DMSP measured Poynting Flux during magnetic storms

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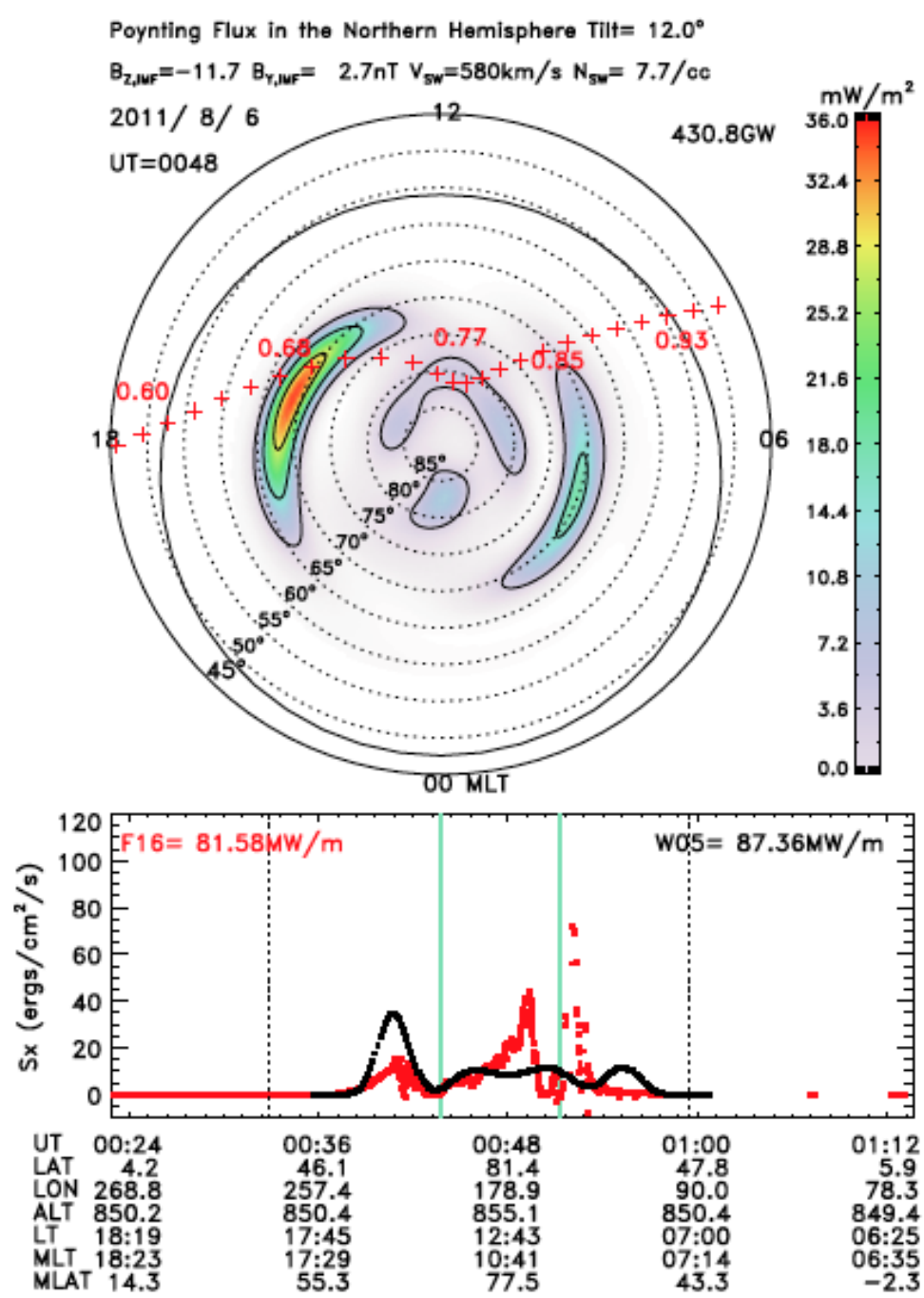


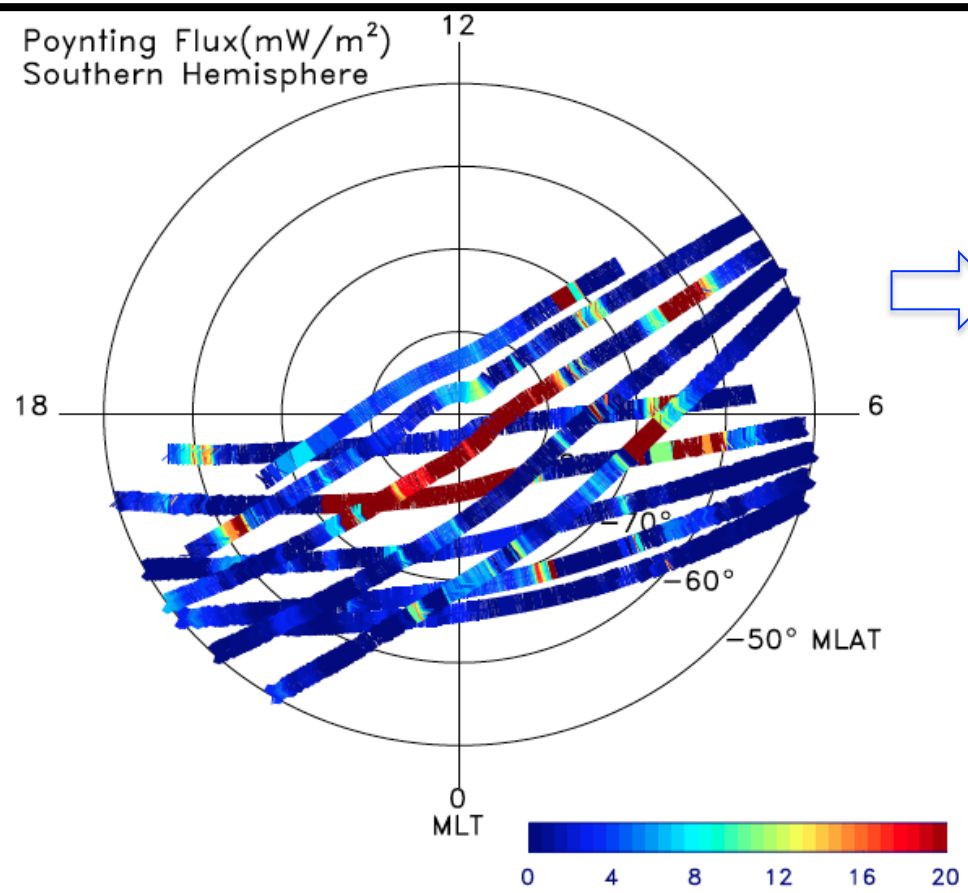
[*Huang et al.*, 2014]

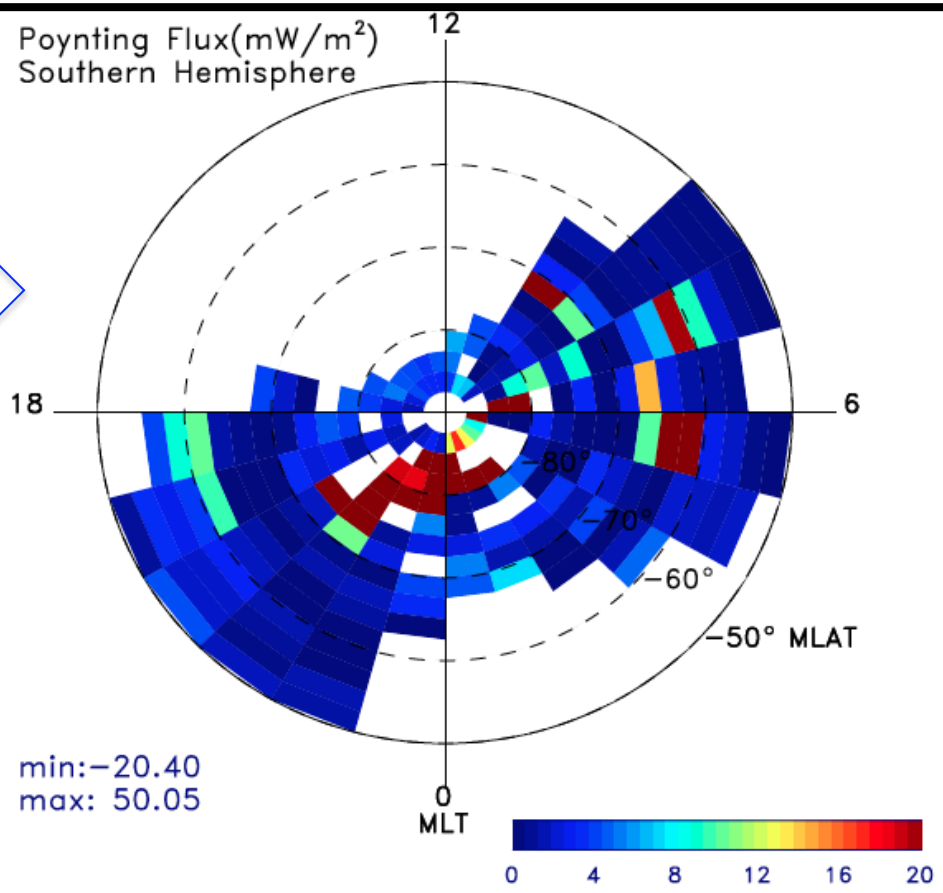
Weimer05 simulation vs DMSP F16 measurement of Poynting Flux

- August 2011 storm, main phase, northern hemisphere
- Disagreement of magnitude and location.
- Clear enhancement of Poynting Flux inside CRBs, which is missed by empirical model simulation.

- Question: how often can we observe strong Poynting Flux in the polar cap?

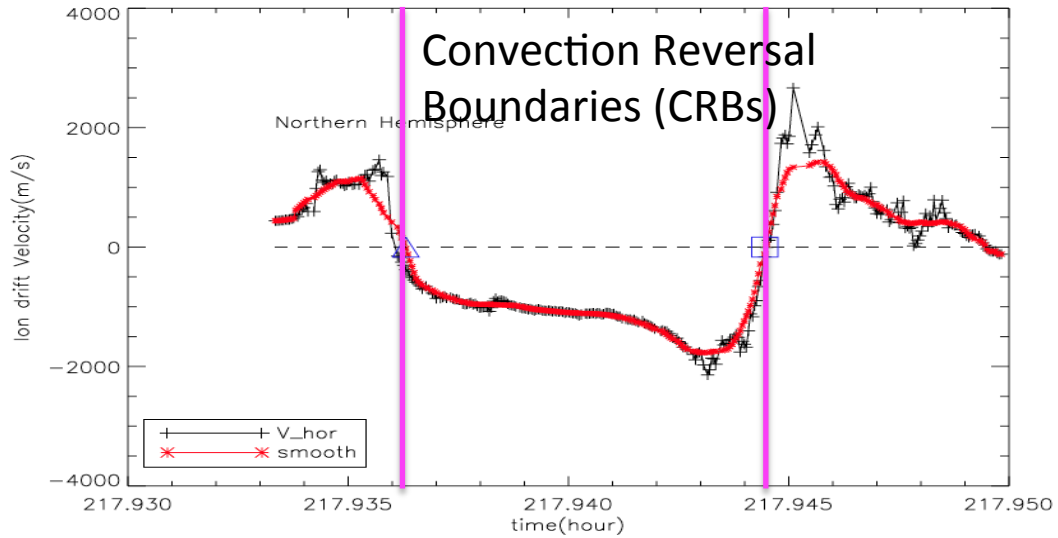
Bin averaged Poynting Flux



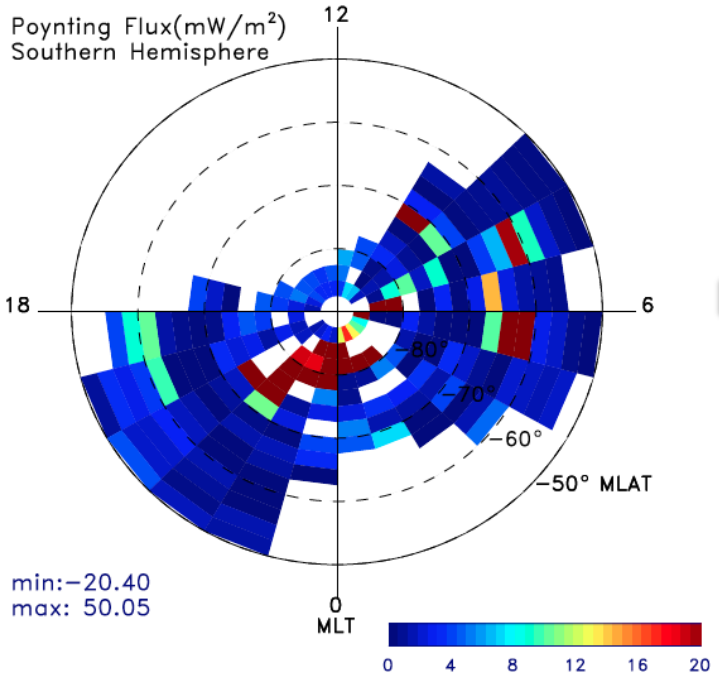


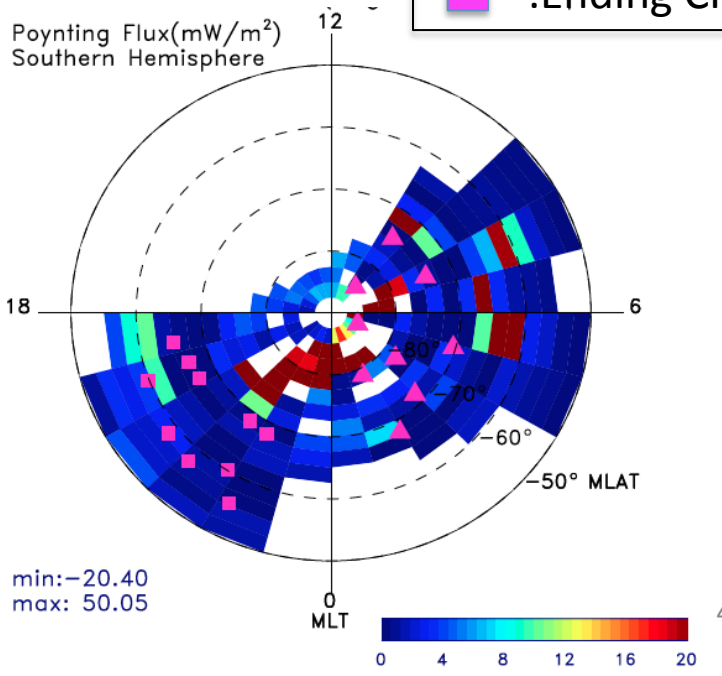
- August 2011 storm, main phase, southern hemisphere
- Bin size: $2.5°\ \mathrm{MLAT} \times 1\ \mathrm{hr\ MLT}$

Define area of Polar Cap

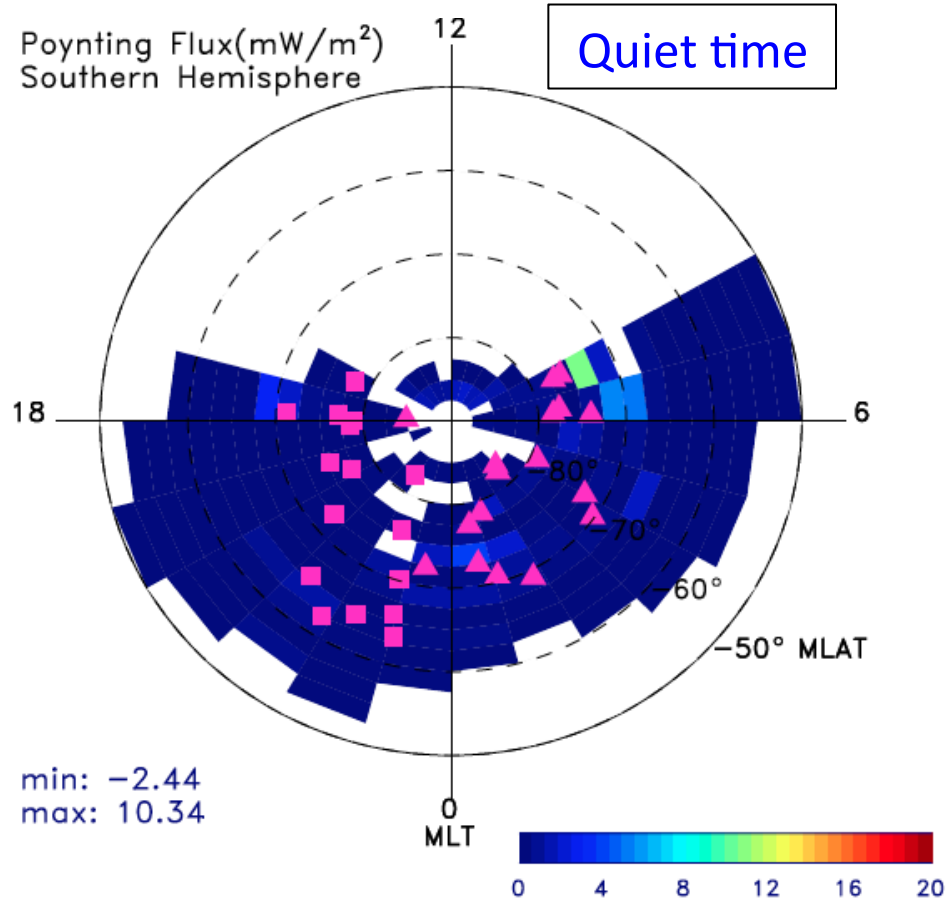


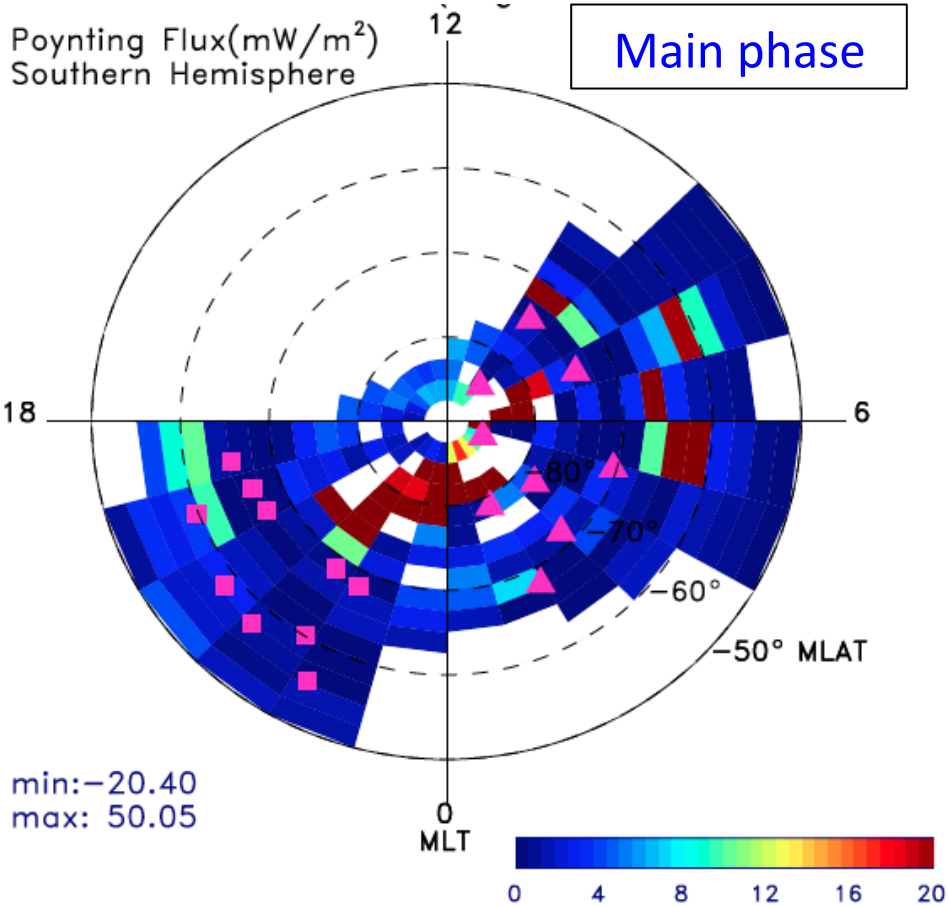
- Horizontal component of Ion drift velocity:
  - Sunward: auroral zone
  - Anti-sunward: polar cap





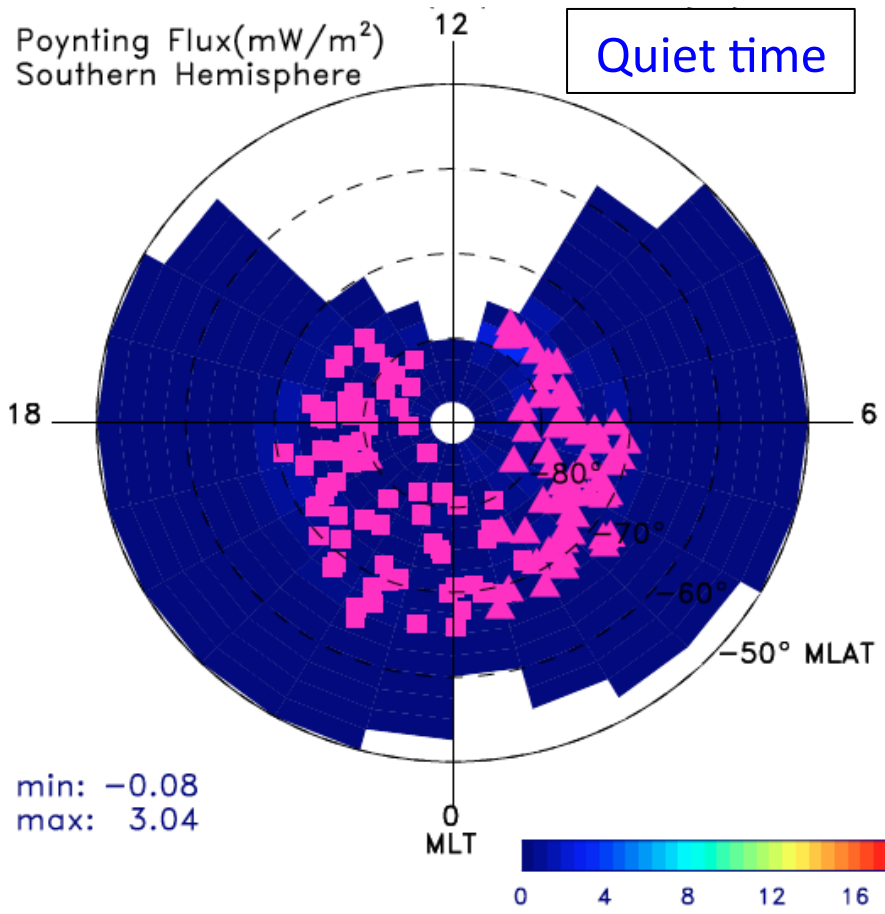
August 2011 storm: southern hemisphere

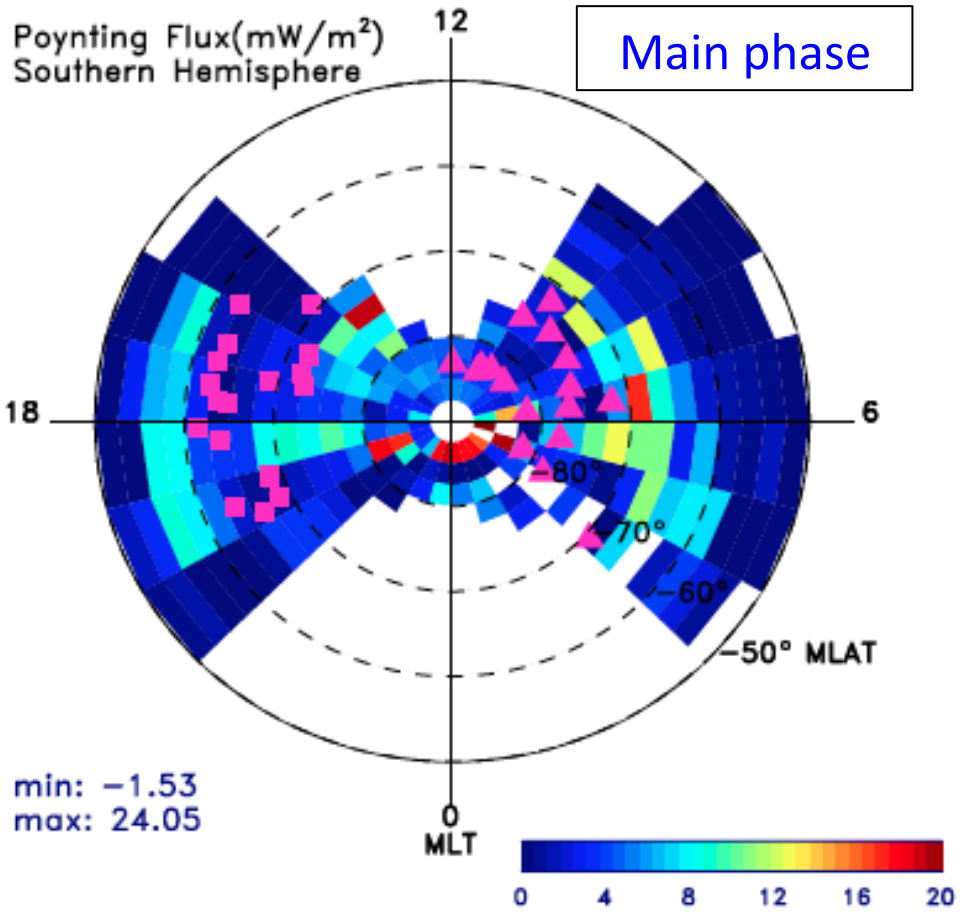




- Clearly enhanced Poynting flux poleward of 75 MLAT in the nightside (polar cap).
- Equator-ward Extended polar cap to 60 MLAT during main phase.

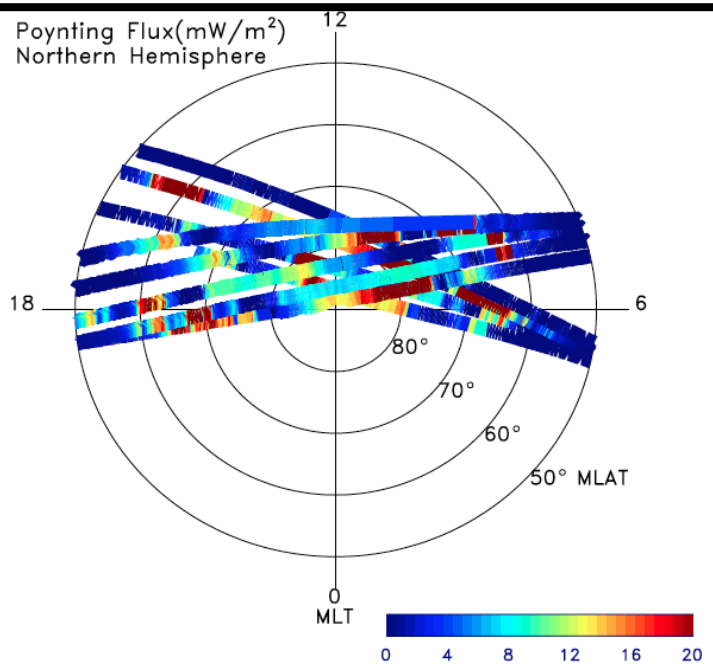
September 2011 storm: southern hemisphere



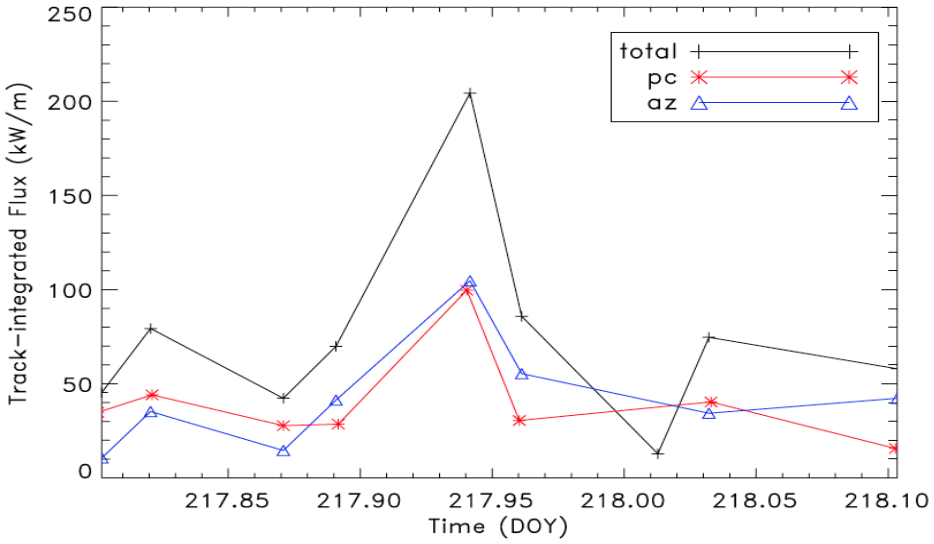


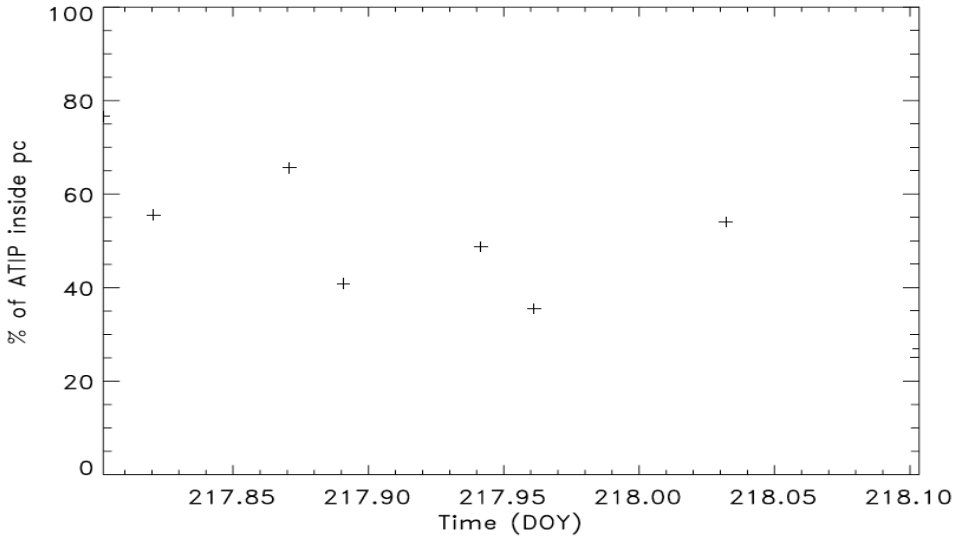
- Clearly enhanced Poynting flux poleward of 80 MLAT in the polar cap inside CRBs.
- Enhanced Poynting flux in auroral zones outside CRBs.

Pass-integrated Poynting Flux in different zones

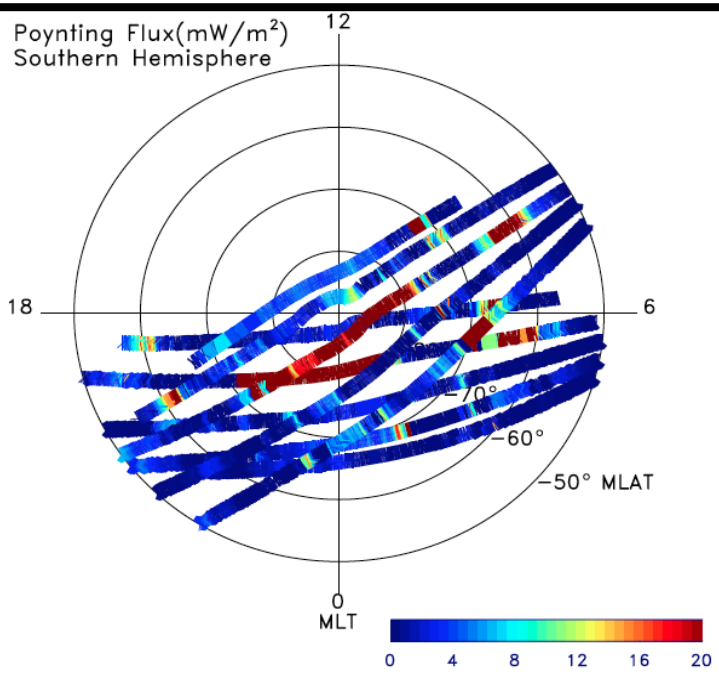


- August 2011 storm: NH (most passes in dayside), main phase.
- Clearly enhanced Poynting flux in both the auroral zone and polar cap.
- Percentage of Poynting Flux inside polar cap can be close to 65%.

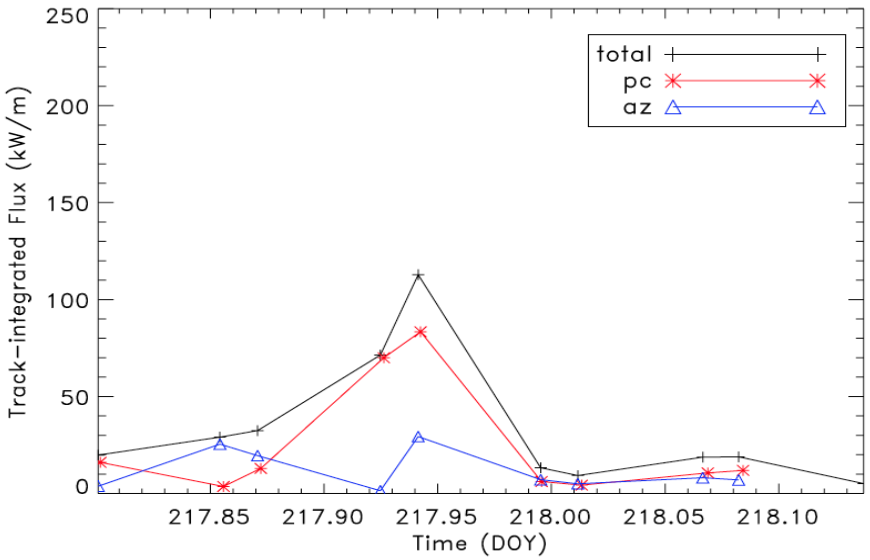


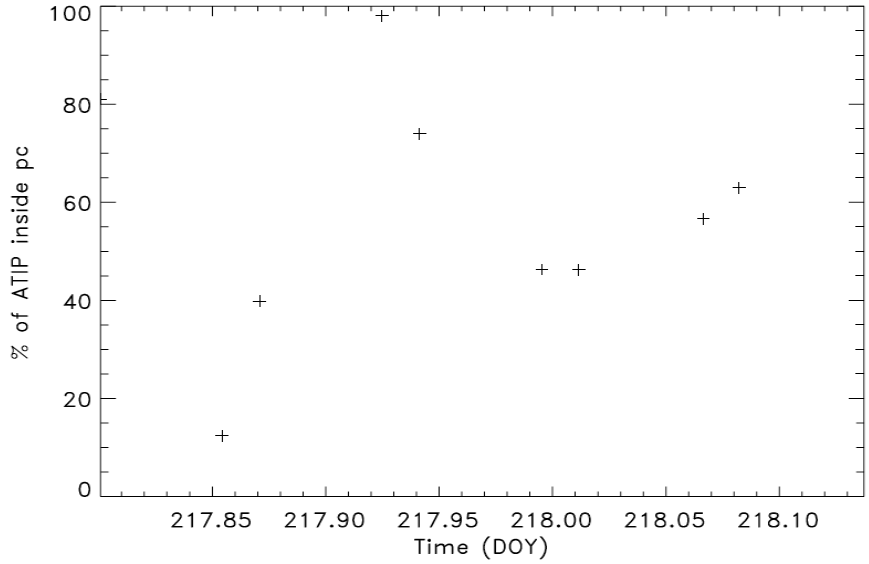


Pass-integrated Poynting Flux in different zones



- August 2011 storm: SH (most passes in nightside), main phase.
- Clearly enhanced Poynting flux in the polar cap.
- Percentage of Poynting Flux inside polar cap can be close to 100%.





Summary

- We investigated the Poynting Flux measured by DMSP satellites (F15, F16, F17, F18) during magnetic storms.
- We defined the area of polar cap using CRBs.
- Polar cap can extend equator-ward to 60 degree MLAT during main phase.
- Clear enhancement of Poynting Flux was found in the polar cap, which is comparable to that in the auroral zone during main phase.
- The energy deposited in the polar cap, either in the dayside or in the nightside, plays an important role during main phase of magnetic storms.