

DMSP Measurements of Poynting Flux into the Ionosphere-Thermosphere System: Examples and Statistics

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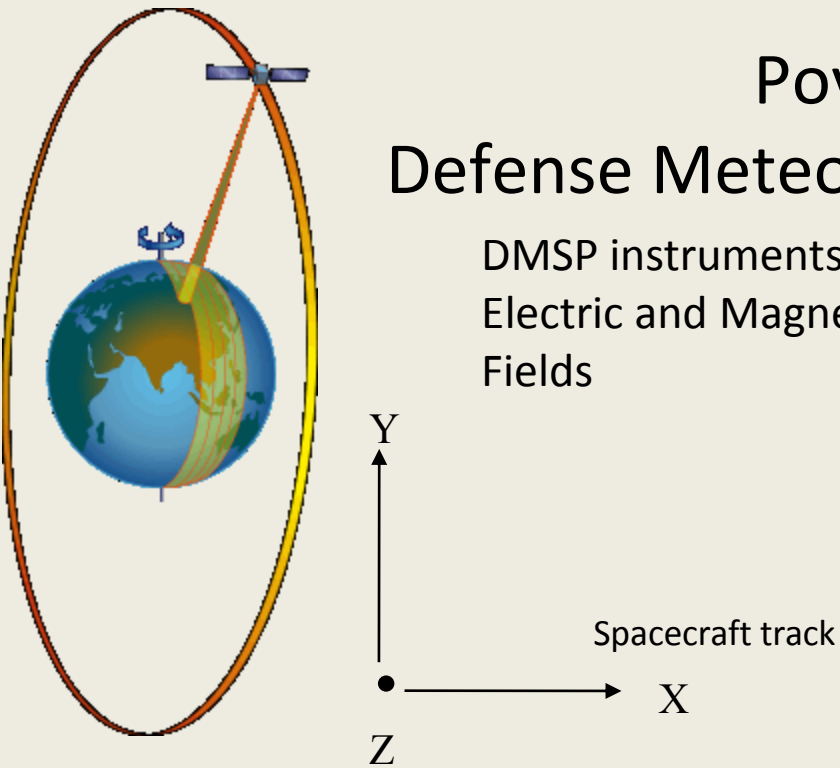
³Space Environment Technology through a contract from USAFA

with contributions from:

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K. Drake, C. Lin, A. Richmond*

Poynting Vector from Defense Meteorological Satellite Program S/C

DMSP instruments sense
Electric and Magnetic
Fields

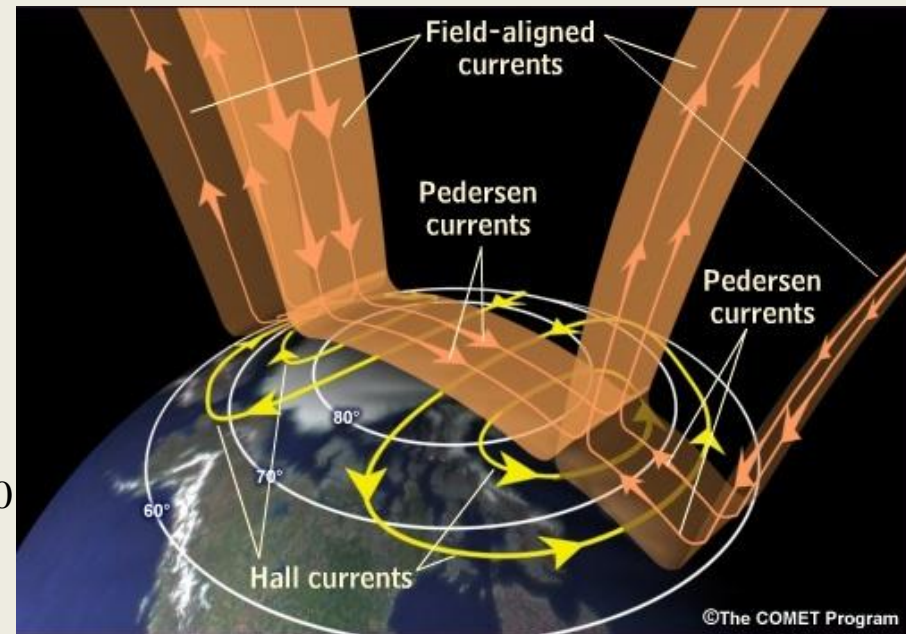


$$\mathbf{S} = \frac{1}{\mu_0} \mathbf{E} \times \delta \mathbf{B}_{DMSP\ Horizontal}$$

$$S_{||} = (E_x \delta B_y - E_y \delta B_x) / \mu_0$$

where

$$\mathbf{E} = -\mathbf{V} \times \mathbf{B}_{IGRF} \quad \text{and} \quad \delta \mathbf{B}_{DMSP\ Horizontal} = \mathbf{B}_{DMSP} - \mathbf{B}_{Main}$$



Poynting Flux Comparison 2000-2005 IMF By Influence

Extreme Poynting Flux in the Dayside Thermosphere: Examples and Statistics [Knipp et al., 2011] GRL in press

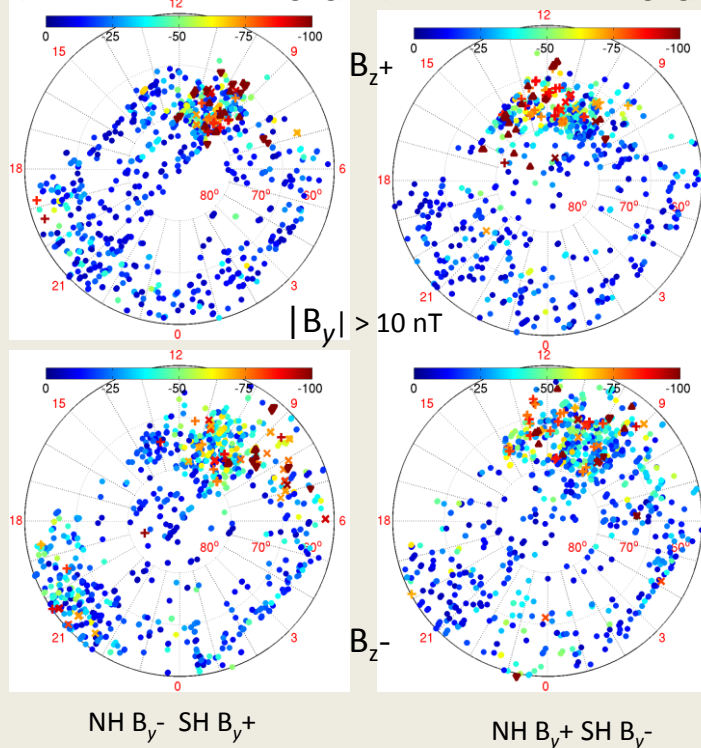
-We combine DMSP F-15 Poynting flux data from 2000-2005, in the northern and southern hemispheres according to the location of the preferred magnetopause merging region.

-When the IMF By component is large, significant Poynting flux is deposited in the dayside. Deposition may exceed 170 mW/m^2 —an order of magnitude above typical auroral values.

-Empirical Joule heat models do not capture this result.

Intervals of large IMF By produce enhanced, and even extreme, Poynting flux deposition into the dayside thermosphere. These events have now been simulated to good agreement with the OpenGGCM MHD model.

(Dawn Flank/Lobe Merging) (Dusk Flank/Lobe Merging)

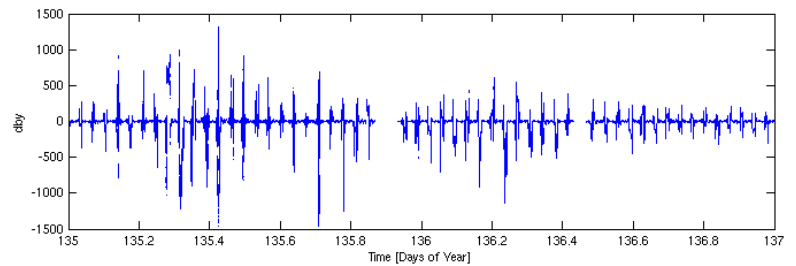
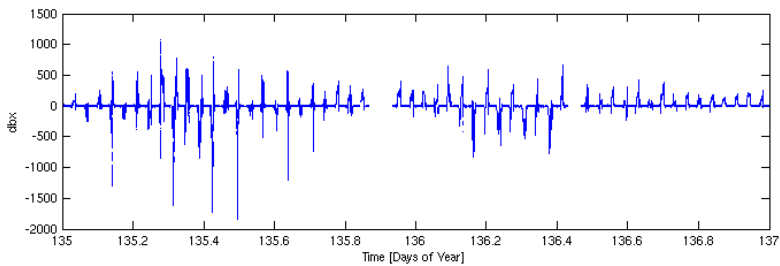
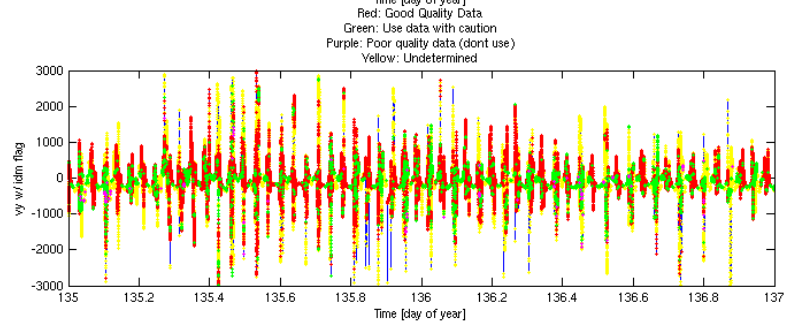
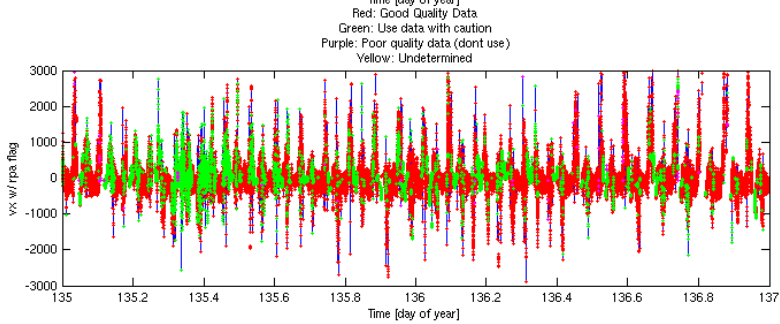
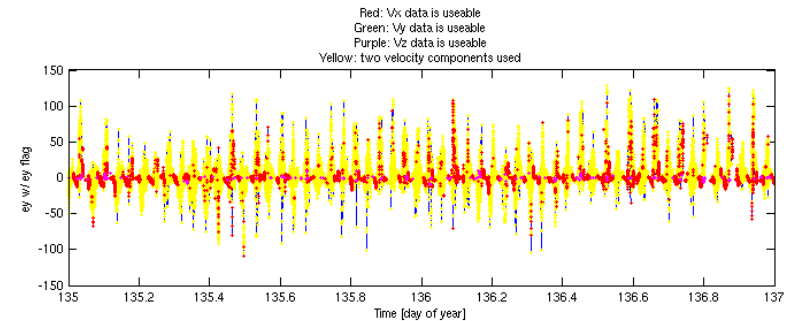
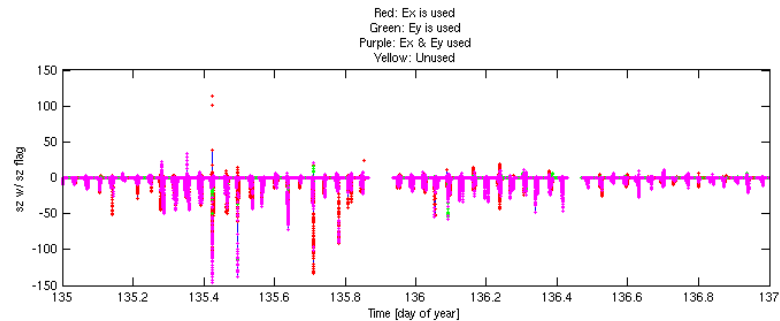


Each dot represents the maximum value of the of the pass

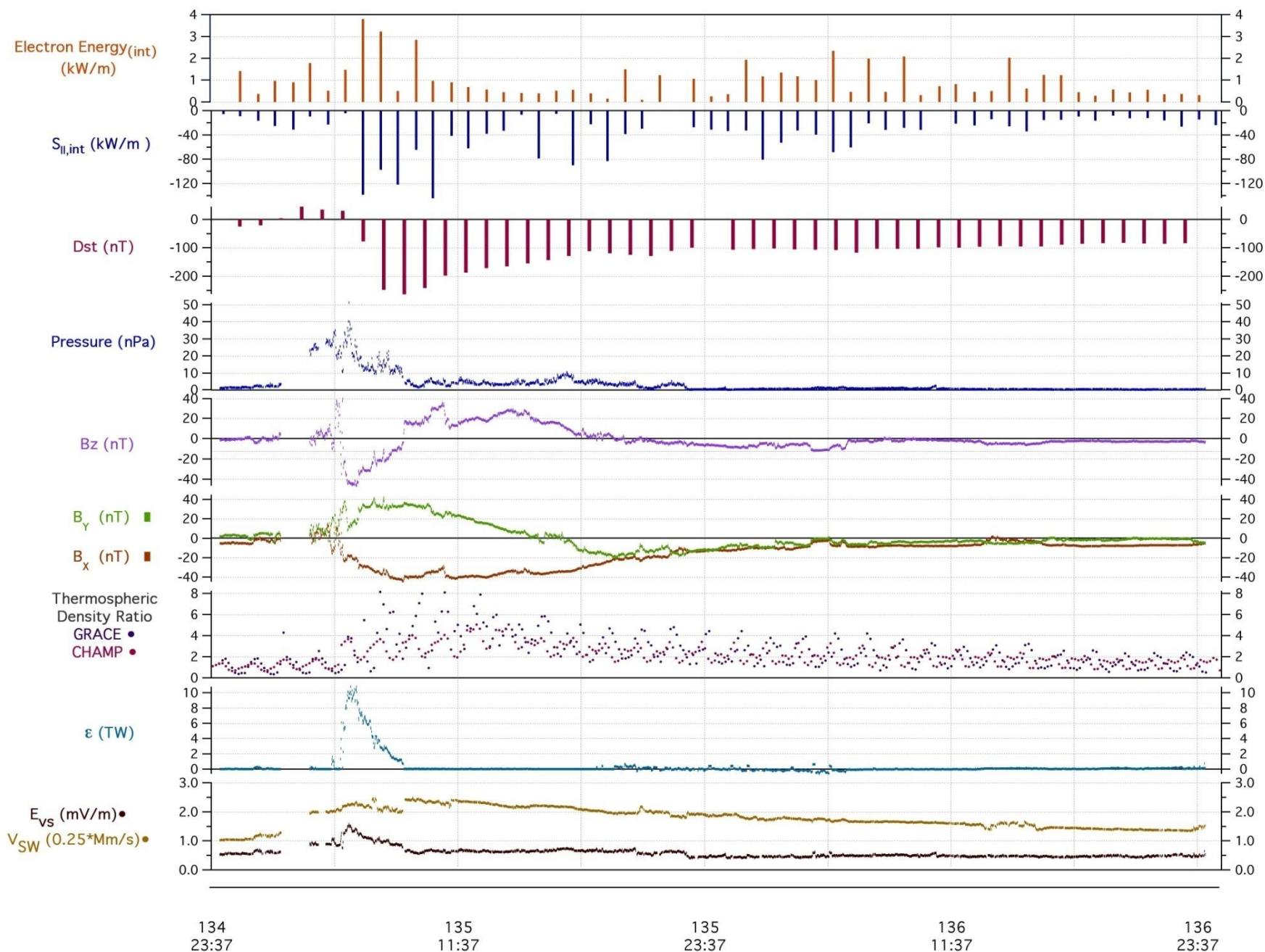
Colored dots show Poynting flux in excess of 75 mW/m^2

~ 1500 passes are shown

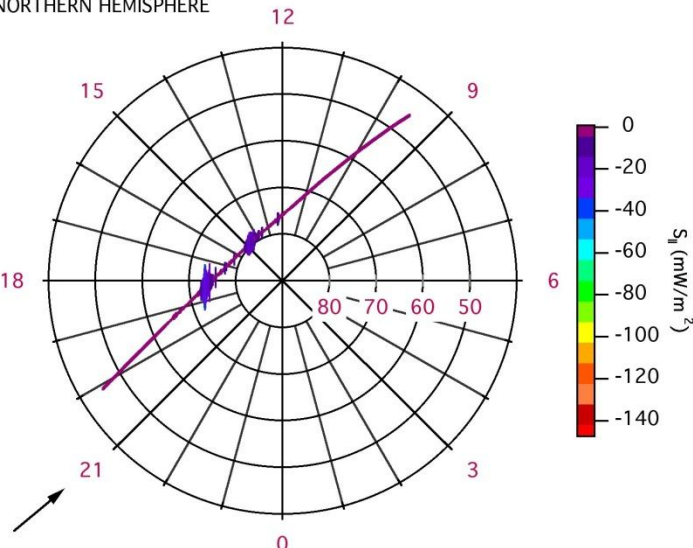
May 15 and 16 2005



DMSP F15 / ACE / GRACE 05/15/05 to 05/16/05 (135 - 136)



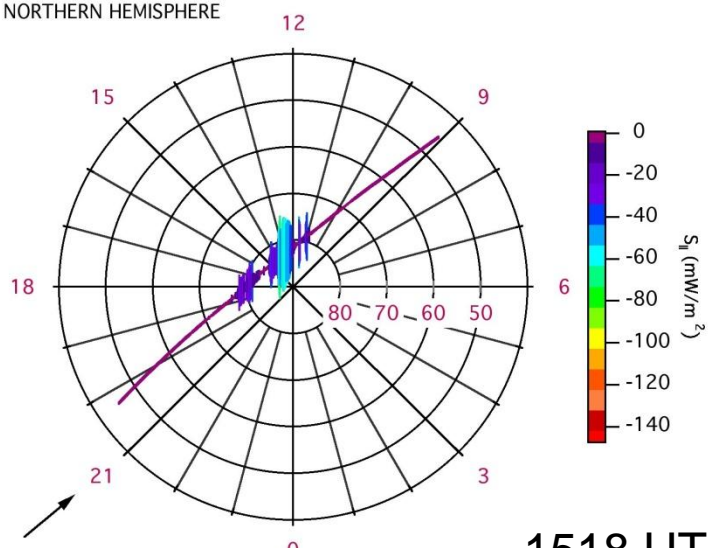
NORTHERN HEMISPHERE



1337 UT

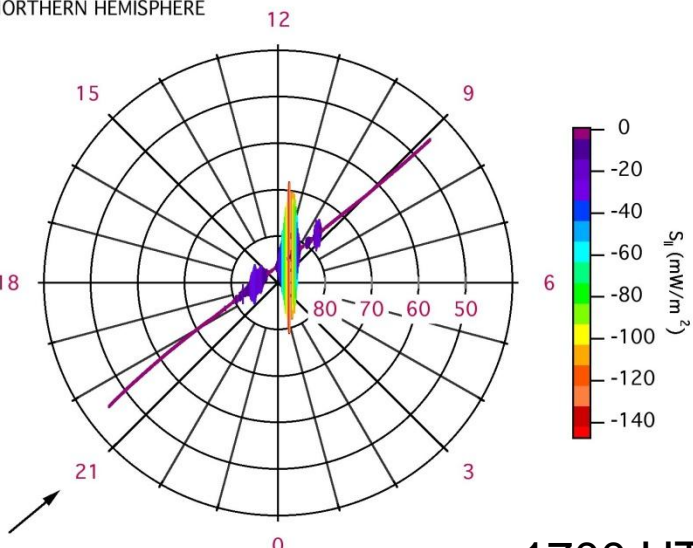
May 15 2005
DMSP F-15
Poynting Flux

NORTHERN HEMISPHERE



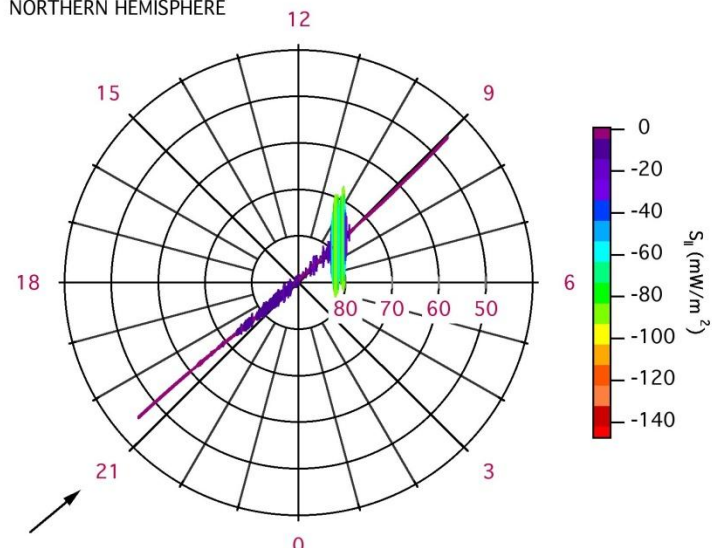
1518 UT

NORTHERN HEMISPHERE



1700 UT

NORTHERN HEMISPHERE



1841 UT

Oct 29 2003

DMSP- SWMF-Weimer Comparison

Compared along DMSP F-15 satellite track

