Magnetic Field Modeling Constrained by GOES and THEMIS

– the 16 February 2008 Substorm event –

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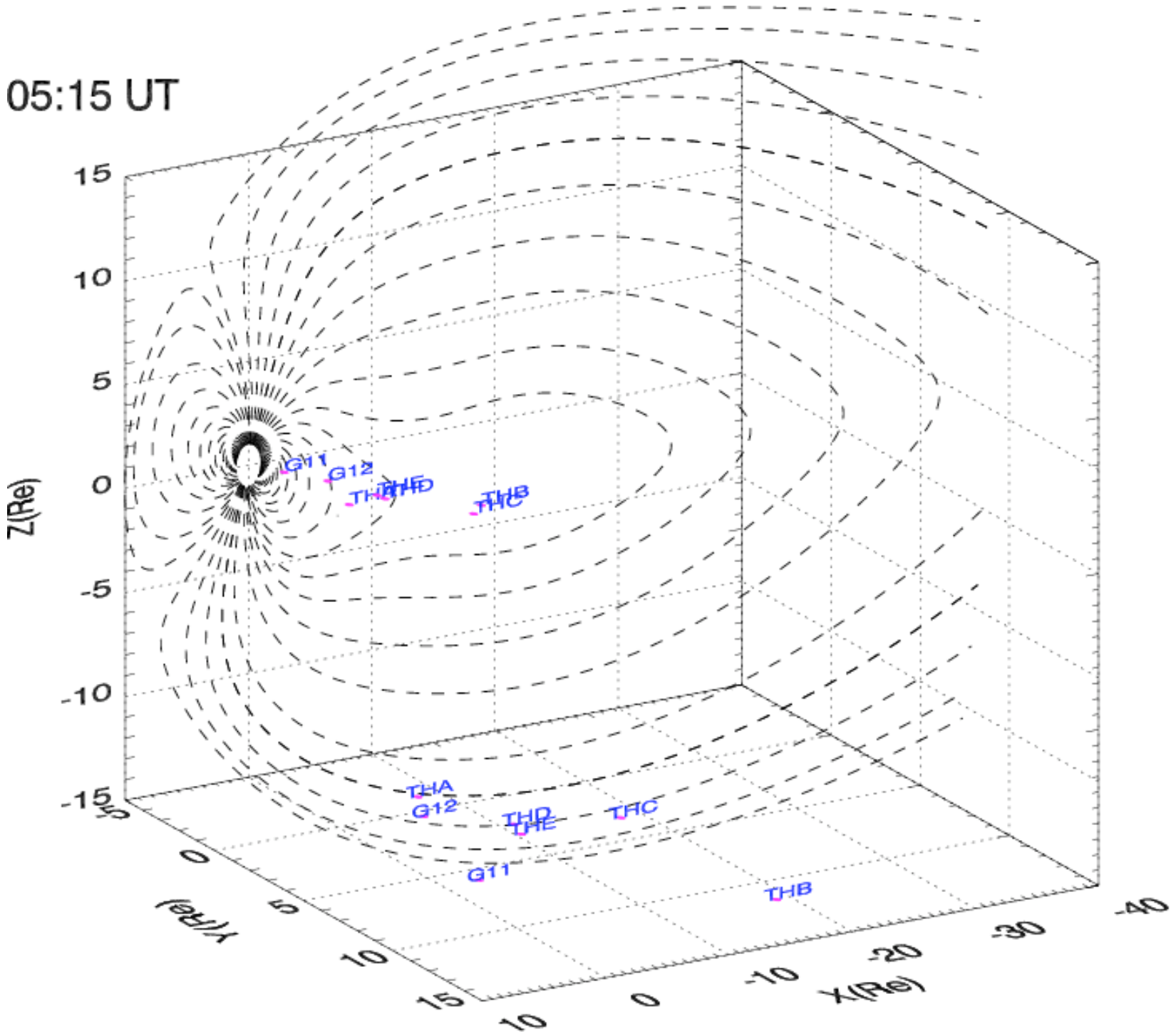
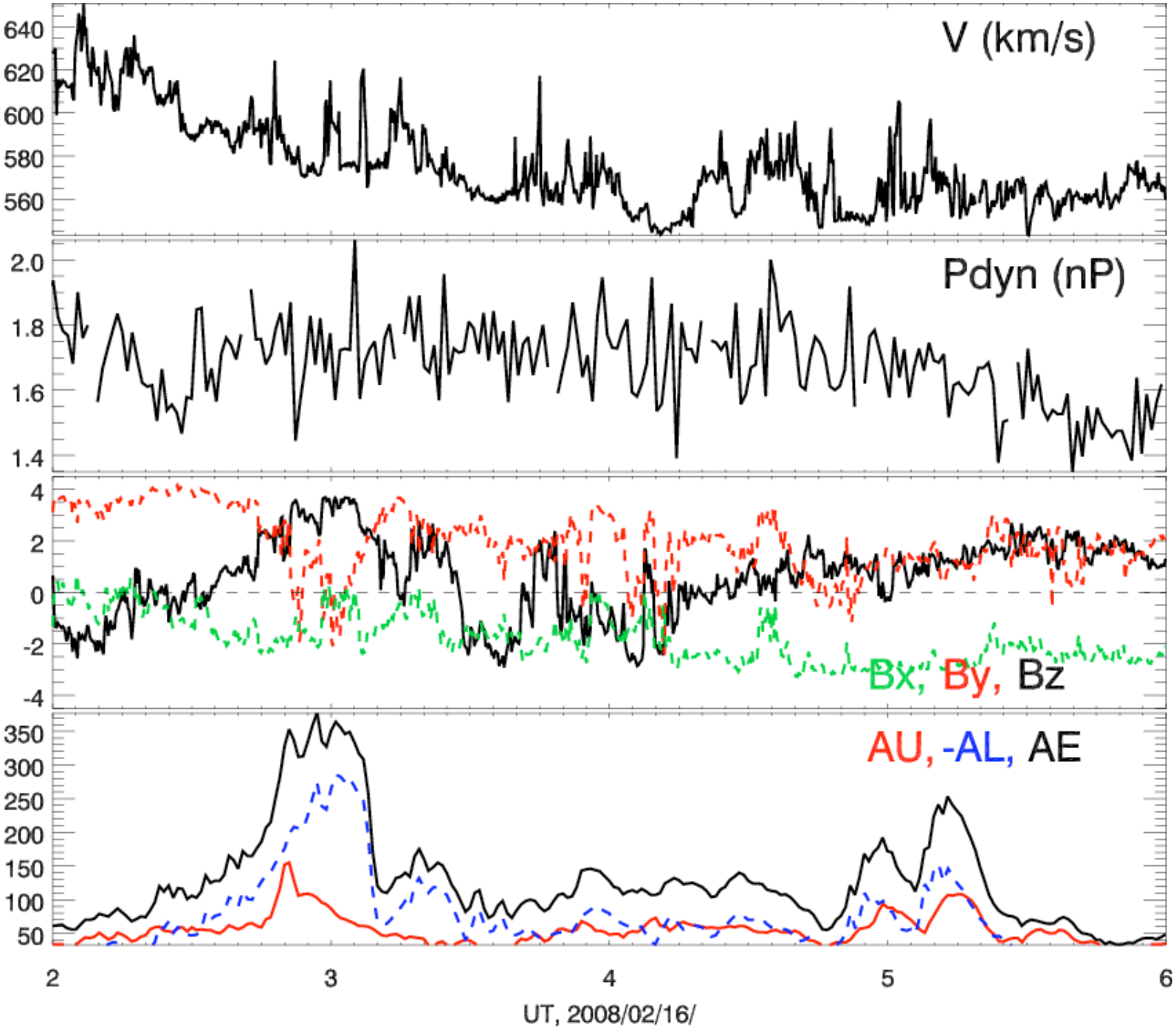
HAO/NCAR

GEM Workshop, June 18-22, 2012, Snowmass


05:15 UT
Z(Re)
15
10
5
0
-5
-10
-15
G11
G12
THA
THD
THE
THB
THC
Y(Re)
10
5
0
-5
-10
-15
X(Re)
10
0
-10
-20
-30
-40


V (km/s)
640
620
600
580
560
Pdyn (nP)
2.0
1.8
1.6
1.4
Bx, By, Bz
4
2
0
-2
-4
AU, -AL, AE
350
300
250
200
150
100
50
2
3
4
5
6
UT, 2008/02/16/

Model Description

$$B = B^* + B_{SCW}$$

Where

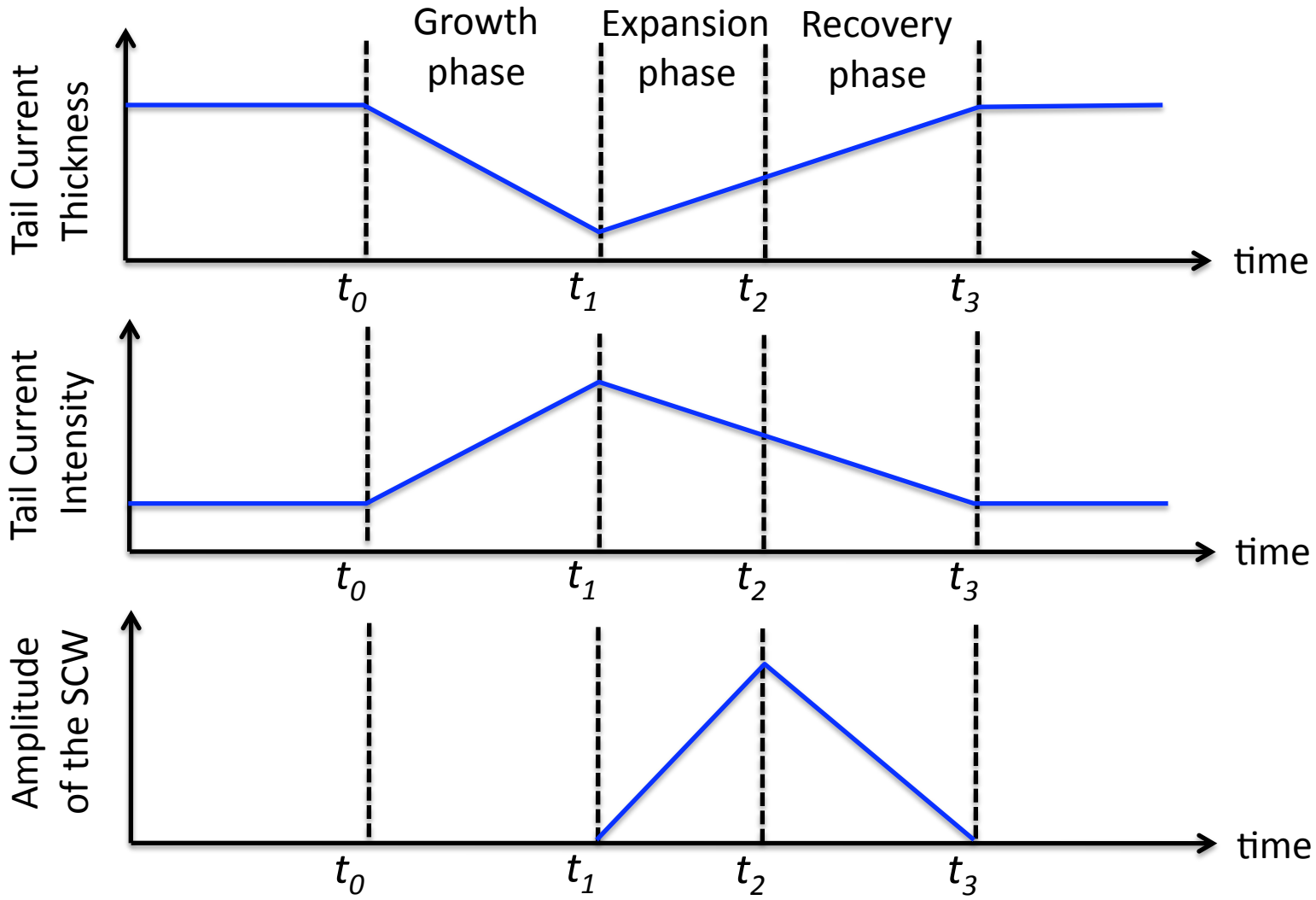
B^* is the modified T04 (T96, T01) model by changing the tail current intensity and the sheet thickness to:

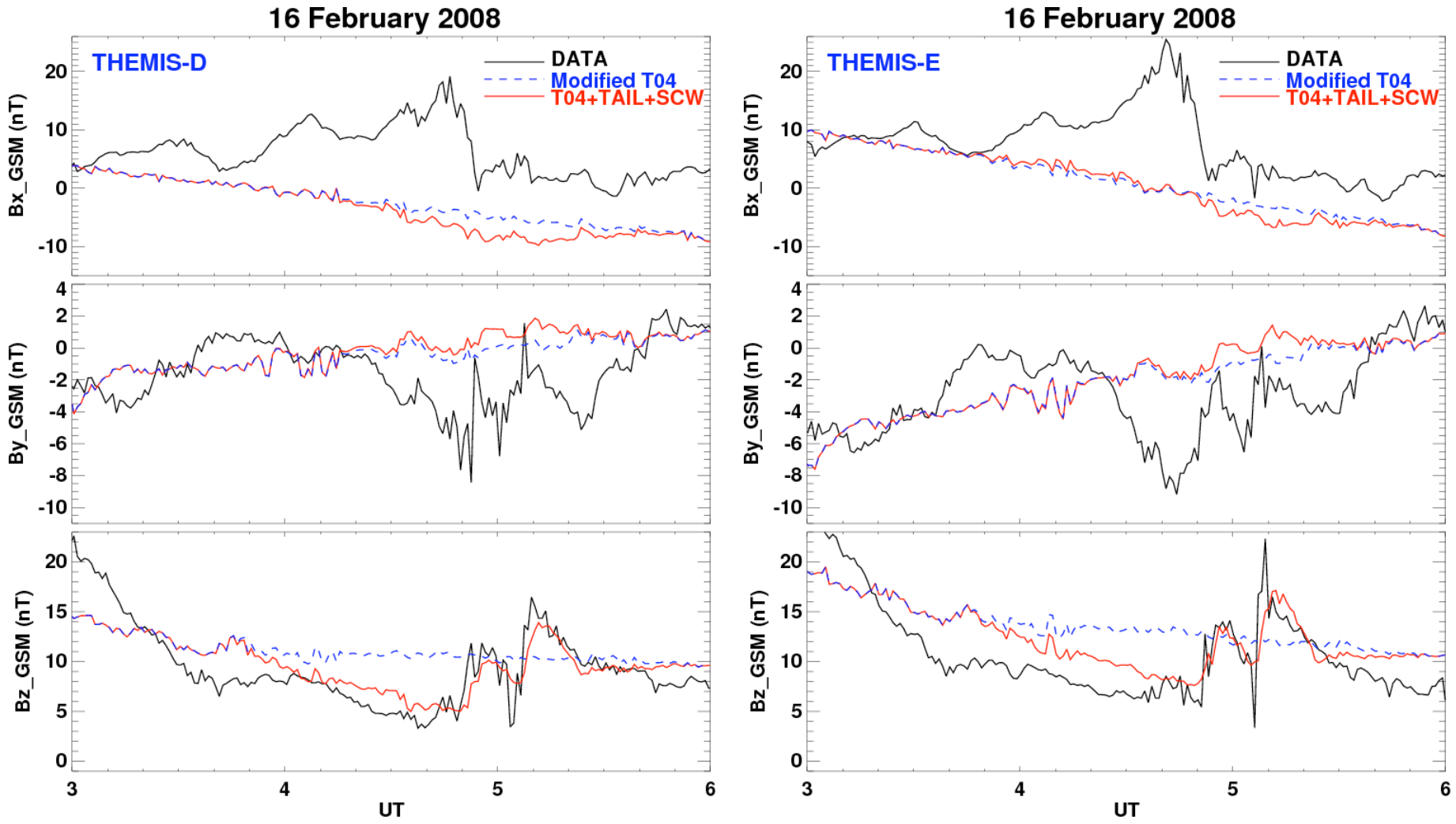
$$D(X,Y) \rightarrow D(X,Y)\left[1 - f\left(\frac{X - X_c}{\Delta X}, \frac{Y - Y_c}{\Delta Y}\right)\right]$$

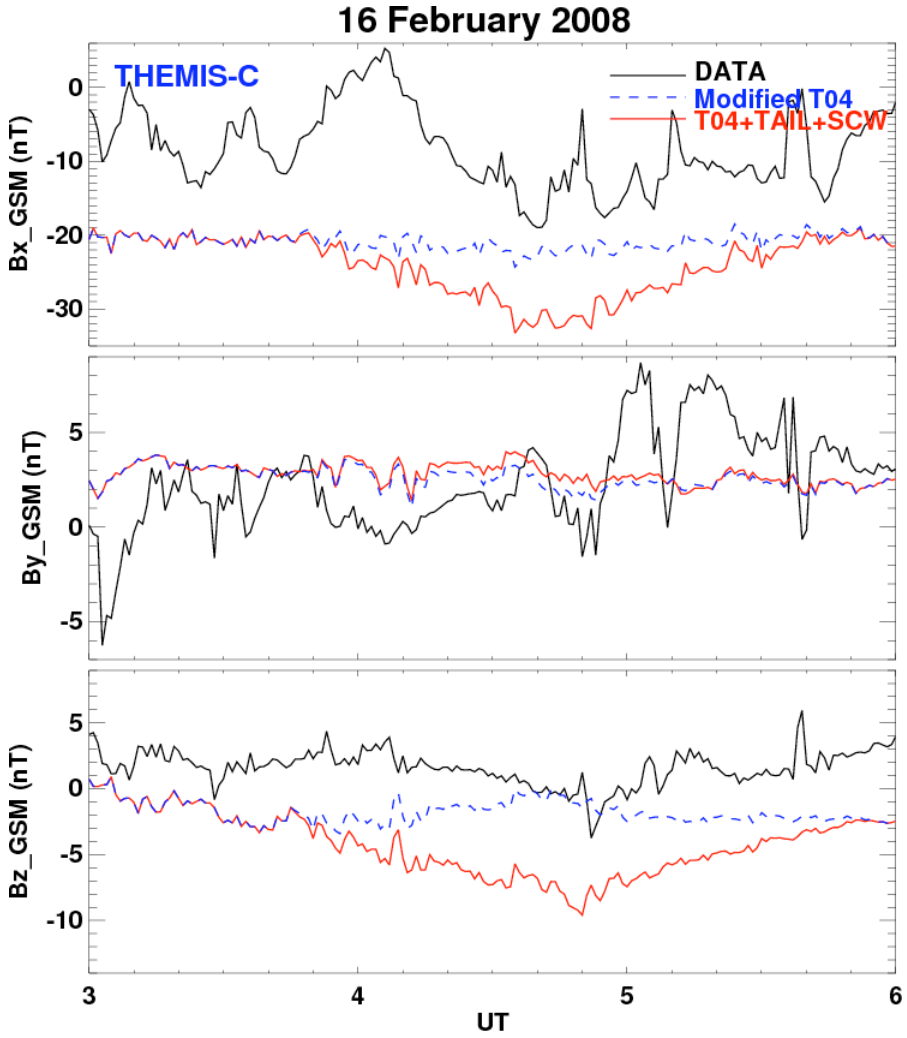
B_{SCW} is the substorm current wedge model [Tsyganenko, 1997] which consists of a pair of spread-out current loops. The amplitude of the SCW is defined by:

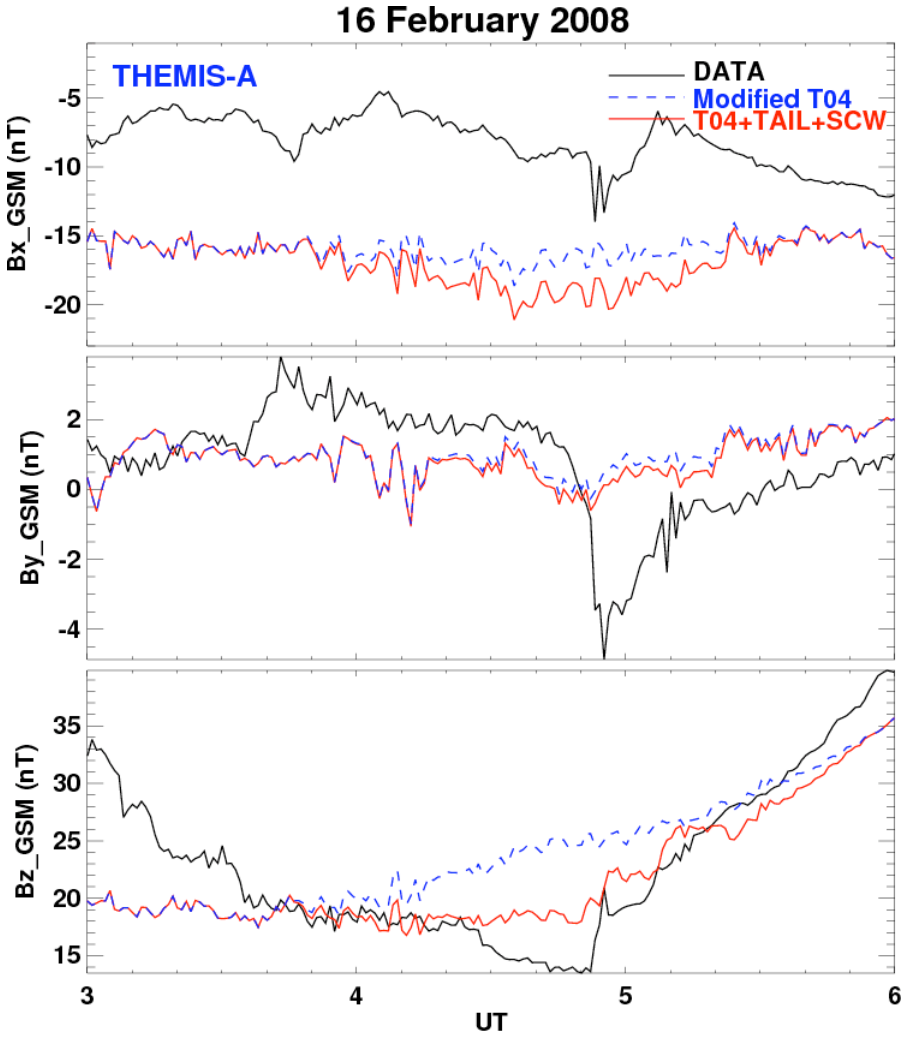
$$A = \begin{cases} 0 & AL > AL_0 \\ f\left(|AL| - |AL_0|\right) & AL < AL_0 \end{cases}$$

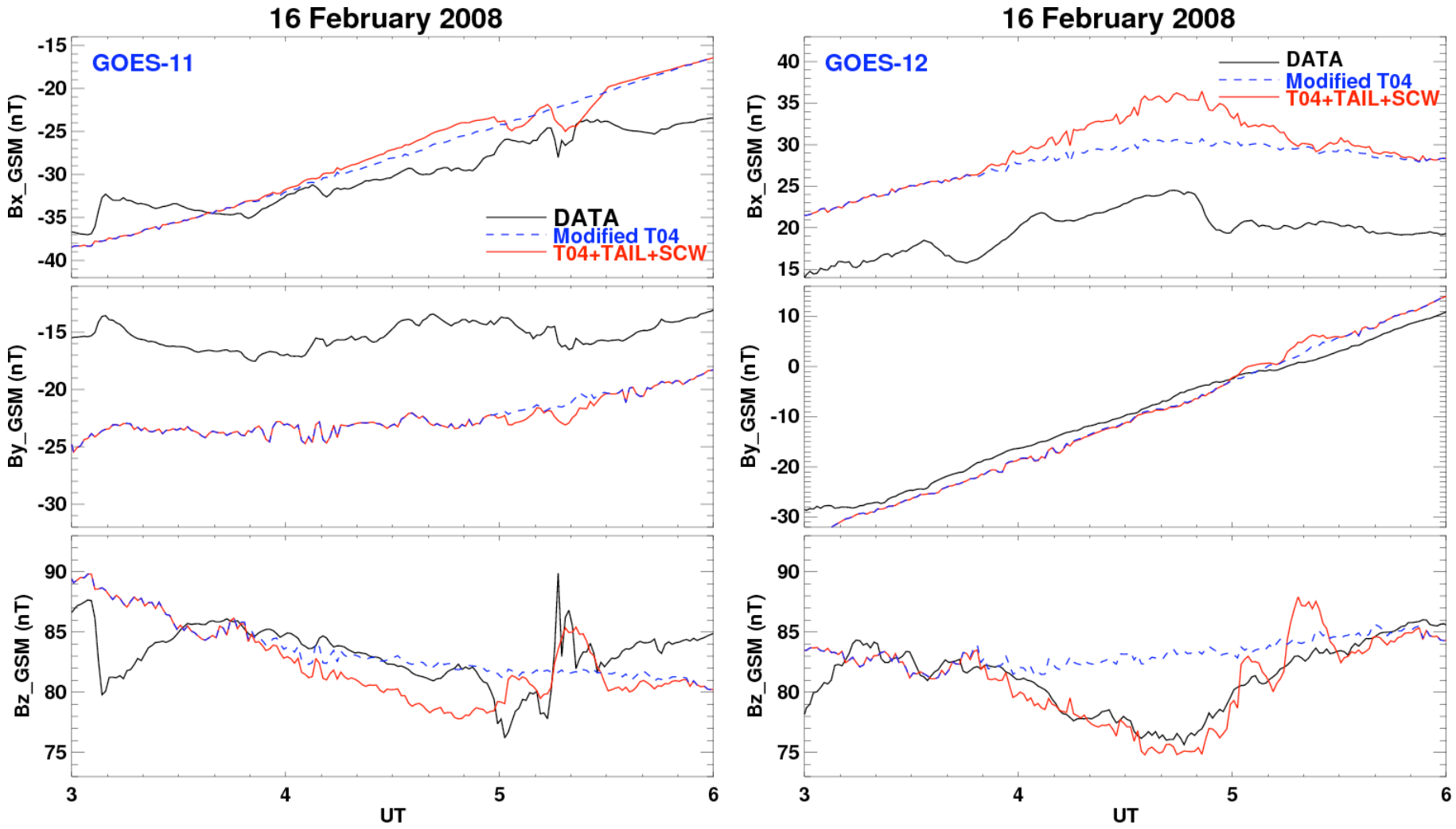
Modification of Parameters




16 February 2008
THEMIS-D
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT
16 February 2008
THEMIS-E
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT


16 February 2008
THEMIS-C
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT


16 February 2008
THEMIS-A
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT


16 February 2008
GOES-11
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT
16 February 2008
GOES-12
DATA
Modified T04
T04+TAIL+SCW
Bx_GSM (nT)
By_GSM (nT)
Bz_GSM (nT)
UT