Ionospheric Poynting Flux Binned in Auroral Boundary Coordinates

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Project Overview

- Background
- Coordinate Corrections
- Velocity Corrections
- Poynting Flux Calculation
- Quality Flags and Uncertainty
- CDF Generation and Next Steps
Poynting flux and particle energy flux
Energy Deposition in Polar Region

• How much flux?
• Where does it enter?
Defense Meteorological Satellite Program
- Run by Air Force Space and Missile Systems Center (SMC)
- 101 min, sun-synchronous, near-polar orbit at 830 km
- Special Sensors-Ions, Electrons, and Scintillation (SSIES) thermal plasma package – IDM, RPA
Geocentric vs. Geodetic

Velocity calculations dependent on coordinate system.
Co-Rotational Velocity

- Plasma "tied" to magnetic field lines
- Rotational movement not included in Poynting Flux calculations
- Relevance in Polar Region
Behavior of Poynting Flux in Polar Region

Minimum (most negative) Poynting Flux Northern Hemisphere 2006-04

Uncertainty of Minimum (most negative) Poynting Flux Northern Hemisphere 2006-04
Minimum (most negative) Poynting Flux
Southern Hemisphere 2006-04

Uncertainty of Minimum (most negative) Poynting Flux
Southern Hemisphere 2006-04

Borovsky Coupling Function

Borovsky Function [nT km/s]

Minimum (most negative) Poynting Flux
Southern Hemisphere 2006-04

Uncertainty of Minimum (most negative) Poynting Flux
Southern Hemisphere 2006-04
Poynting Flux in Northern Hemisphere Auroral Zone and Polar Cap 2006-04

[Graph showing Poynting Flux as a function of Magnetic Latitude of First Equatorward and Poleward Auroral Boundary]
Behavior of Poynting Flux in Polar Region
Histogram of Total Poynting Flux in Auroral and Polar Regions (per pass)
2006-04

Total Poynting Flux in Auroral Zone: 267531
Total Poynting Flux in Polar Cap: -174404
Average AZ total PF per day: -4612
Average PC total PF per day: -3006
Average AZ total PF per pass: -298
Average PC total PF per pass: -194
Final Product

• Combination of SSIES raw data and Auroral Boundary code

• Includes (per pass over polar cap):
  • Poynting Flux mean, max, min, median, sum / Region
  • Corresponding magnetic local time, magnetic latitude
  • Corresponding uncertainty values
  • Boundary positions

• 894 passes ID'ed for 04/2006
Next Steps

• Statistical Analysis
  • How much Poynting flux comes into the polar region?
  • Where are the active regions?
  • How do active energy deposition regions relate to boundary locations?

DMSP Usability

• Cleaned and corrected data
Questions?