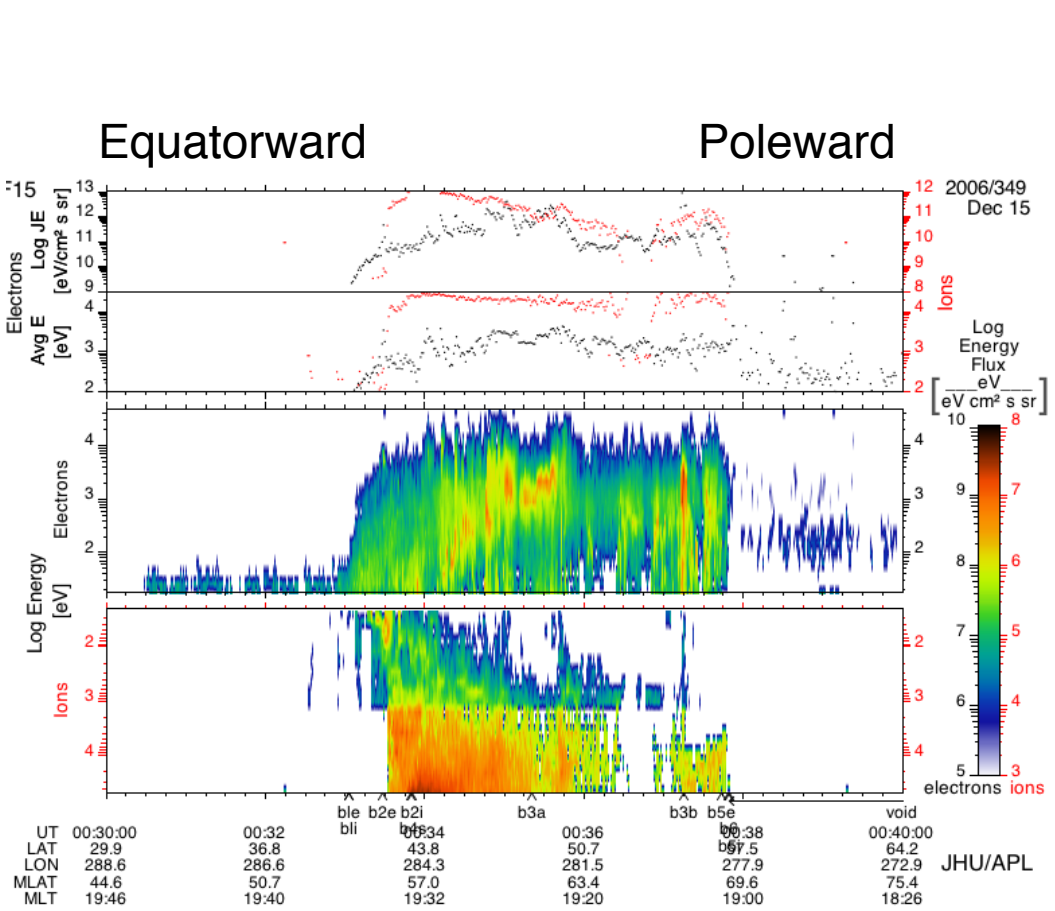
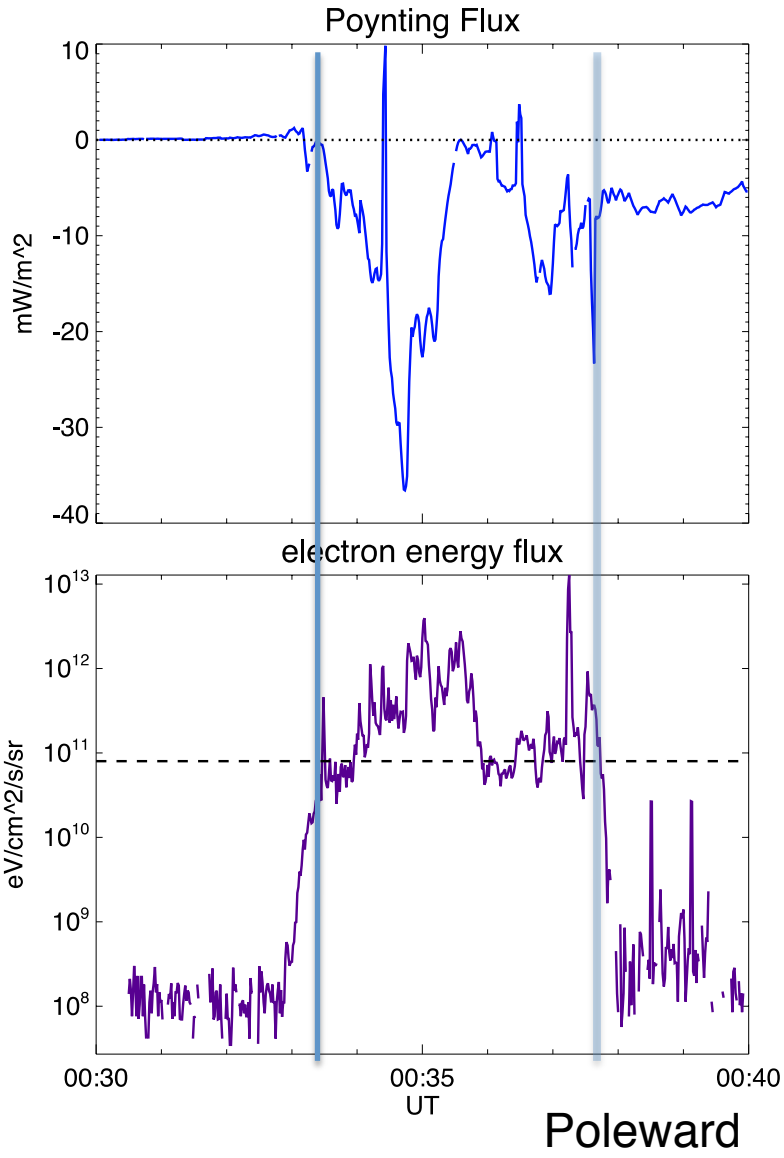
Auroral Precipitation Model Validation – What has been done

- Started with equatorward boundary - discussed at previous mini-GEM workshops
- Discussed different boundary definition criteria (physical boundary based, threshold-based) – the document is posted at the CCMC website
- Invited the community's participation in the model validation effort
- Participating models: old Hardy, New Hardy, Ovation Prime, Weimer, coupled global MHD model with Fok ring current model, AMIE
- Maj. Cory Lane (now Lt. Col. Lane) worked with CCMC on auroral model validation (paper of the results submitted to Space Weather Journal - Under review)
  - During low to moderate Kp conditions, Ovation Prime has the best prediction efficiency and OH (Old Hardy) closely follows. SWMF-Fok and AMIE suffer
  - High Kp: SWMF-Fok provides the best prediction effeciency
- Connecting auroral properties/boundaries to other important physical parameters/processes in the same region such as Poynting flux, Joule heating, field-aligned currents, or total electron content, etc. so that a better understanding of the ITM coupling can be understood. Some of these have been explored. More remains to be done.

Poynting Flux vs Aurora Precipitation



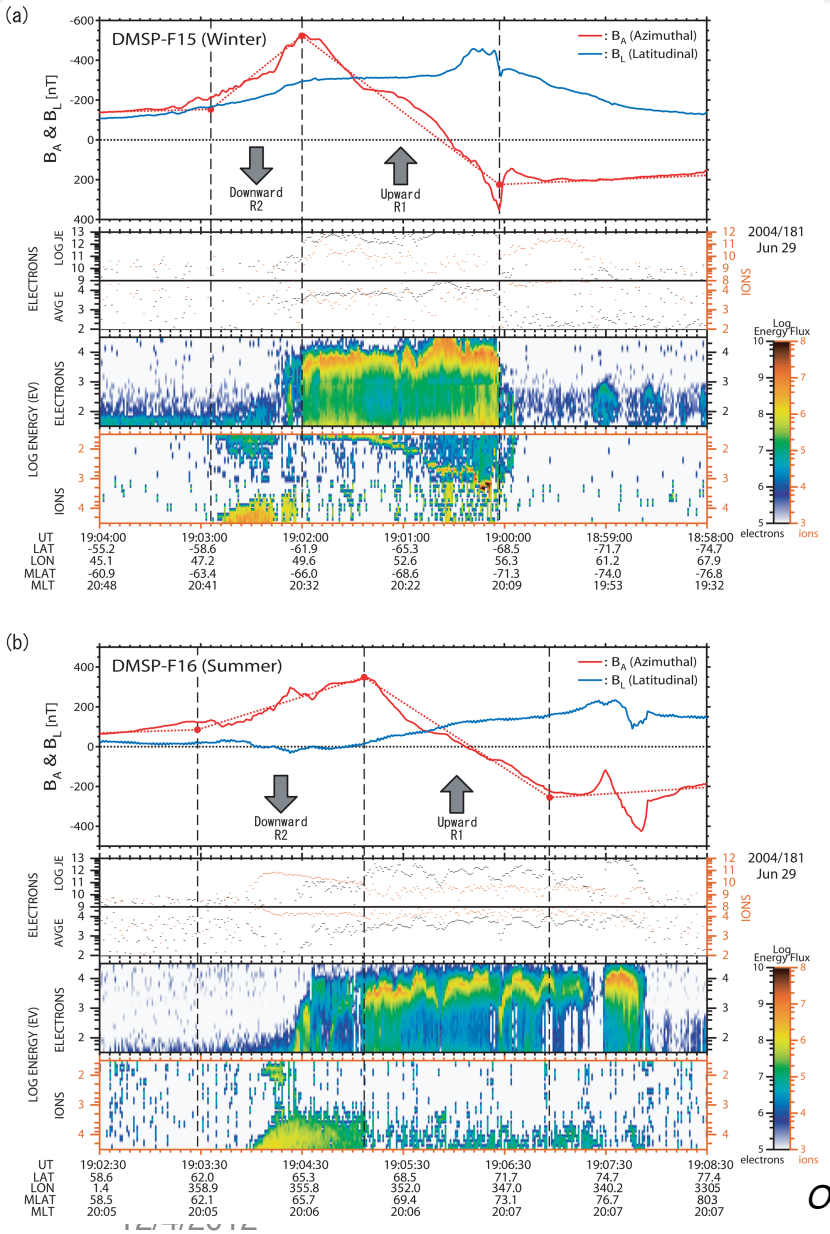


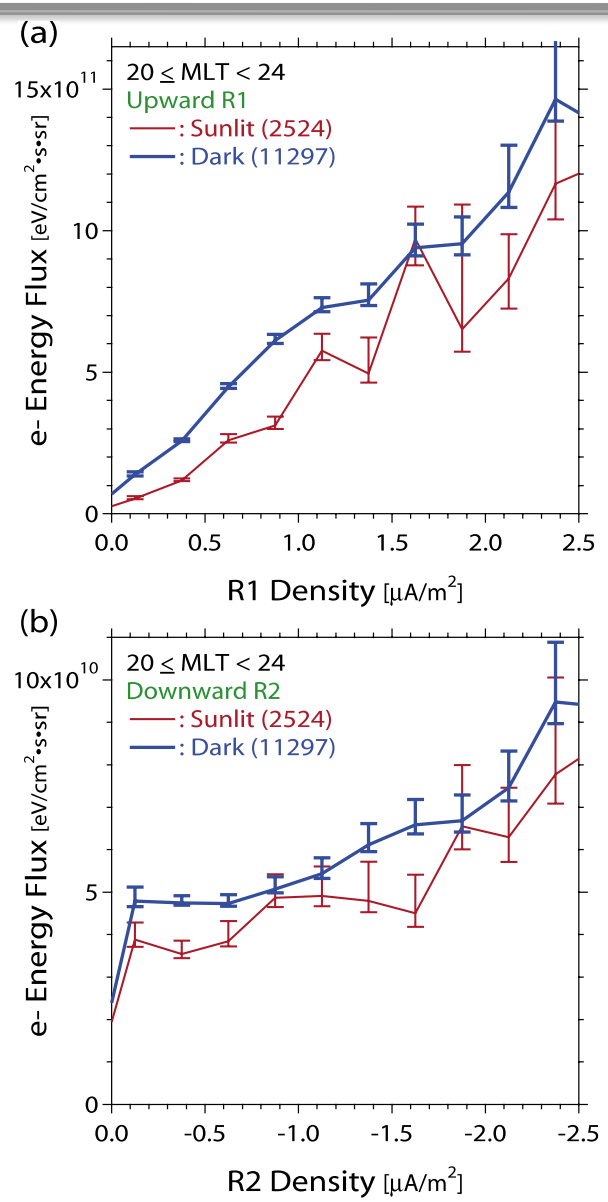
Dusk:

Eqbn: equatorward disturbance of Poynting flux

Pobn: last local maximum on the poleward side

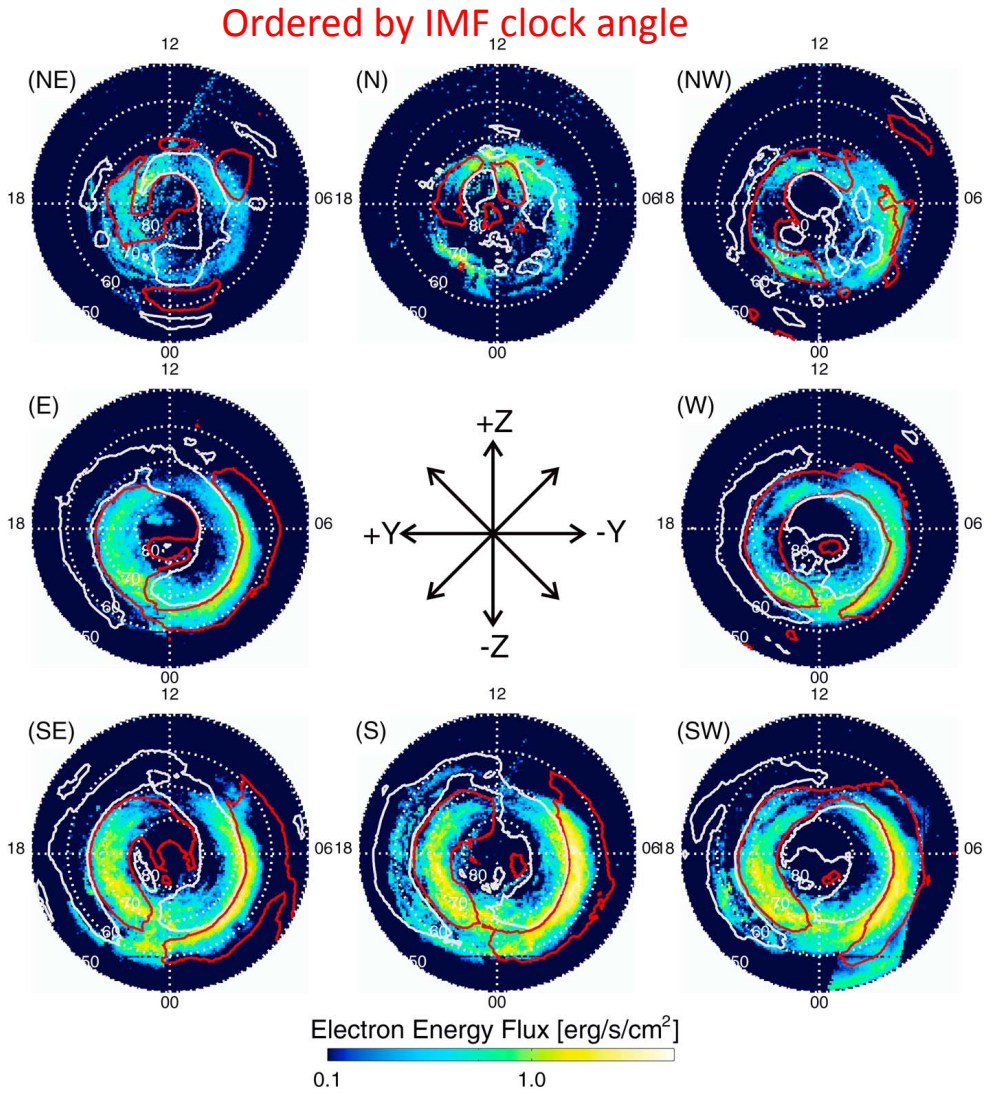
Nightside: Region 1 FAC vs Aurora Precipitation





Ohtani et al., 2009, JGR

Statistical relationship between FACs and e- precipitation



Korth, H., Y. Zhang, B. J. Anderson, T. Sotirelis, and C. L. Waters (2014), Statistical relationship between largescale upward field-aligned currents and electron precipitation, J. Geophys. Res. Space Physics, 119, 6715–6731, doi:10.1002/2014JA019961.

Southward IMF: e- precipitation occurred primarily within and near large-scale upward currents. The correspondence less evident for northward IMF.

Better correlation in the dusk sector than other local time sectors between FACs and e-precipitation (due to different physical processes operating in different local time sectors).

Figure 7. Statistical distributions of the electron energy flux observed in the Northern Hemisphere in 45° wide clock angle bins were color coded according to the color bar at the bottom of the panel, which has a maximum value of 5 erg/s/cm^2. The 2σ contours of the upward (red) and downward (grey) Birkeland currents from Figure 2 are overlaid on each distribution.

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