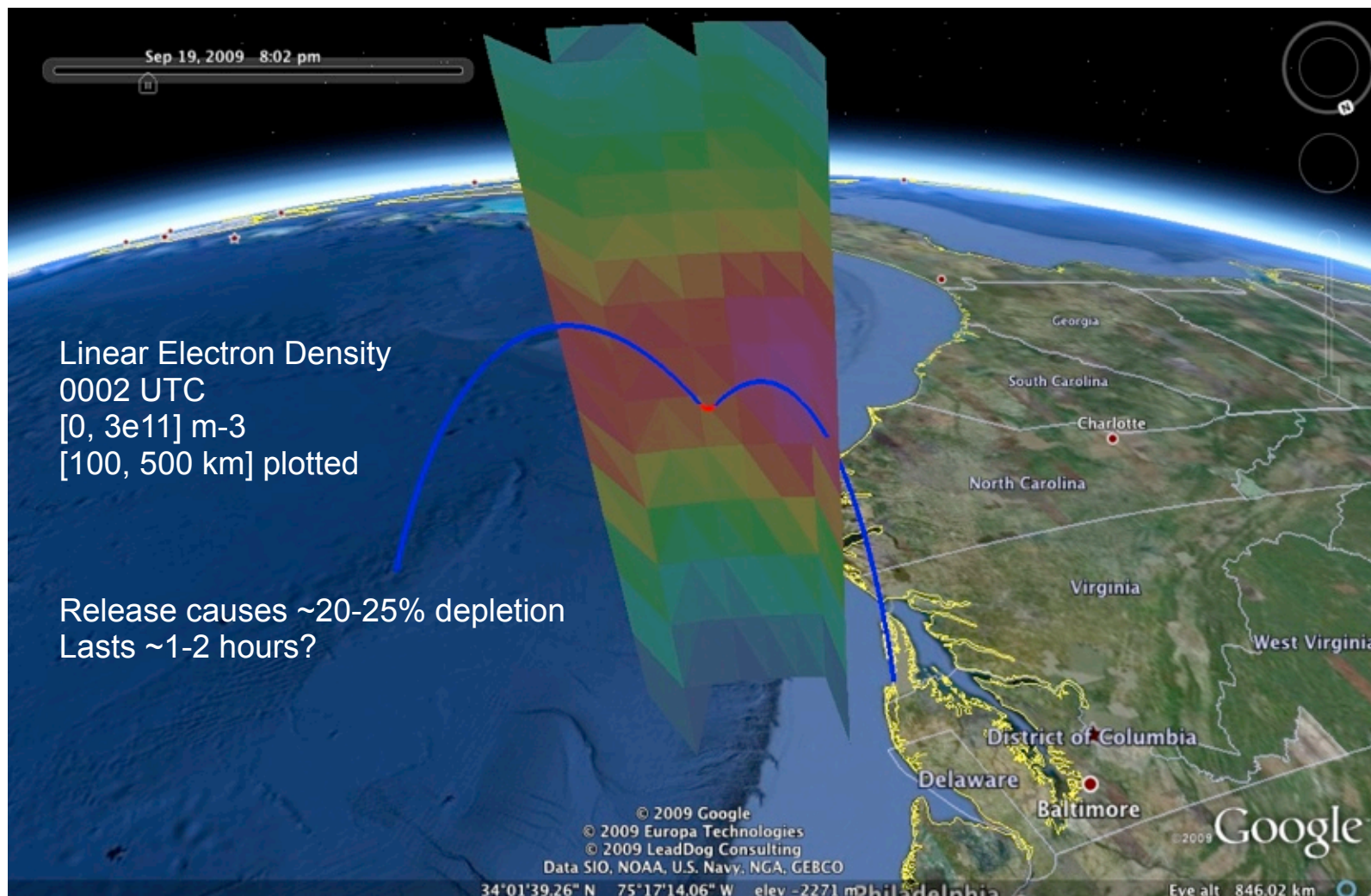
# Post-Release Stare Spectra: Multi-Ion?



Normal IS Theory would predict disappearance of normal up/down shifted ion-acoustic peaks  
(not observed)

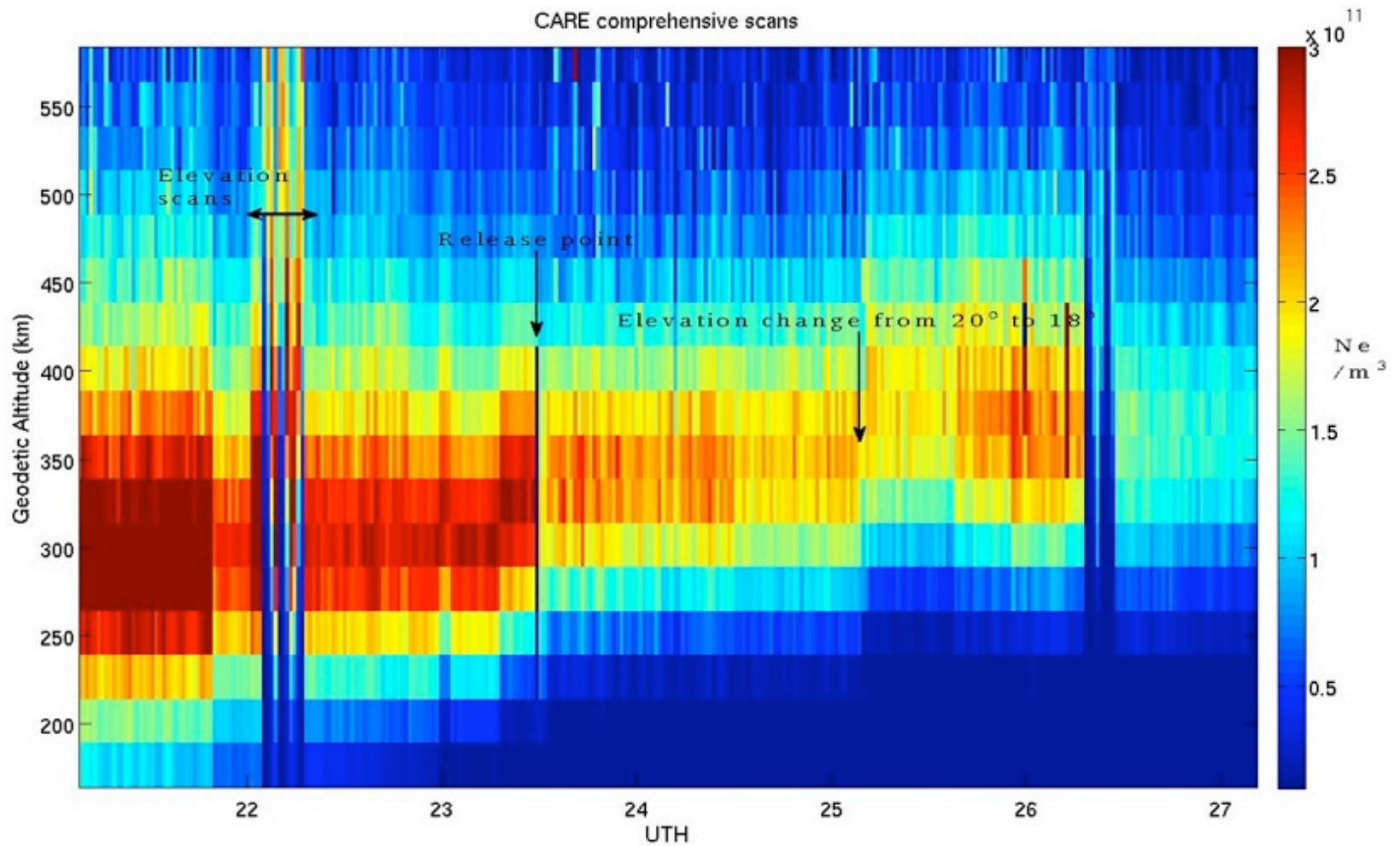
Enhanced turbulence?  
Other idea?

# Azimuth Scans Post-Release

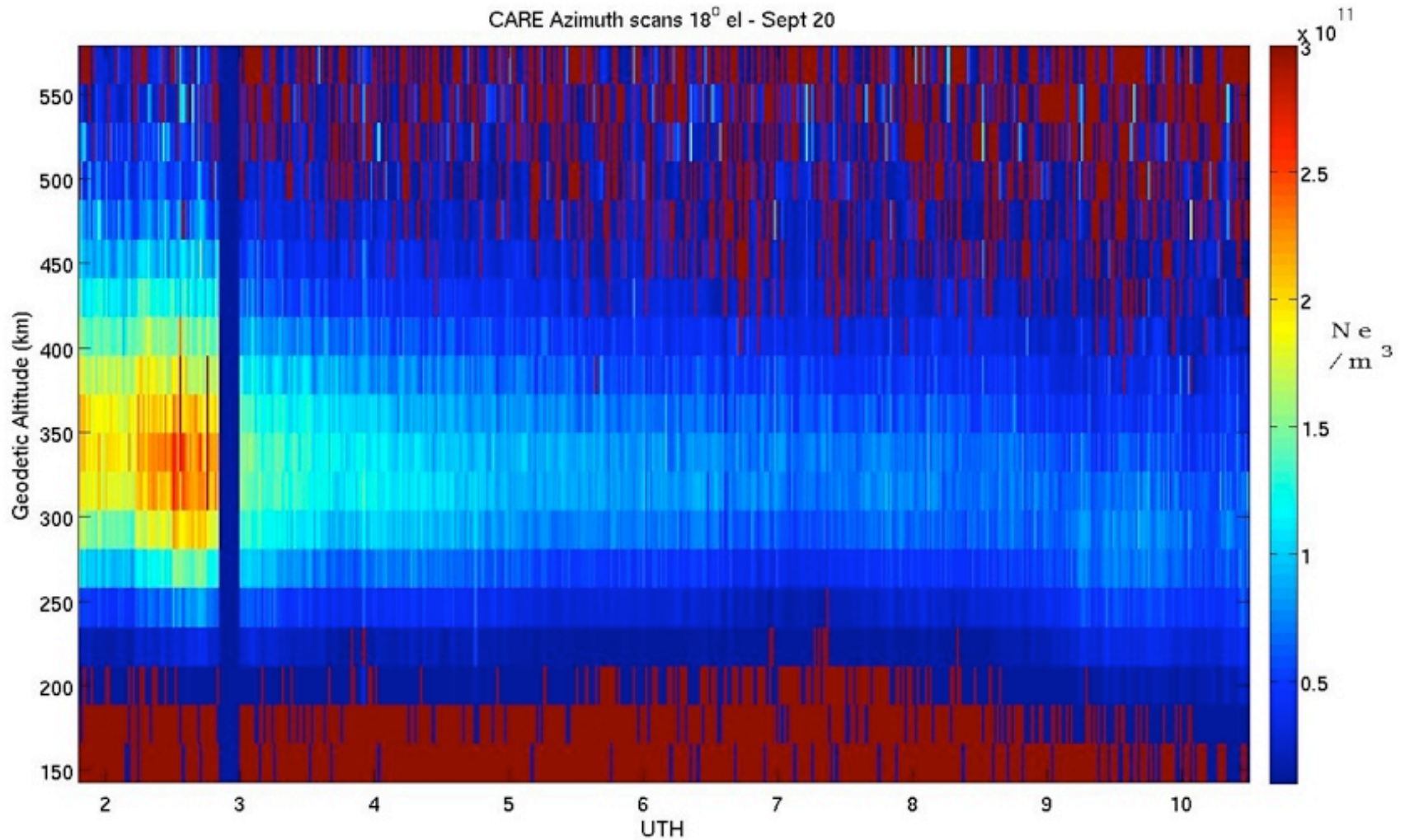




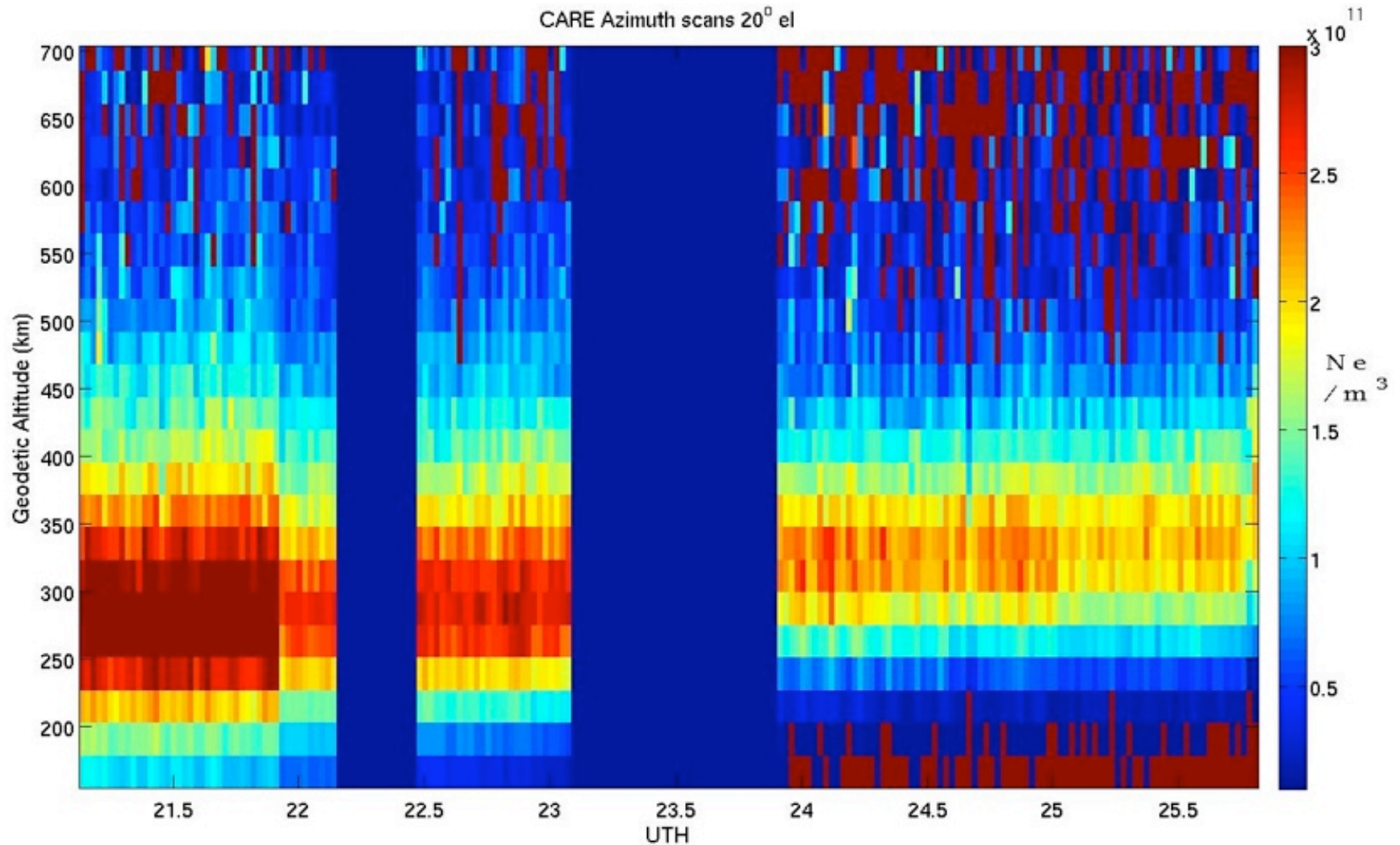
# Azimuth Scans Post-Release: Electron Density



# Azimuth Scans @ 18 Deg El: Electron Density

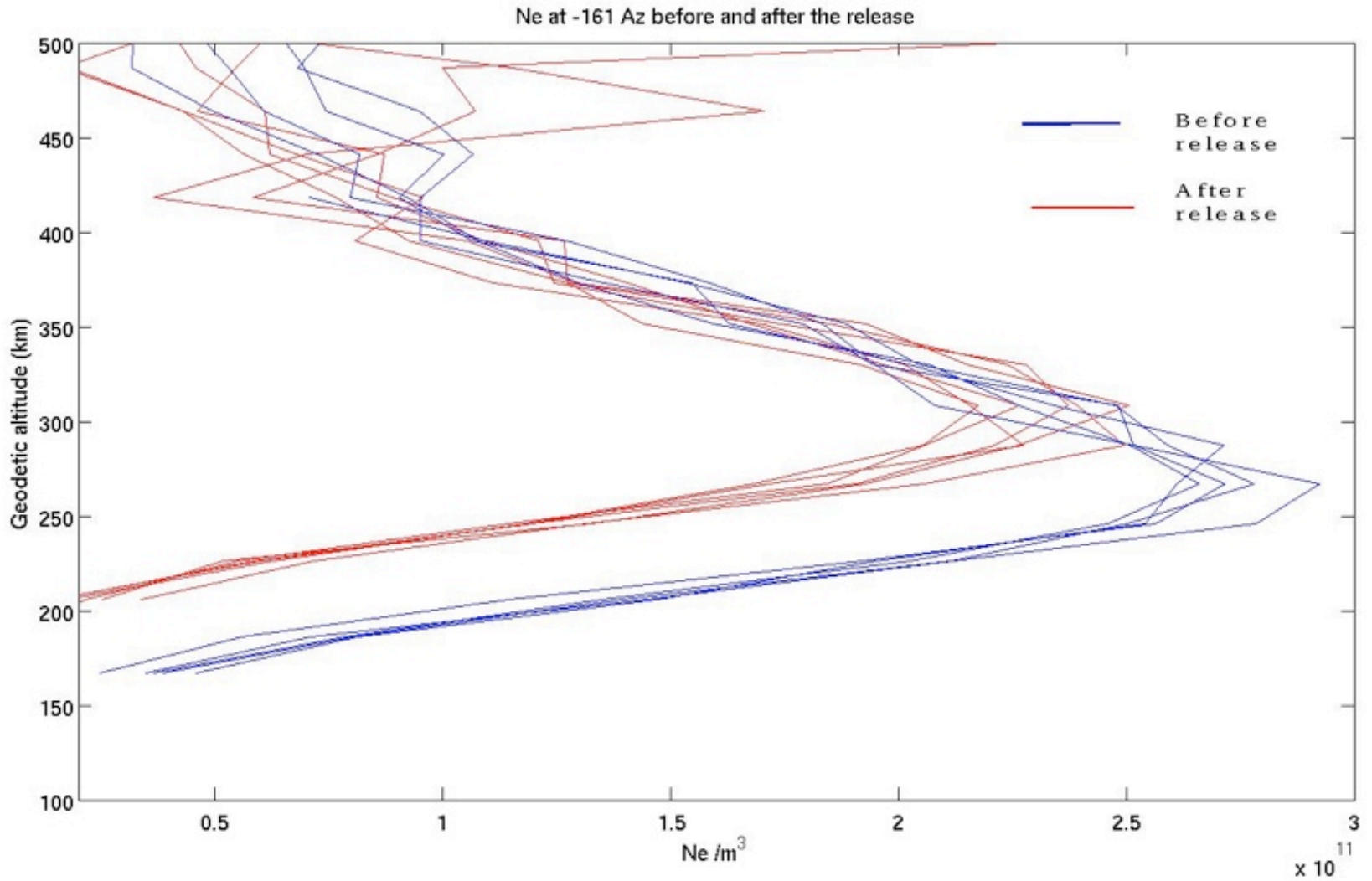


# Azimuth Scans @ 20 deg El: Electron Density

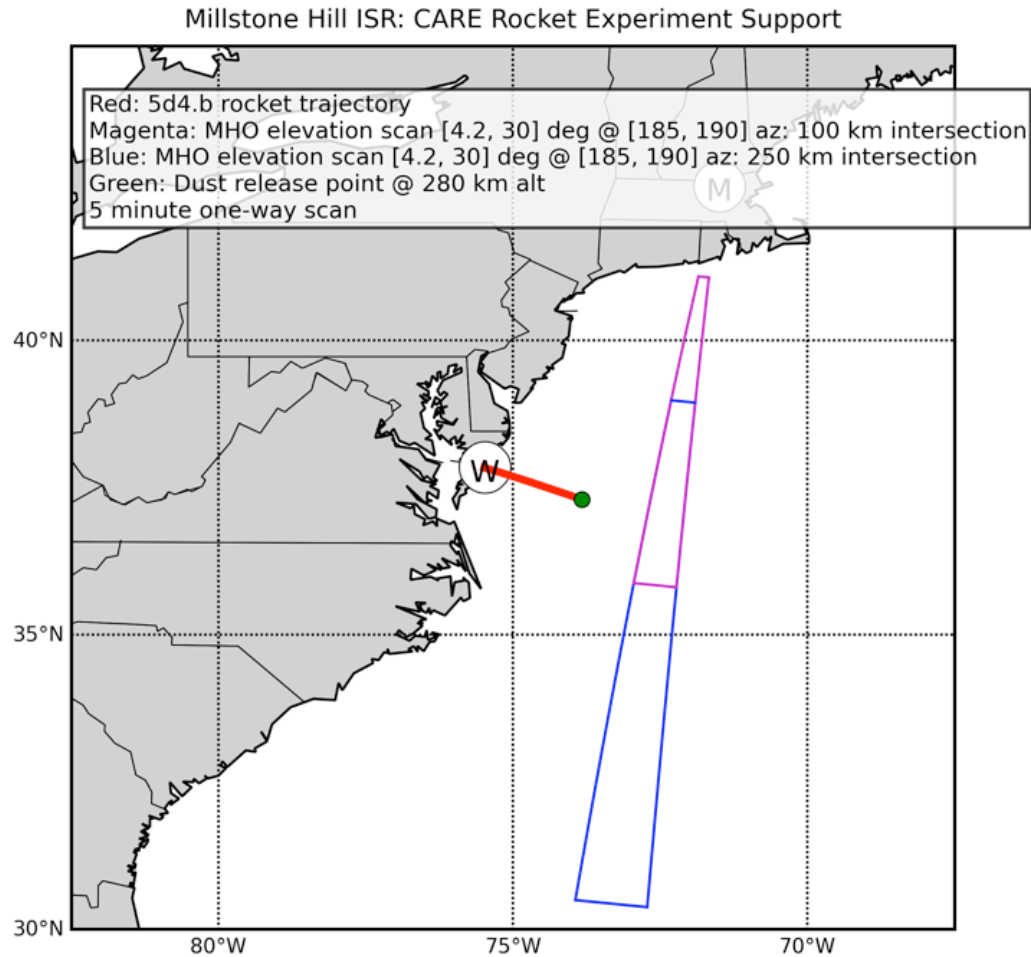




# Detailed Before/After Release Profile



# Elevation Scan 'Slot' Geometry





# Elevation Scan 'Slot' (Almost Due South)

