

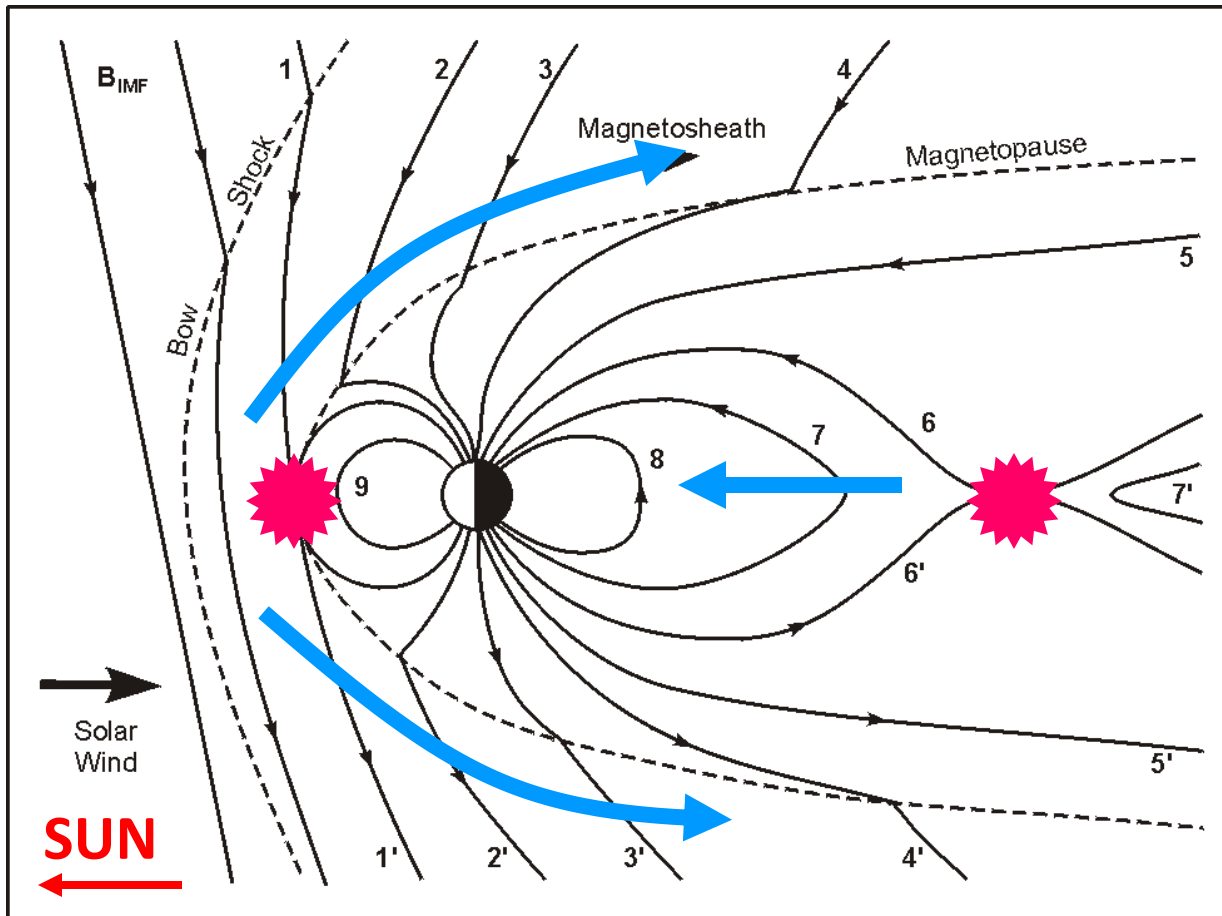
# Ion Convection Velocity Reversal Over Latitude - Compared over Sondrestrom, EISCAT, PFISR, & SuperDARN

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# Objective

Attempt to observe and compare current flow velocity reversal in the F Region using radar scanning over latitude from stations at multiple longitudes.

# Convection in the Magnetosphere

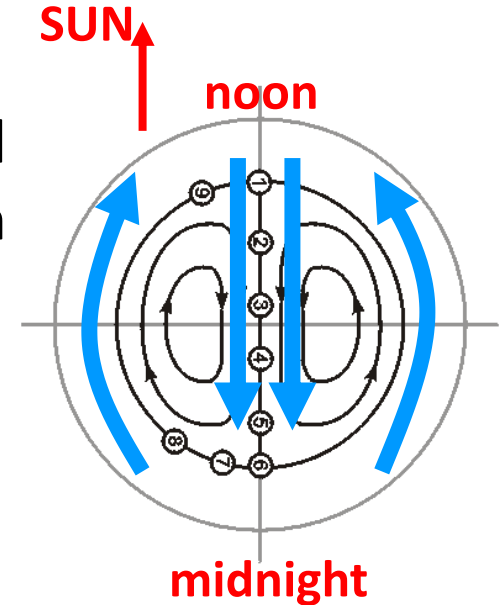


A southward interplanetary magnetic field can connect directly to the Earth's field.

This connection drives the plasma convection in the ionosphere.

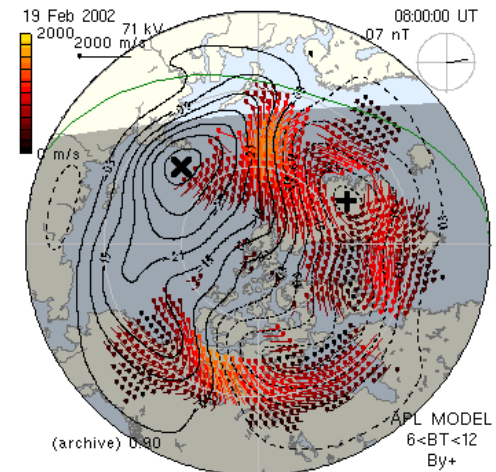
# Ionosphere Convection Pattern

idealized  
convection pattern

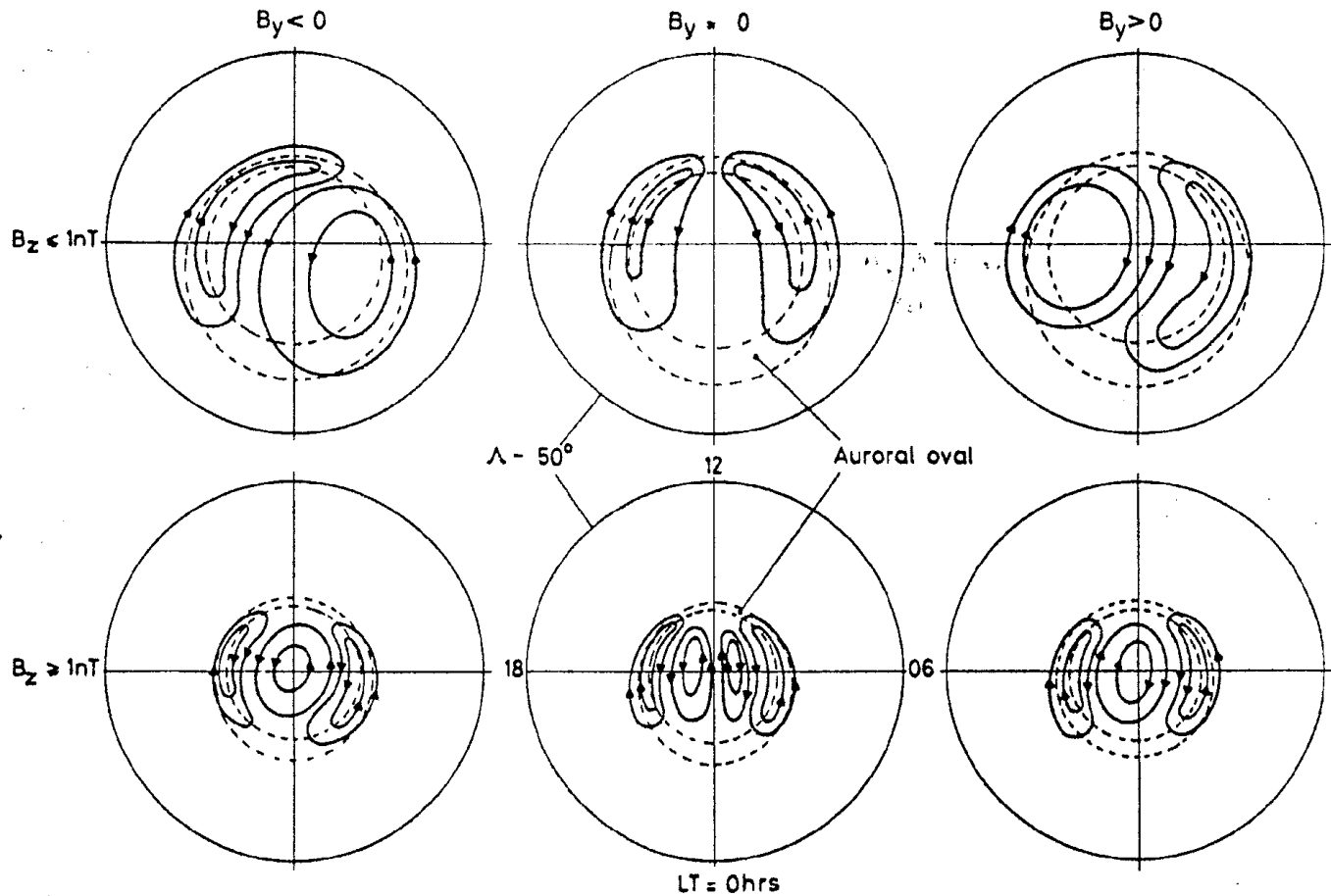


The ionosphere acts as a large “screen” onto which magnetosphere dynamics are projected

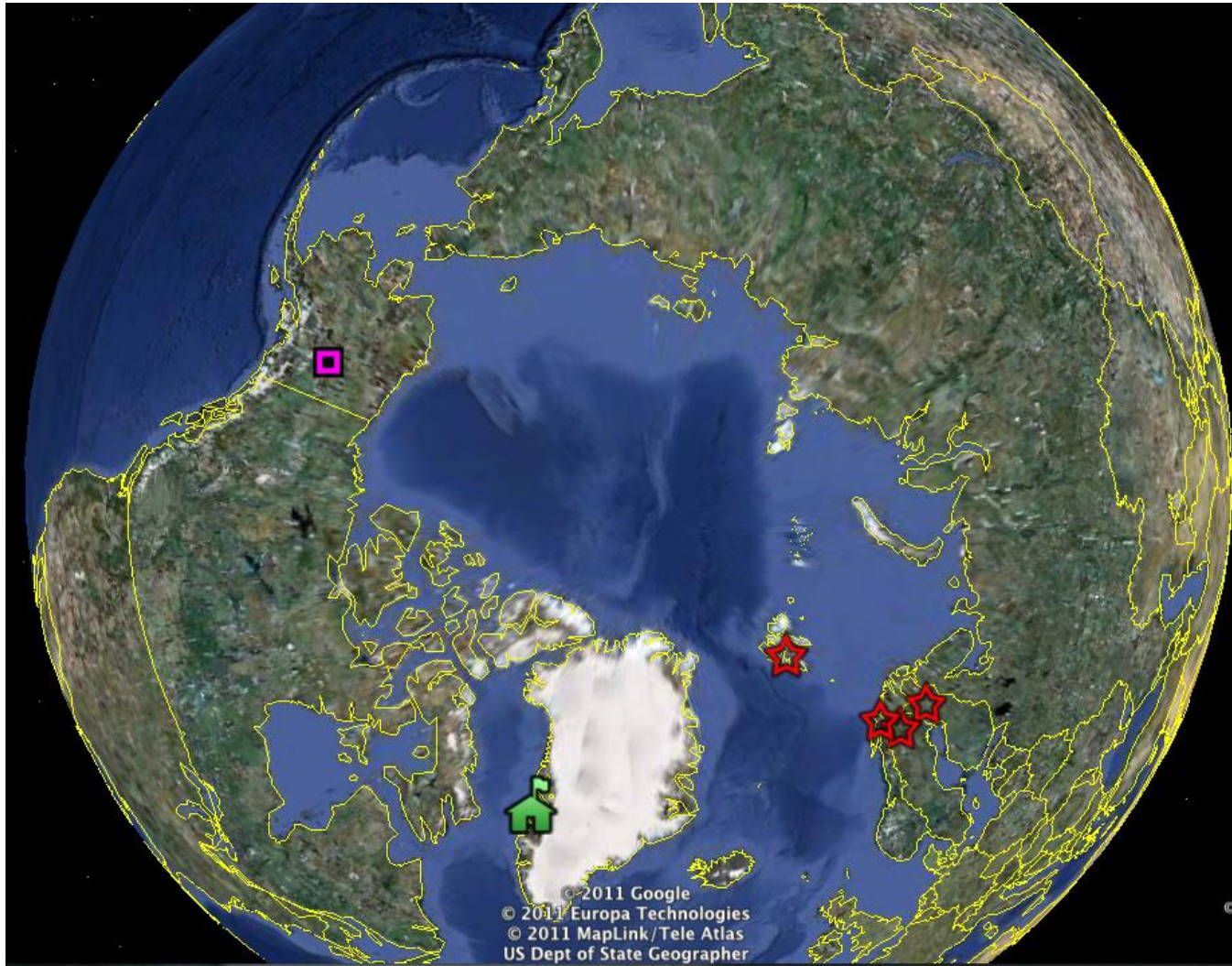
measured  
convection pattern  
(SuperDARN)



# Ionosphere Convection Pattern



# Data Types



 **Sondrestrom**

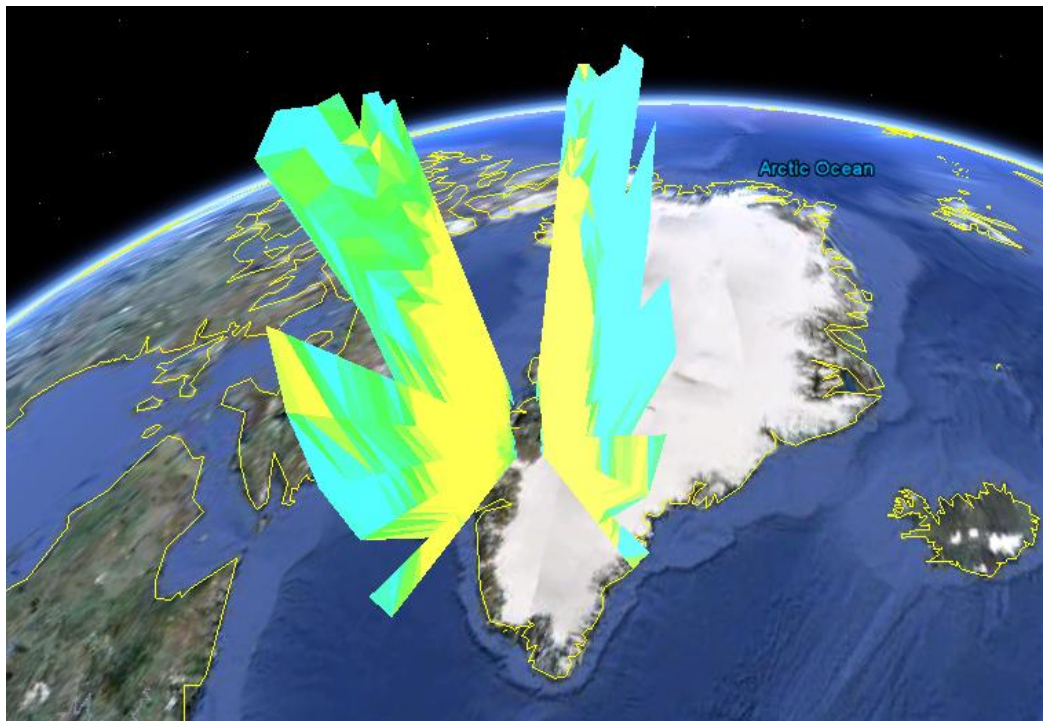
 **PFISR**

 **EISCAT**

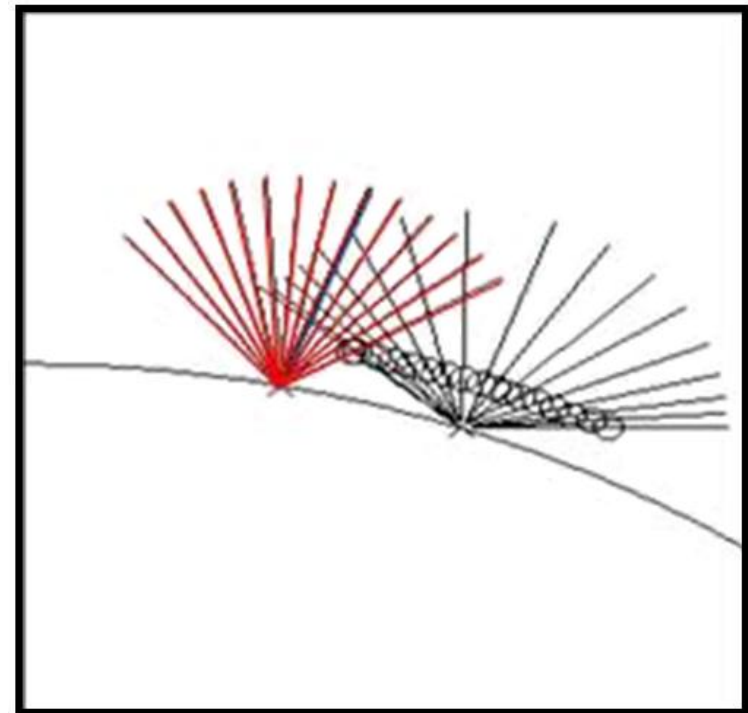
Not Pictured:  
**SuperDARN**

# Scan Techniques

- Conducted scans from 23:30-01:00 UT



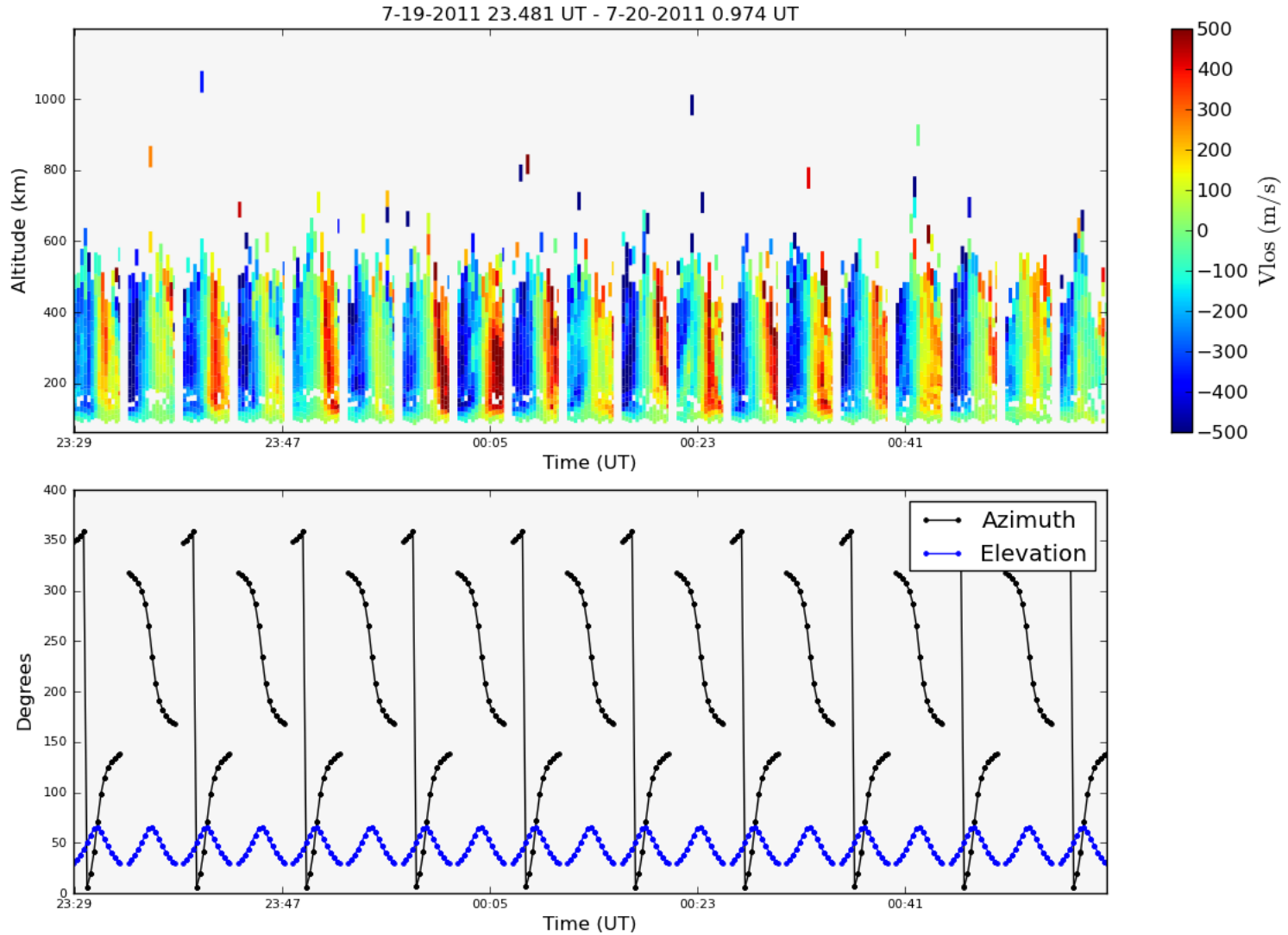
Sondrestrom Composite Scan



EISCAT CP3 Scan



# Initial Line-of-Sight Velocity Plot





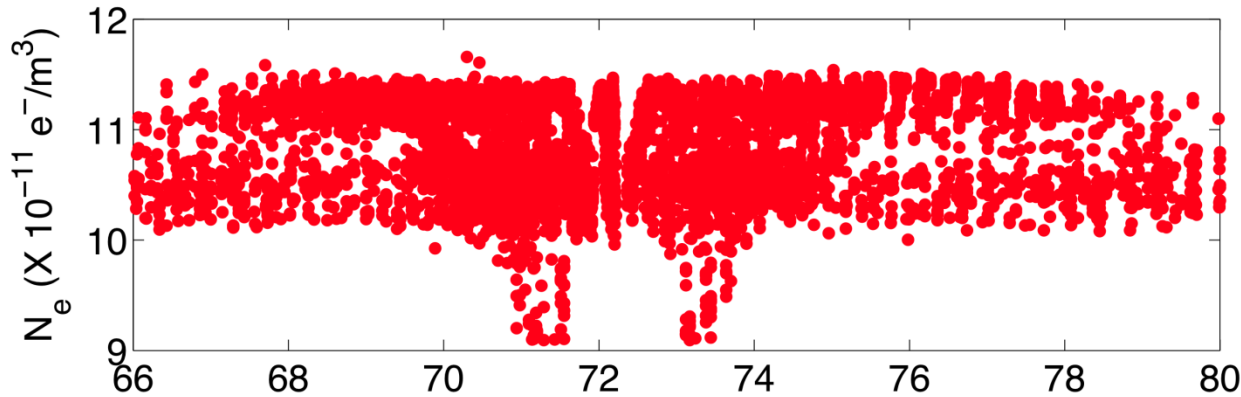


# Error Culling

- Sonderstrom
  - All data with velocity errors above 250 m/s removed
- EISCAT
  - All errors above 250 m/s removed
- PFISR
  - All errors above 250 m/s removed
- Less than 10% of data removed.

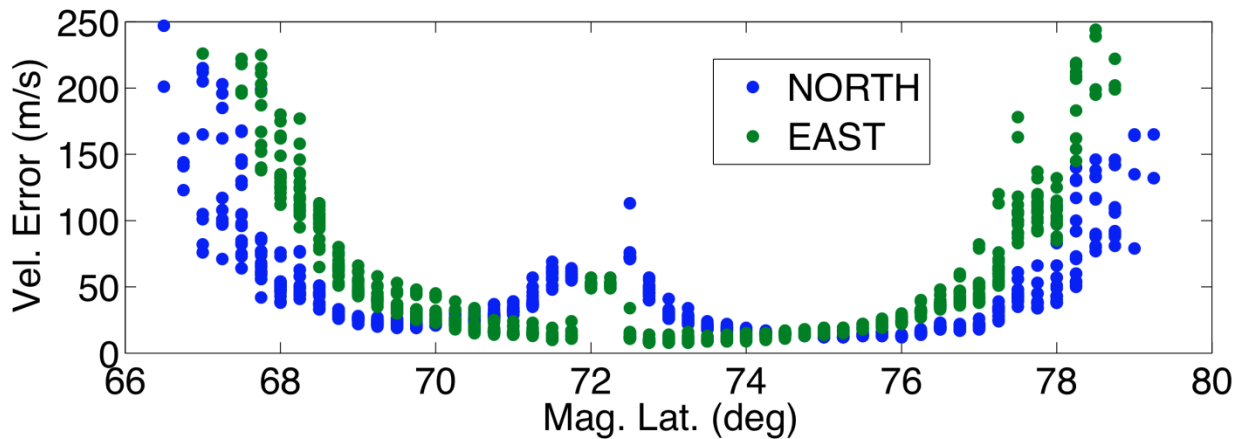
# Error Analysis

Error w.r.t. Electron Density



- Errors correlated with electron density?

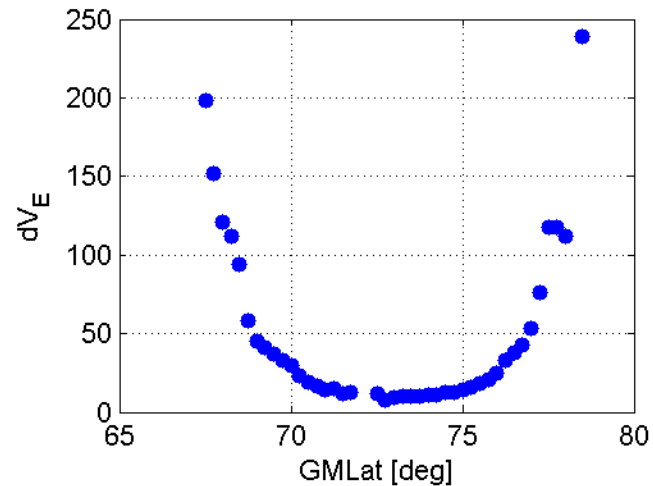
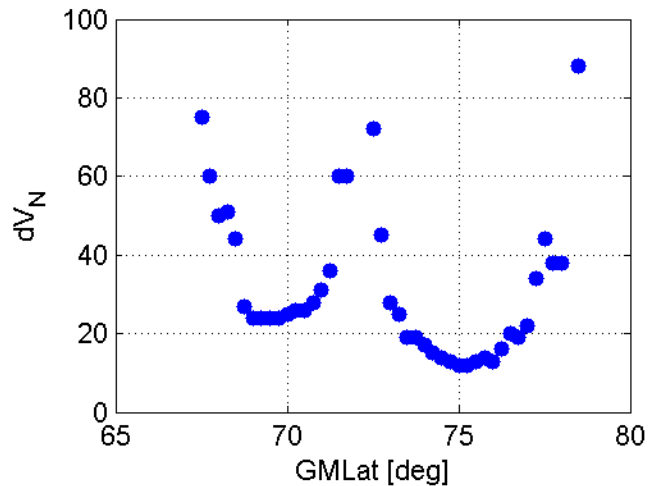
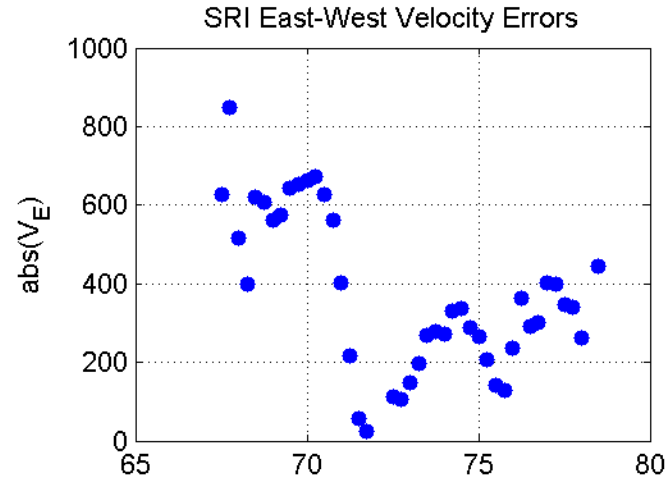
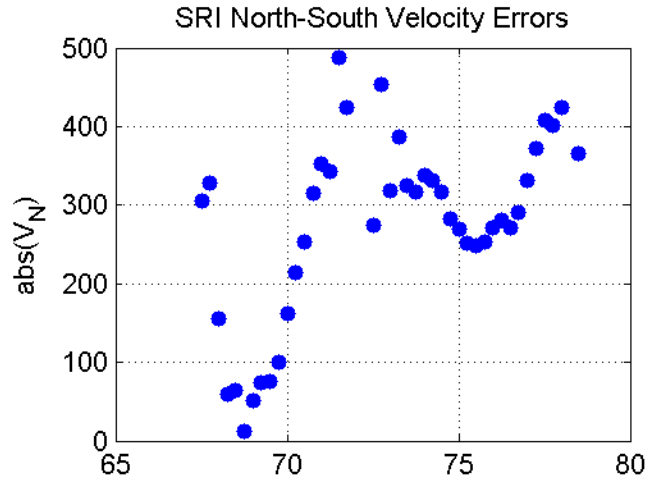
- Lowest electron densities associated with lowest and highest altitudes.



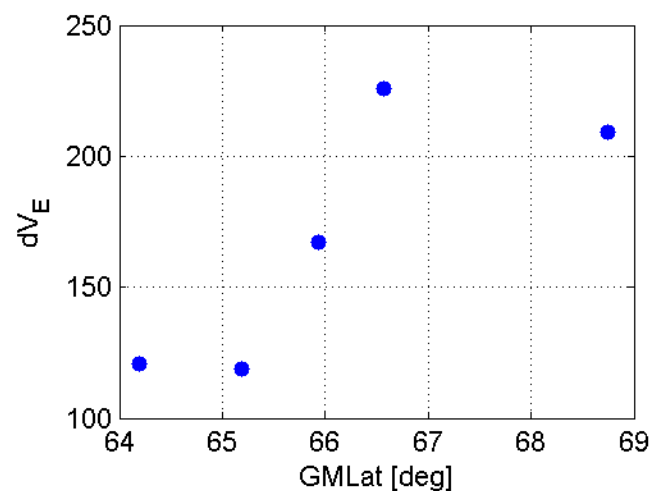
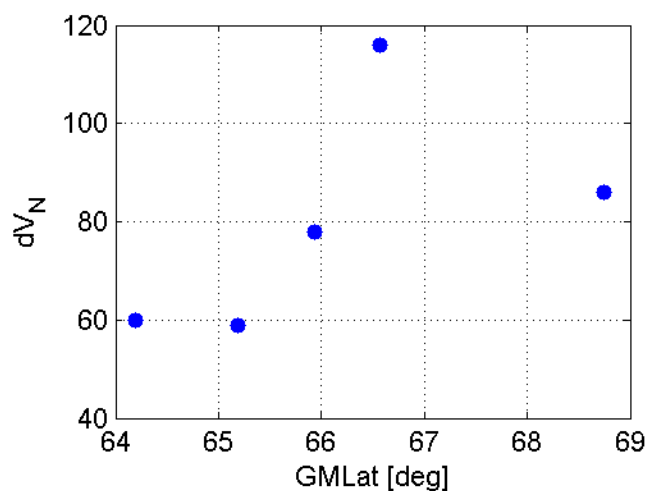
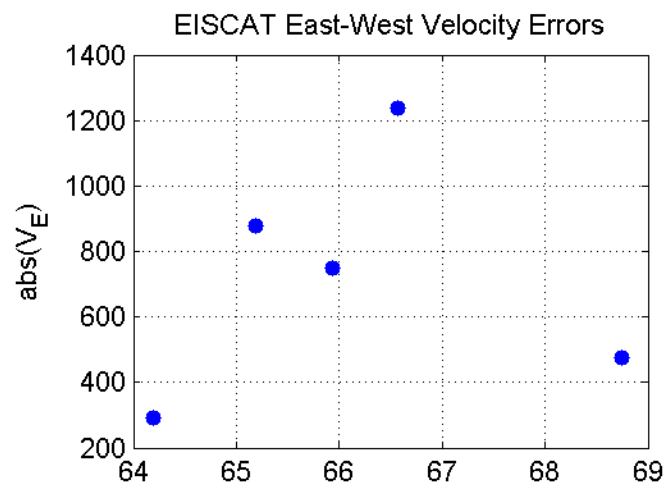
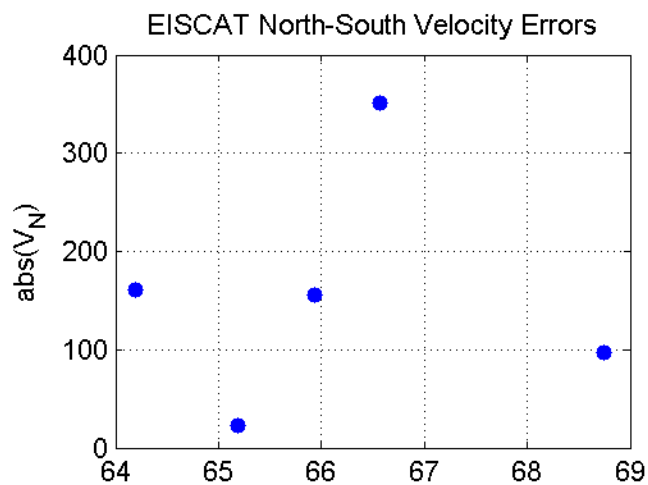
- Debye length larger than transmission wavelength in these regions.



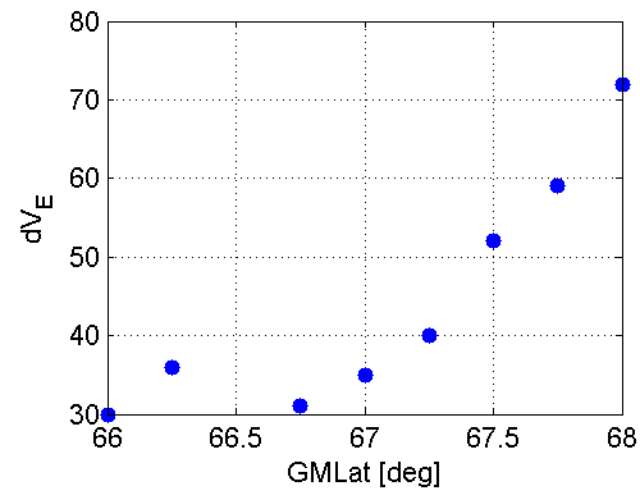
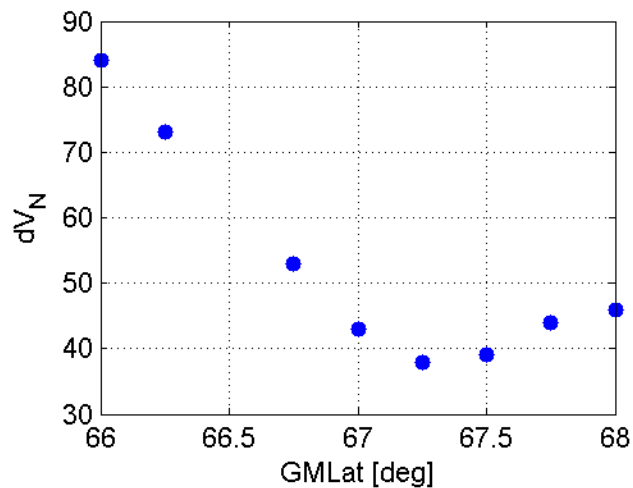
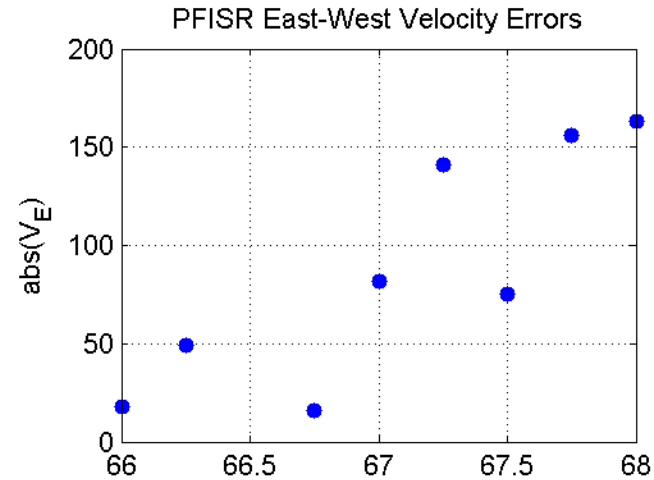
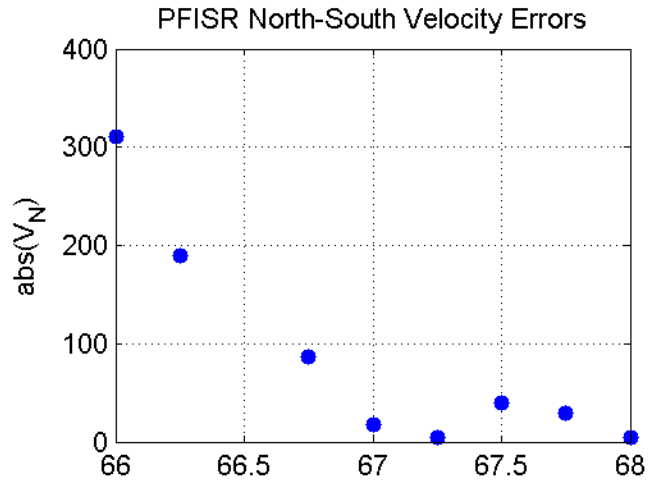
# Sondrestrom Error Analysis



# EISCAT Error Analysis

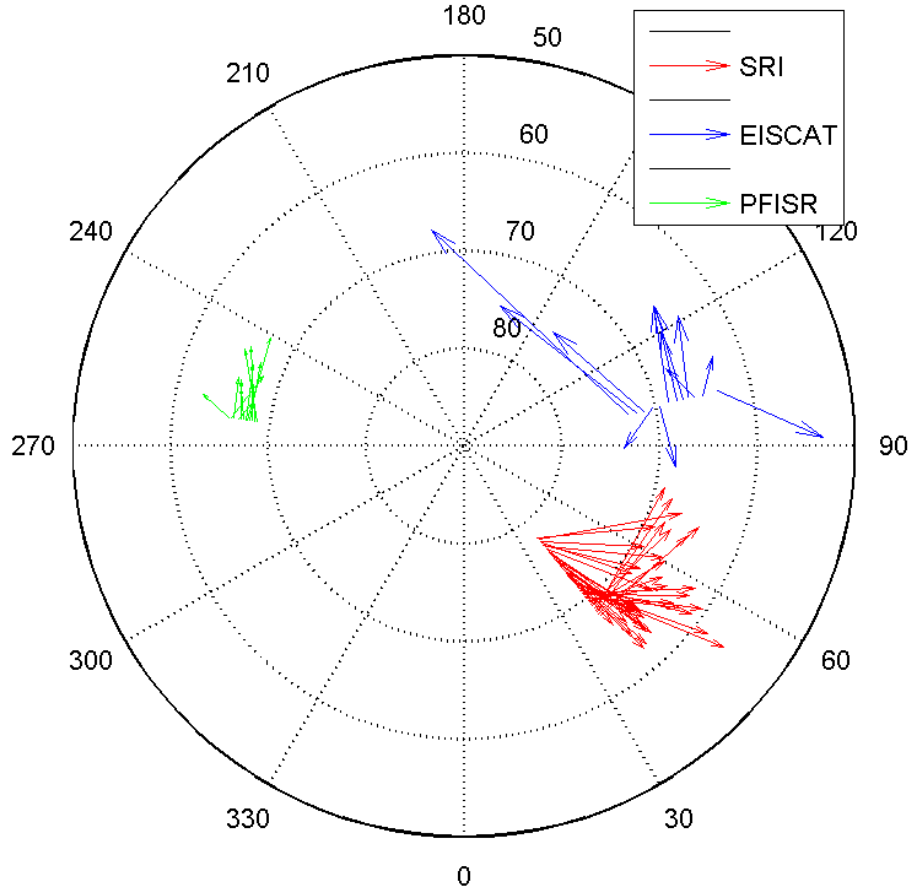


# PFISR Error Analysis

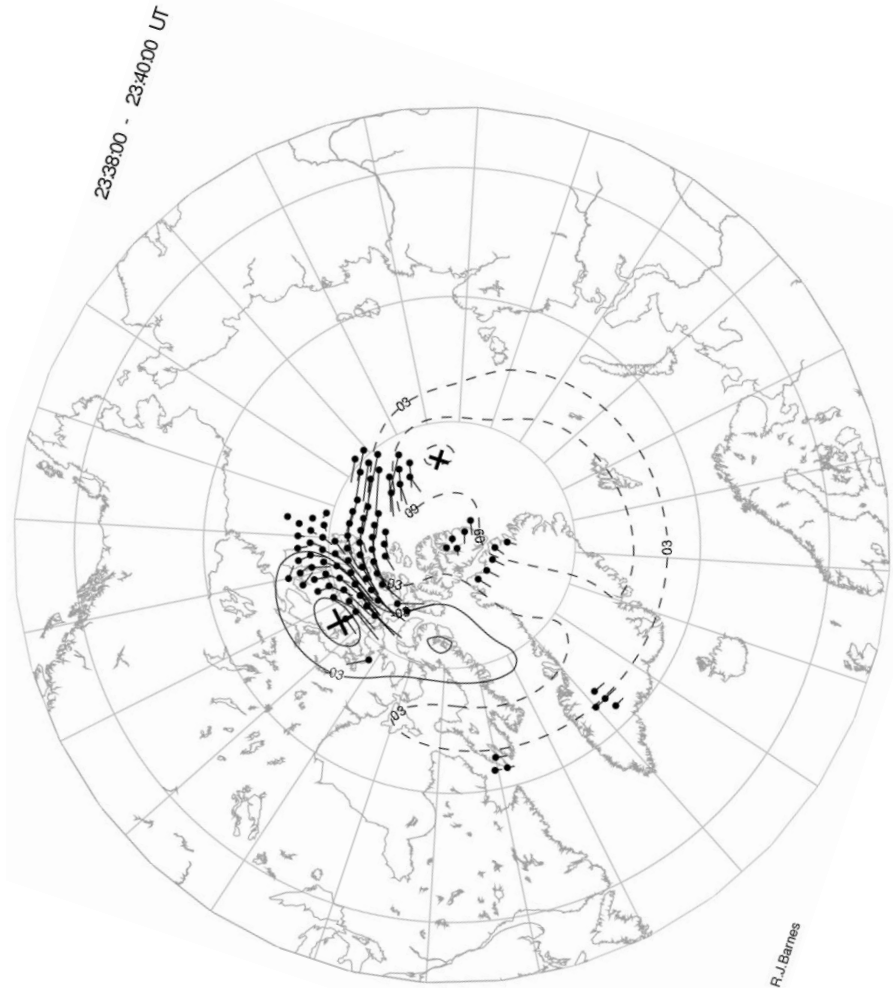


# Results

UT  
SRI: 23.63 EISCAT: 23.56 PFISR: 23.63



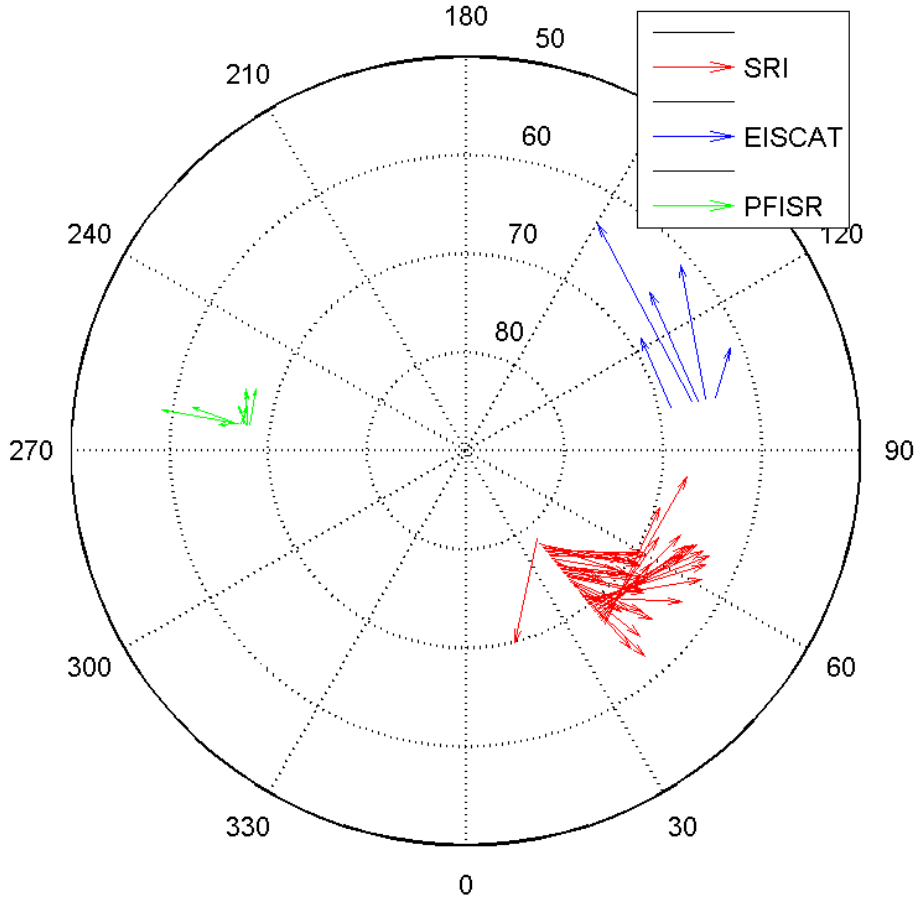
Geomagnetic Velocity Vectors



SuperDARN  
JHU/APL Software by F.J. Barnes

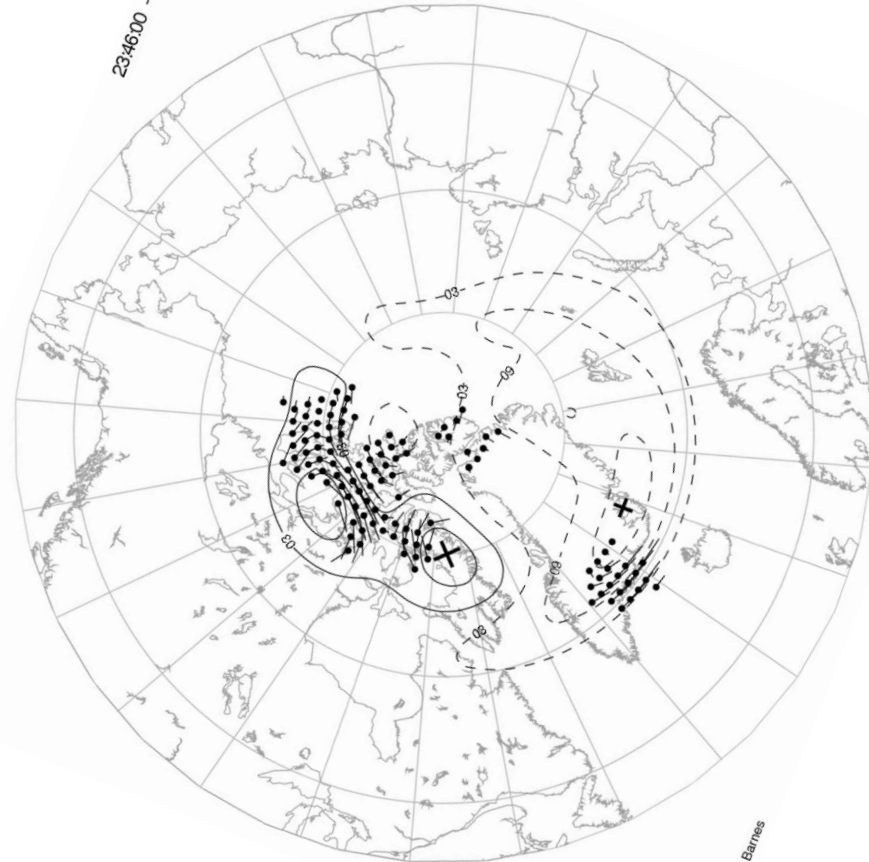
# Results

UT  
SRI: 23.78 EISCAT: 23.97 PFISR: 23.78



Geomagnetic Velocity Vectors

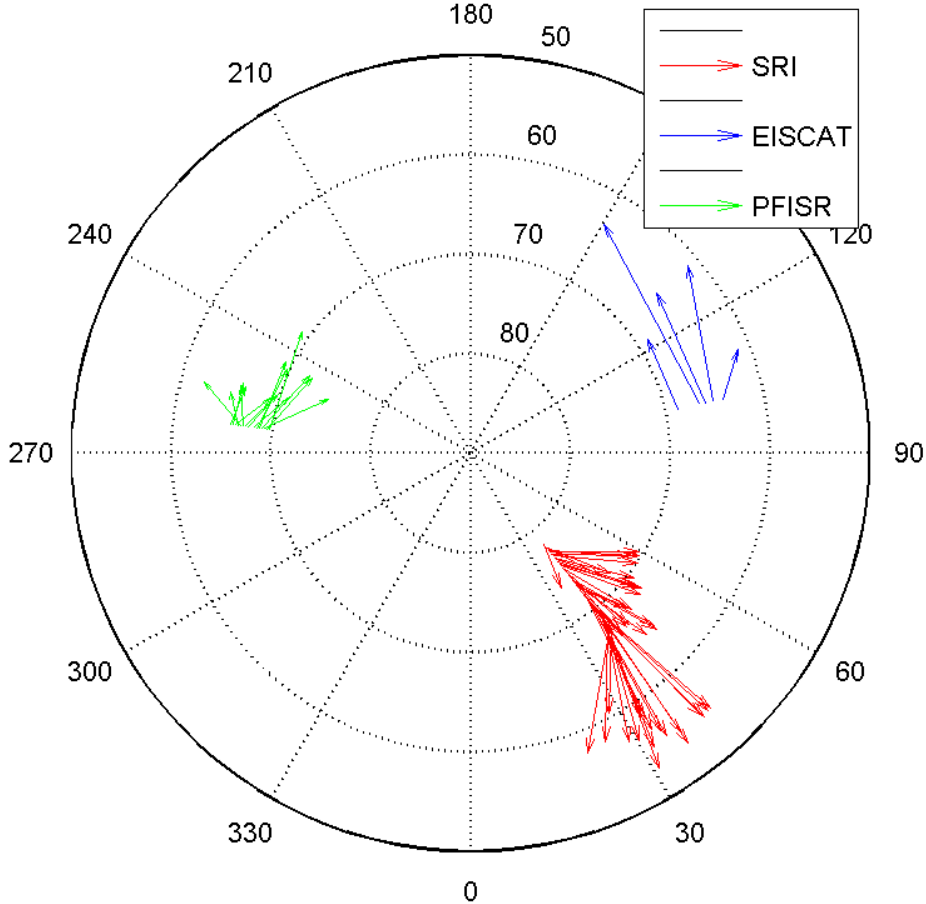
23:46:00 - 23:48:00 UT



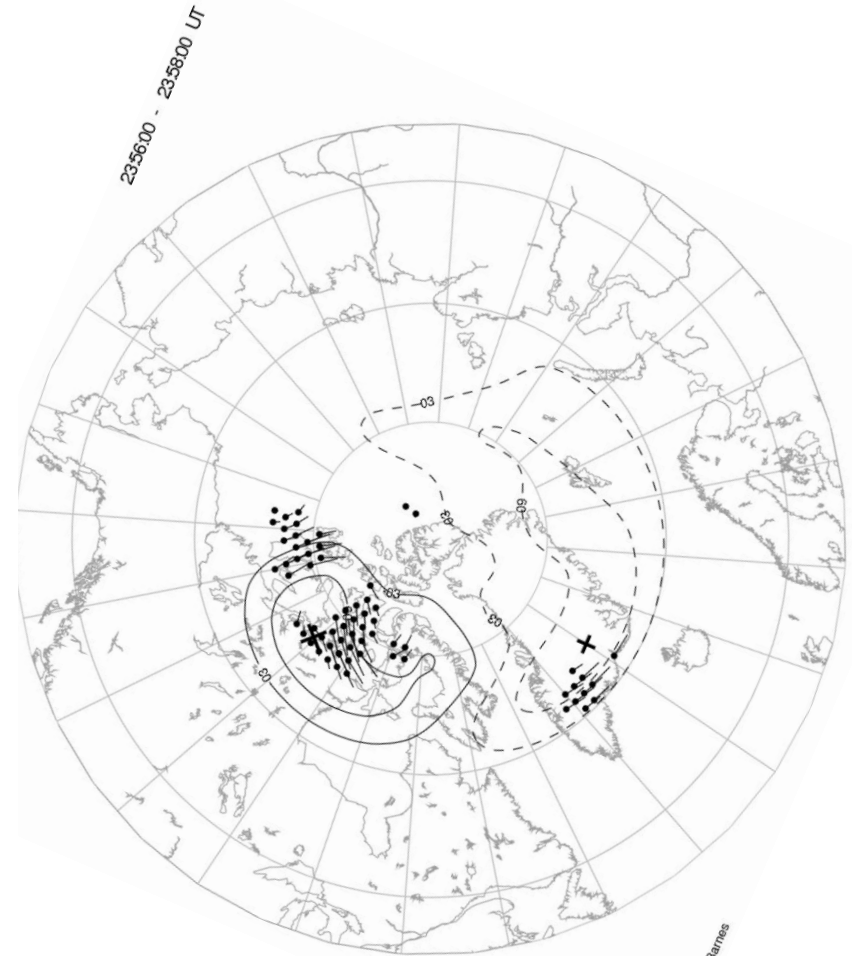
SuperDAFIN  
JHU/APL Software by R.J.Barnes

# Results

UT  
SRI: 23.95 EISCAT: 23.97 PFISR: 23.95



Geomagnetic Velocity Vectors



SuperDARN  
JHU/APL Software by R. J. Barnes

<http://superdarn.jhuapl.edu>





# Analysis

- Did we image inversion or convection?
  - Probably, looks like potential reversals.
- Did we agree with SuperDARN?
  - Generally 2 of 3 radar sites show potential match with SuperDARN.

# Conclusions

- Did it work?
  - Yes, we could map velocity over Geomagnetic Pole.
- What else should be tried?
  - Higher Geomagnetic Latitude
  - Center of convection currents too far from scans to get reversal.