Diffuse Aurora

Where we started

Eric Donovan – Midway Utah – June 21, 2007

1. *Introduction*
2. *Where do the particles come from?*
3. *How do they become diffuse aurora*
4. *Remote sensing the magnetosphere*
5. *Unstructured quiet time H+ aurora*
6. *Structure in the diffuse aurora*
7. *Opportunities for future studies*
8. *Final thoughts*

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Diffuse Aurora

Where we started

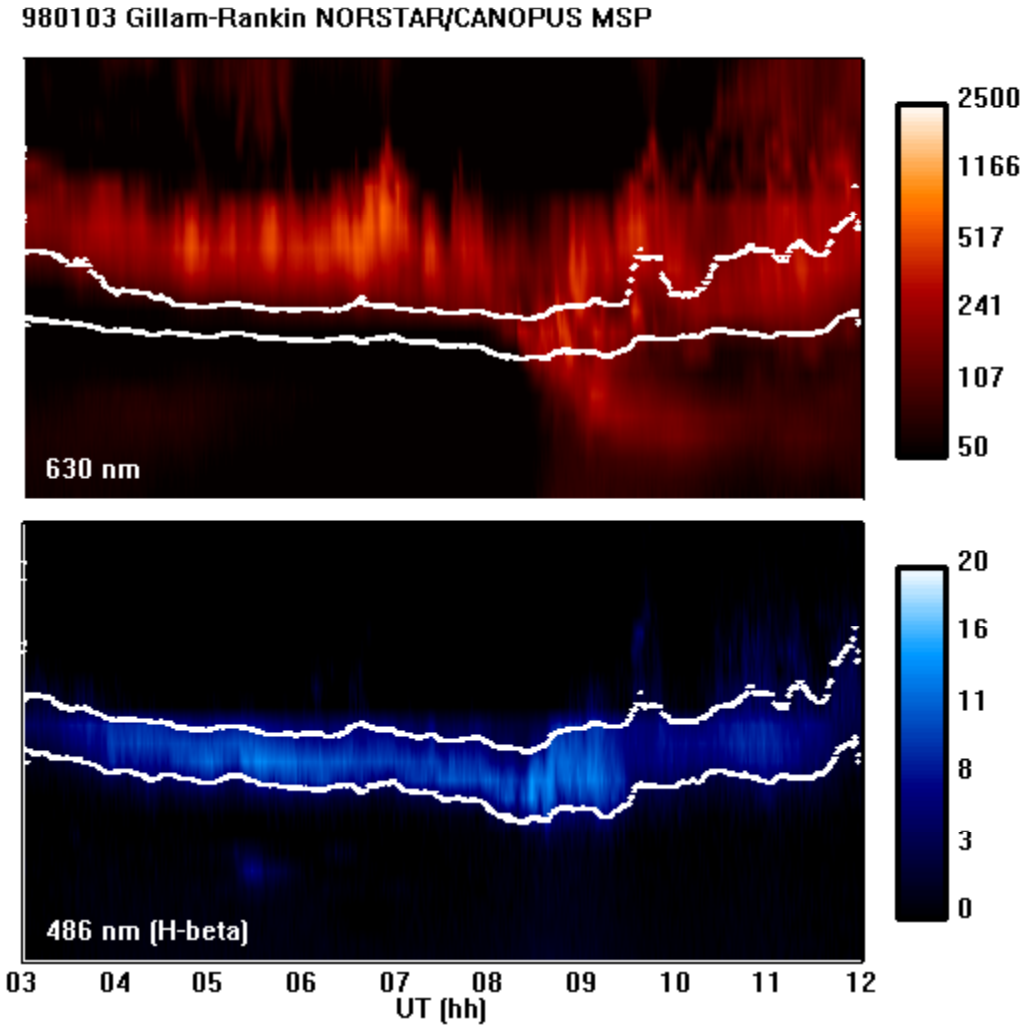
Plasma Physics	Geospace Remote Sensing	Role in Dynamics
What causes the precipitation??	What can we infer about geospace from the diffuse aurora?	Is the diffuse aurora "important"?
ECH	OC Boundary	Loss of low E e-
Chorus	E- CPS inner edge	Loss of high E e-
EMIC	H+ CPS inner edge	Loss of low E H+
Turbulence	Stretched-dipolar trans	Low of high E H+
Potential Difference	Stretching	Direct role in currents
FL Curvature	H+ pressure	Conductivity effects
MASER	Presence of MHD waves	Role in wave generation
•	Presence of waves	•
•	•	•
✓	✓	**not so much**

Where we started

Images from rom http://spaceweb.oulu.fi/~jussila/aurora/

Diffuse Aurora

Where we started



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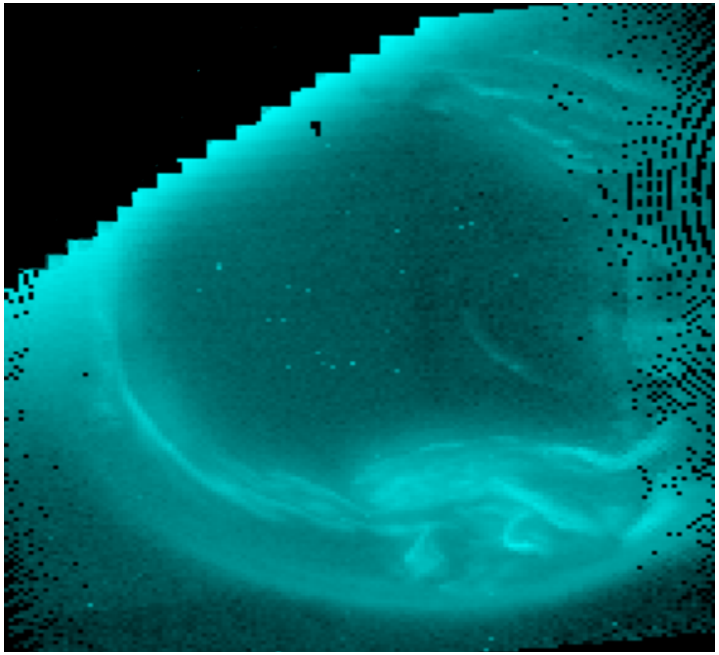

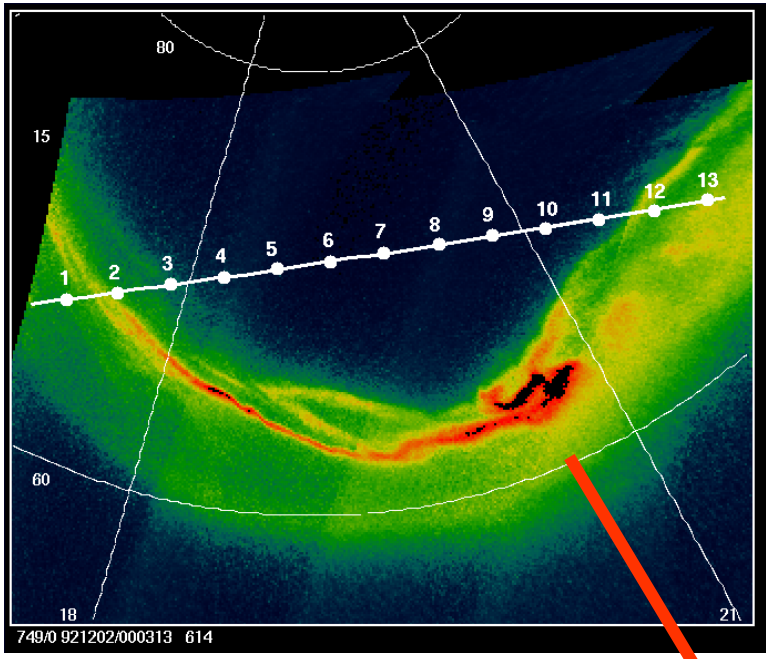

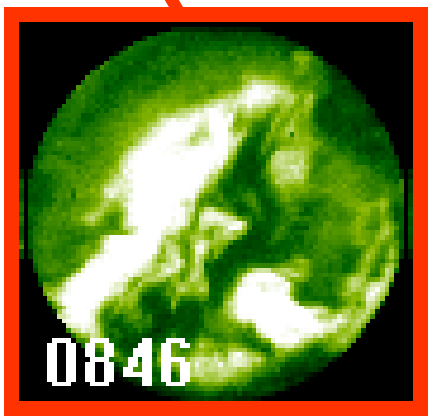

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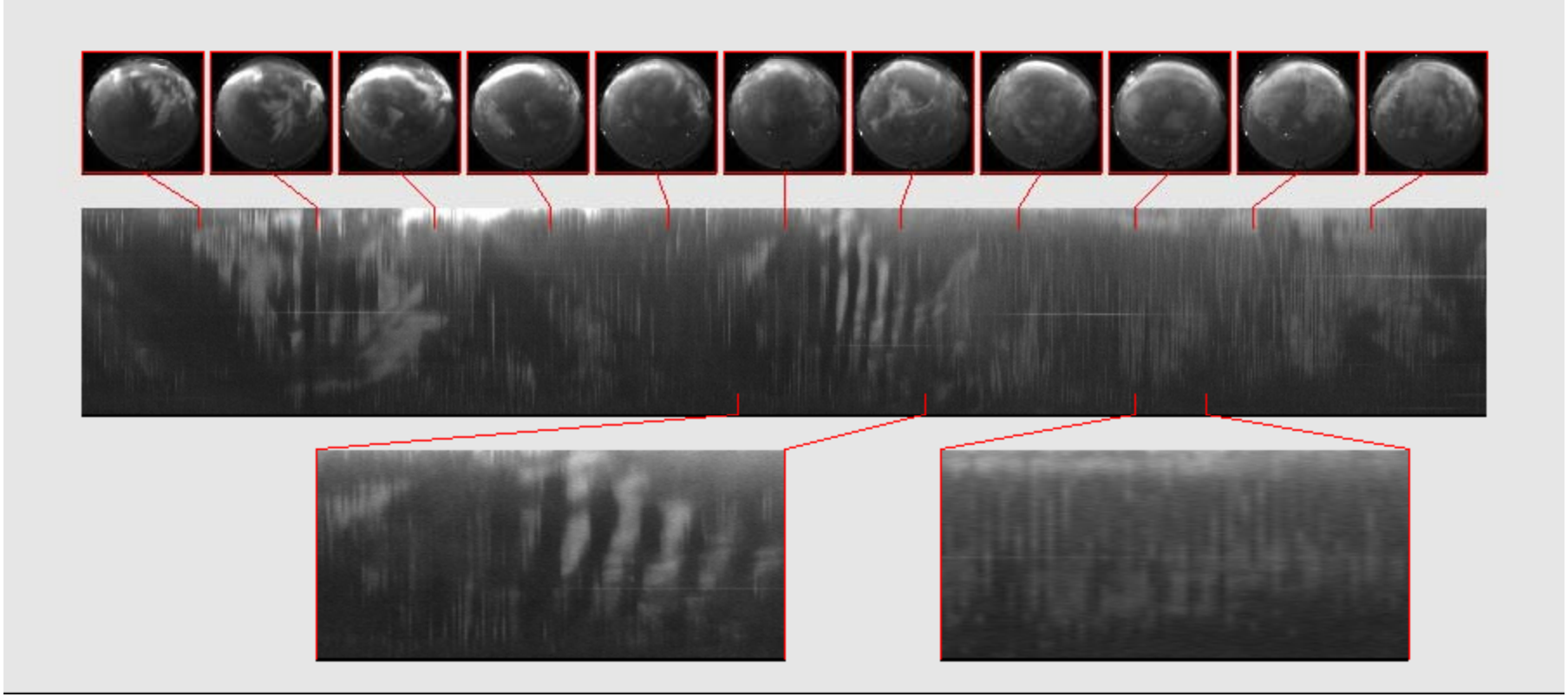

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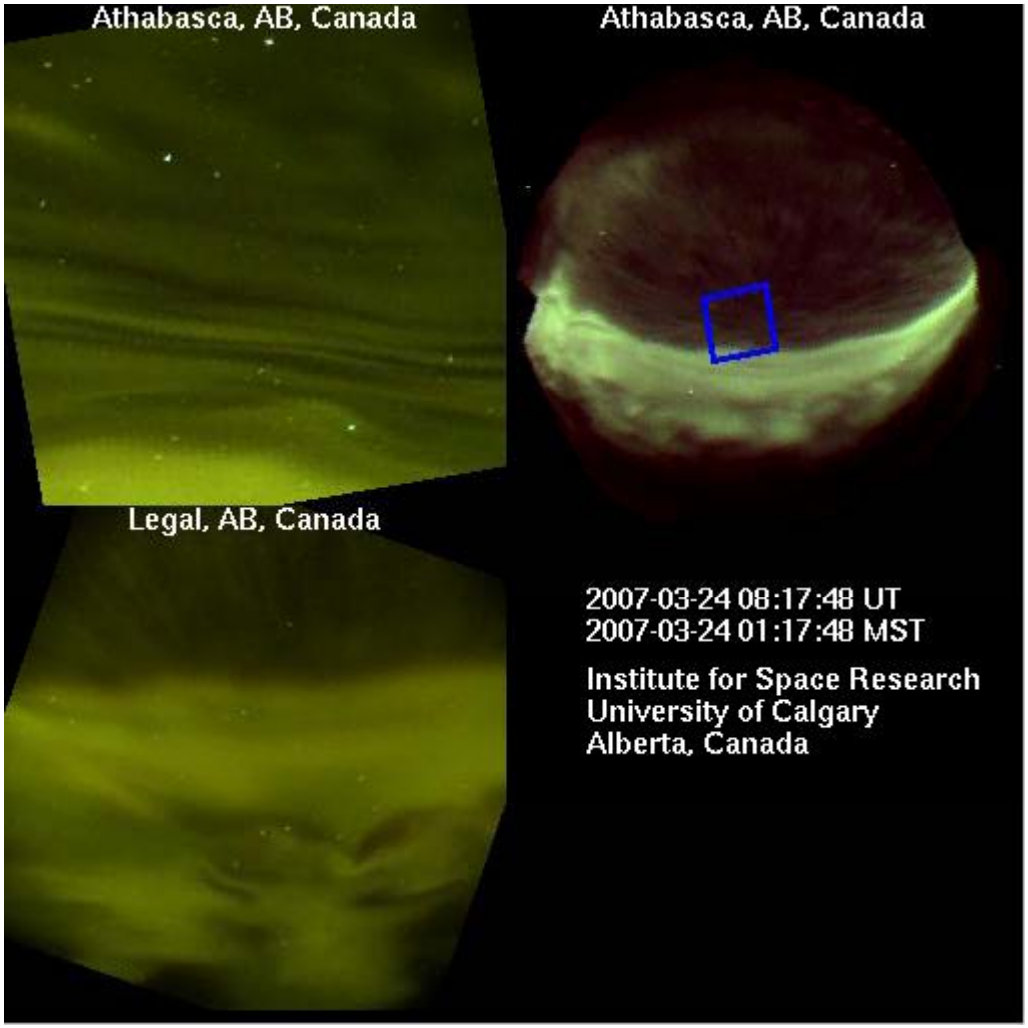

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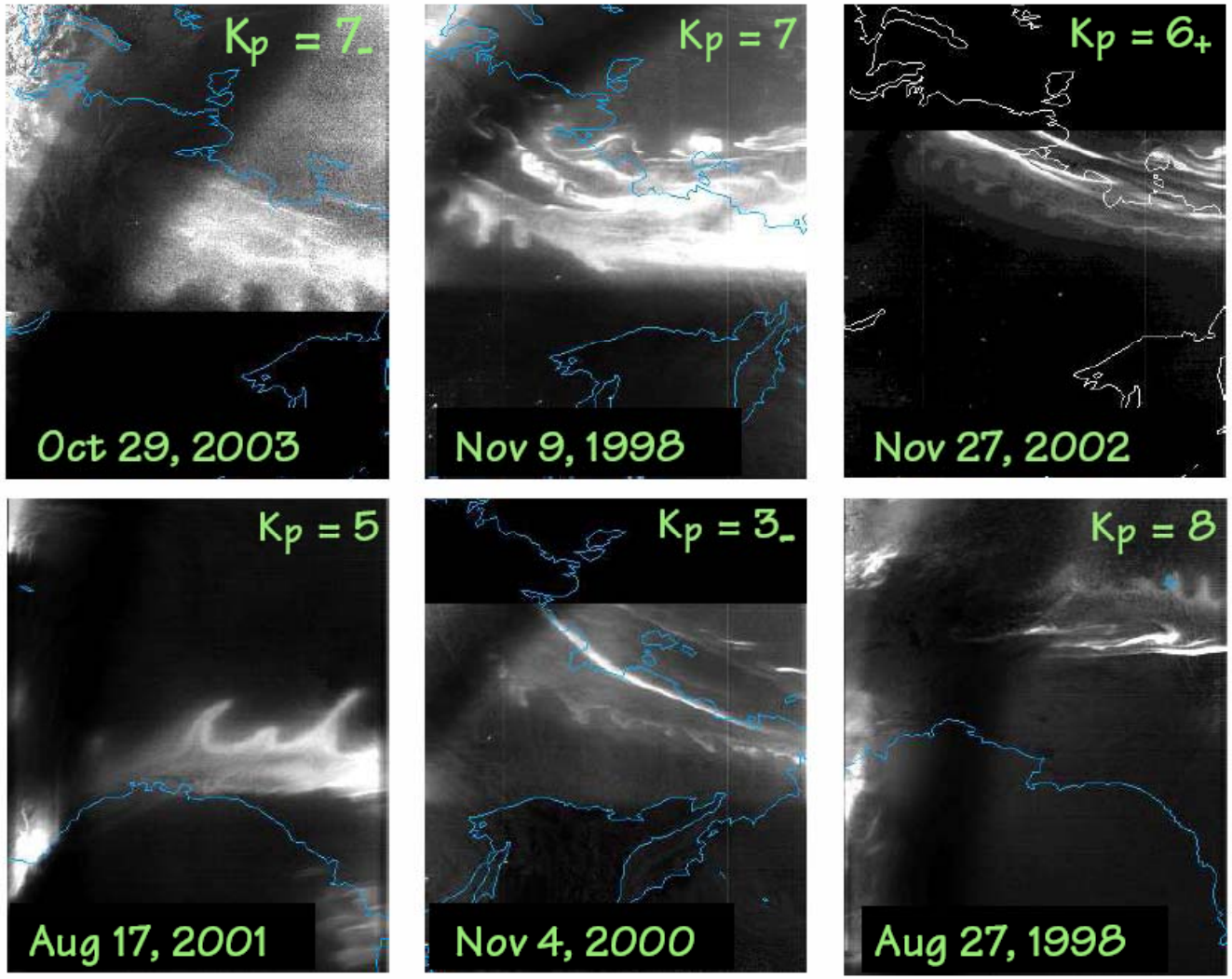

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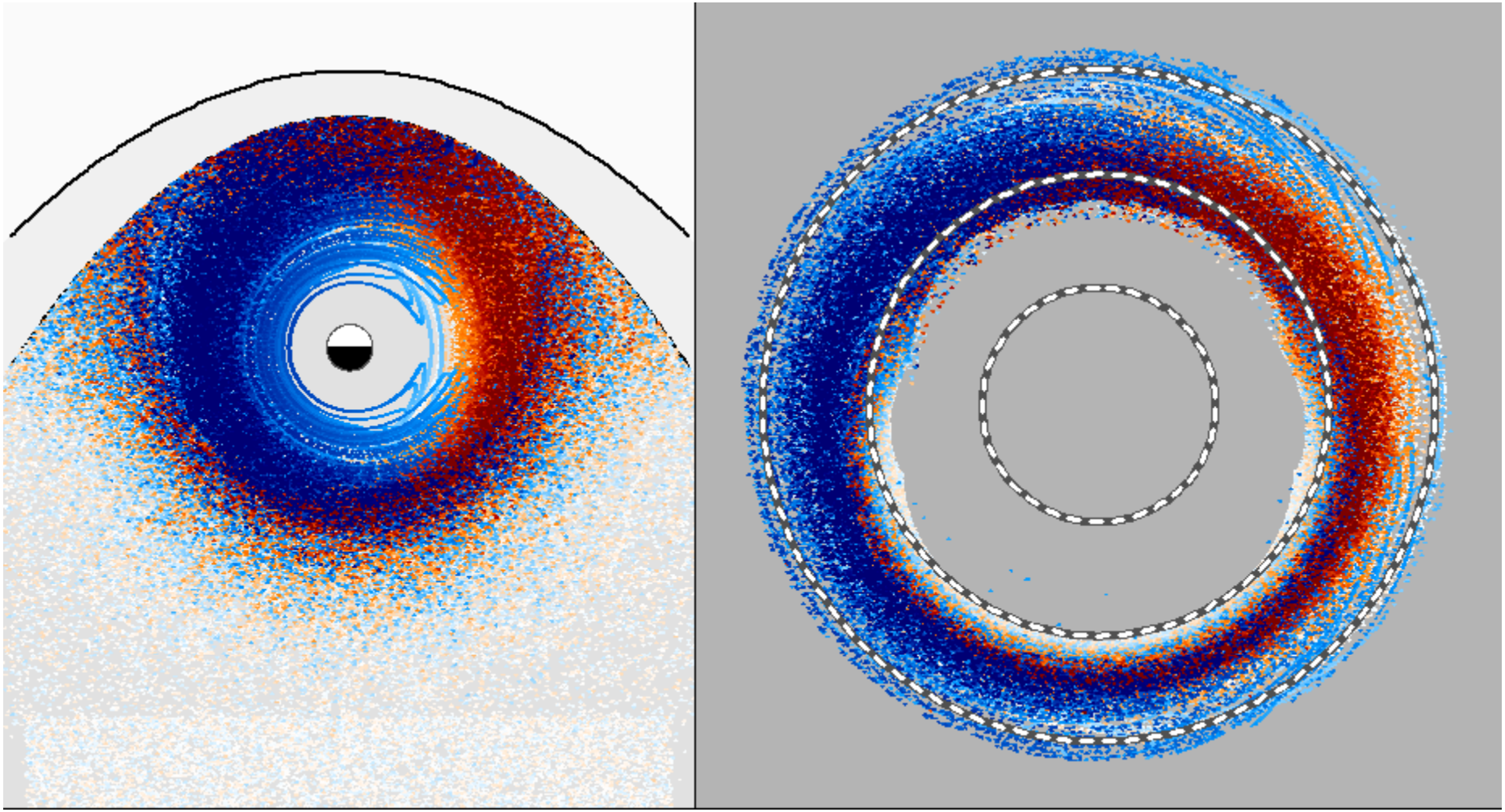

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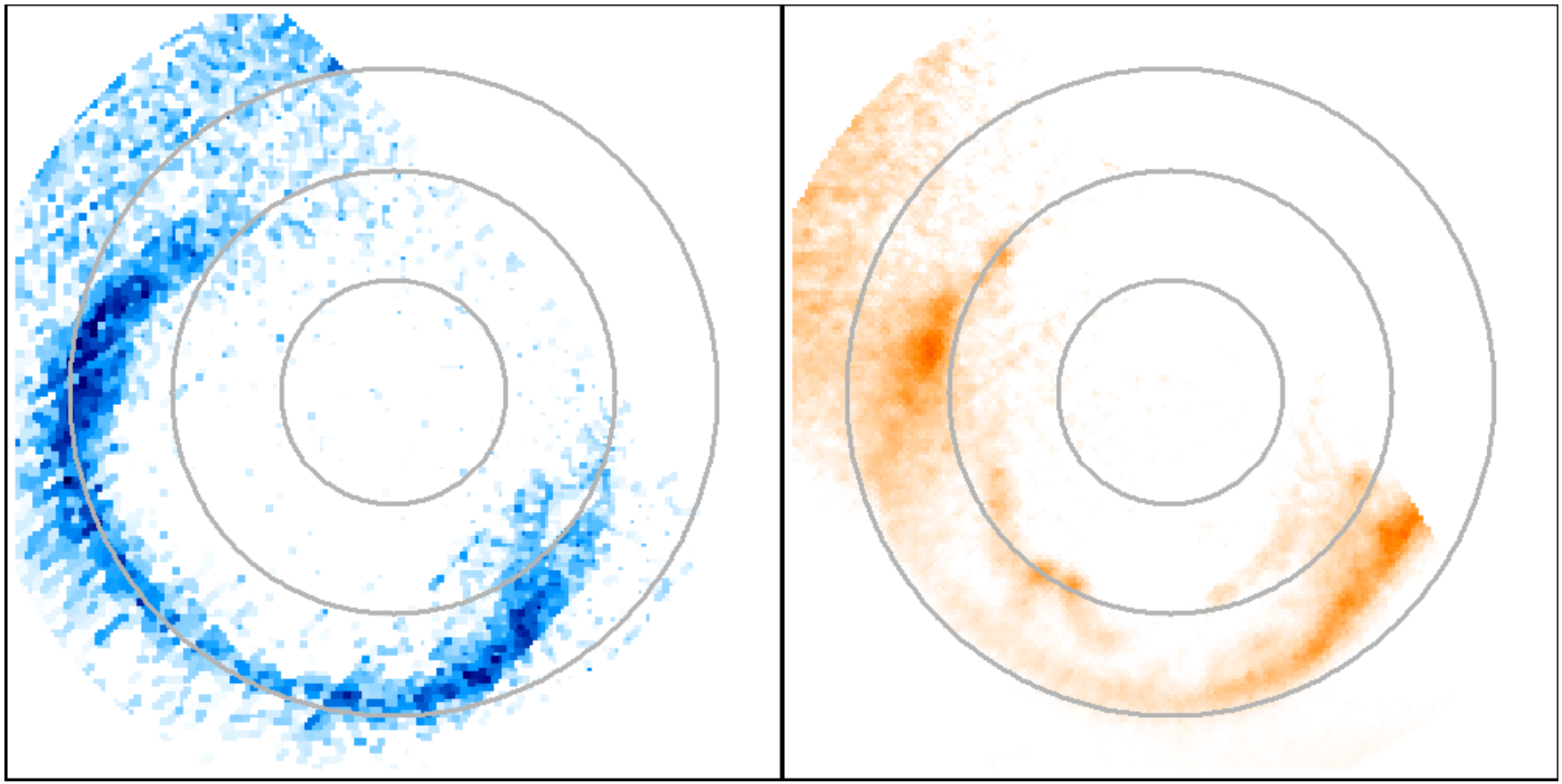

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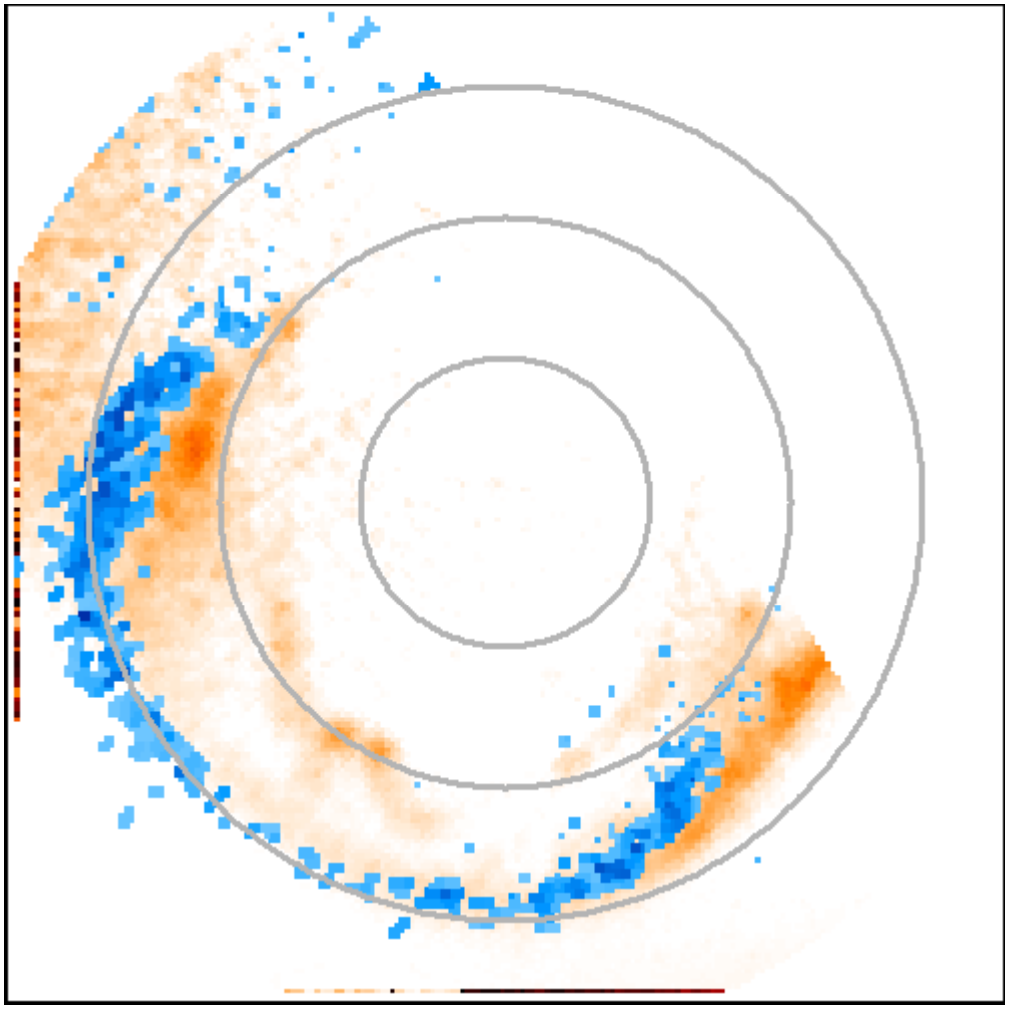

High Points

Where we started

Discovery & Early Exploration of the Diffuse Aurora

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The systematic behvior of H emission in the aurora, PSS, 5, 87-91, 1961.

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High Points

Where we started

Properties of the major relevant plasma populations (mostly the CPS)

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Diffusion mechanisms

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Sergeev, V., E. Sazhina, N. Tsyganenko, J. Lundblad, and F. Søraas, *Pitch-angle scattering of energetic protons in the magnetotail current sheet as the dominant source of their isotropic precipitation into the nightside ionosphere, PSS, 31(1147-1155), 1983.*

High Points

Where we started

Inferring things from diffuse auroral boundaries

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High Points

Where we started

Papers from which I learned the most

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D. Fairfield and A. Viñas
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The electron and proton aurora as seen by IMAGE-FUV and FAST, GRL, 28(1135-1138), 2001.

Diffuse Aurora
- some thoughts on where we are now -

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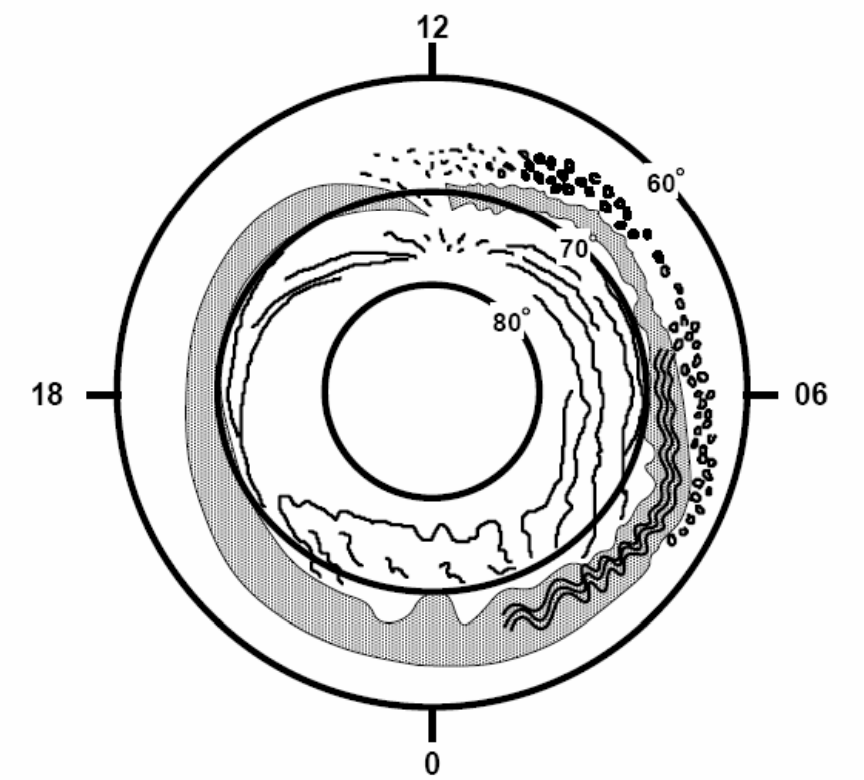
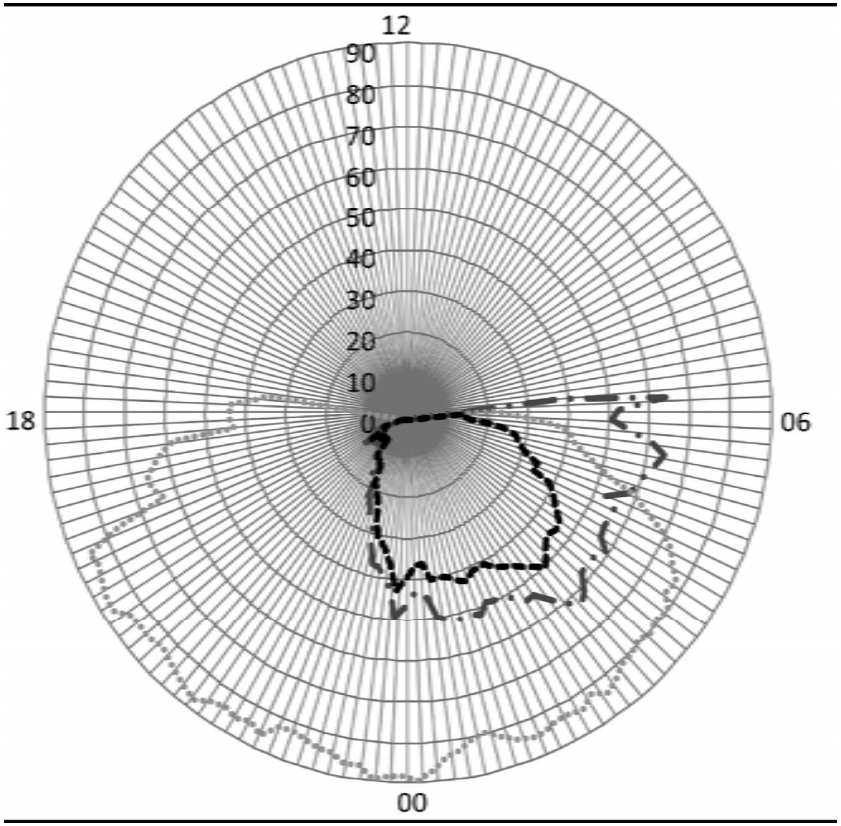
Diffuse Aurora

Regions of specific auroral type: Where, when, and how big? How do they start? How do they stop? ….





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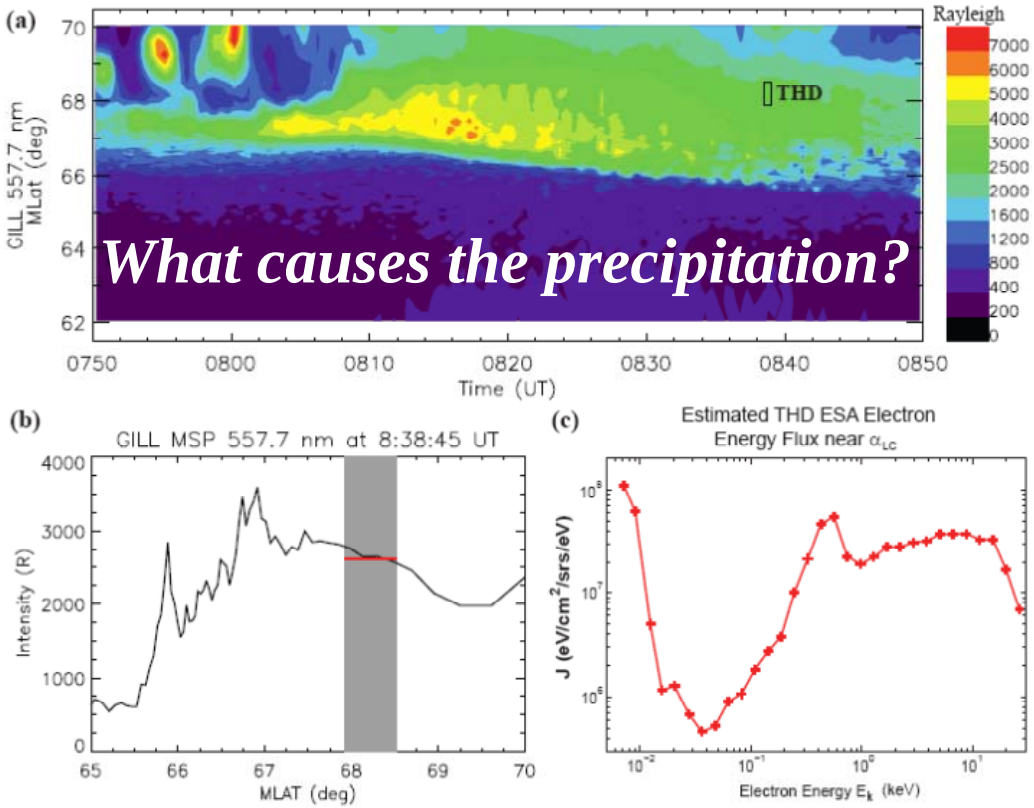

Figure 7. (a) NORSTAR GILL MSP green-line (557.7 nm) auroral observations for an hour period from 07:50 UT to 08:50 UT on February 5, 2009. The superimposed rectangle denotes the footprint of THD for the time interval of interest, 08:38:43 – 08:38:51 UT. (b) The latitudinal variation of MSP green-line auroral intensity for the time stamp centered at 08:38:45 UT. The gray band shows the THD footprint in magnetic latitude, plus/minus 0.3°. The horizontal line in red represents the modeled gree-line auroral intensity based upon the estimate of ionospheric electron precipitation flux caused by the ECH wave scattering. (c) Electron energy flux near the equatorial loss cone obtained from the THD ESA differential flux measurements with pitch angle information.

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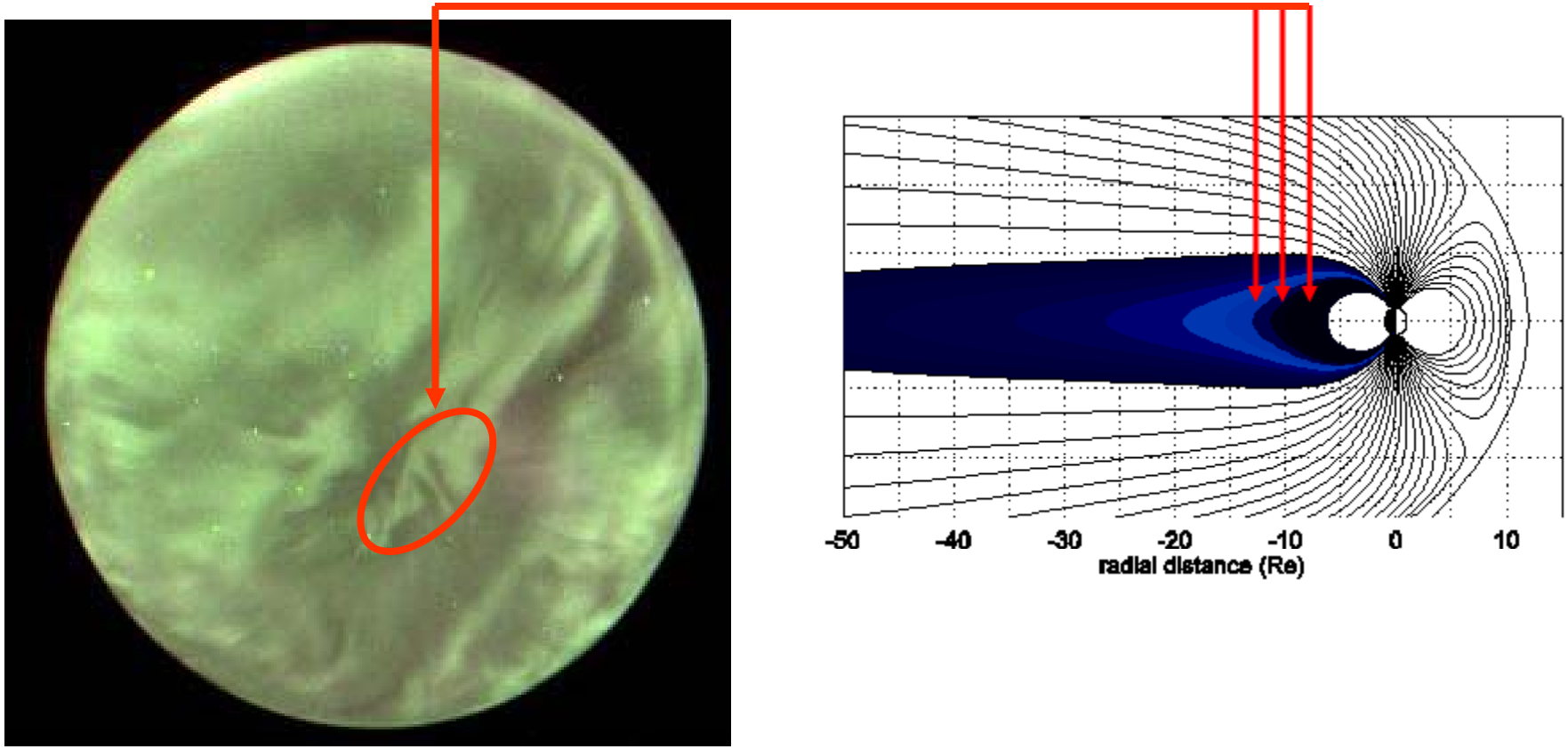
Where do specific auroral forms come from in the magnetosphere?



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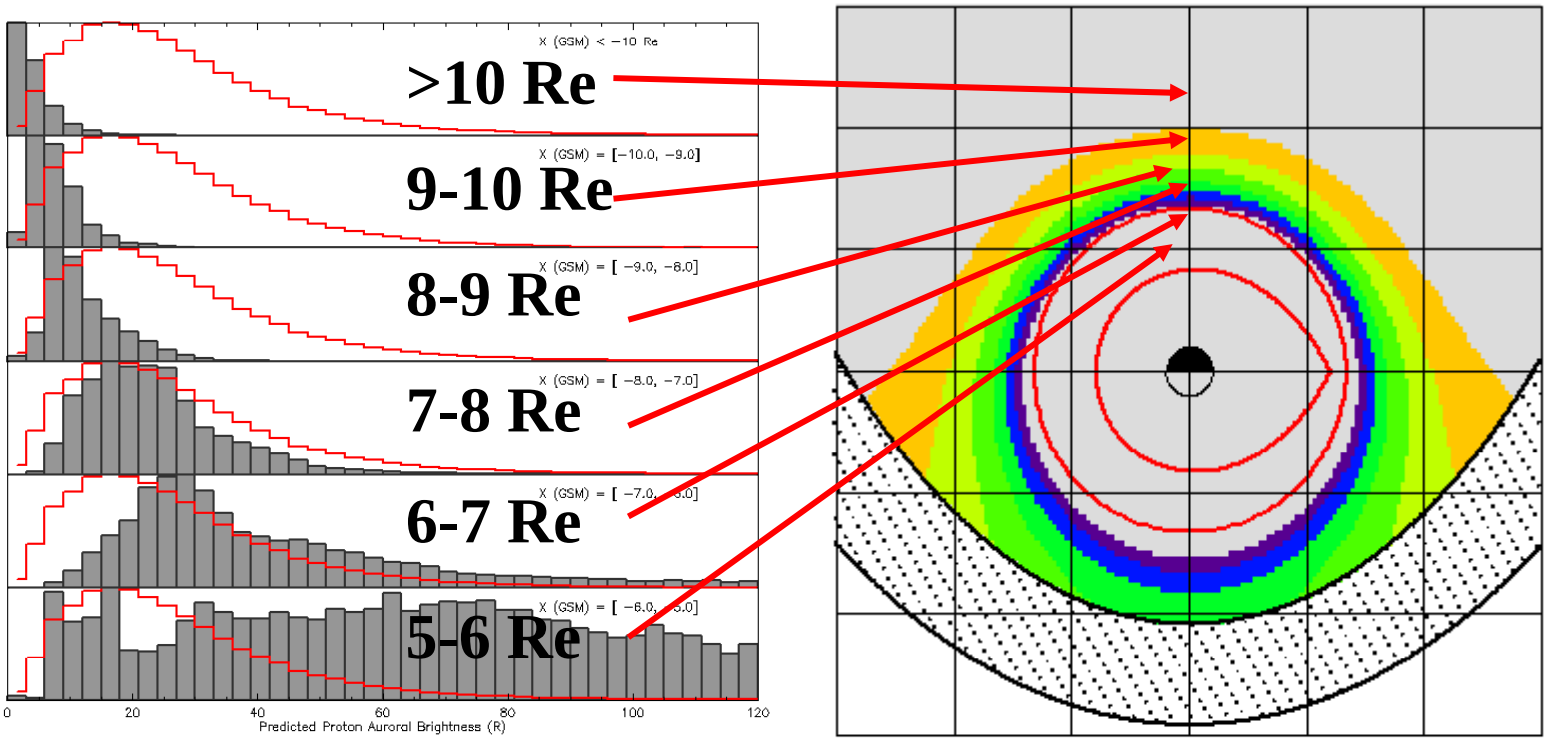

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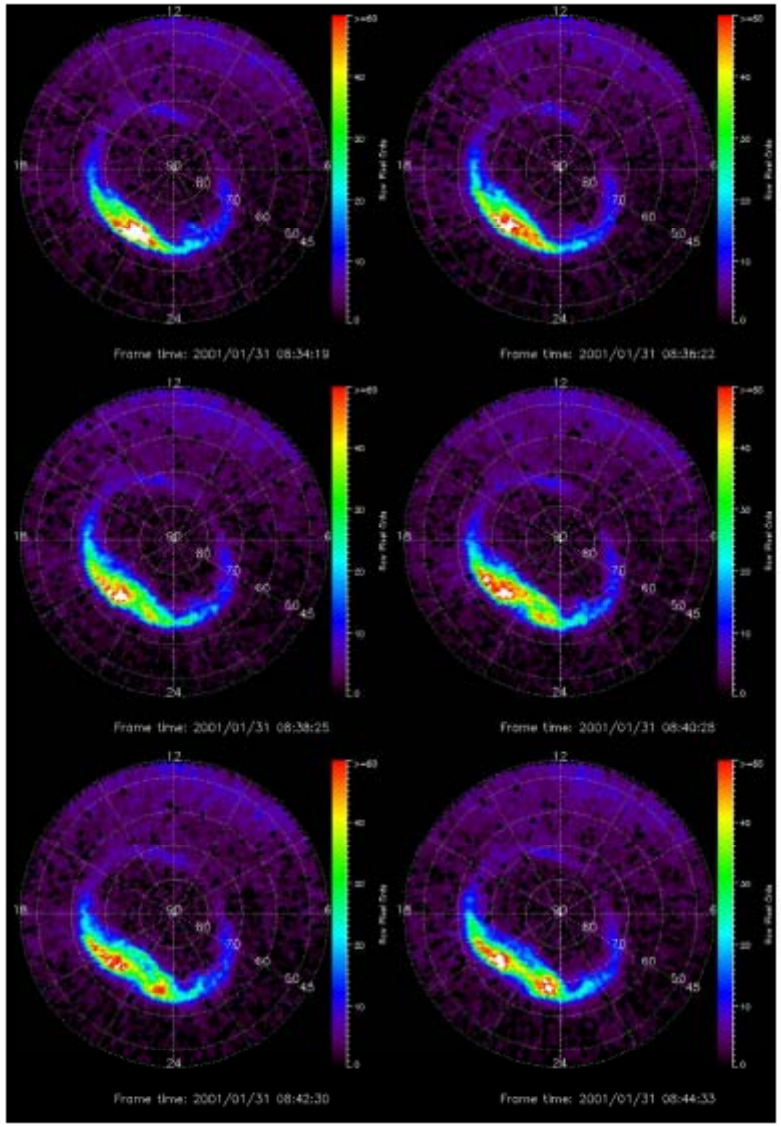

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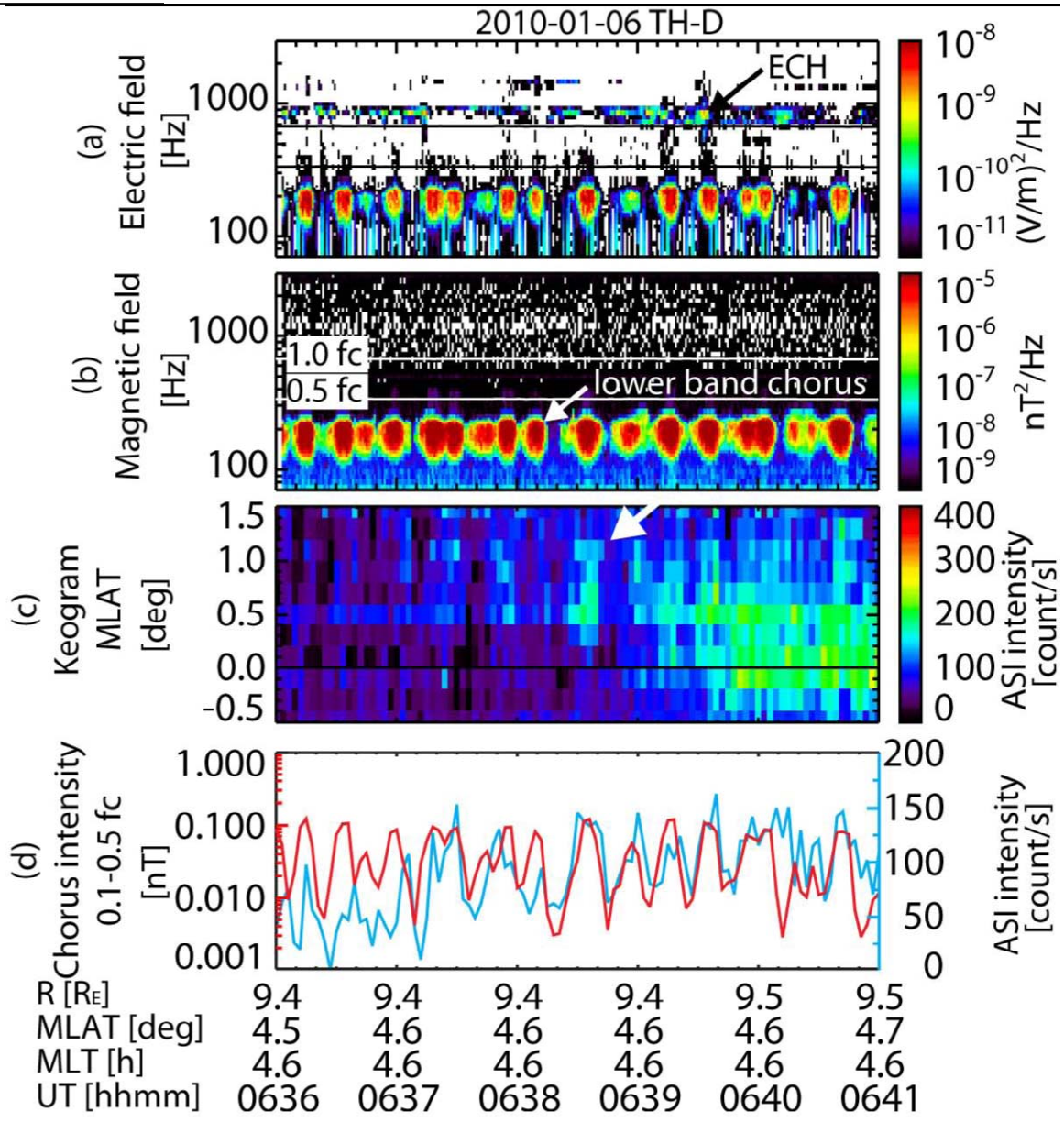

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(1 min) correlation between GOES 13 ~50 keV e- fluxes and THEMIS white light ASI pulsations

Blue: 0.5-0.6

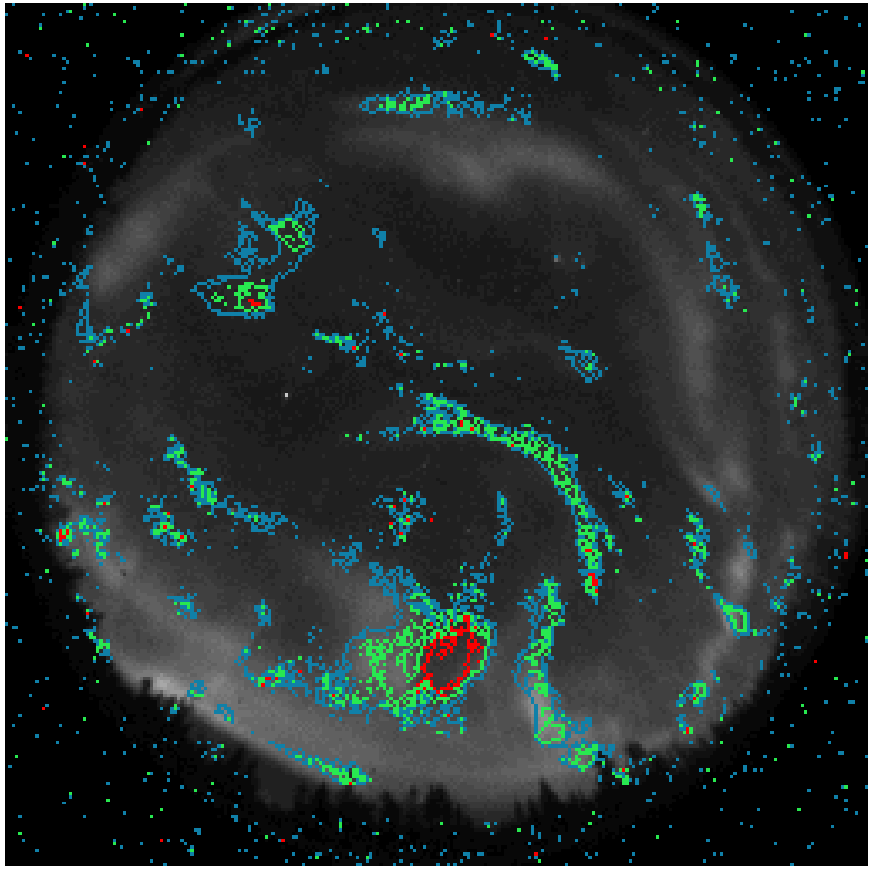
Green: 0.6-0.7

Red: 0.7+

Max correlation = 0.74

1105-1106 UT

Telescope 6



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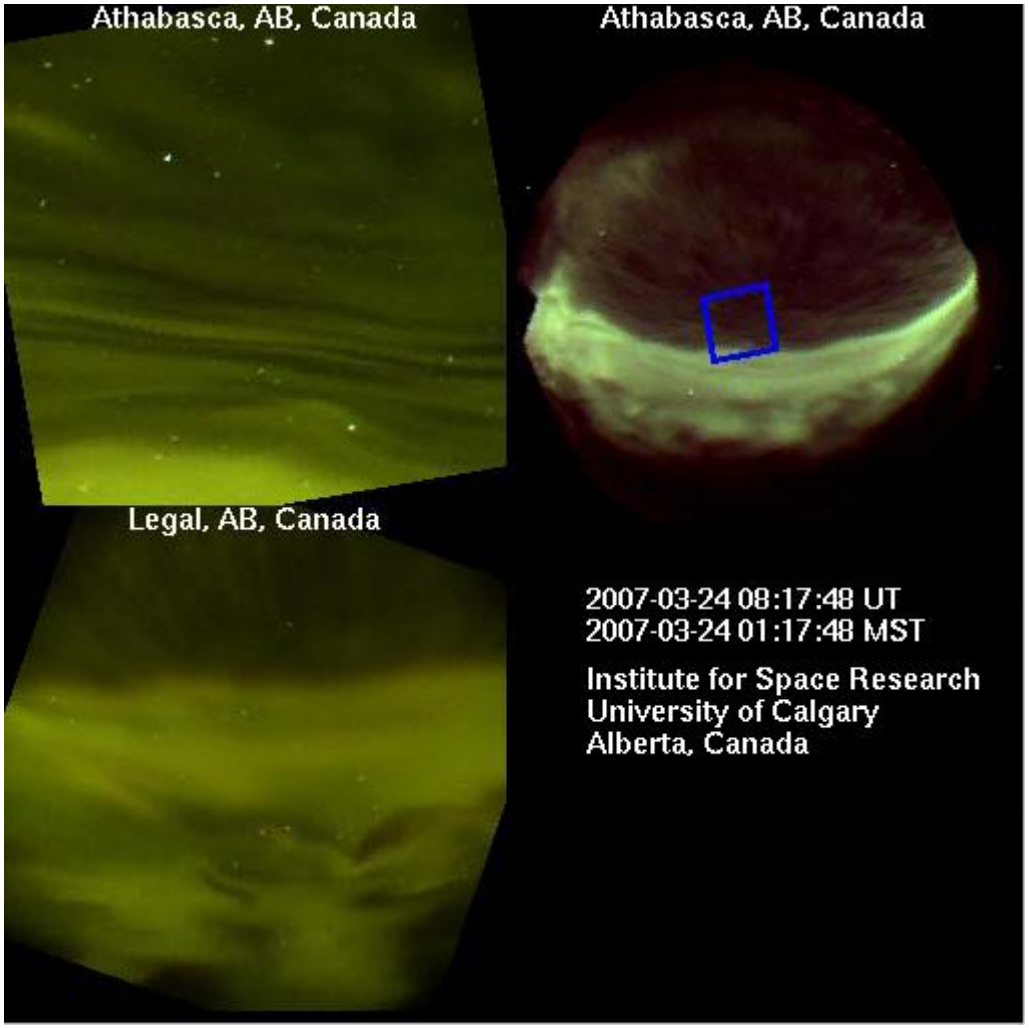


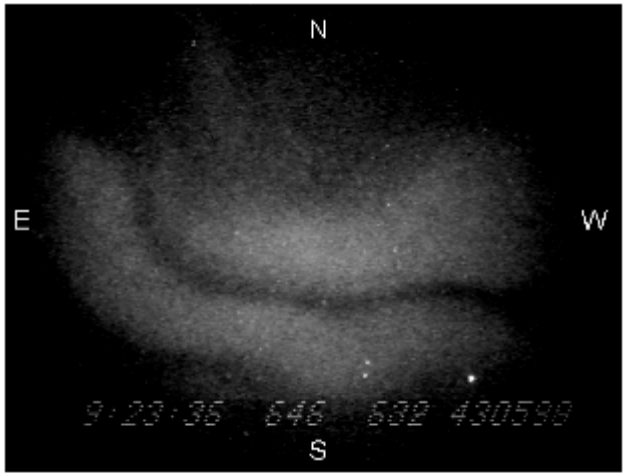
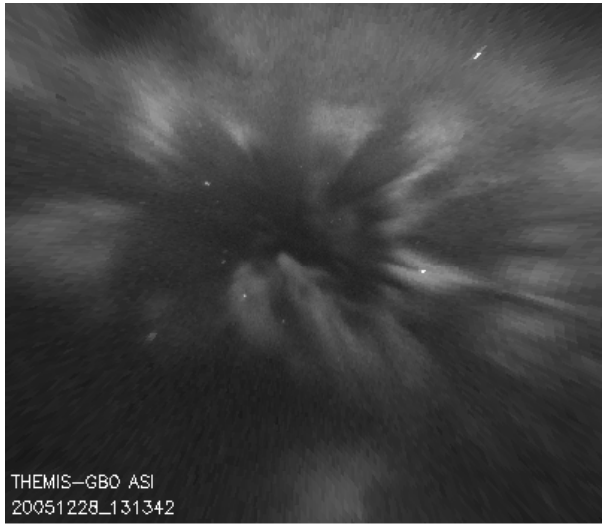


Figure 12: Typical example of a black auroral form in pulsating aurora.
The top of the field of view is north, while east is to the left. Image taken January 18, 2007.



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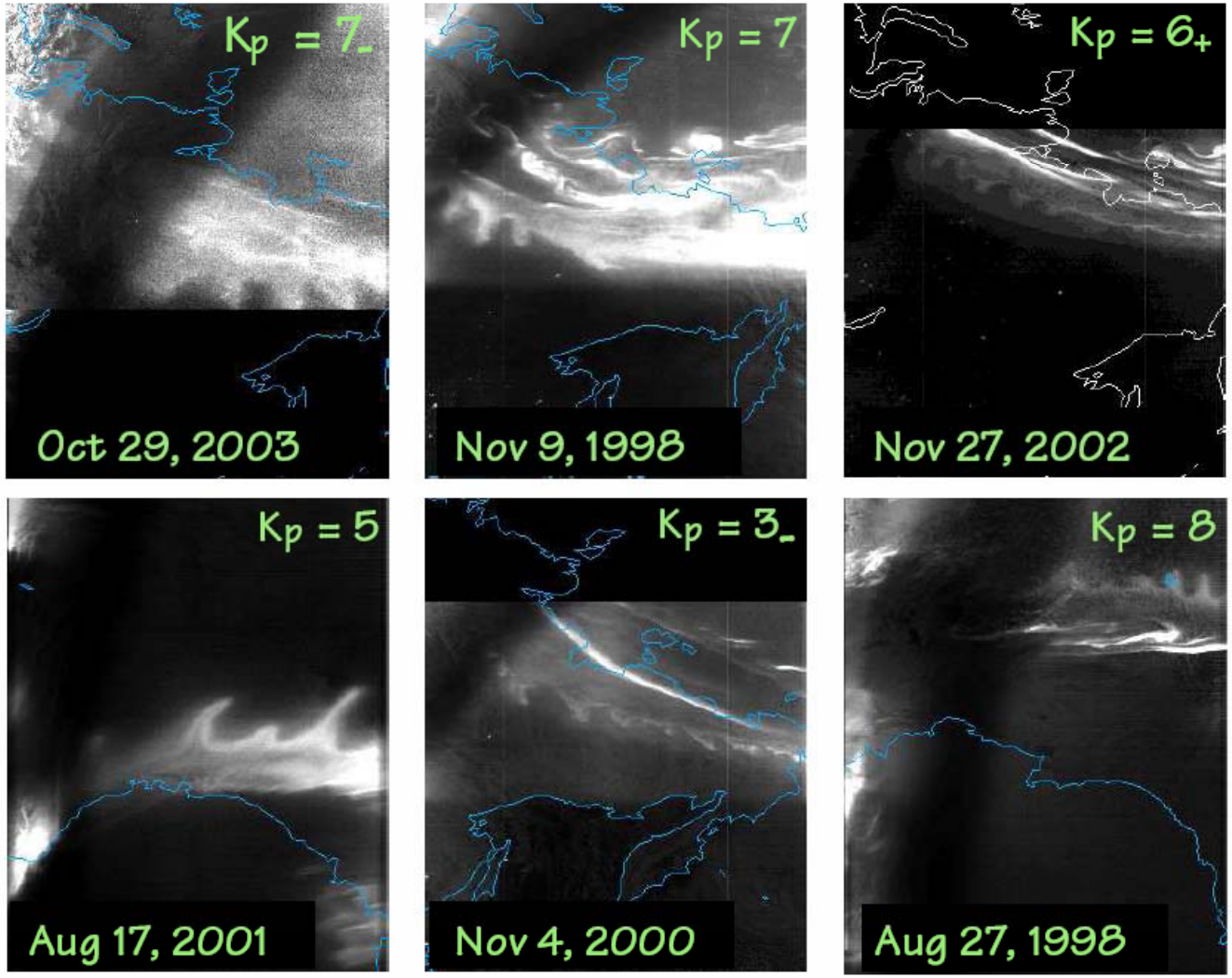

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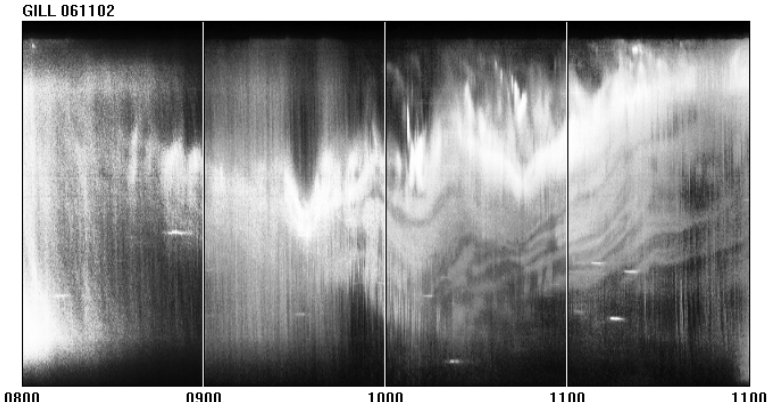

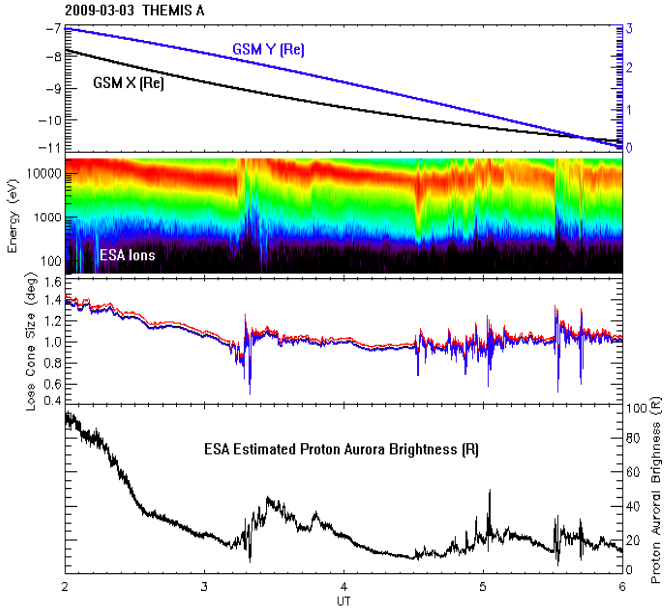

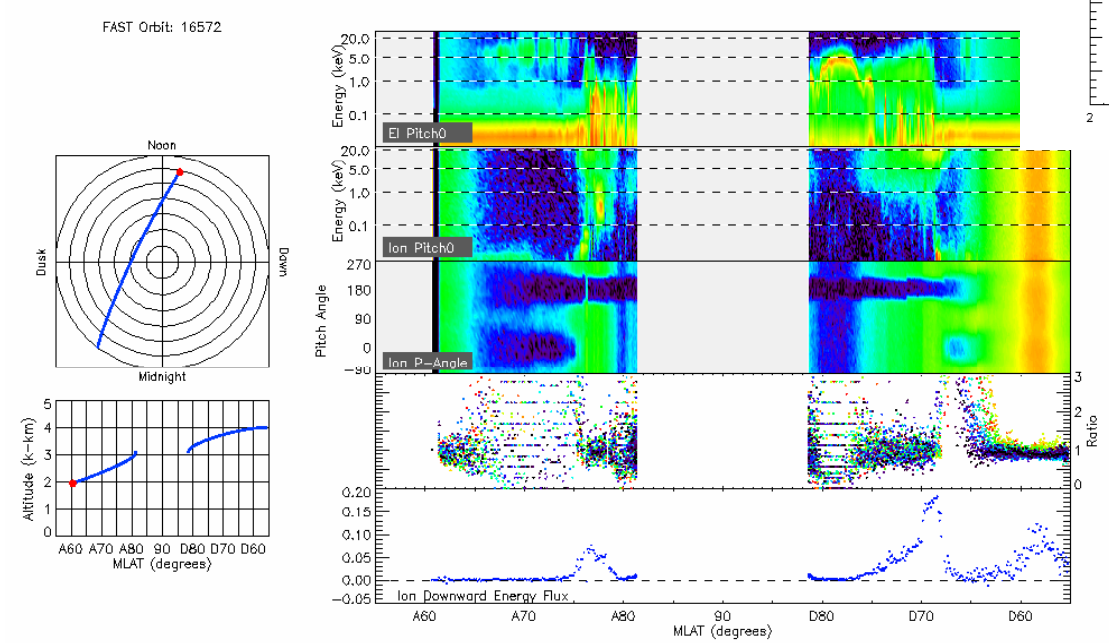

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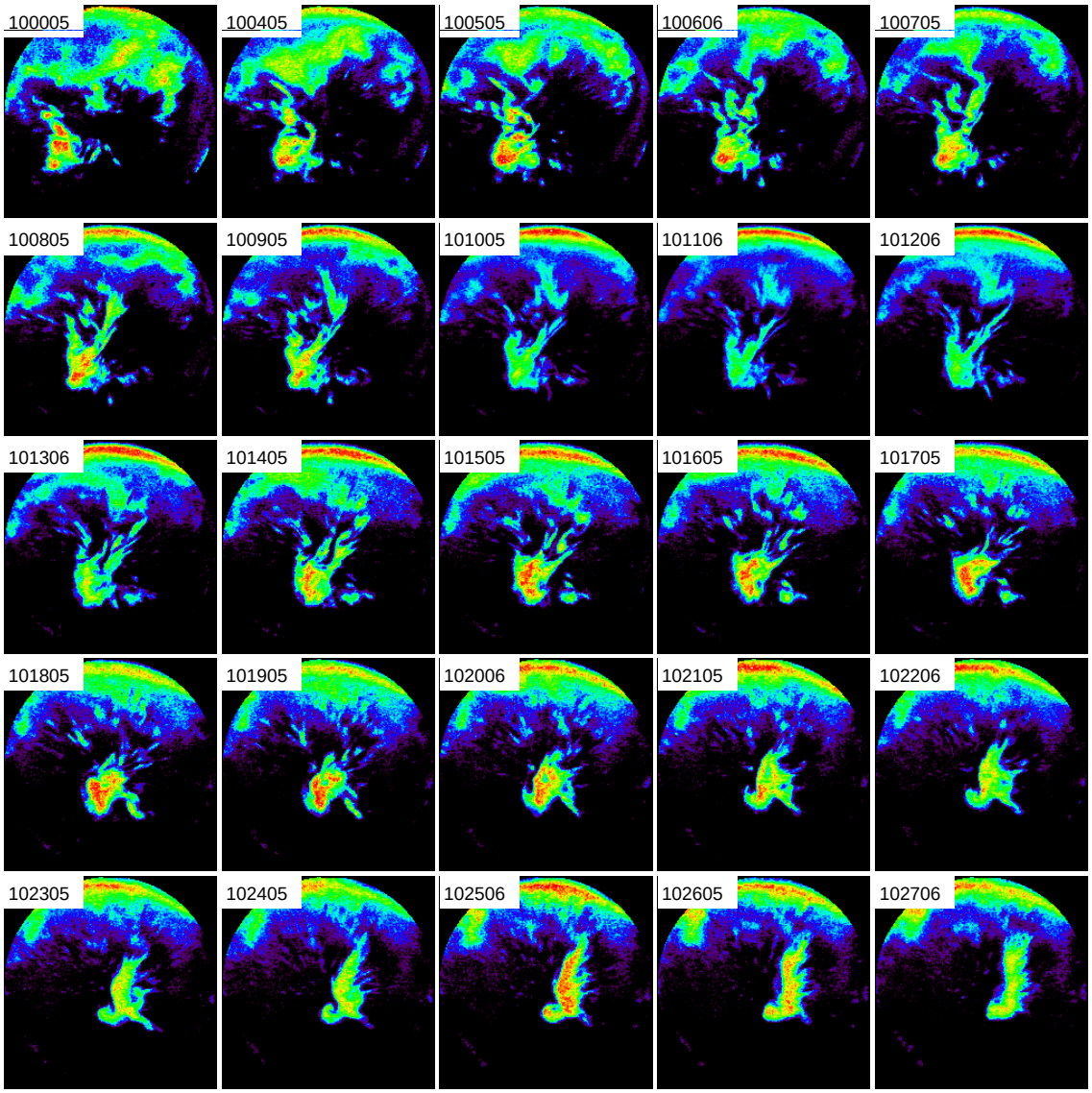
Magnetic Mapping FG
- flows naturally from the -

Diffuse Aurora



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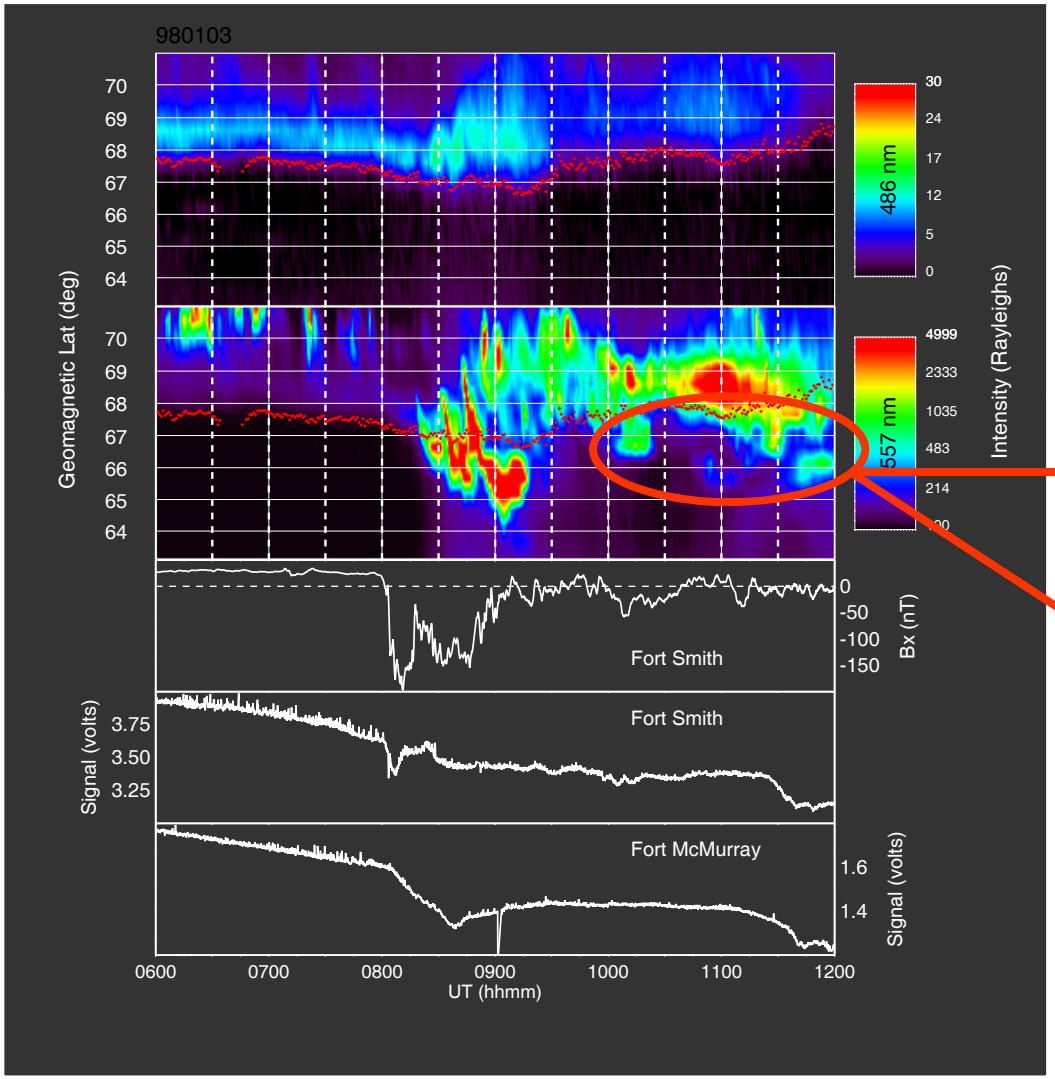

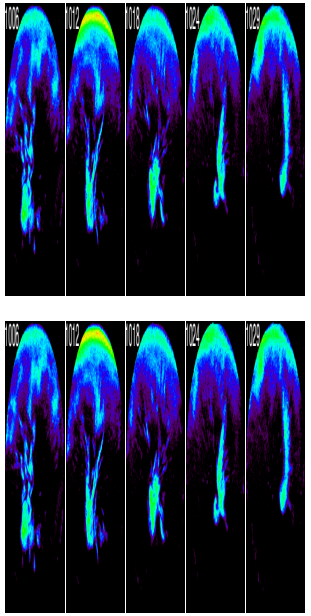

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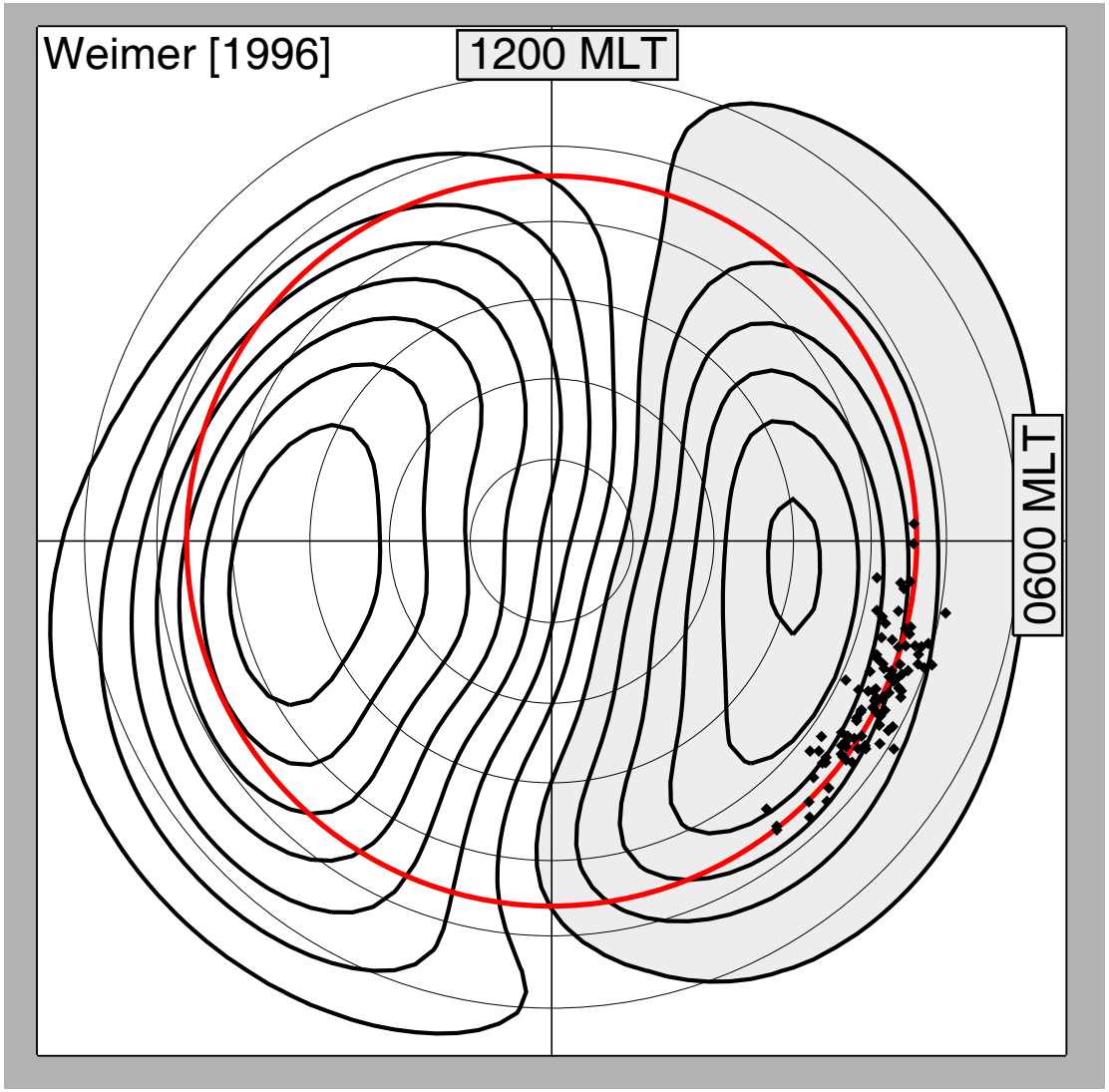

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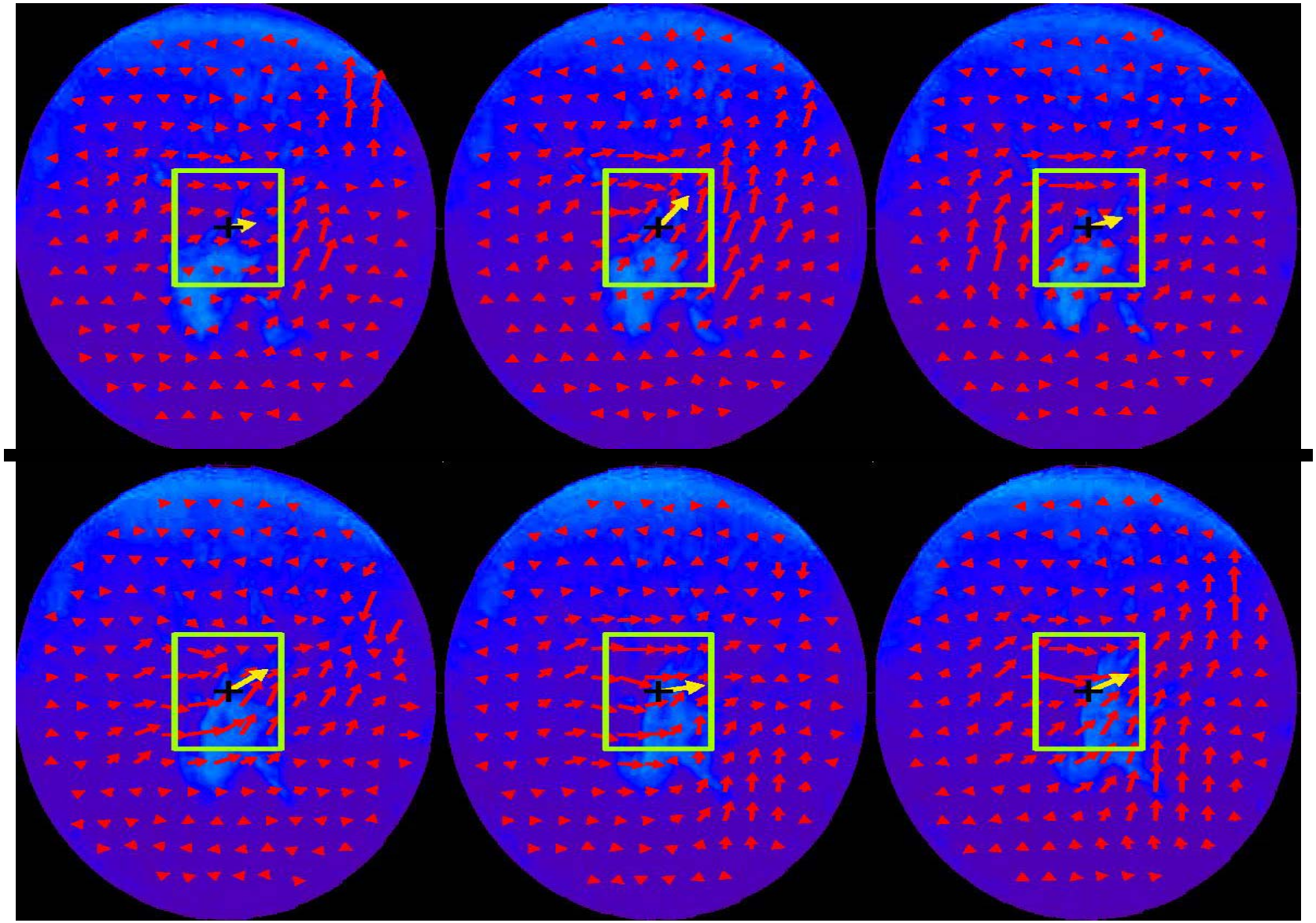

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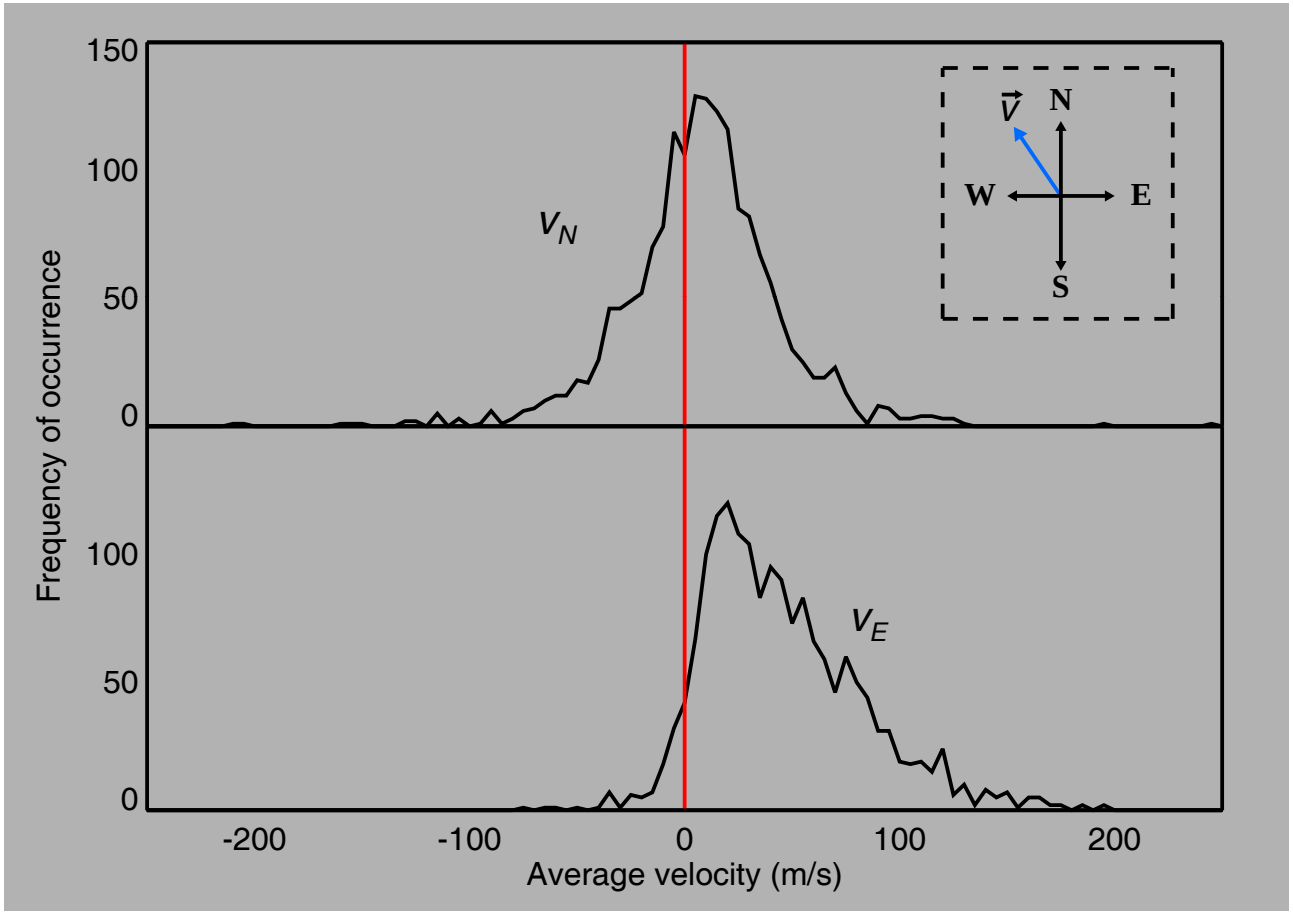

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