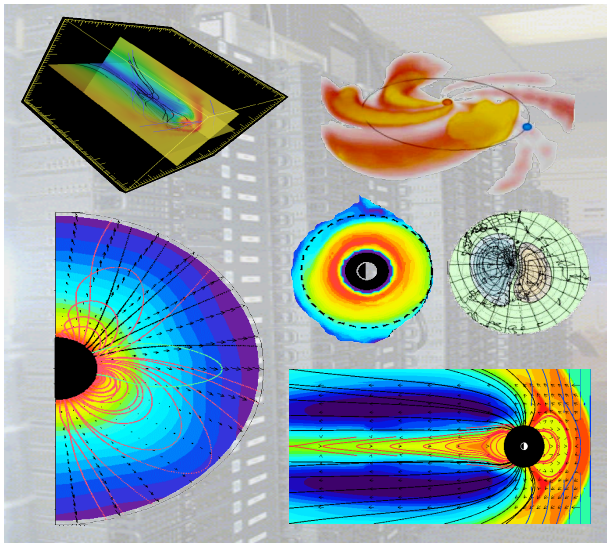
COMMUNITY COORDINATED MODELING CENTER

DST index in 2008 GEM modeling challenge



L. Rastaetter, M. Kuznetsova, A. Pulkkinen, A. Chulaki

Modelers:

J. Raeder, A. Vapirev, UNH

T. Gombosi, A. Ridley, U. Mich.

R. Weigel, GMU

D. Welling, LANL

Data: WDC, Kyoto

http://ccmc.gsfc.nasa.gov

DST

- 1-hour index (real-time, provisional, definitive) from KYOTO World Data Center
- Two types of "DST" calculations:
  1. SWMF, OpenGGCM, LFM magnetosphere models: "DST at Earth's center"
     Integral over $(\mathbf{J}\times\mathbf{R})_Z/R^3 dV$ with
     - **R**=(-x,-y,-z) and dV the volume element at position **R**.
     - Dst computed at center of Earth.
     - Use Z-component in SM coordinates.
  2. Ring Current models:
     Dessler-Parker-Sckopke relation from total energy.

Model runs

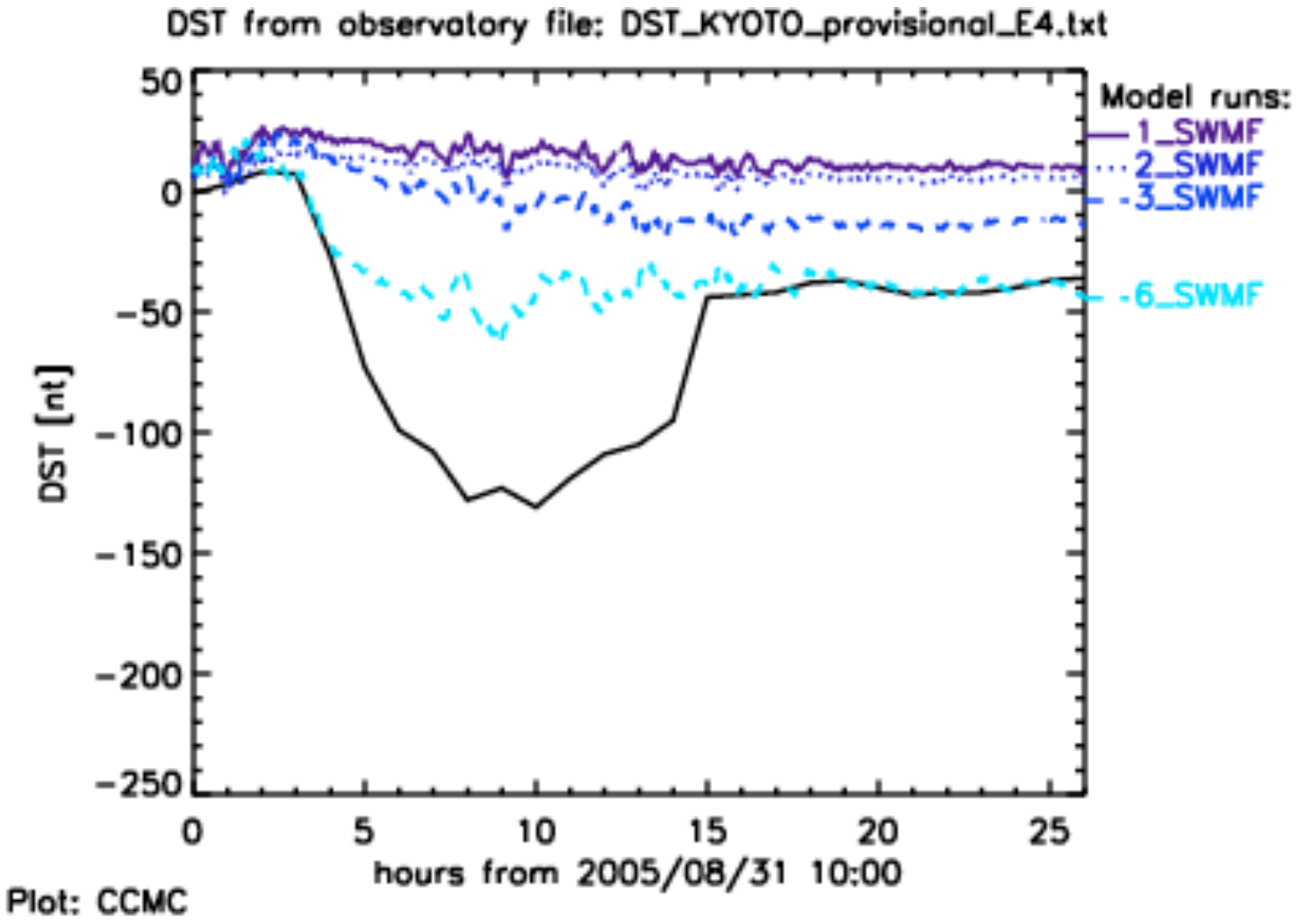
- **SWMF**
  - DST as written by model
  - DST computed from 3D magnetosphere outputs
- **OpenGGCM** (**LFM** runs to be added)
  - DST computed from 3D magnetosphere outputs

New models:

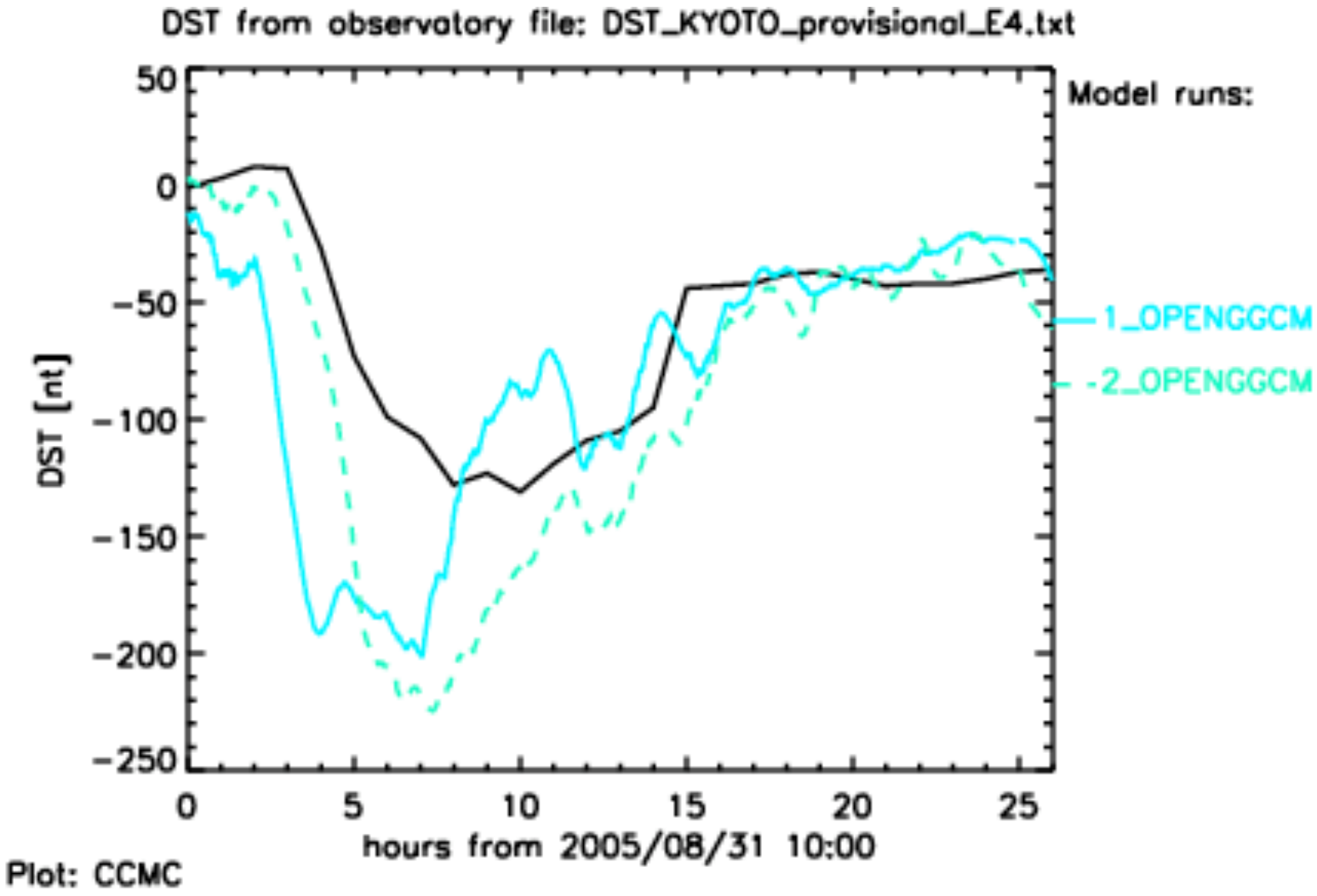
- **IRF-96:** Impulse Response Function with 96 lags, R. Weigel, GMU
- **RAMSCB**: Ring current model with self-consistent magnetic field, Daniel Welling, LANL
- **BFM92**: empirical relation by Burton et al. (1975), modified by Feldstein (1992) and Murayama (1982)

Model Setting ID	Model/Version	Submitted by
1_SWMF	BATSRUS 7.73, 2M cells	CCMC
2_SWMF	BATSRUS 7.73, 700k cells (real-time setup	CCMC
3_SWMF	BATSRUS 8.01 with RCM, 2M cells	CCMC
6_SWMF	SWMF V.20090403, BATSRUS+RCM2, 900k cells, RT on 64 procs	A. Ridley, CSEM
1_OpenGGCM	OpenGGCM 3.1, 3 M cells	CCMC
2_OpenGGCM	OpenGGCM 3.1, 6.5M cells	CCMC
1_LFM	LFM, 53x64x48 cells	CCMC
1_IRF96	IRF-96, Impulse Response Function with 96 lags	R. Weigel, GMU
1_RAMSCB	RAM-SCB stand-alone mode	D. Welling, LANL
2_RAMSCB	RAM-SCB driven by single fluid/species BATS-R-US	D. Welling, LANL
3_RAMSCB	RAM-SCB driven by multispecies BATS-R-US	D. Welling, LANL
1_BFM92	Empirical relation by Burton et al. (1975), modified by Feldstein (1992) and Murayama (1982)	L. Rastaetter, CCMC

Event 4 – 2005/8/31



Event 4 – 2005/8/31



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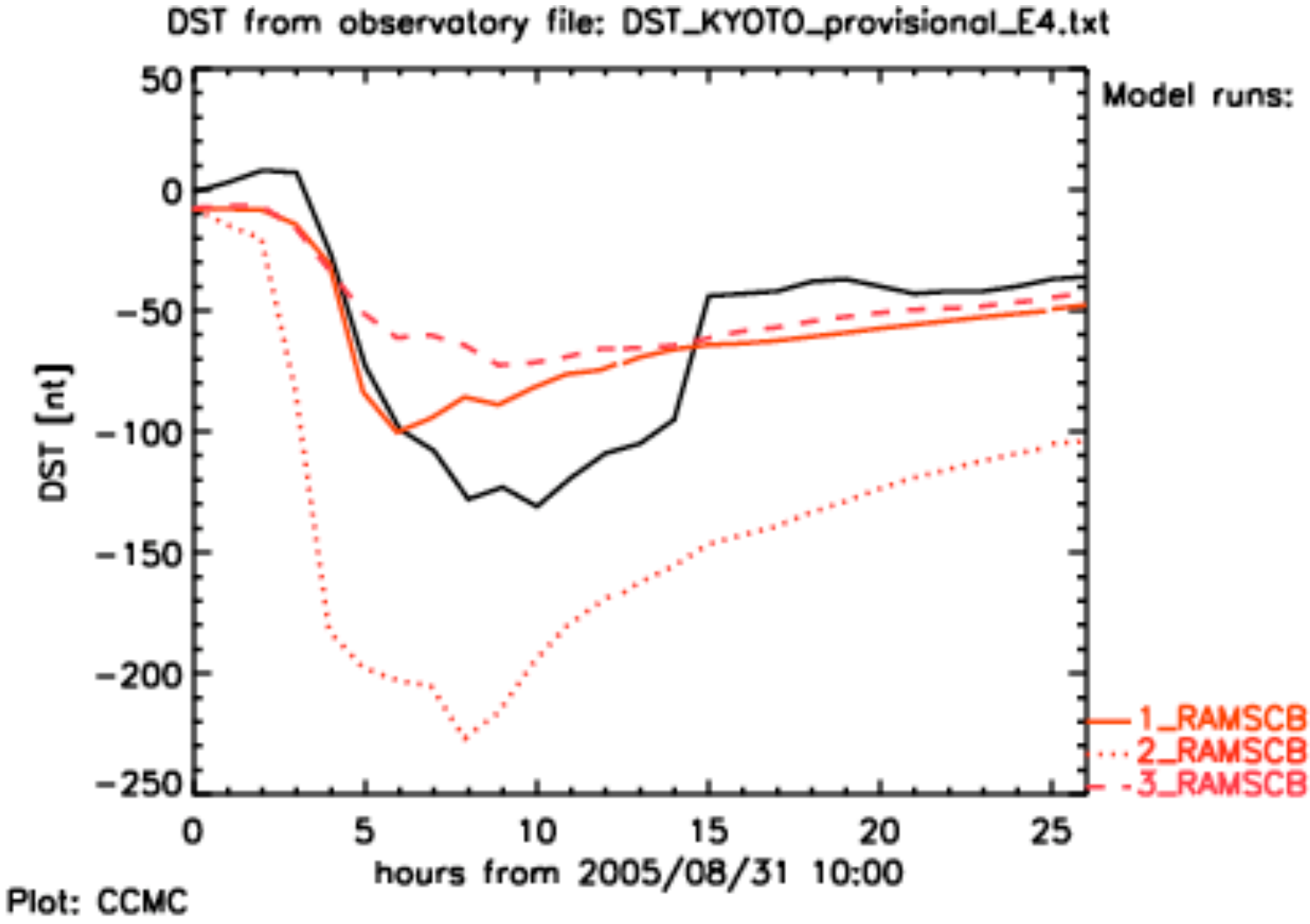

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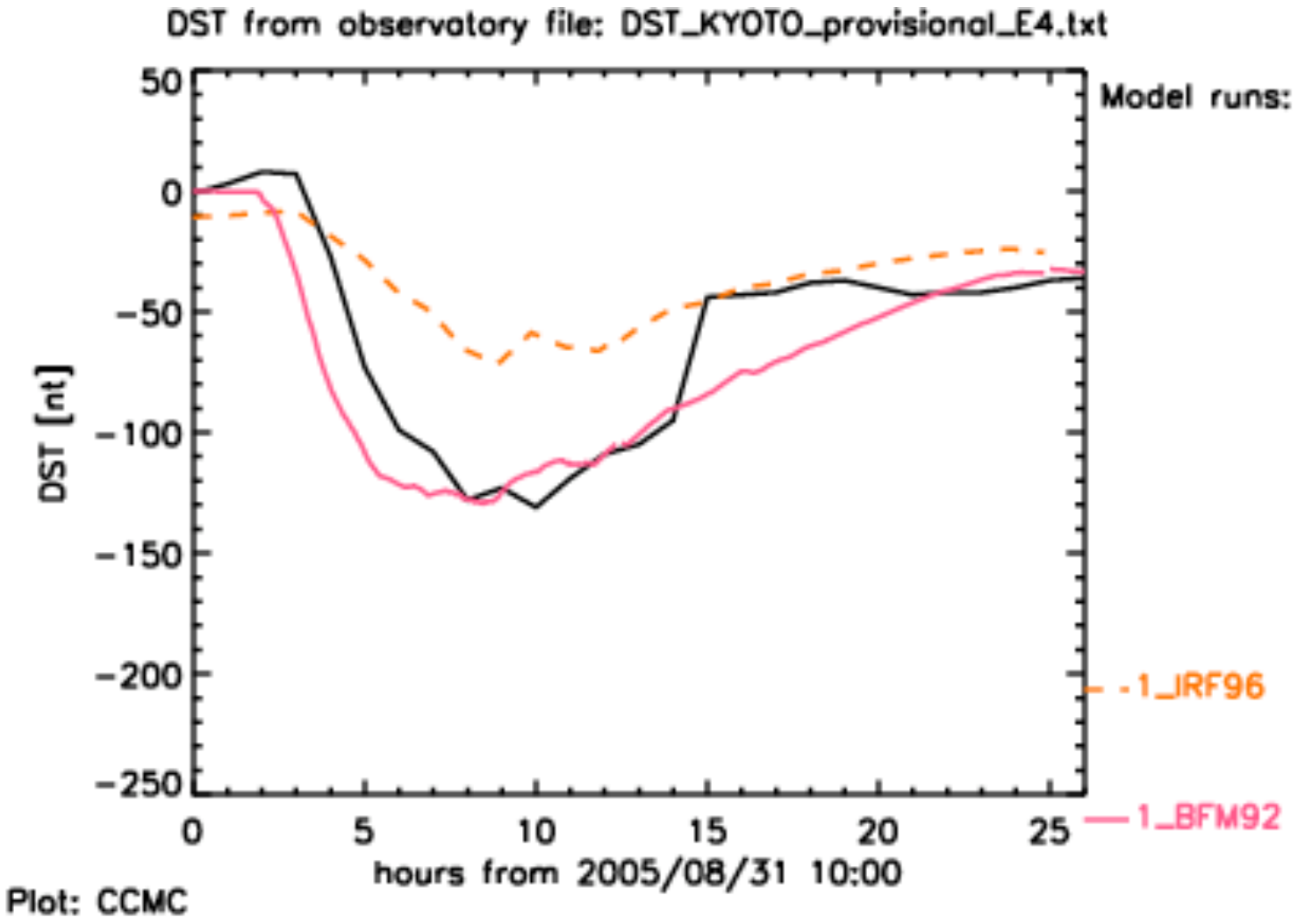

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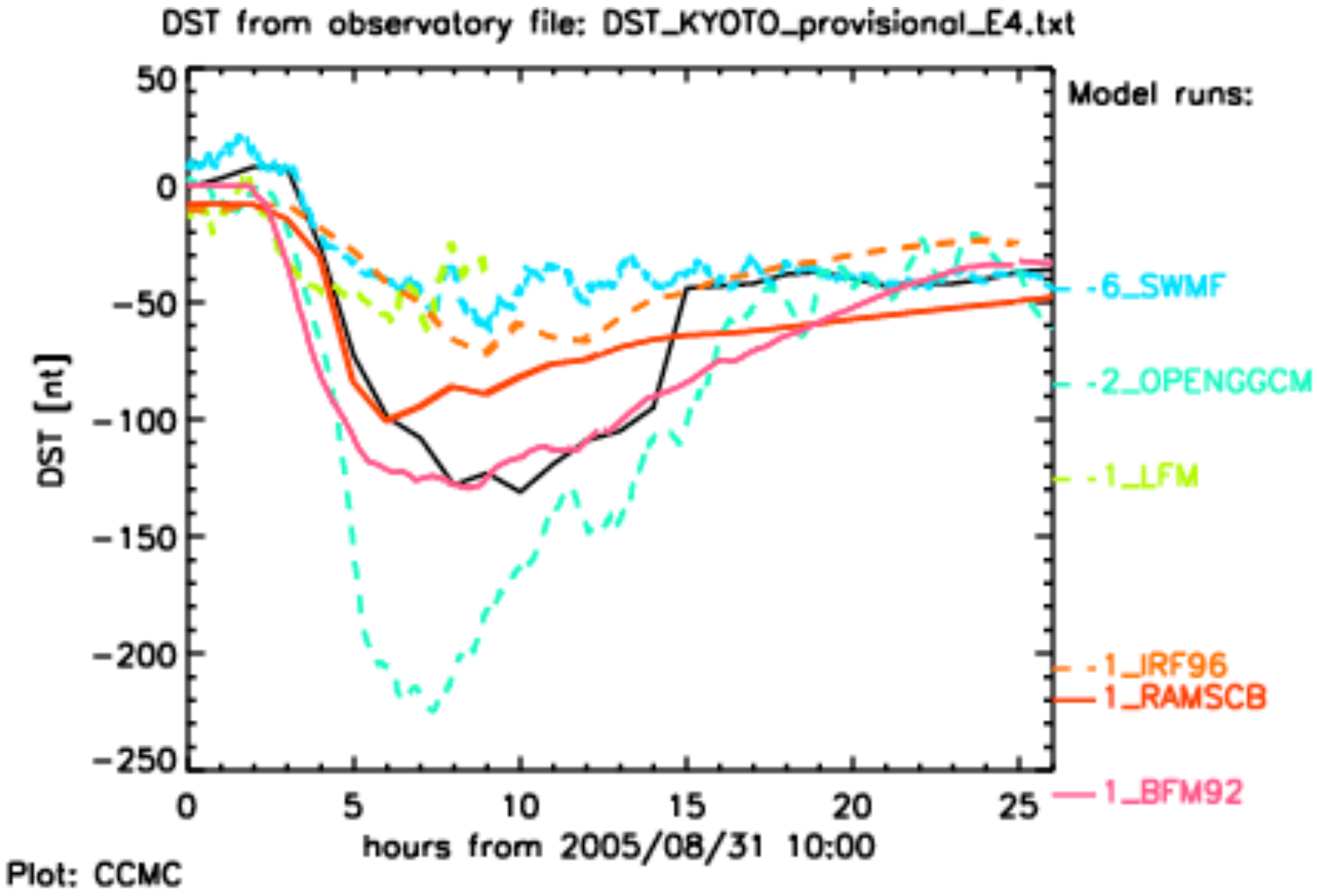
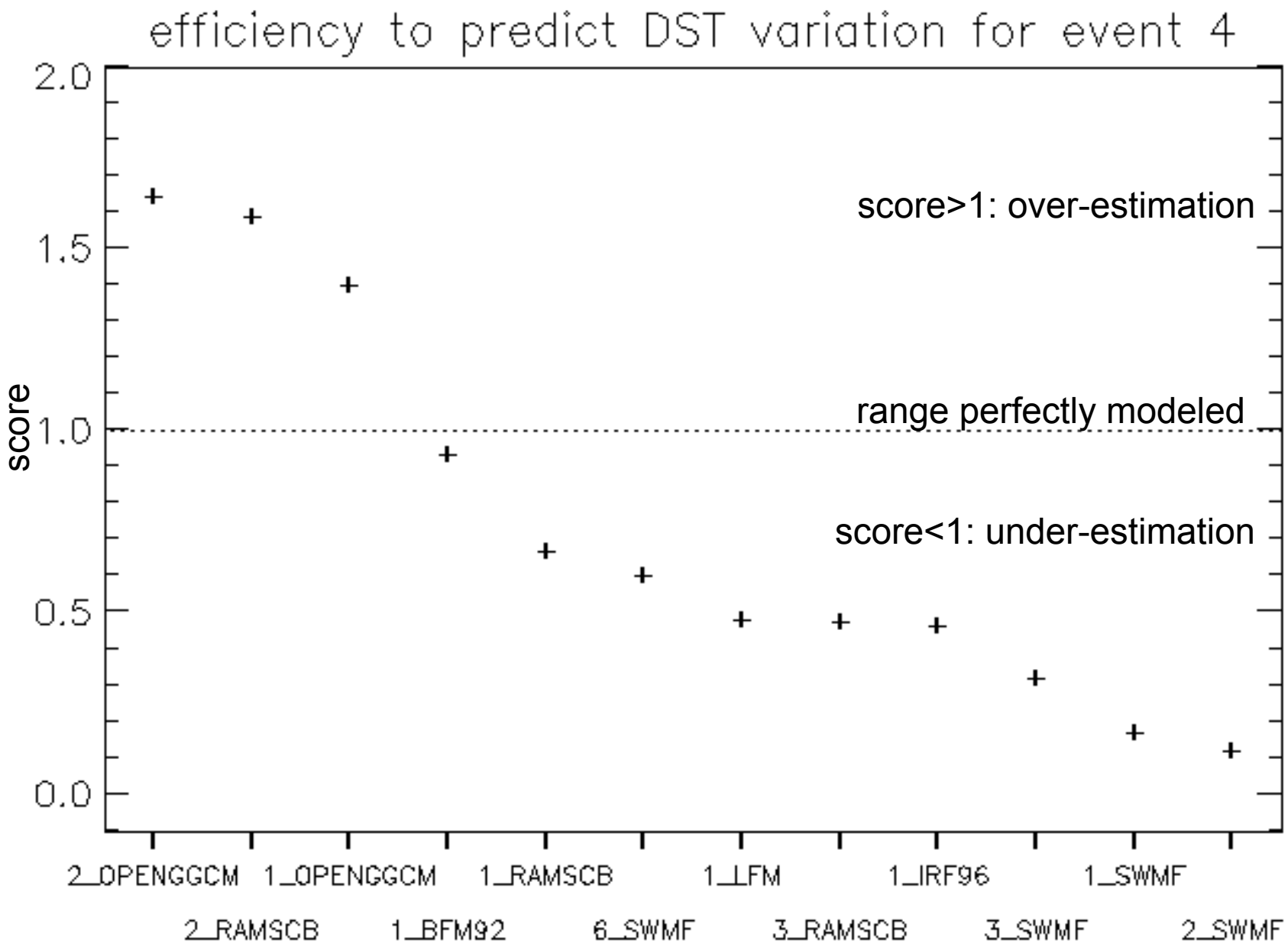
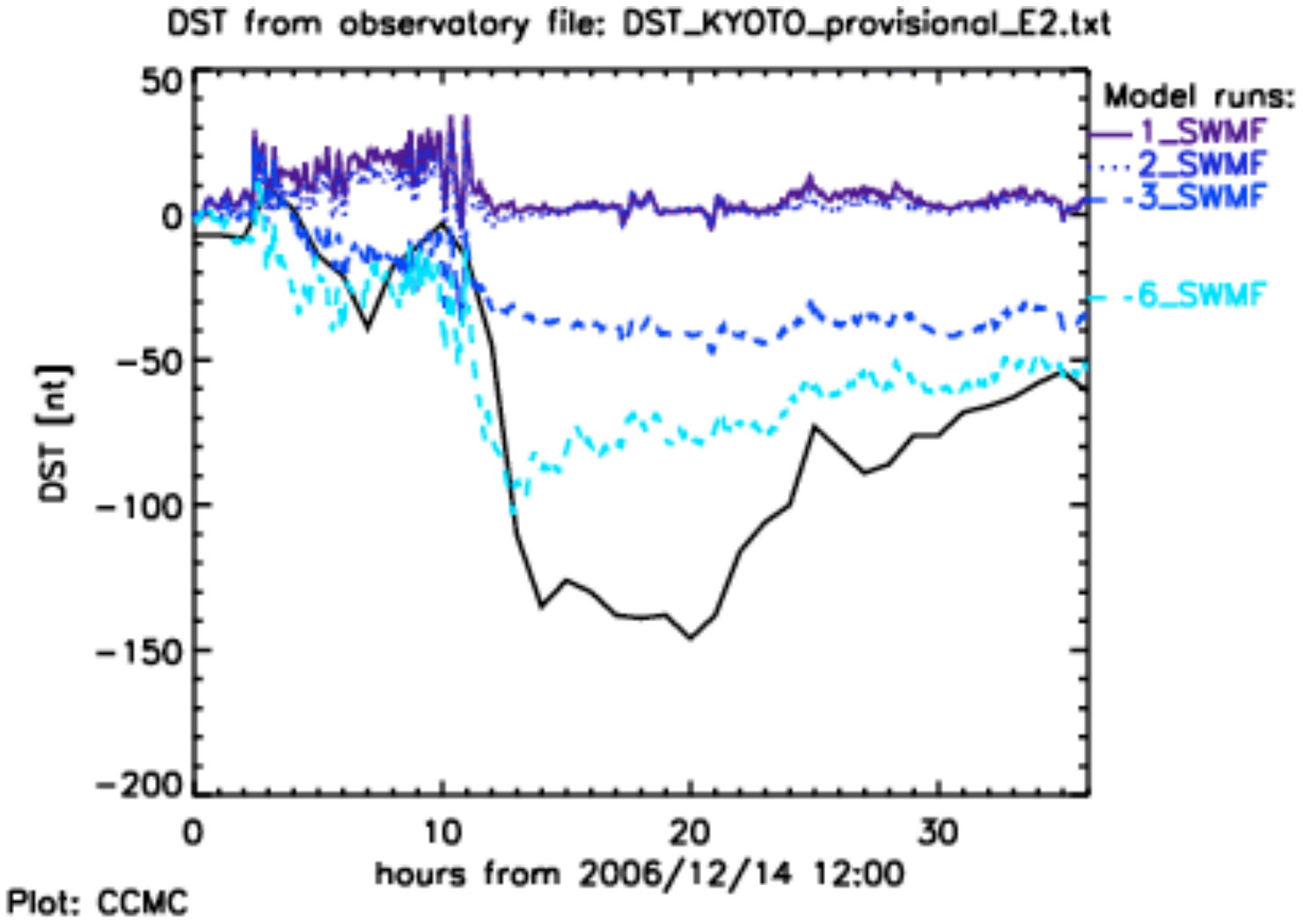



efficiency to predict DST variation for event 4
score
2.0
1.5
1.0
0.5
0.0
score>1: over-estimation
range perfectly modeled
score<1: under-estimation
2_OPENGGCM
1_OPENGGCM
1_RAMSCB
1_LFM
1_IRF96
1_SWMF
2_RAMSCB
1_BFM92
6_SWMF
3_RAMSCB
3_SWMF
2_SWMF

Event 2 – AGU storm



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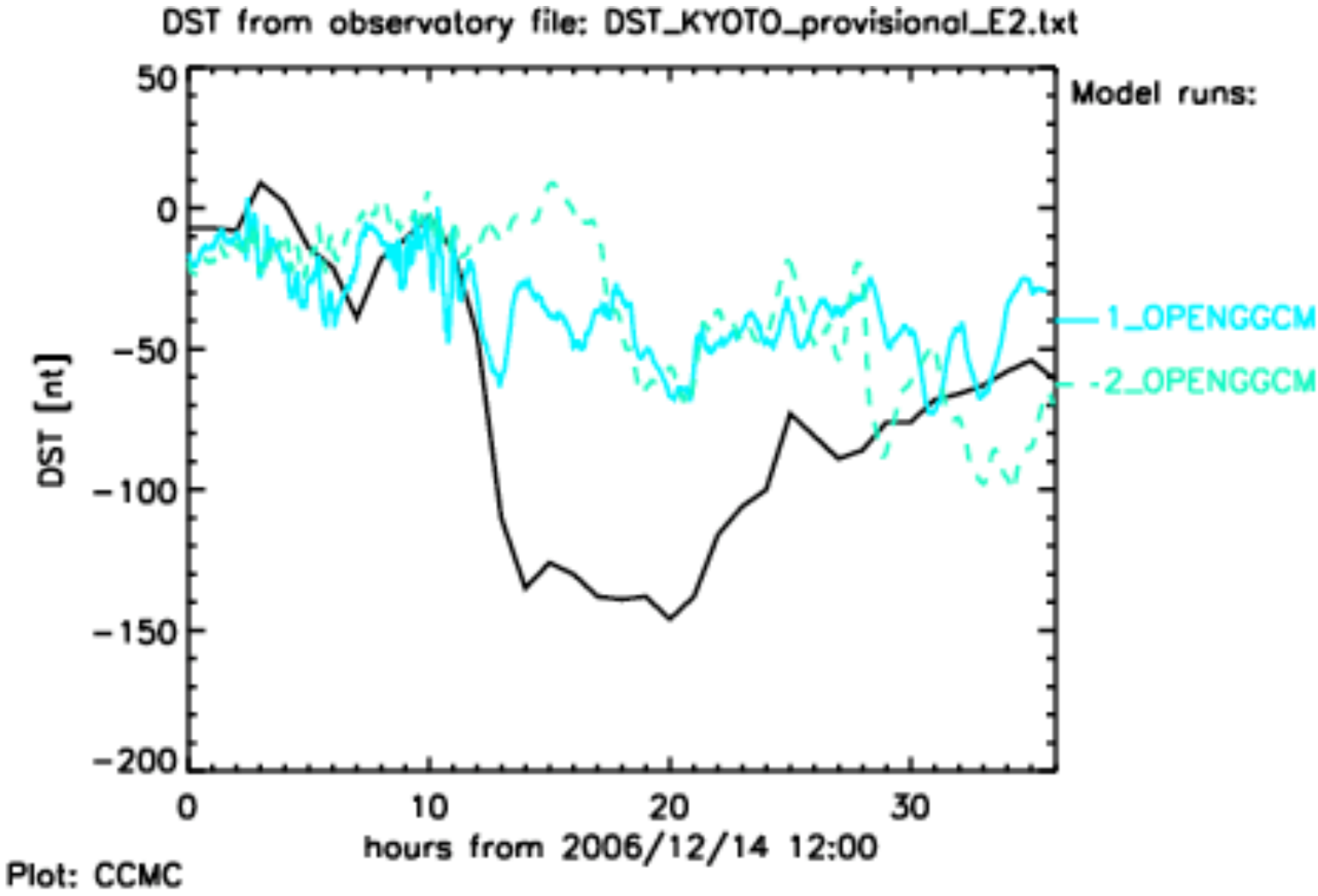

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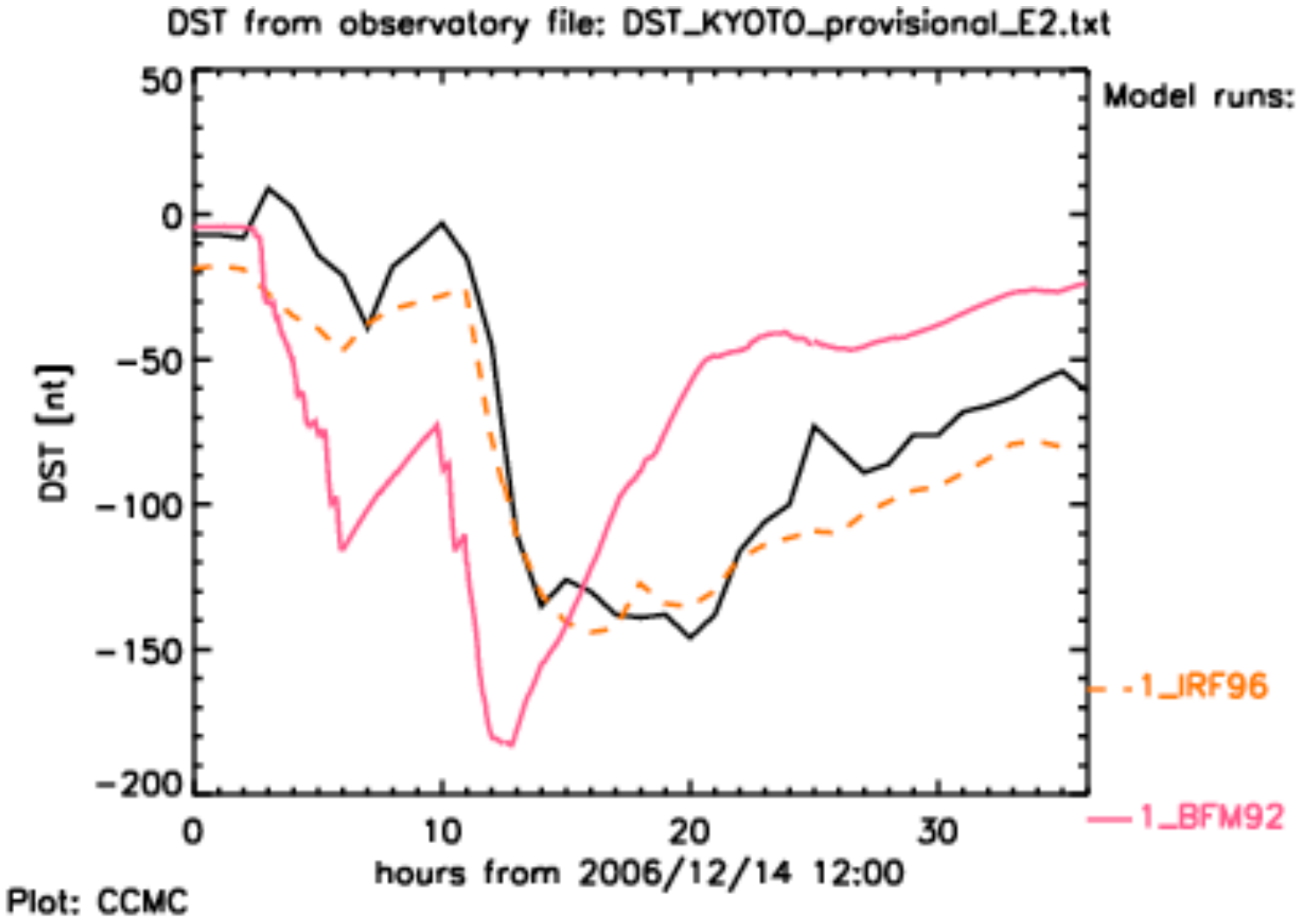

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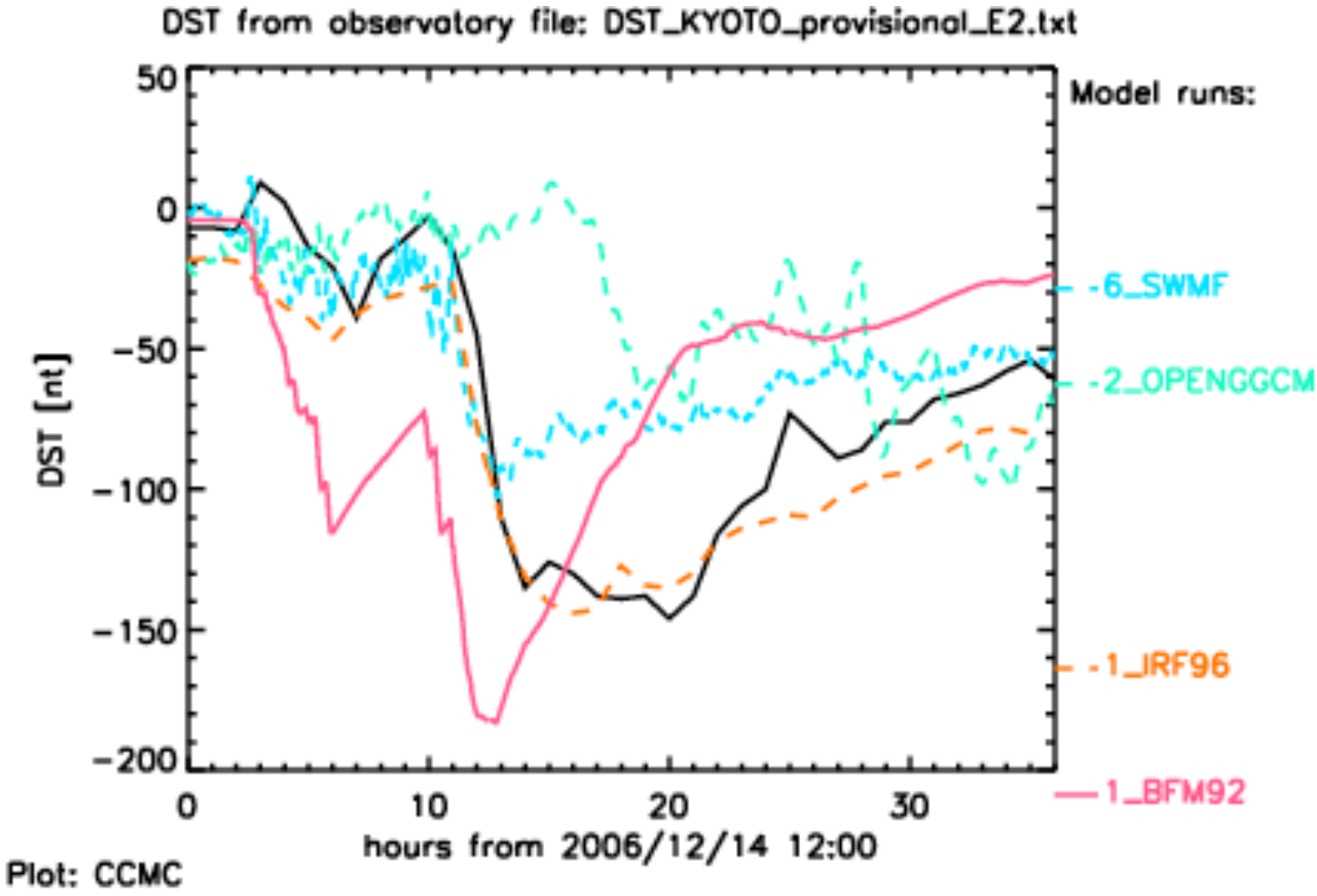

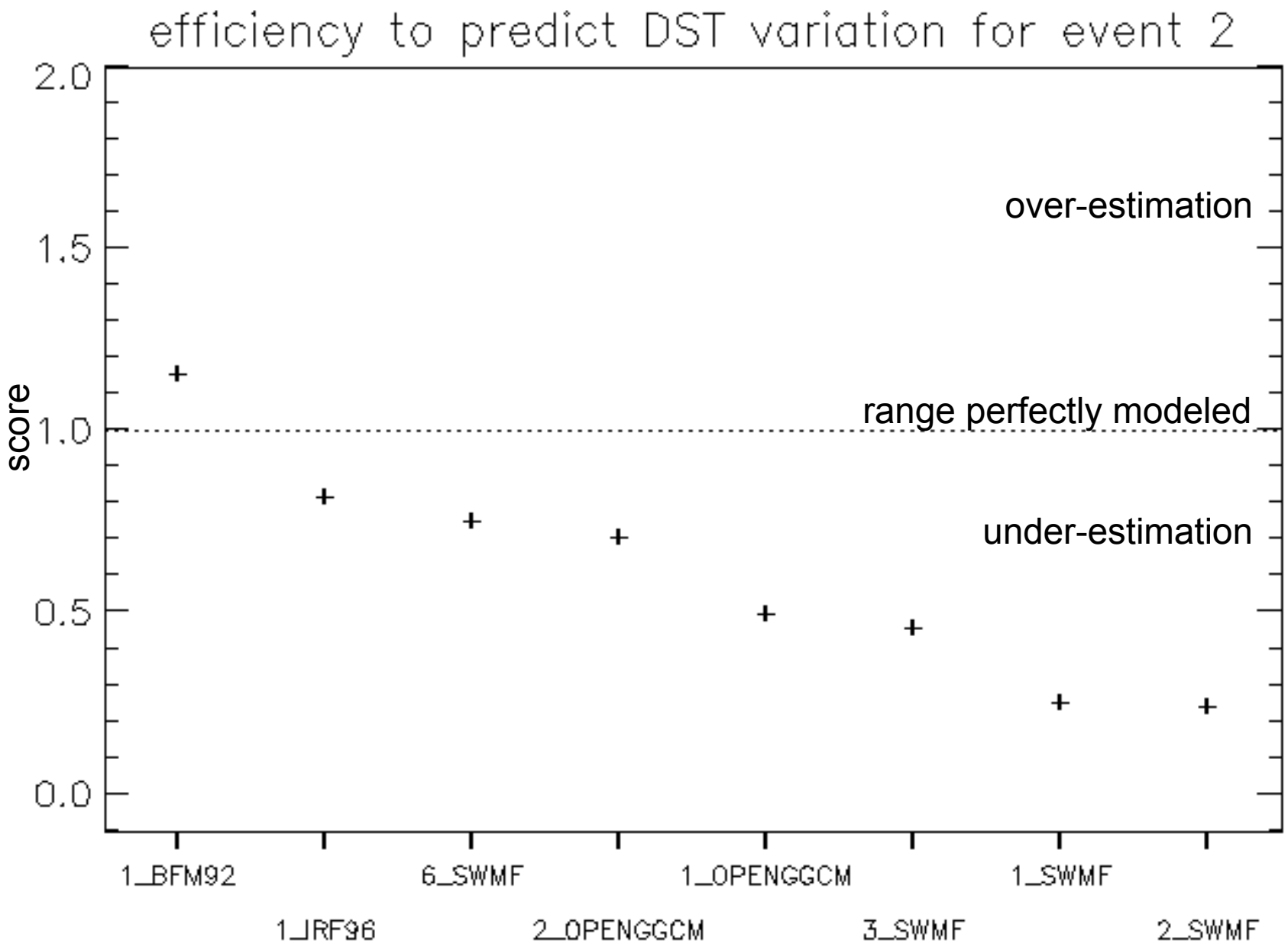
efficiency to predict DST variation for event 2
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score
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range perfectly modeled
under-estimation
1_BFM92
1_JRF96
6_SWMF
2_OPENGGCM
1_OPENGGCM
3_SWMF
1_SWMF
2_SWMF