

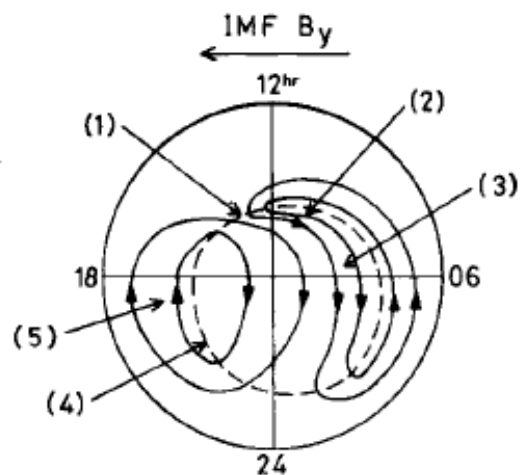
Dawn Dusk Asymmetries in the Coupled Solar Wind Magnetosphere Ionosphere System

A. P. Walsh, S. Haaland, C. Forsyth, A. M. Keese, J. Kissinger, K. Li, A. Runov, J. Soucek, M. G. G. T. Taylor, B. M. Walsh, S. Wing

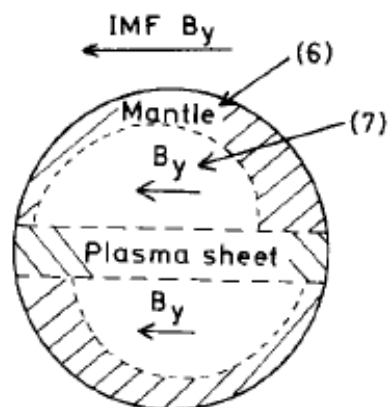
Thanks to ISSI, Bern, CH

- There are a lot...
 - Foreshock, bow shock & magnetosheath
 - Magnetopause & LLBL
 - Plasma entry to the magnetosphere
 - Magnetotail plasma sheet
 - Magnetotail current sheet
 - Magnetotail dynamics
 - Inner magnetosphere
 - Ionospheric properties and convection

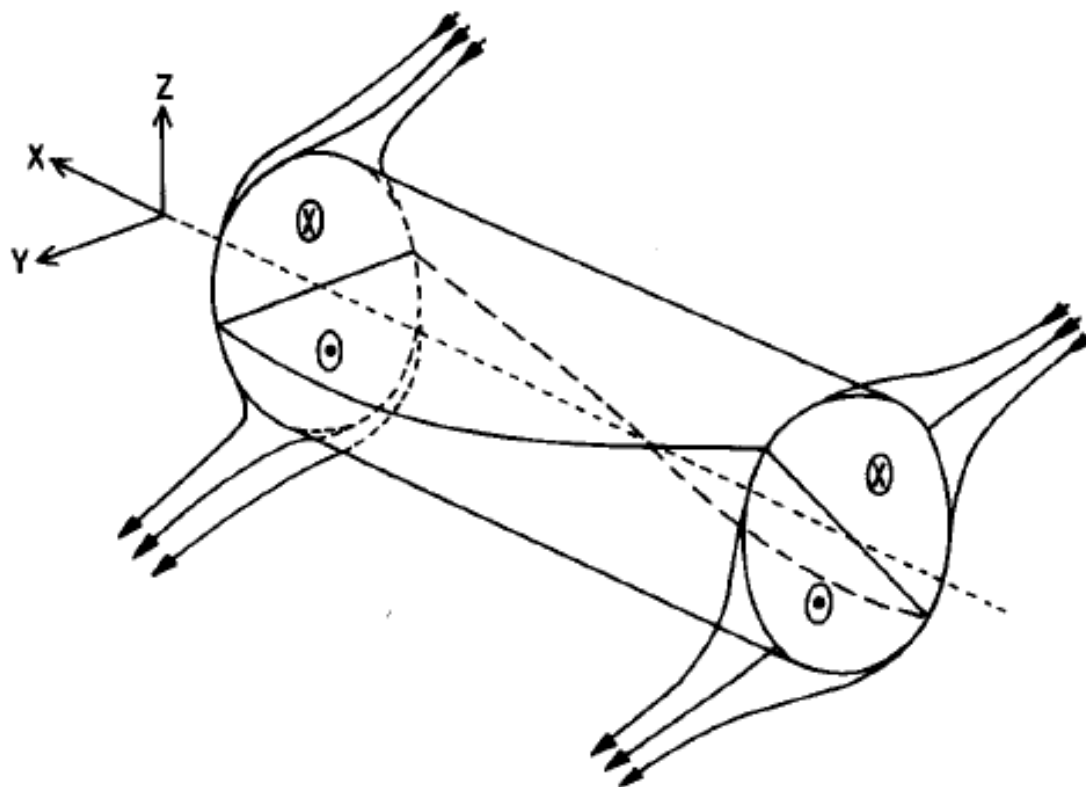
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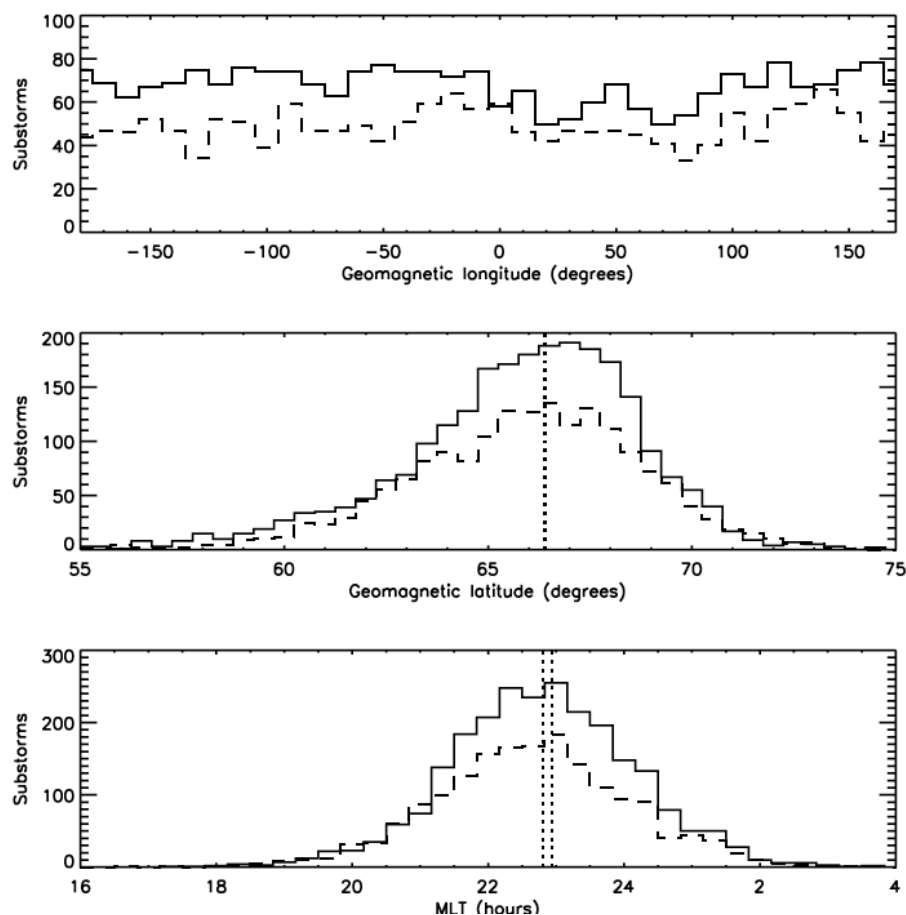
(a) Low altitude polar flows
(northern hemisphere)



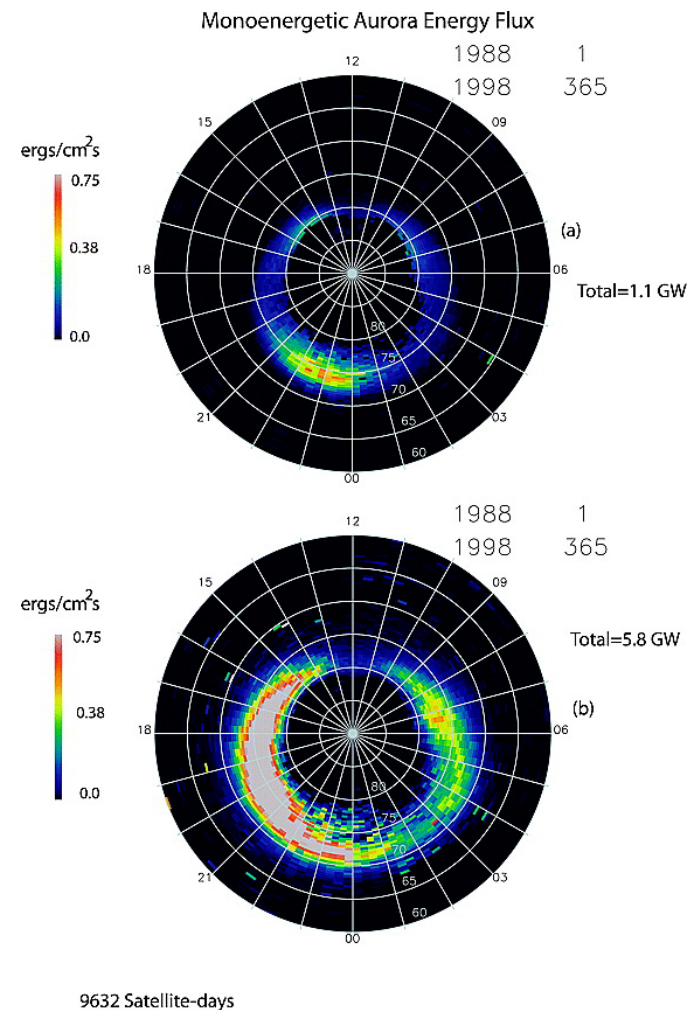
(b) Tail lobe cross-section



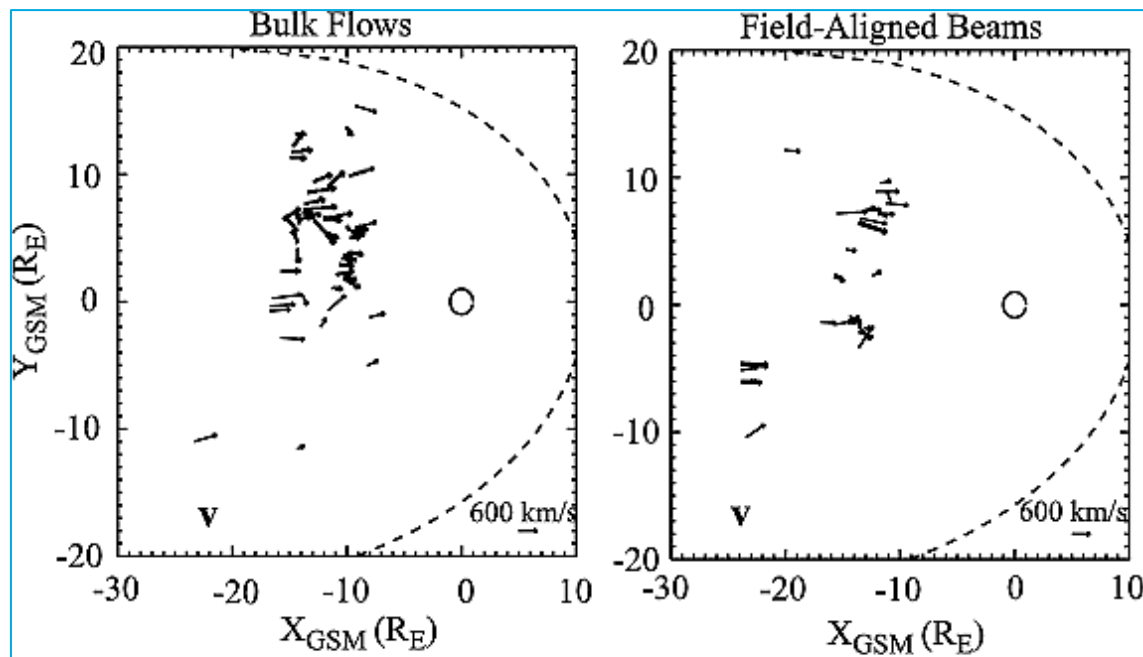
Substorm Onset



(Frey & Mende, 2006)

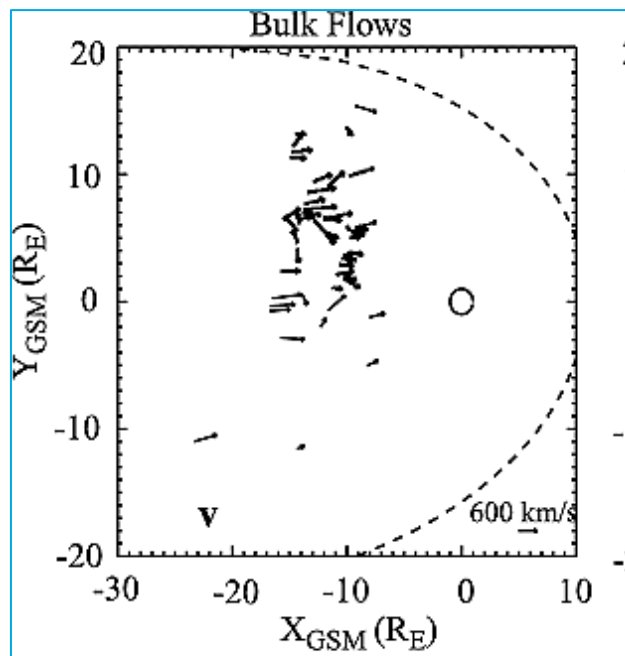


Fast Flows?

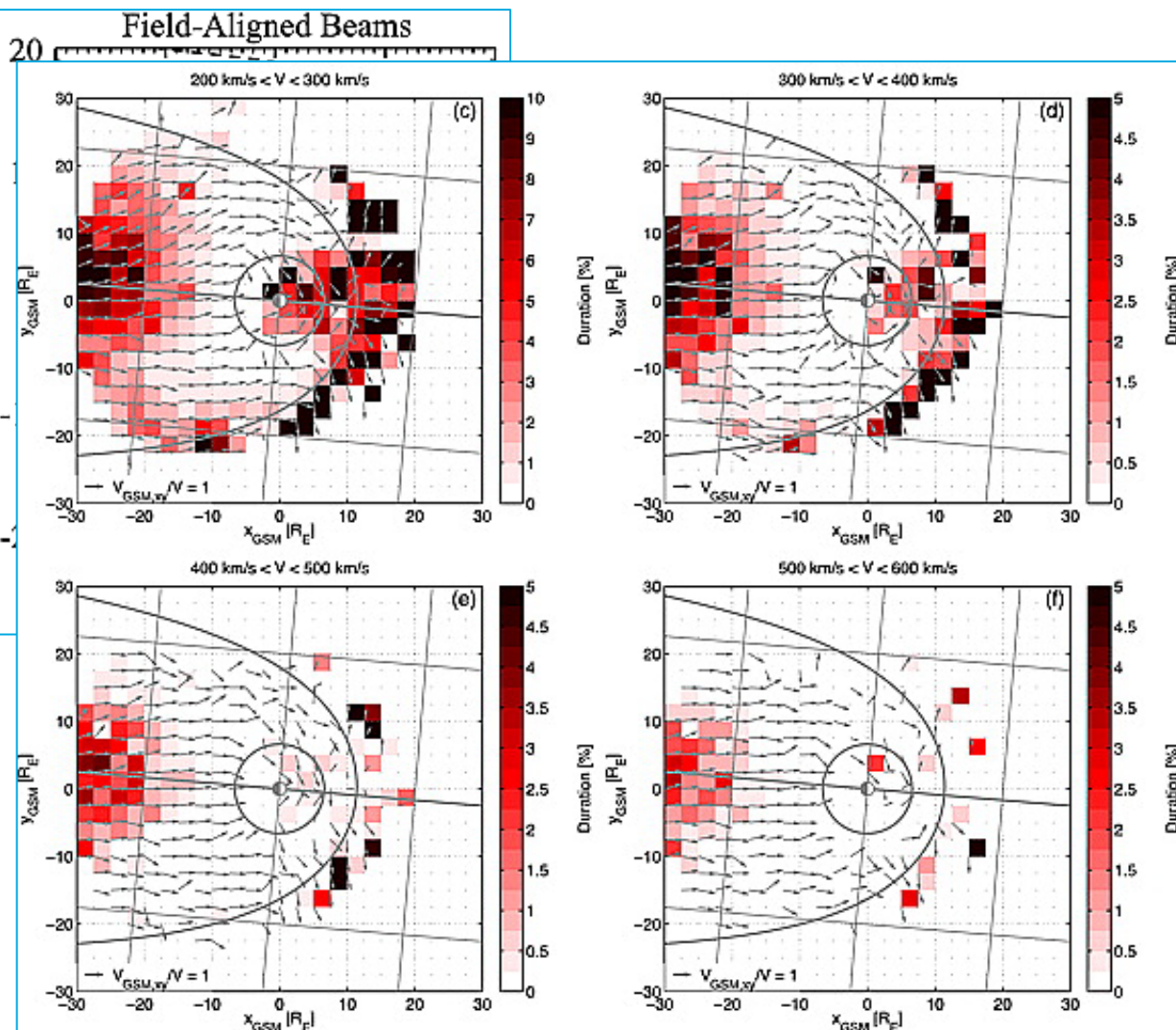


(Raj et al., 2002)

Fast Flows?

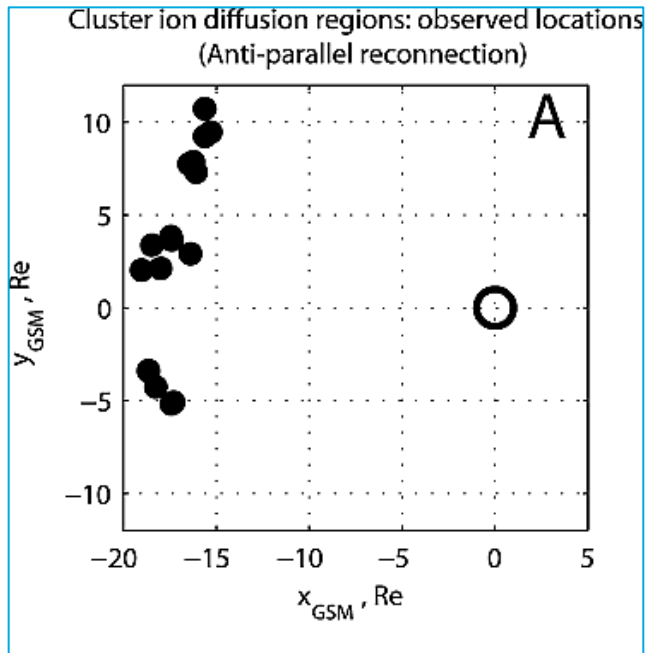


(Raj et al., 2002)



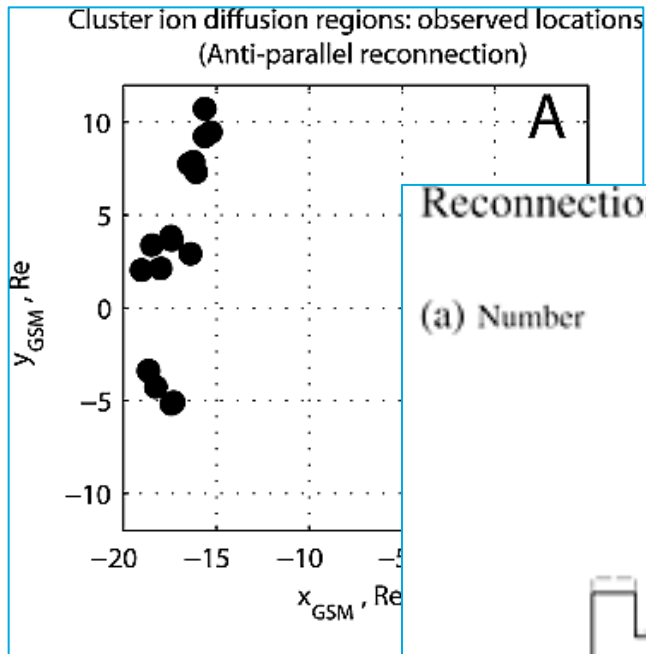
(Juusola et al., 2011)

Cluster



(Eastwood et al., 2010)

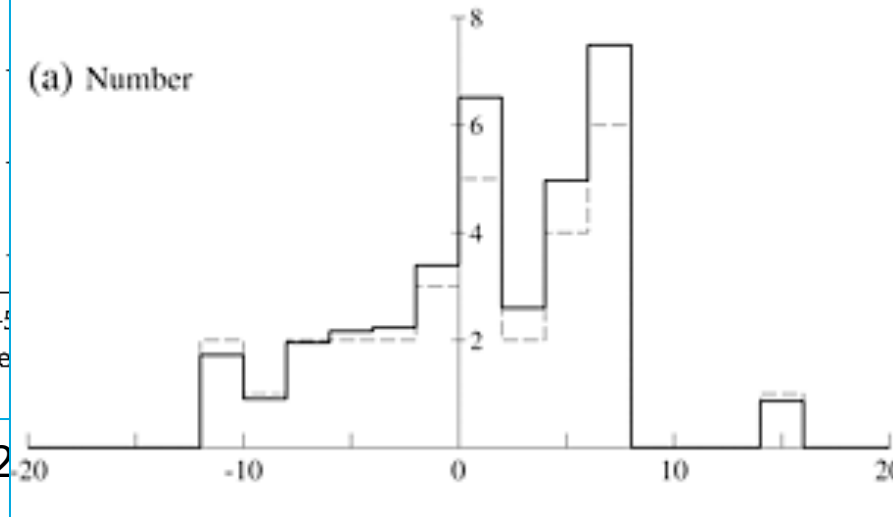
Cluster



Geotail

Reconnection Events

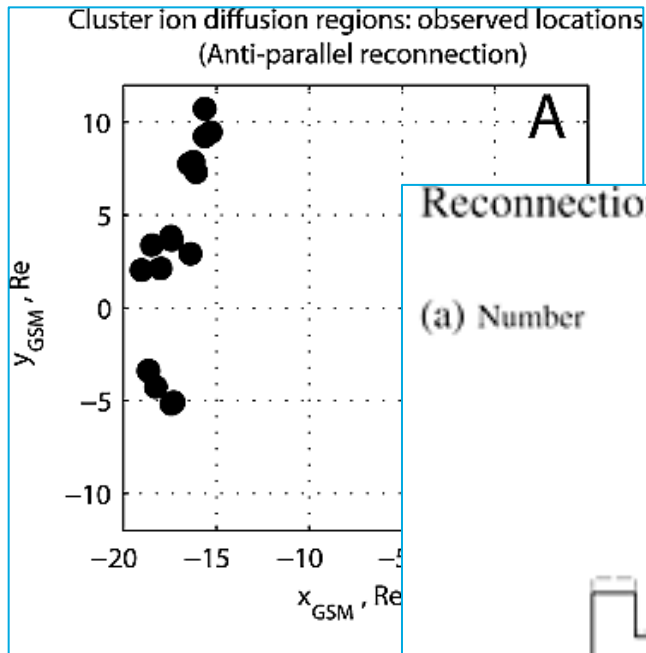
(a) Number



(Eastwood et al., 2002)

(Nagai et al., 2013)

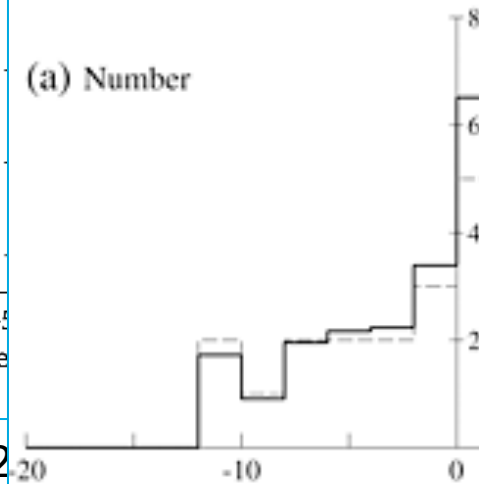
Cluster



Geotail

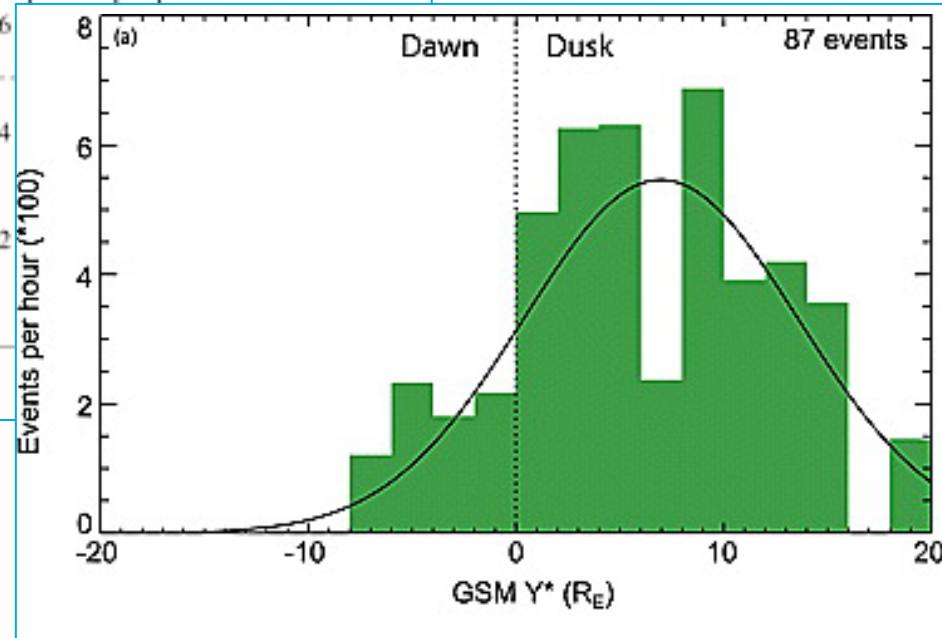
Reconnection Events

(a) Number



(Nagai et al., 2013)

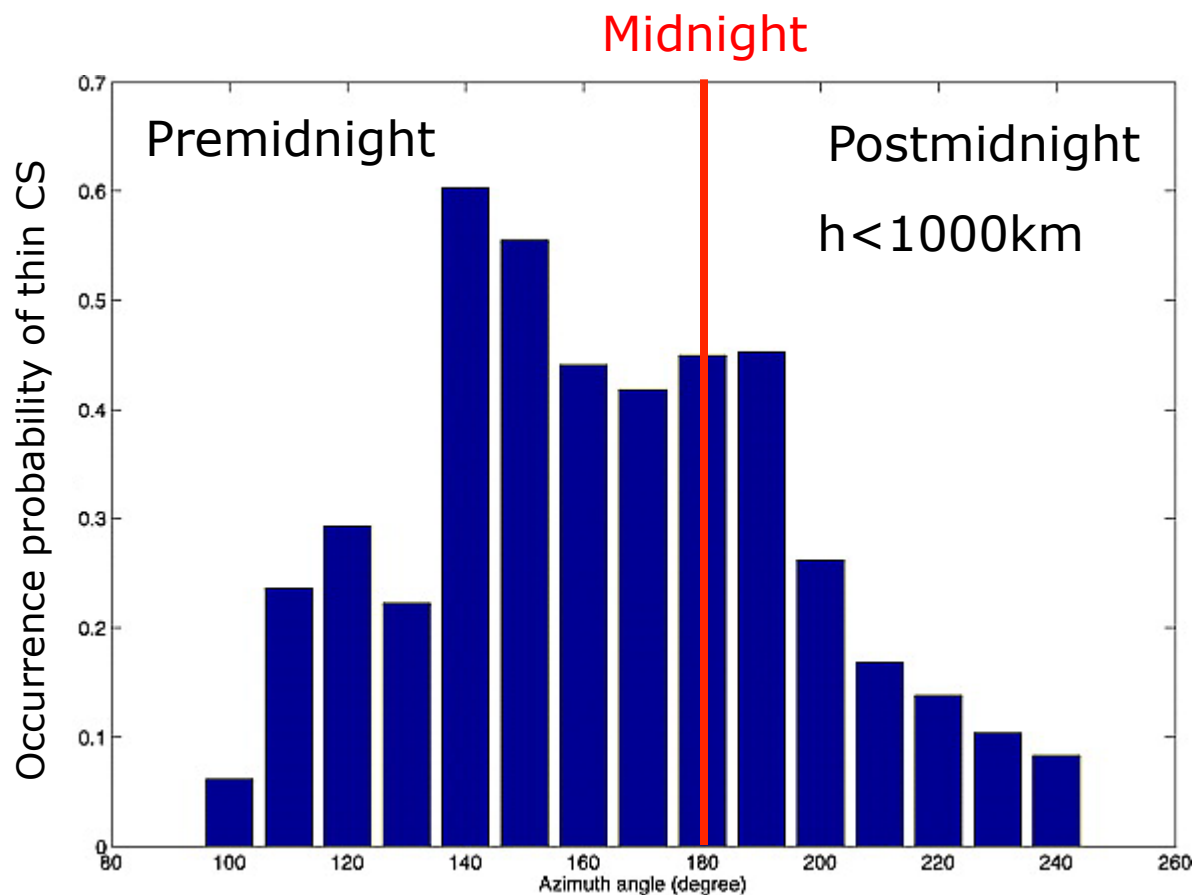
THEMIS



(Imber et al., 2011)

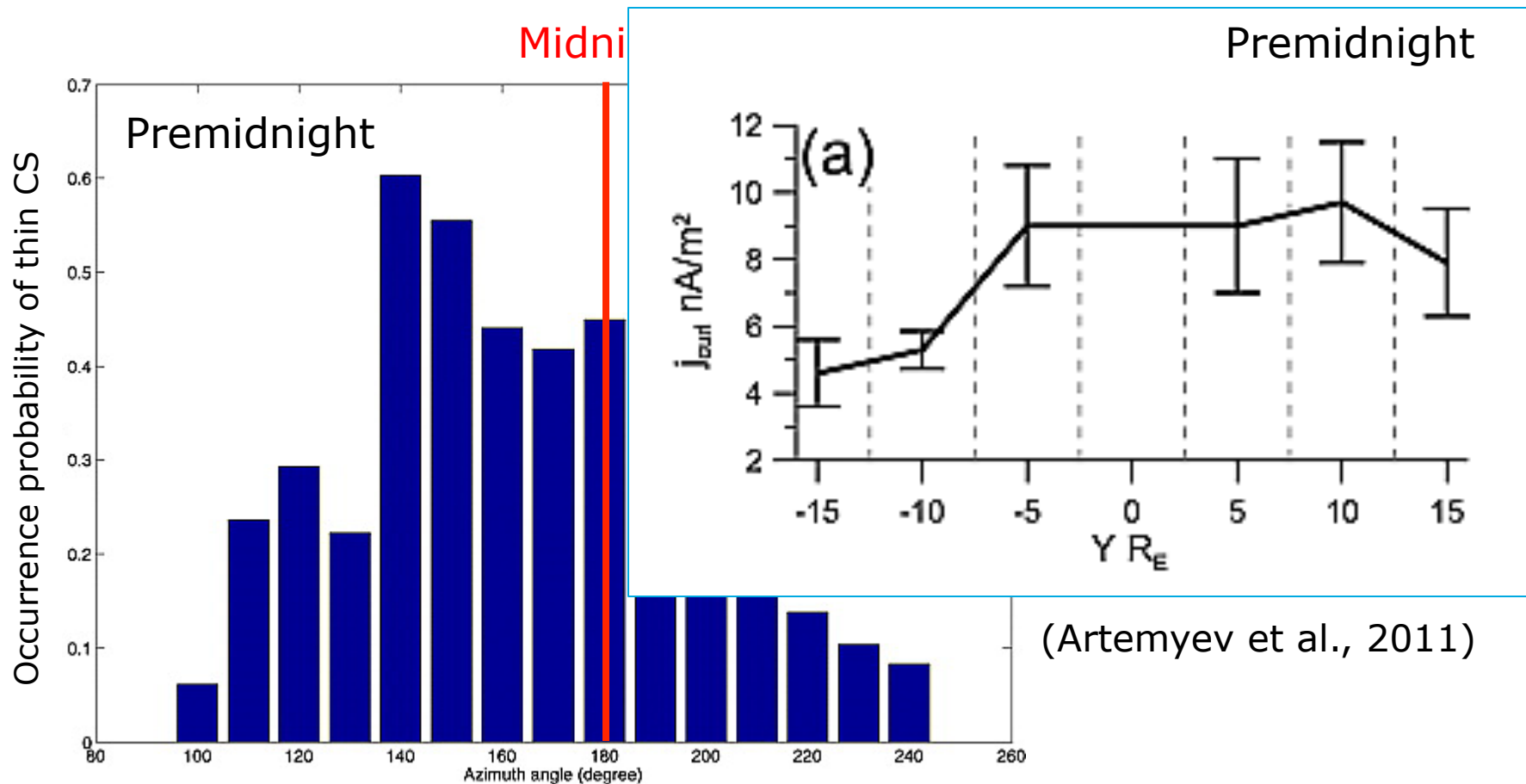
(Eastwood et al., 2006)

Current Sheet Thickness & Strength



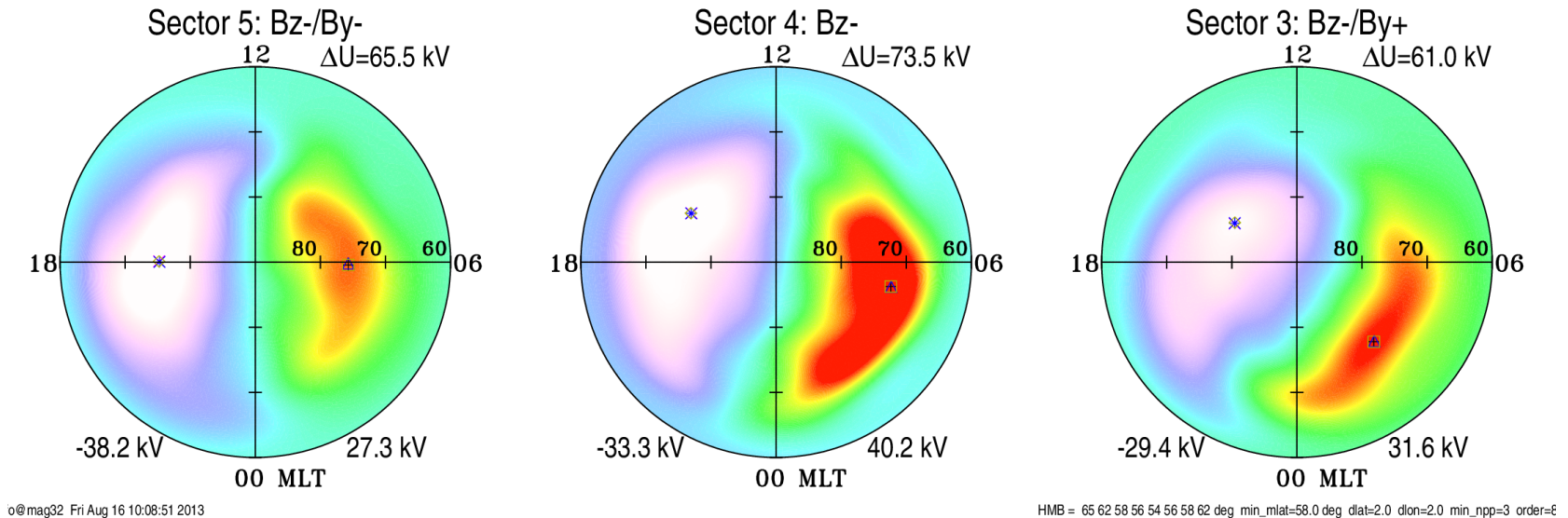
(Rong et al., 2011)

Current Sheet Thickness & Strength



(Rong et al., 2011)

(Artemyev et al., 2011)



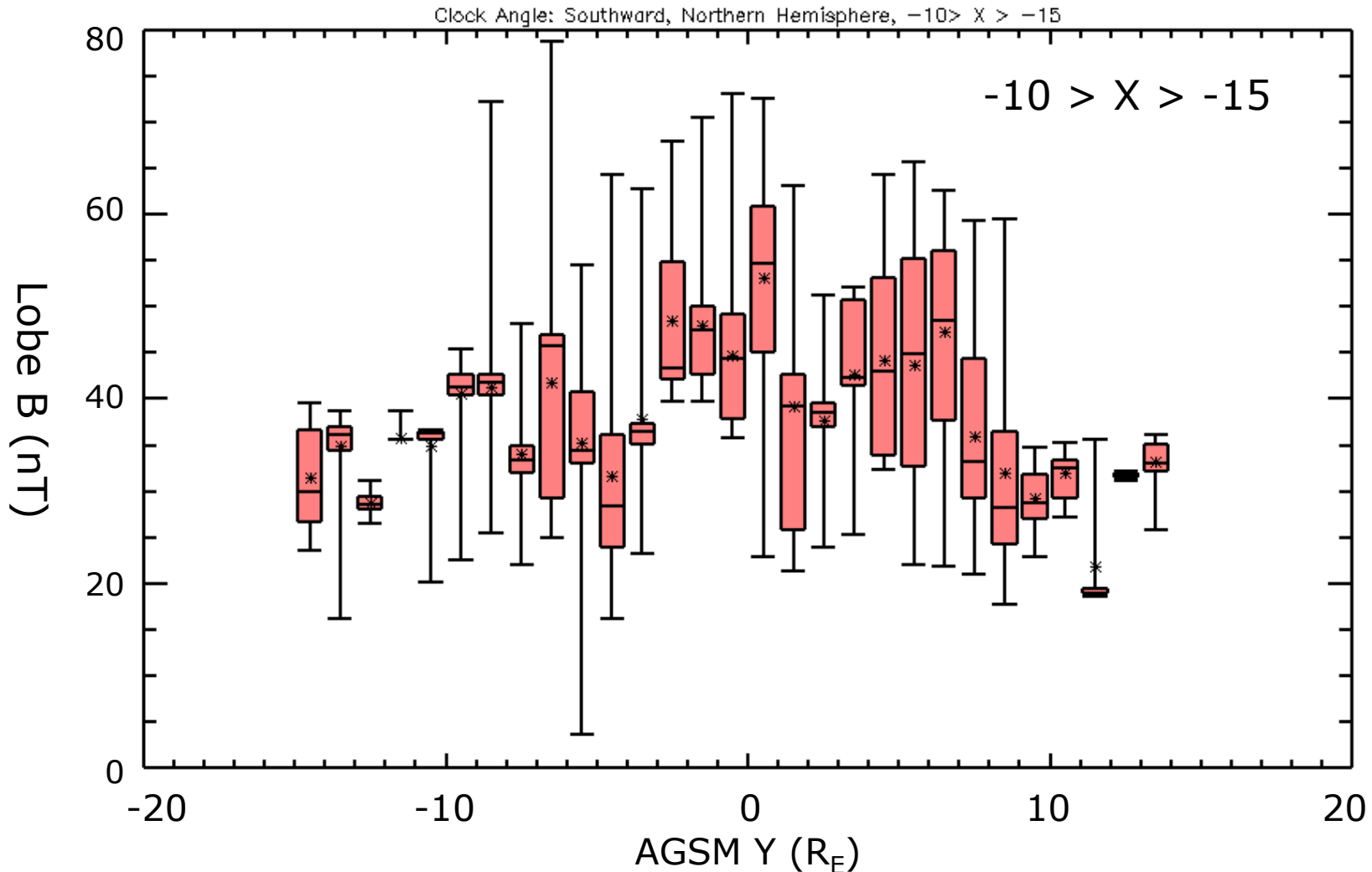
(Foerster & Haaland, in preparation)

Asymmetric Convection cells even for purely Southward IMF

This has been said to be caused by nonuniform ionospheric conductivity (Tanaka et al., 2001).

- Given the above, you might expect a stronger tail lobe magnetic field premidnight.
 - Take Cluster, THEMIS, Geotail & Double Star Data
 - Use the same IMF selection criteria as Foerster & Haaland (IMF Bias vectors -> control for direction and stability)
 - Limit to steady southward IMF
 - Look at the behaviour of $|B|$ for different distances downtail and AGSM Y
 - Nothing clever like scaling for solar wind pressure or applying tail flaring models (yet!).

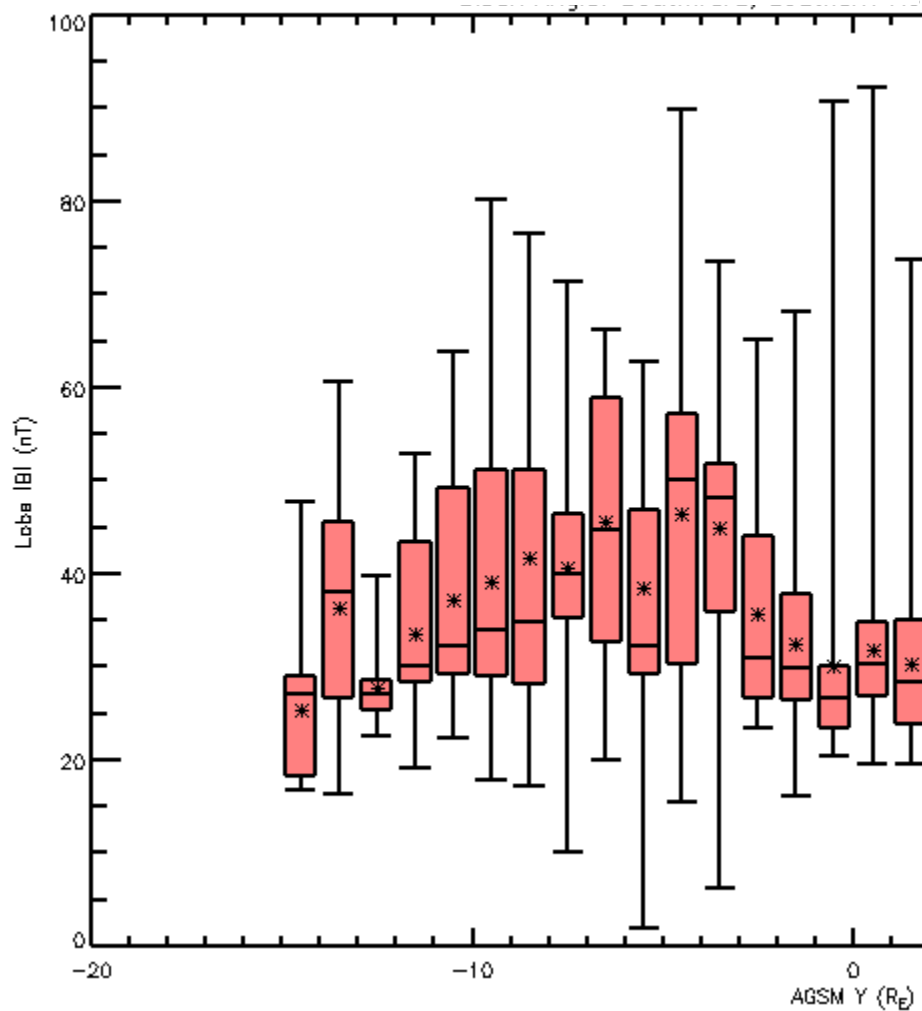
Lobe Field Strength



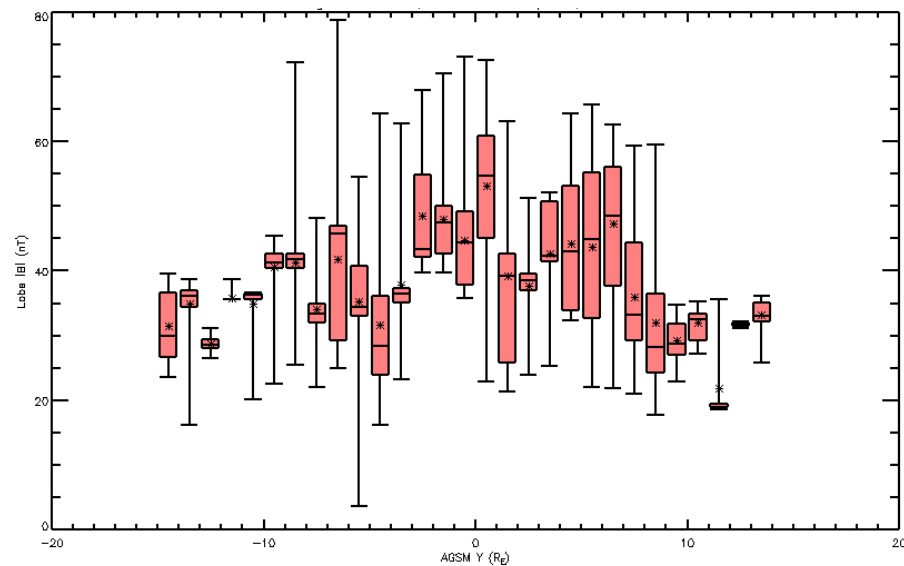
Lobe magnetic field measurements from Geotail, Cluster, Double Star, THEMIS
(Walsh et al., in preparation)

Lobe Field Strength

Southern Hemisphere



Northern Hemisphere

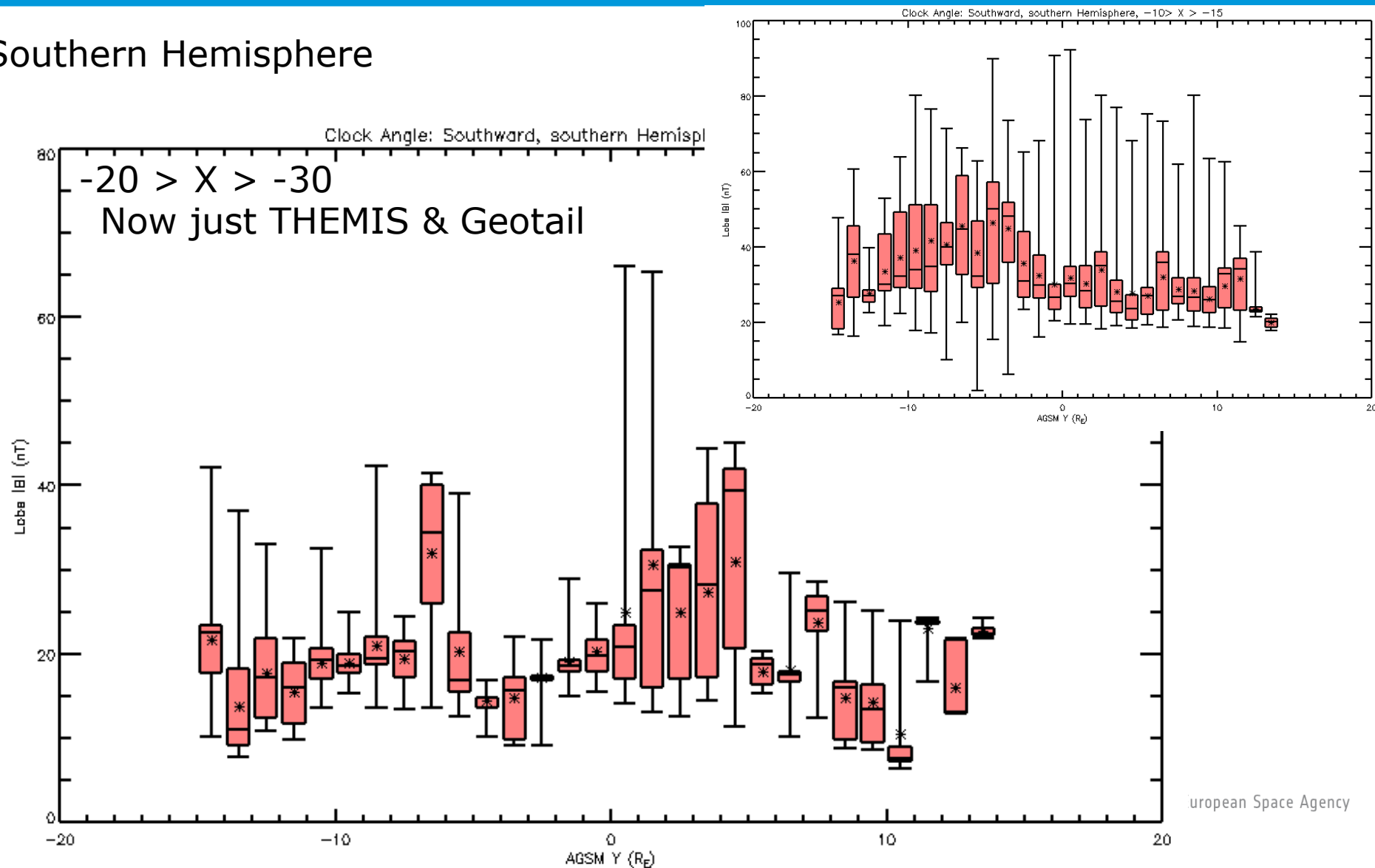


LEMIS

(Waisit et al., in preparation)

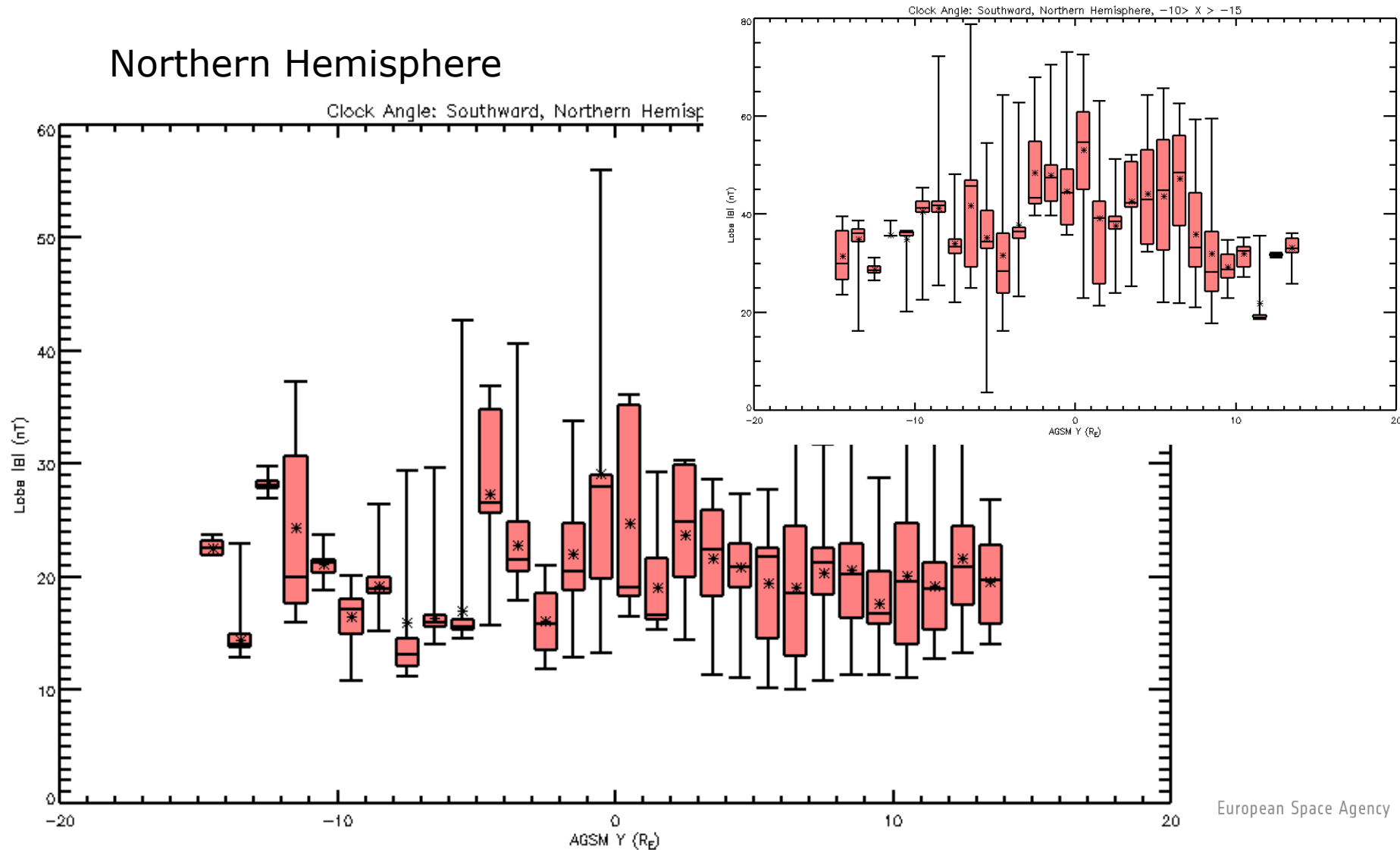
Lobe Field Strength

Southern Hemisphere



Lobe Field Strength

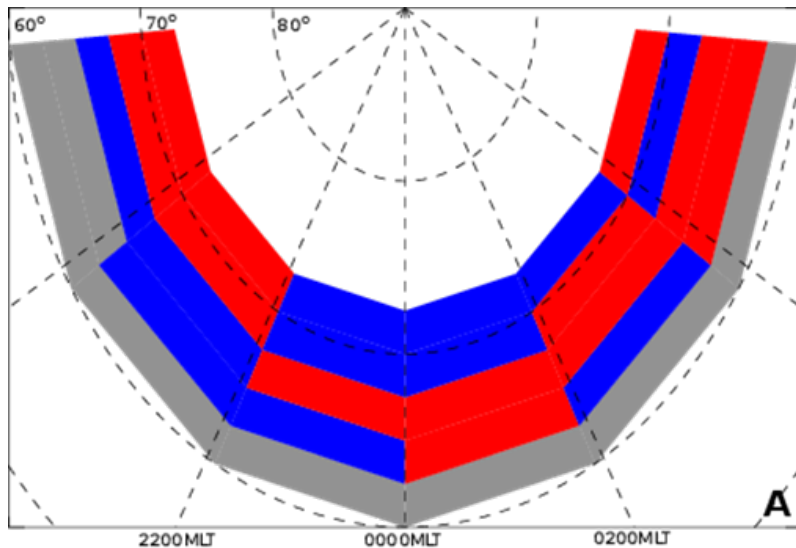
Northern Hemisphere



Plasma Sheet Electron Populations

- There's an asymmetry in the ionospheric footpoints of single and two component electron pitch angle distributions.

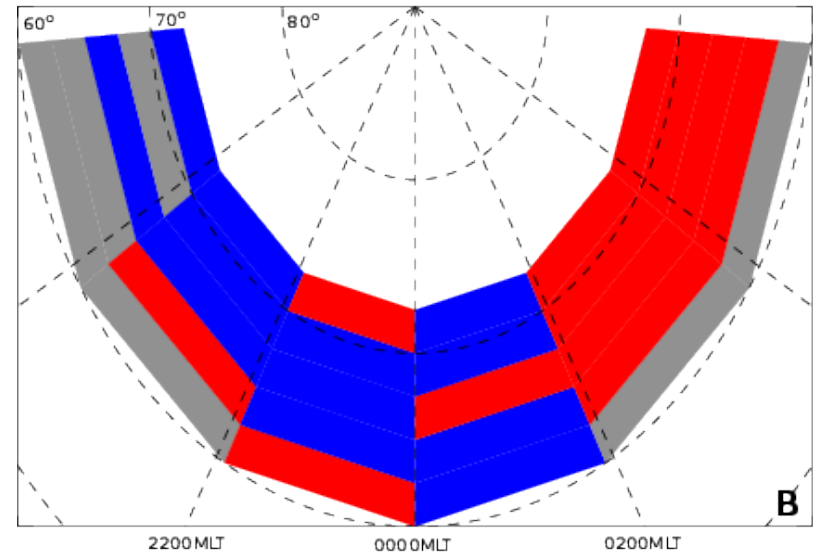
Northward IMF



More two component PADS

Under Southward IMF, plasma sheet electron pitch angle distributions are more likely to have a second component at dusk than dawn.

Southward IMF



Fewer two component PADS

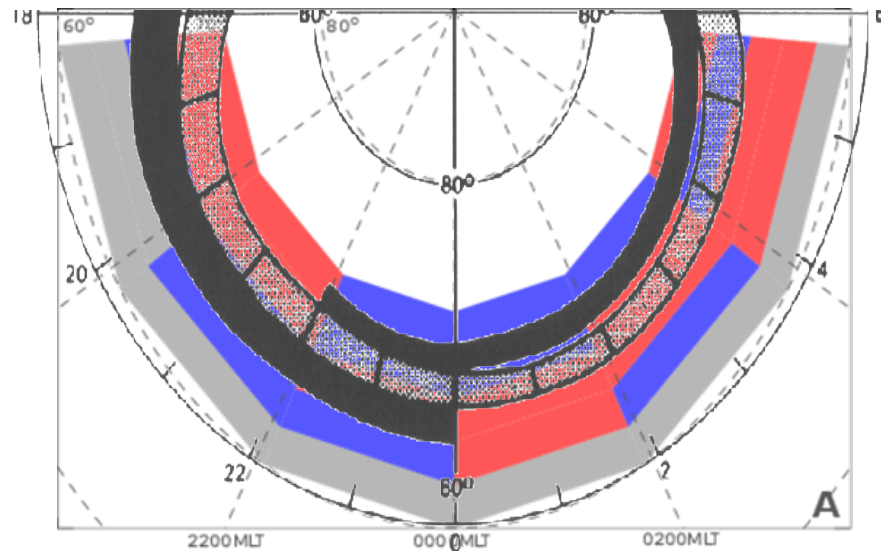
Under northward IMF this follows the pattern of Birkeland Currents

(Walsh et al., JGR 2013)

Plasma Sheet Electron Populations

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Northward IMF

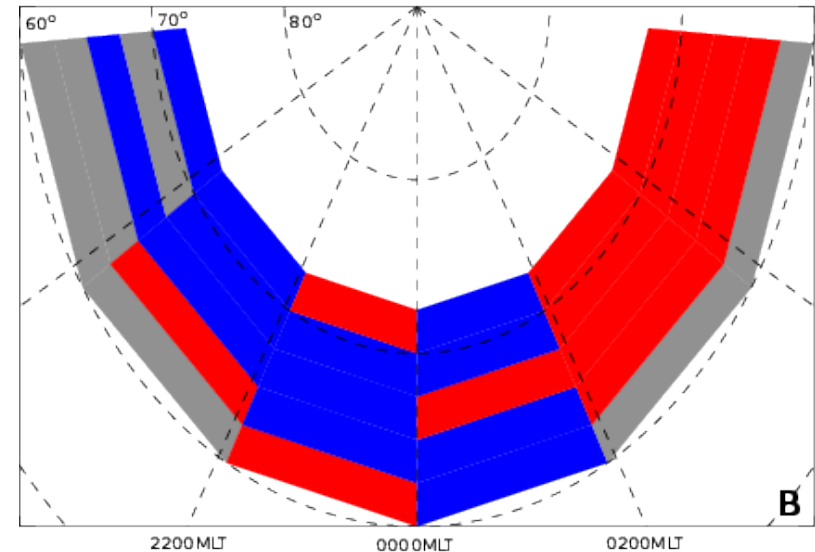


More two component PADS

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Under northward IMF this follows the pattern of Birkeland Currents (Ijima & Potemra, 1978; Walsh et al., JGR 2013)

Southward IMF



Fewer two component PADS

If You Put it Together

- It all sort of fits...
 - Non-uniform ionospheric conductivity
↓
 - Asymmetric ionospheric convection
↓
 - (Asymmetric lobes)
↓
 - Thinner current sheet premidnight
↓
 - Asymmetric dynamics in the magnetotail

If you put it together

- It all sort of fits...

- Non-uniform ionospheric conductivity



- Asymmetric ionospheric conductivity



- (Asymmetric ionospheric conductivity)

- This is what we see in the magnetotail



metric dynamics in the magnetotail

Walsh et al., Ann. Geophys., 32, 705-737, 2014
doi:10.5914/angeo-32-705-2014

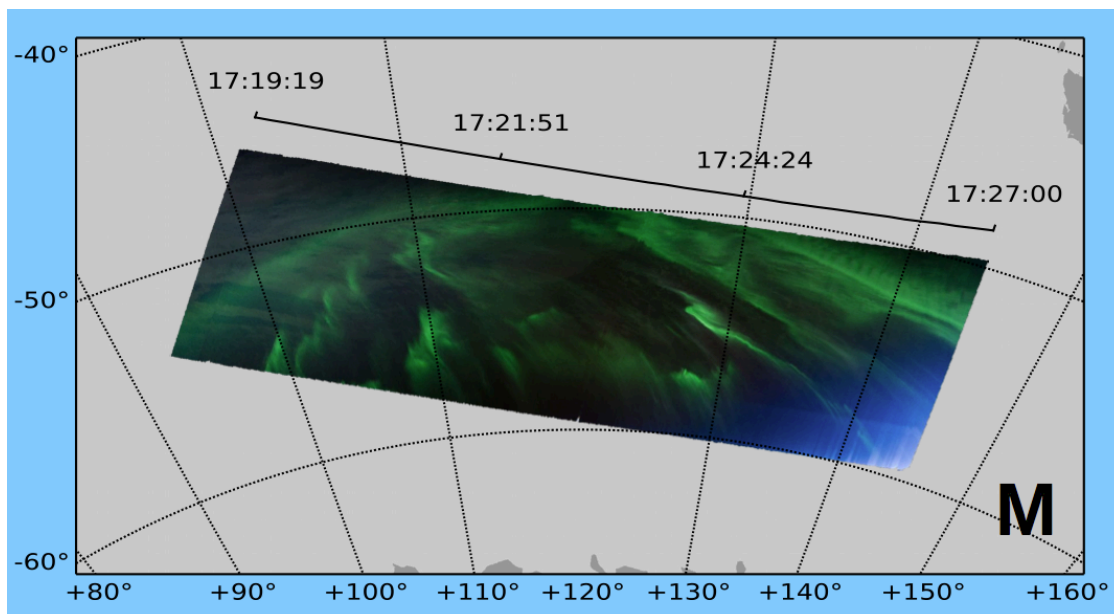
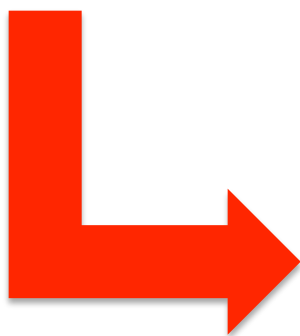
And Finally... ARRRGH



Automatic geoReferencing of astRonaut auRoral photoGraHy

- Reconstruct the pointing of auroral photographs taken by ISS astronauts to make them useful for research
- Provide plots and an open source software library to produce cdfs offline.

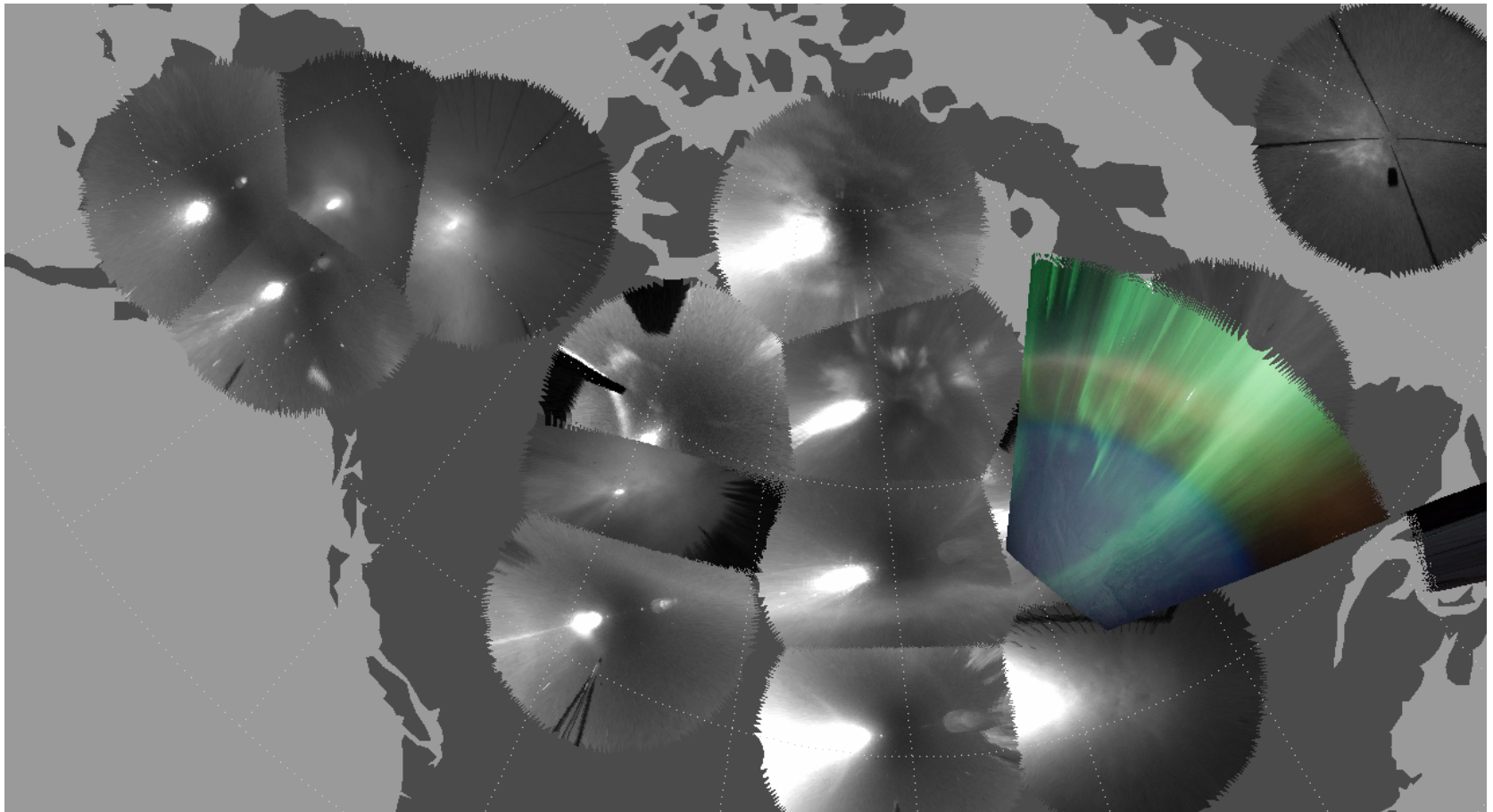
<http://cosmos.esa.int/arrrgh>



<http://cosmos.esa.int/arrgh>



Comparison with THEMIS



If you're interested, grab me during the week or
awalsh@sciops.esa.int