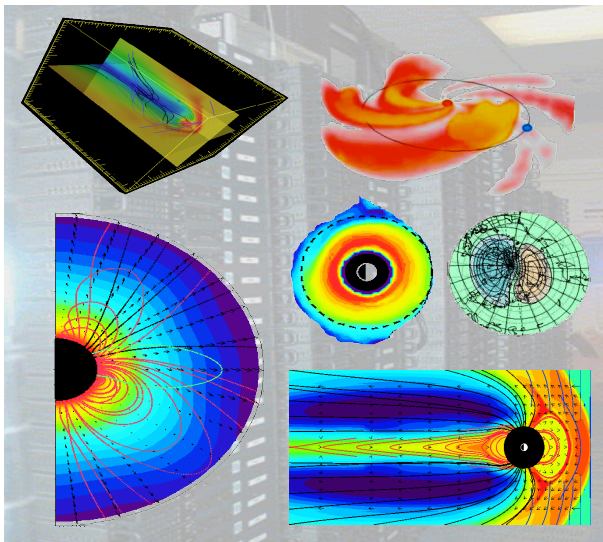


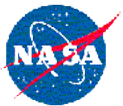
GEM-CEDAR Challenge: Comparing Ionospheric Models with Poynting Flux from DMSP Observations



L. Rastaetter, M. Kuznetsova,
D. Knipp , K.A. Drake, L. Kilkommons,
D. Weimer, T. Fuller-Rowell,
A. Ridley, J. Raeder, M. Wiltberger

GEM Mini Workshop, Dec. 4, 2011

<http://ccmc.gsfc.nasa.gov>



Poynting Flux and Joule Dissipation

Poynting Flux: $PF = \left(\frac{E \times B}{\mu_0} \right)_z$

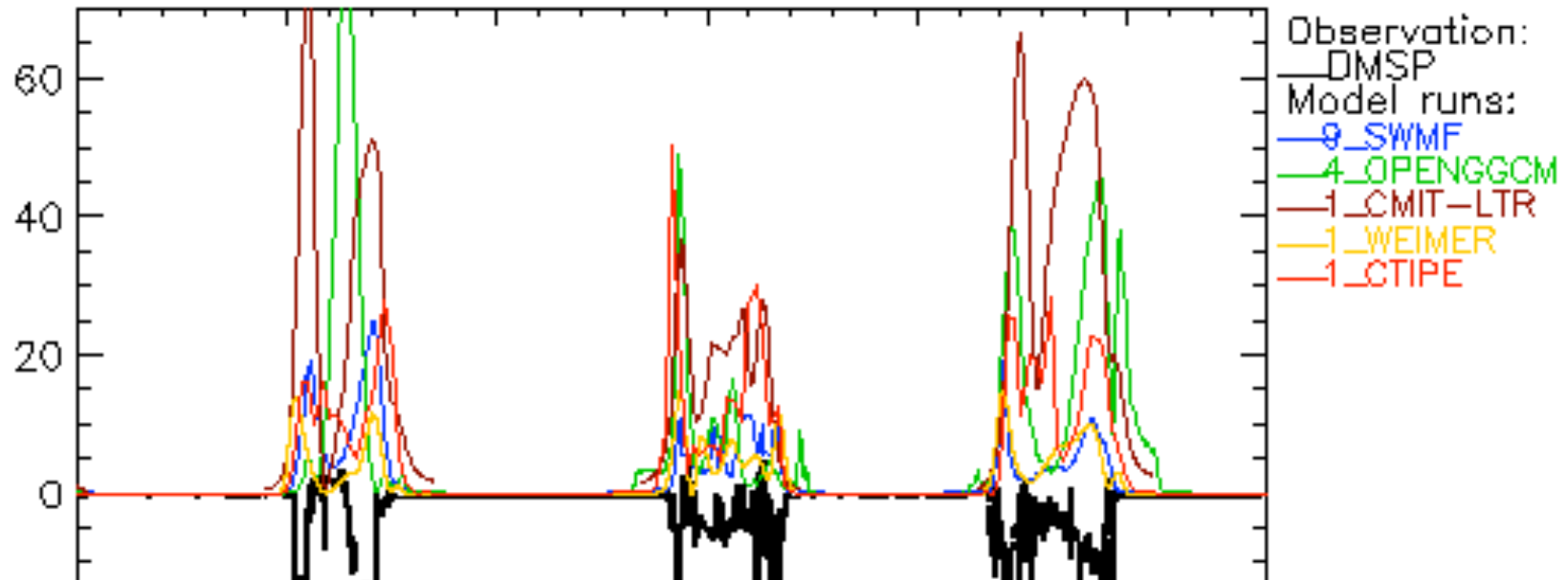
Obtained along DMSP satellite track from E and B measurements.
Mostly negative (inflow of electromagnetic energy).

Joule Heating: $JH = \frac{J^2}{\Sigma_P}$

Use height-integrated currents and Pedersen conductance.
Always positive (drain on electromagnetic energy).

DMSP orbits

Sz from observatory file: OBS_DMSP.txt



Model runs:

9_SWMF: 2011 SWPC model version; realtime with 1M cells,
SWPC_SWMF_052811_4

PI **4_OPENGGCM**: OpenGGCM V. 4.0 real-time setup 3.88M cells,
rotating dipole, SWPC_OpenGGCM_031311_4

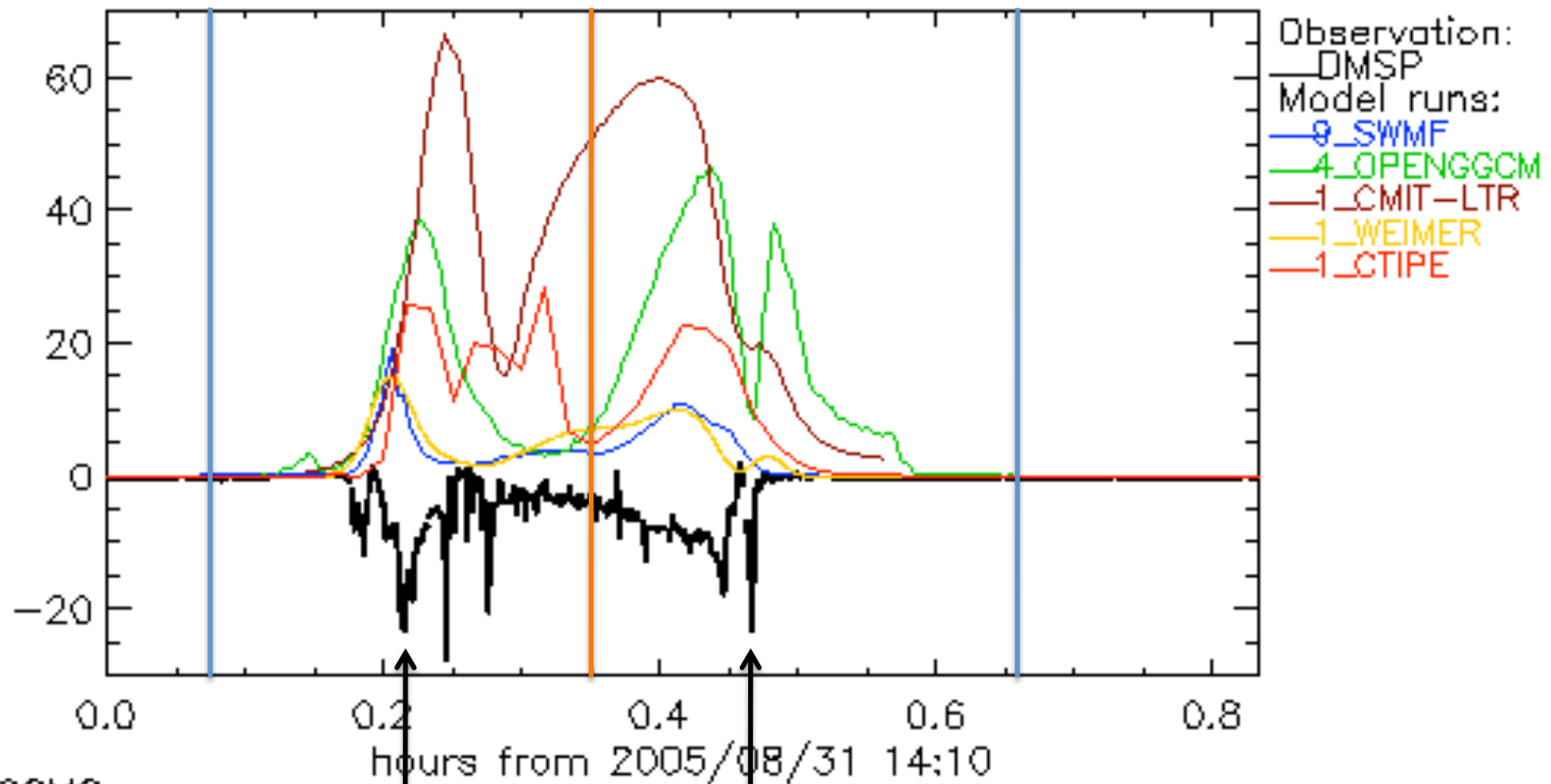
1_CMIT-LTR: 53x48x64 grid, real-time setup (SWPC_CMIT-LFM-MIX_031711_4)

1_WEIMER: results of Weimer-2005 (submitted Dec. 12, 2009)

1_CTIPE: CTIPe 2.0, run SWPC_CMIT-LFM-MIX_031711_4

Analysis of single pass

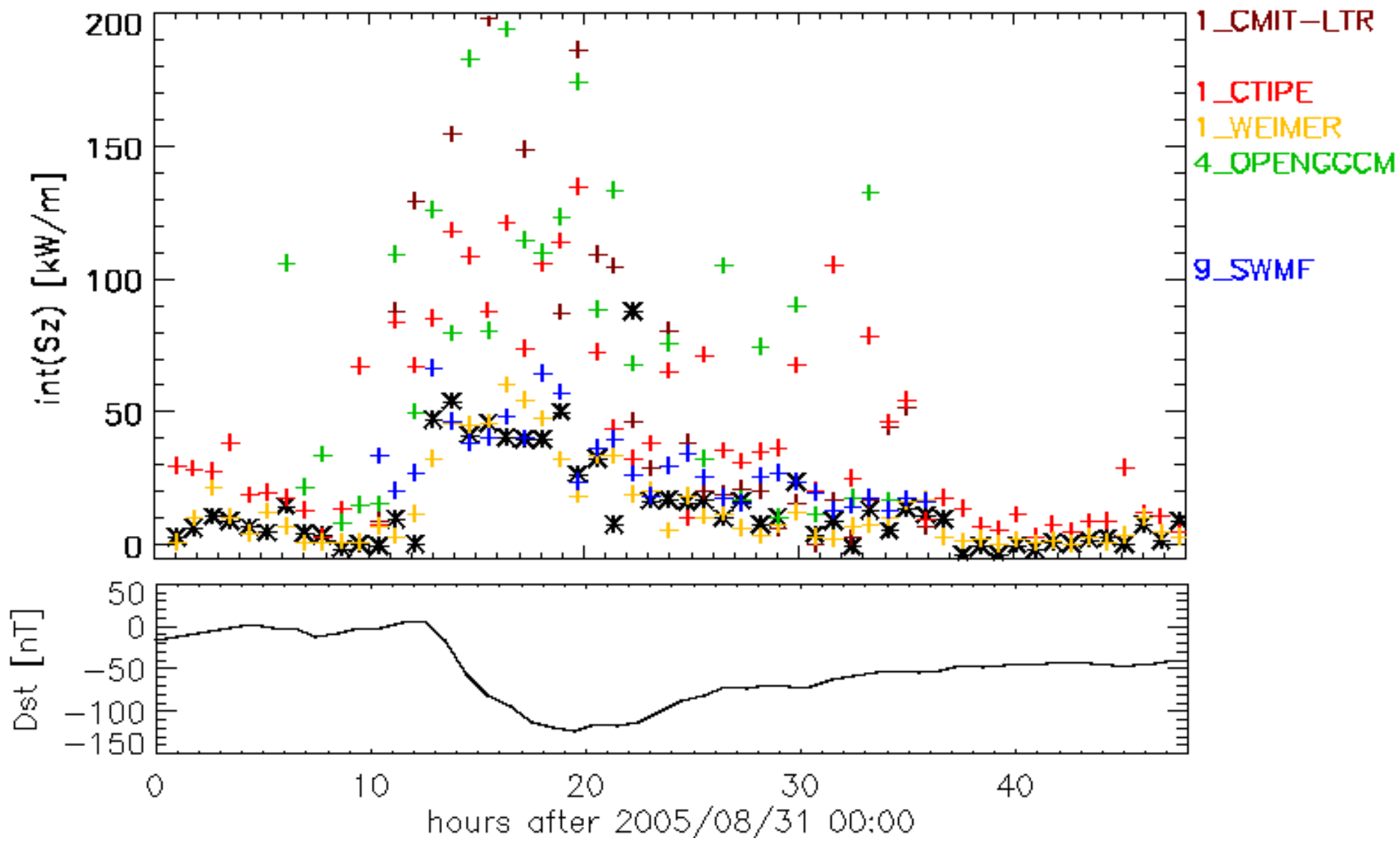
Sz from observatory file: OBS_DMSP.txt



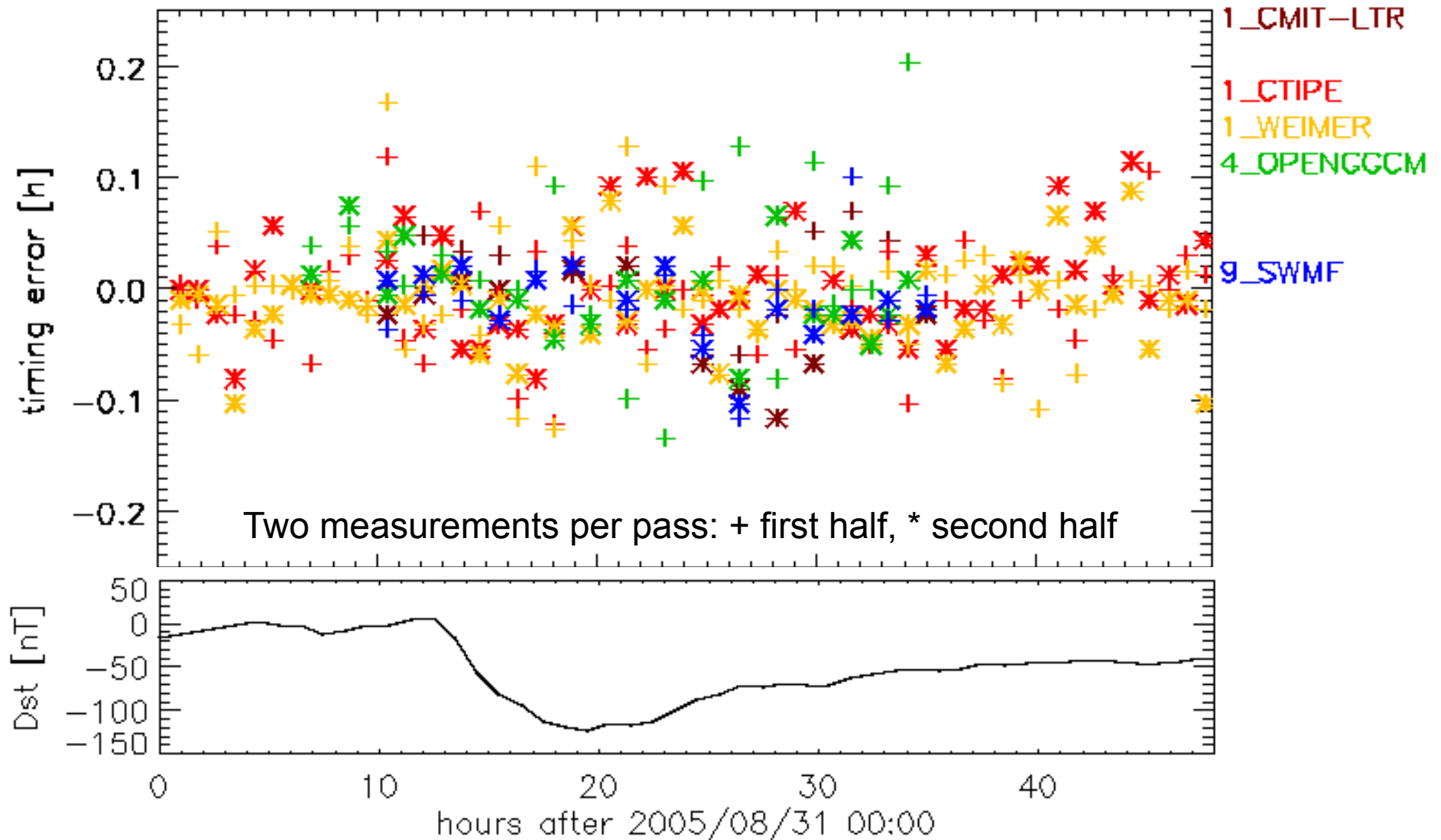
Plot: CCMC

Observed maxima

Integrated Joule Heating vs. PF

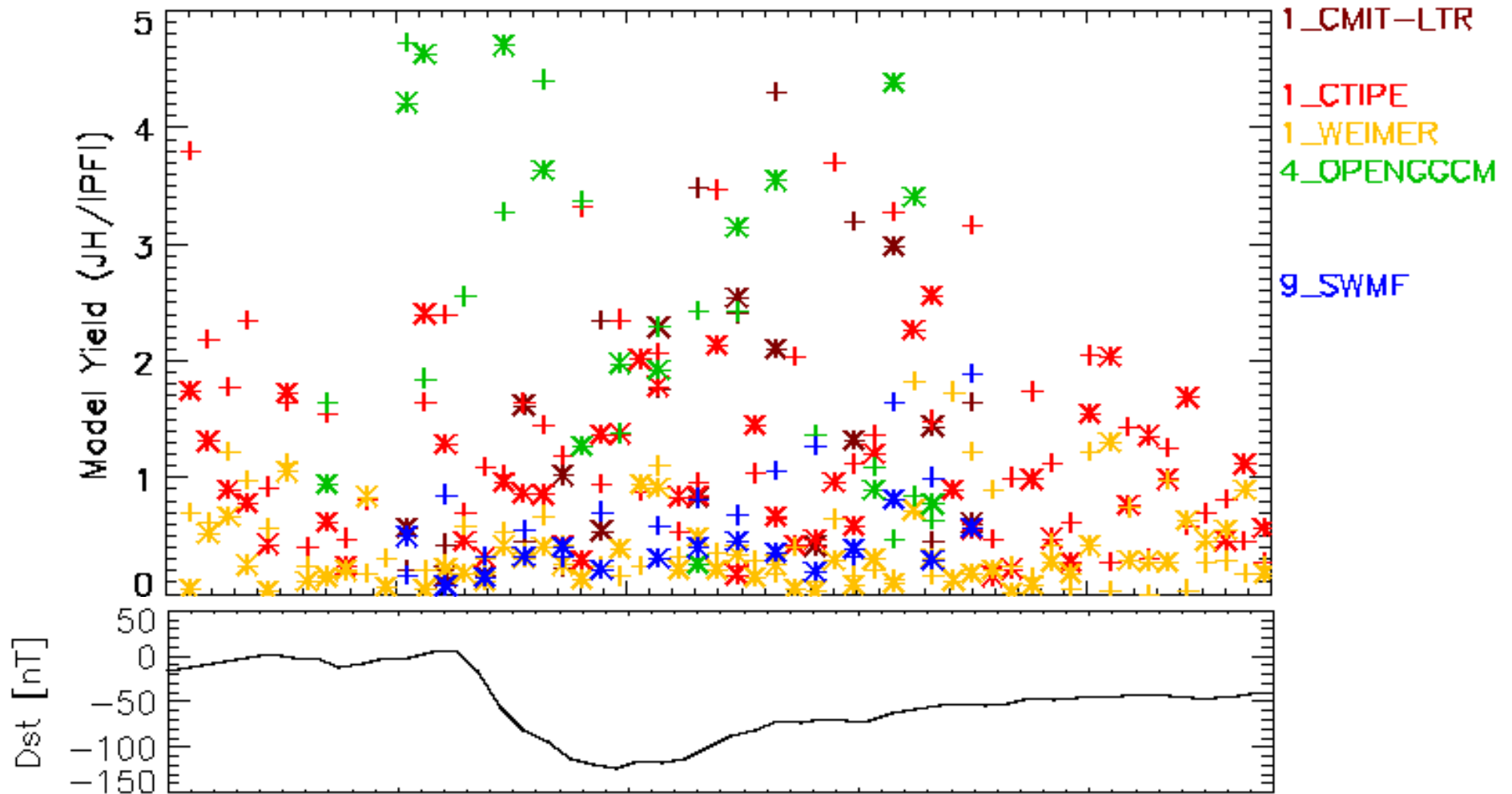


Timing errors (ideal: zero)



No systematic trend: errors go both ways for either segment of pass, not significant variation with activity level.

Model Yields (ideal score: 1)



Weimer, SWMF: Y mostly < 1
CTIPE, OpenGGCM, LFM-MIX: Y mostly > 1

Summary

- Included:
 - statistical model (Weimer)
 - first-principles ionosphere-thermosphere (CTIPe)
 - Electrodynamics of global magnetosphere models (SWMF, OpenGGCM, LFM-MIX)
- Needed:
 - TIE-GCM, USU-GAIM: electrodynamics
 - other coupled models (RCM-CTIPe, ...)
 - LFM-MIX-TIEGCM (can now run at CCMC)
 - Work on other events in challenge.