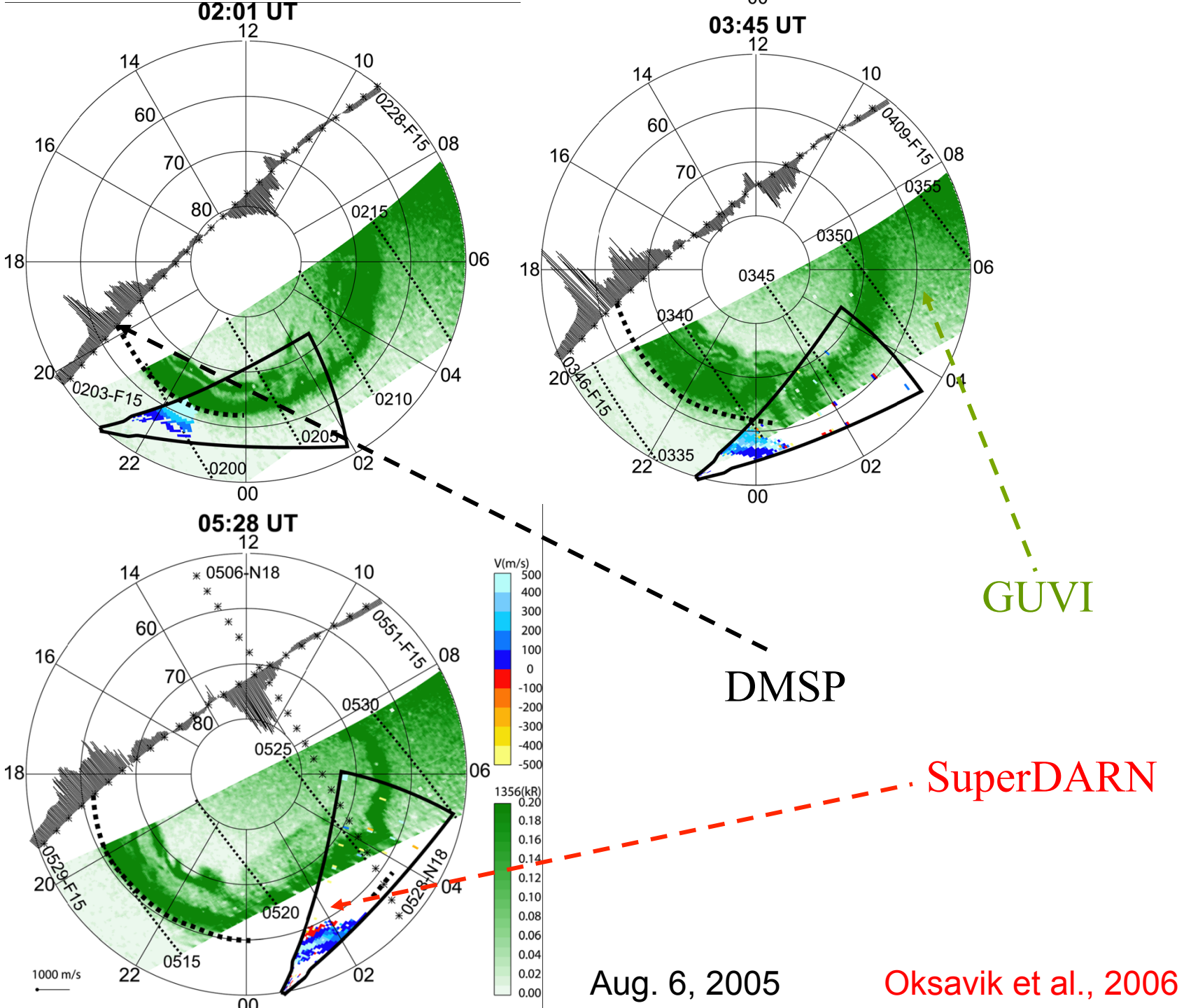
The effect of SAPS on global thermosphere and ionosphere

Wenbin Wang, Elsayed Talaat, Alan Burns, Barbary Emery, Syau-yun Hsieh, Jiuhou Lei, and Jiyao Xu


02:01 UT
03:45 UT
05:28 UT
0228-F15
0215
0210
0205
0200
0203-F15
0409-F15
0355
0350
0345
0340
0346-F15
0335
0506-N18
0551-F15
0530
0525
0520
0515
0529-F15
0528-N18
1000 m/s
V(m/s)
500
400
300
200
100
0
-100
-200
-300
-400
-500
1356(kR)
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
GUVI
DMSP
SuperDARN
Aug. 6, 2005
Oksavik et al., 2006

Model

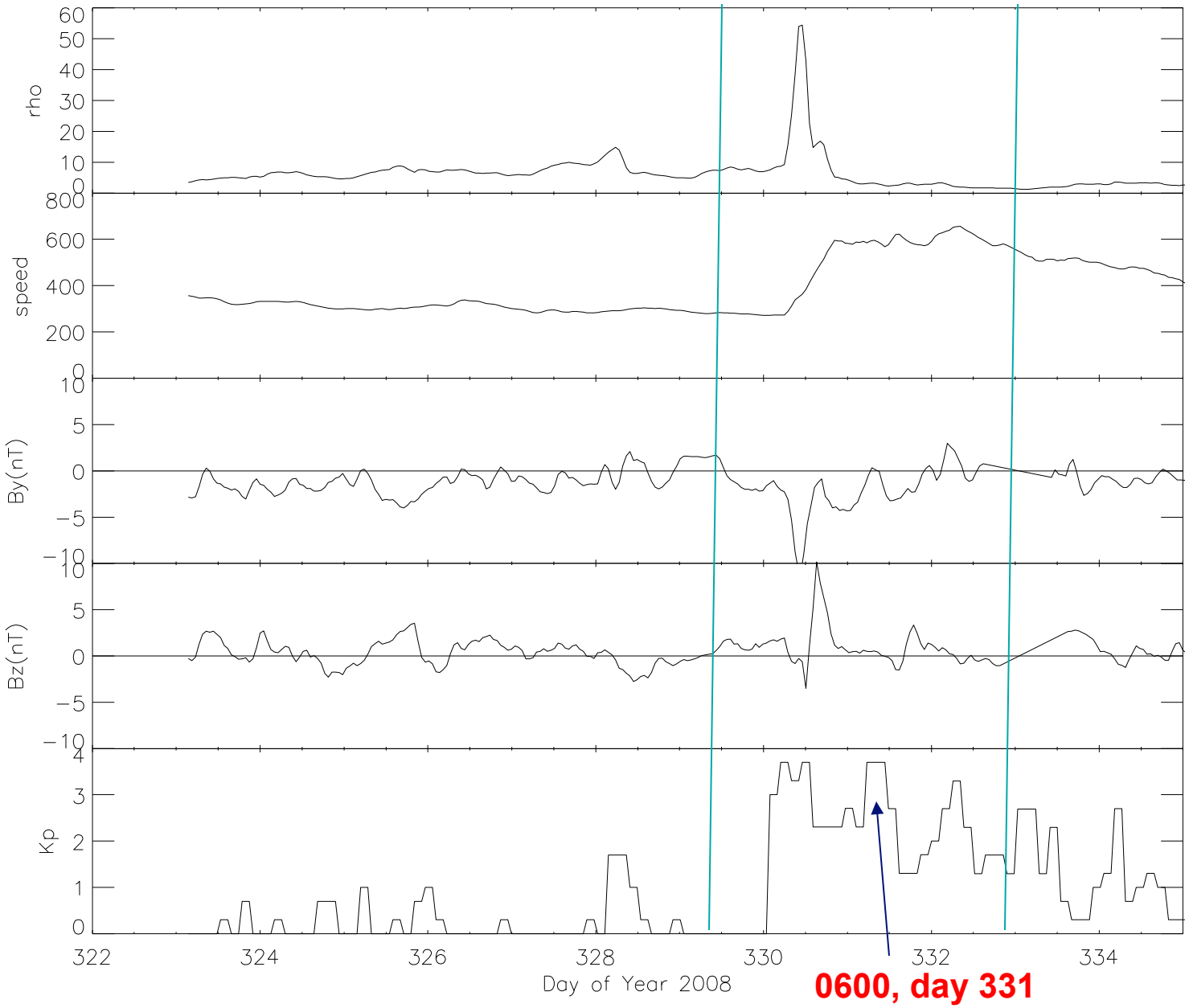
TIEGCM, 2.5 degree resolution

Kp driven

Only horizontal drifts were added to ion drifts in the model

Not self-consistent

Nov. 25-28, 2008

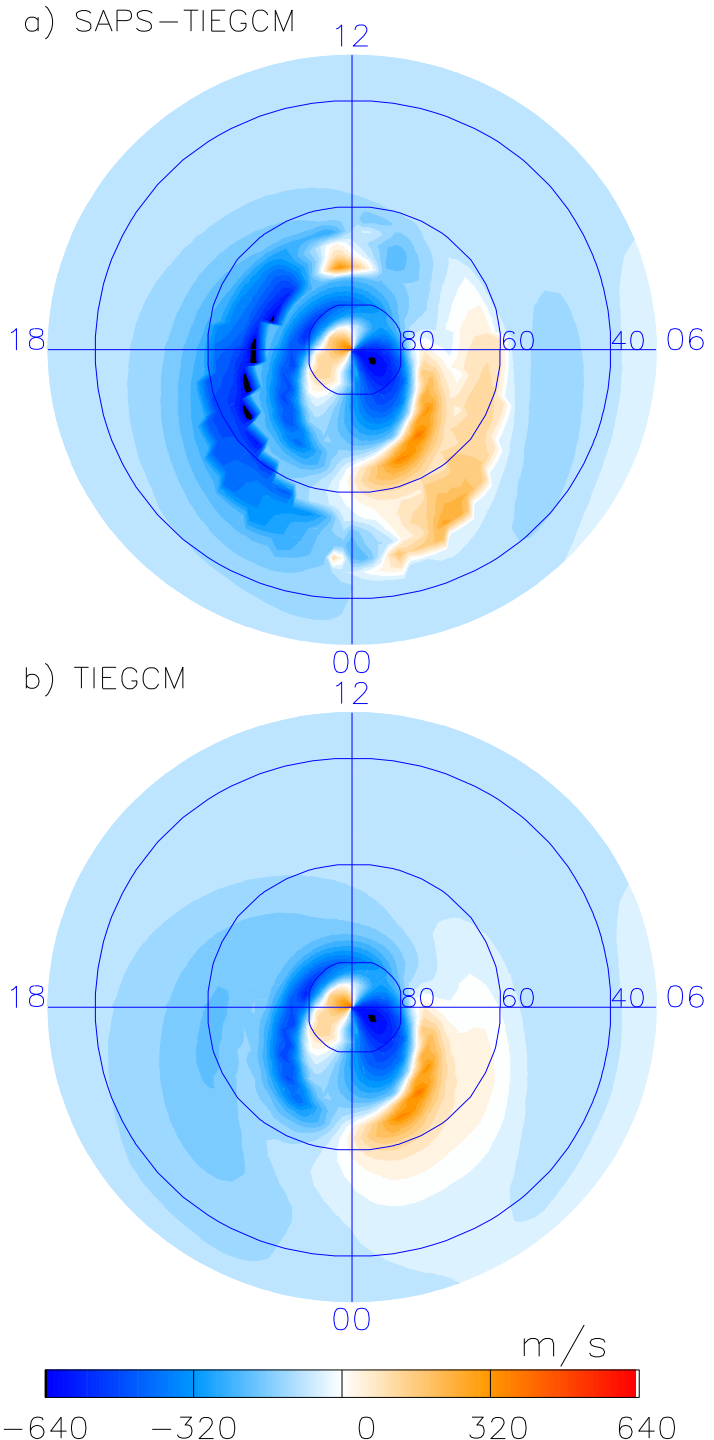


Zonal Ion drifts

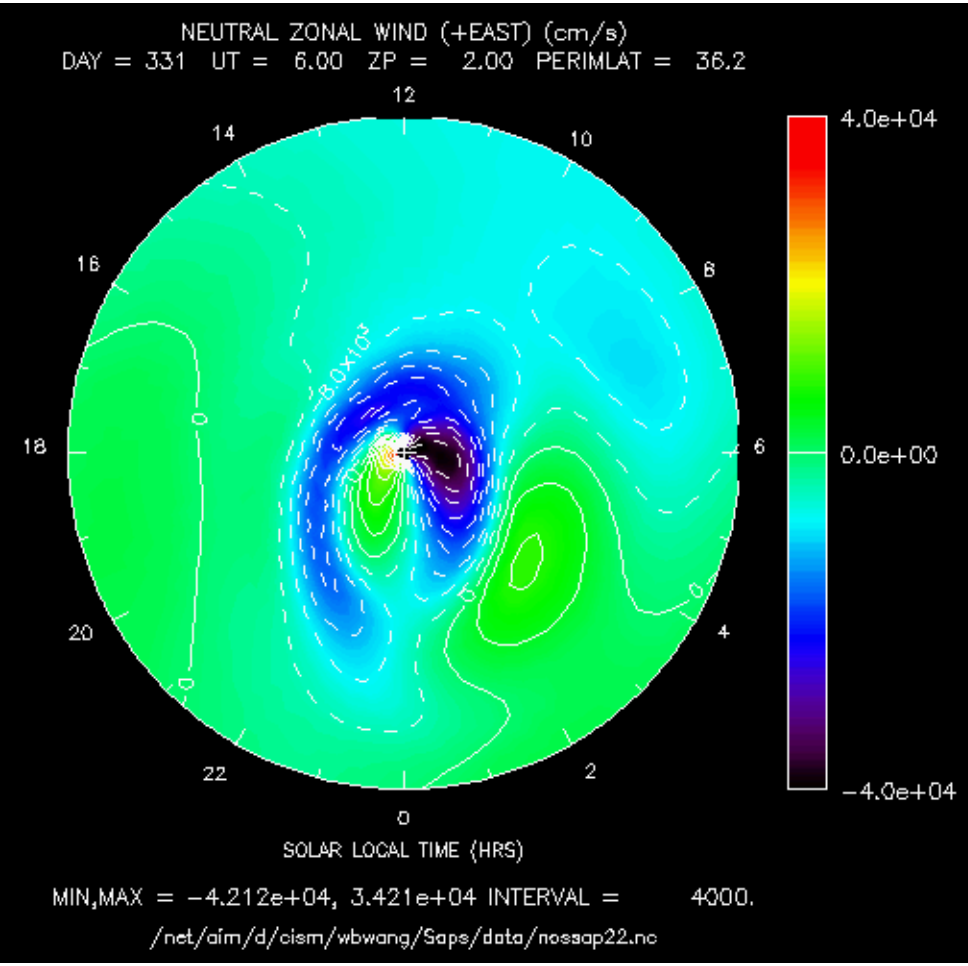
Kp=4

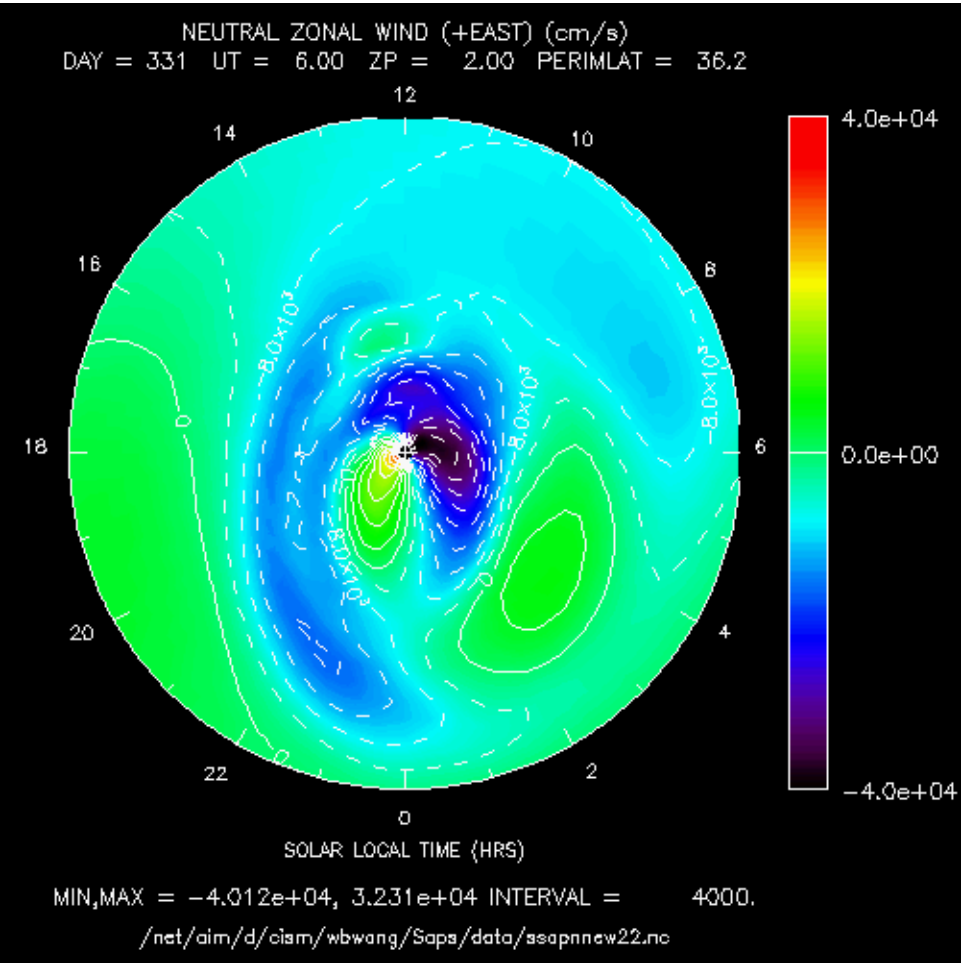
With Saps

Without Saps



Zonal Neutral Winds

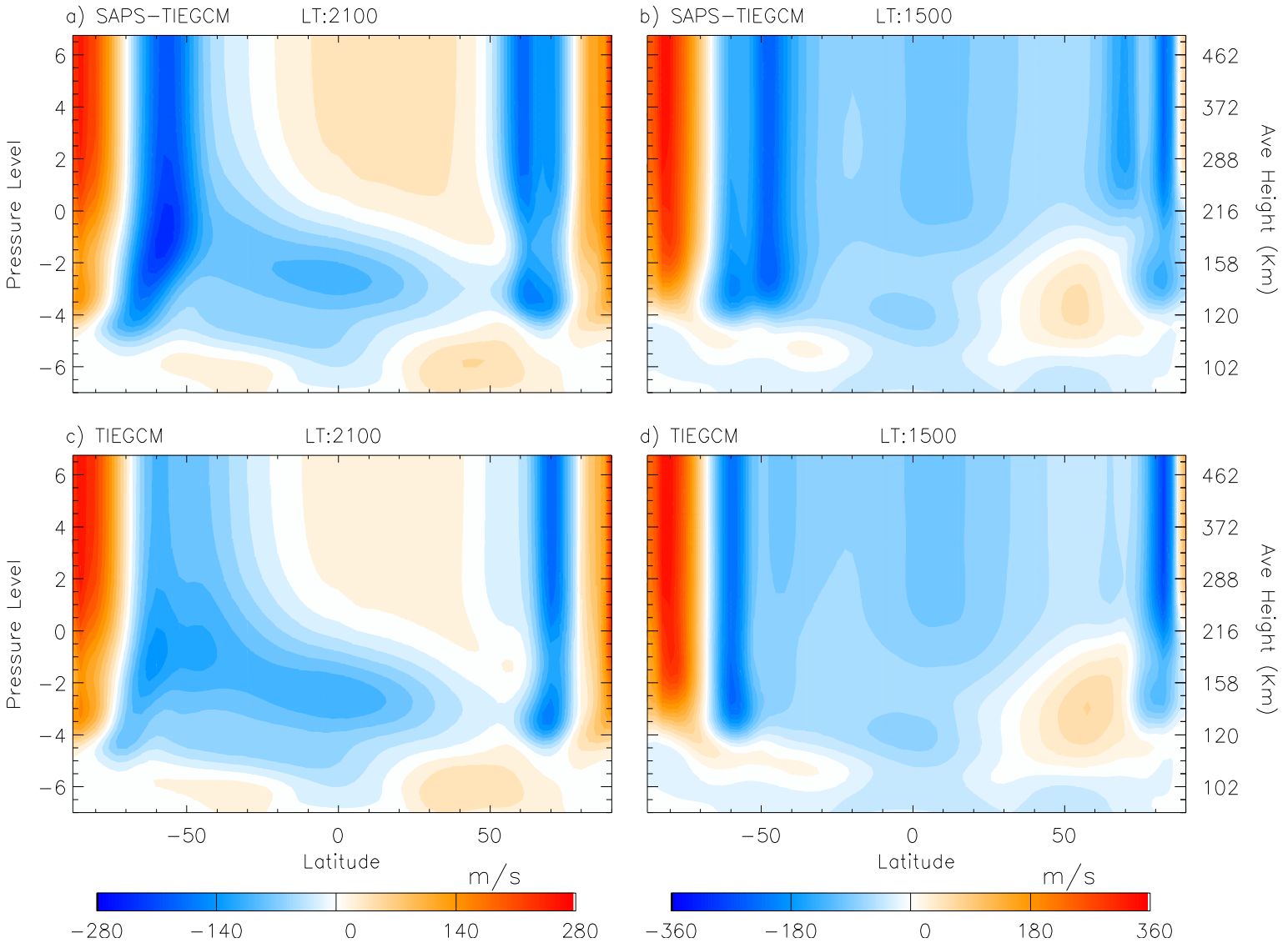




Without Saps

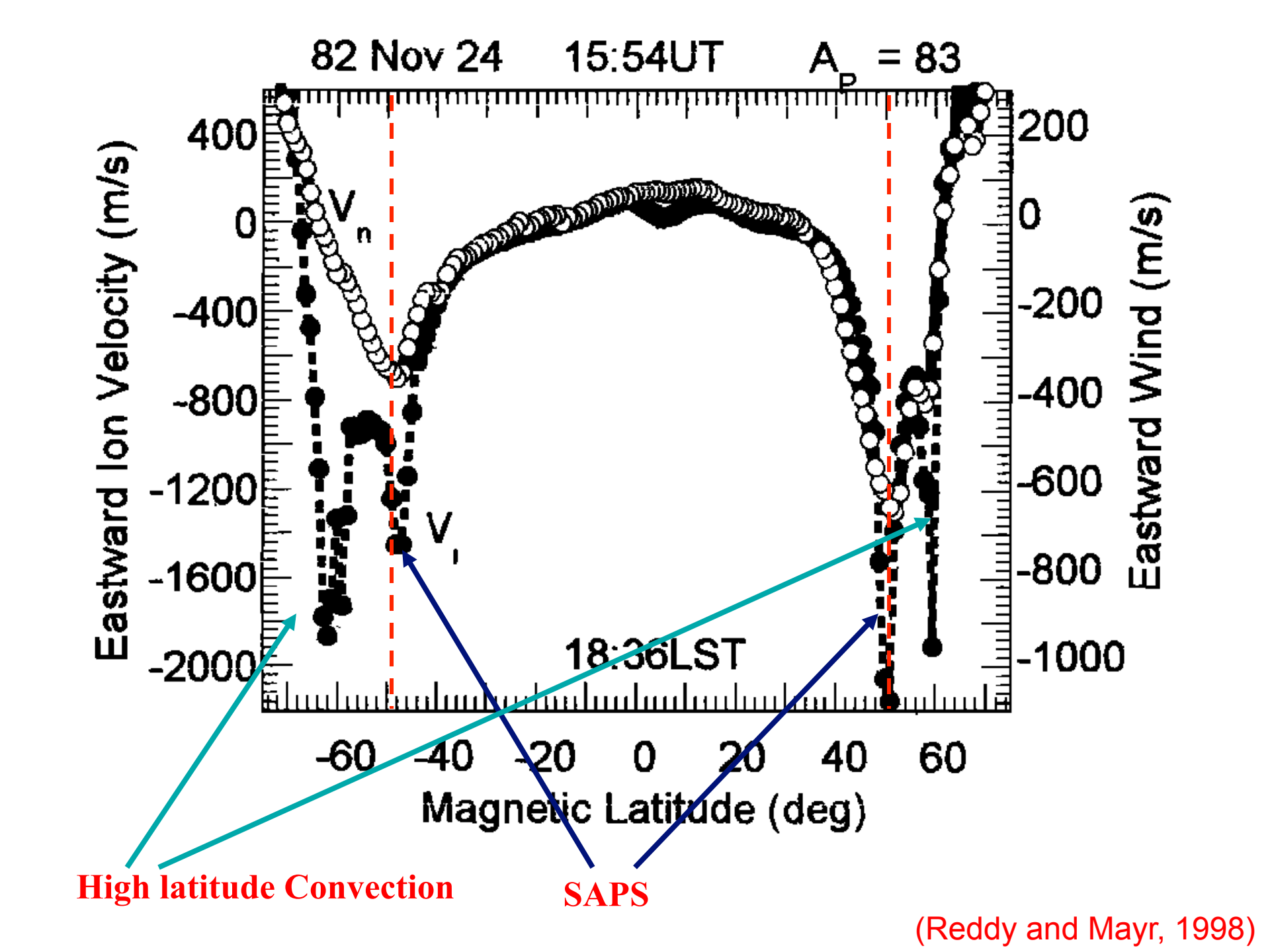
With Saps

Zonal Neutral Winds



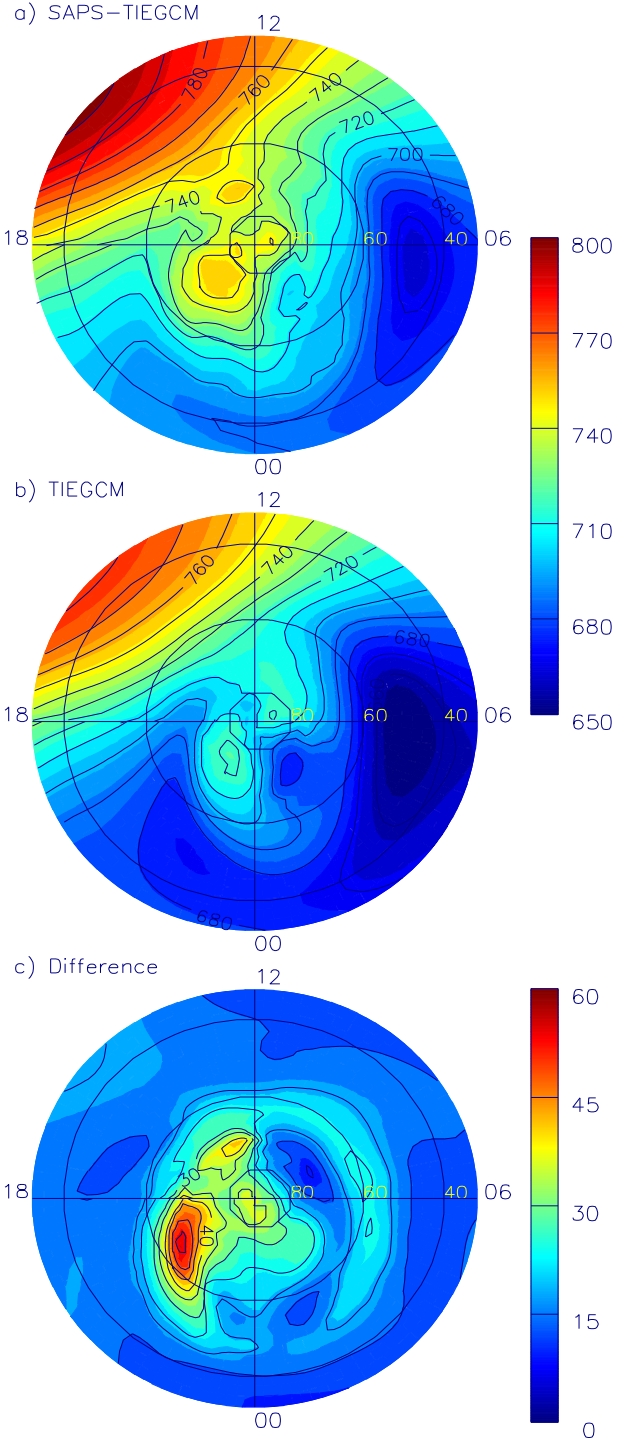
Without Saps

With Saps



(Reddy and Mayr, 1998)

Neutral Temperature

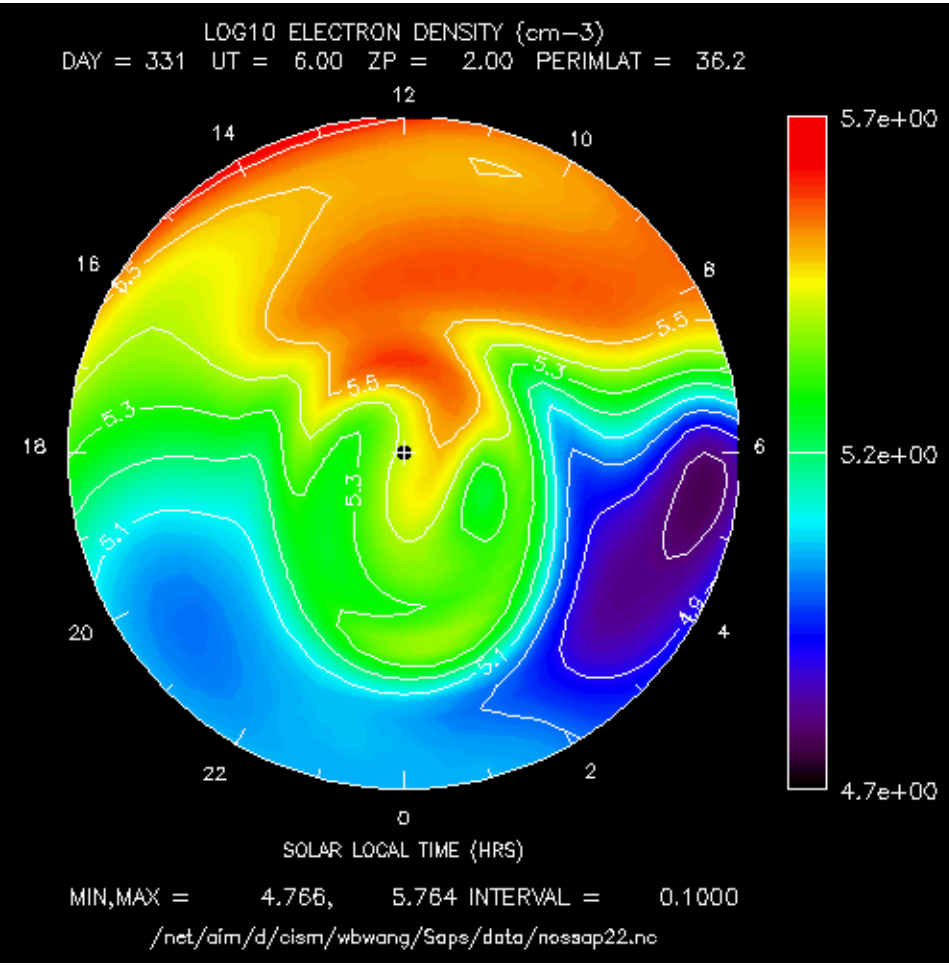


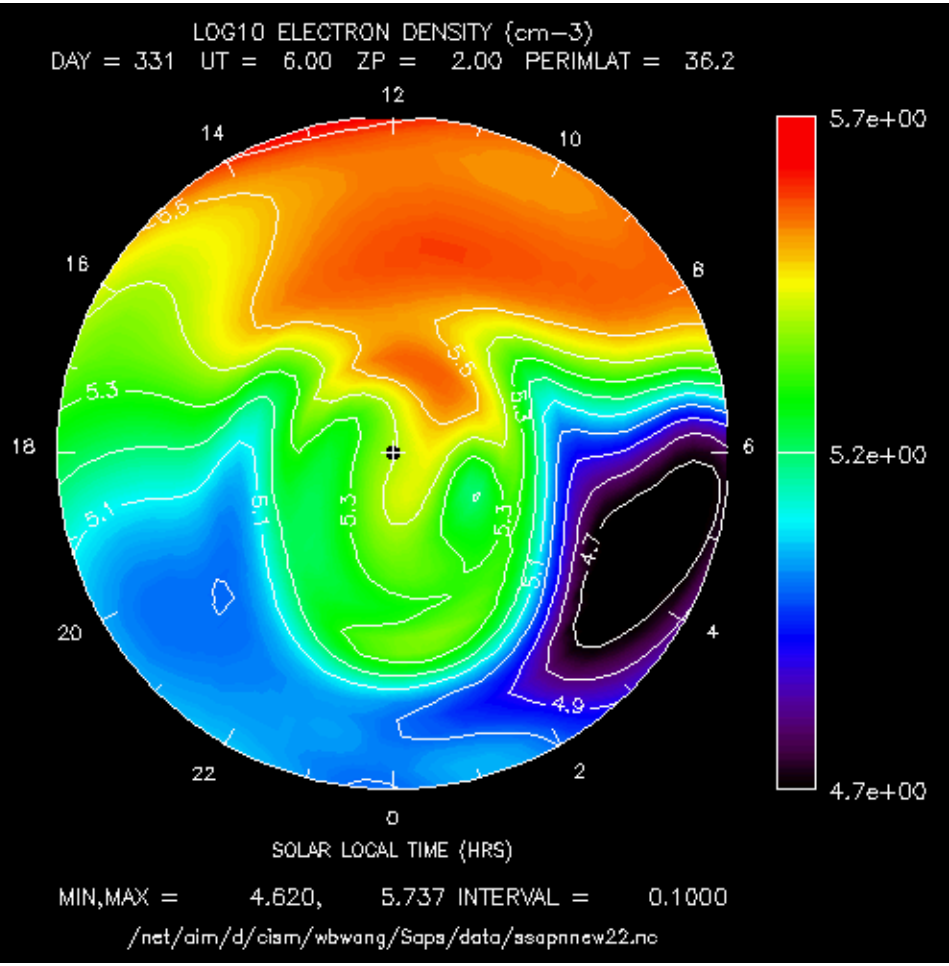
With Saps

Without Saps

Difference

Electron Density

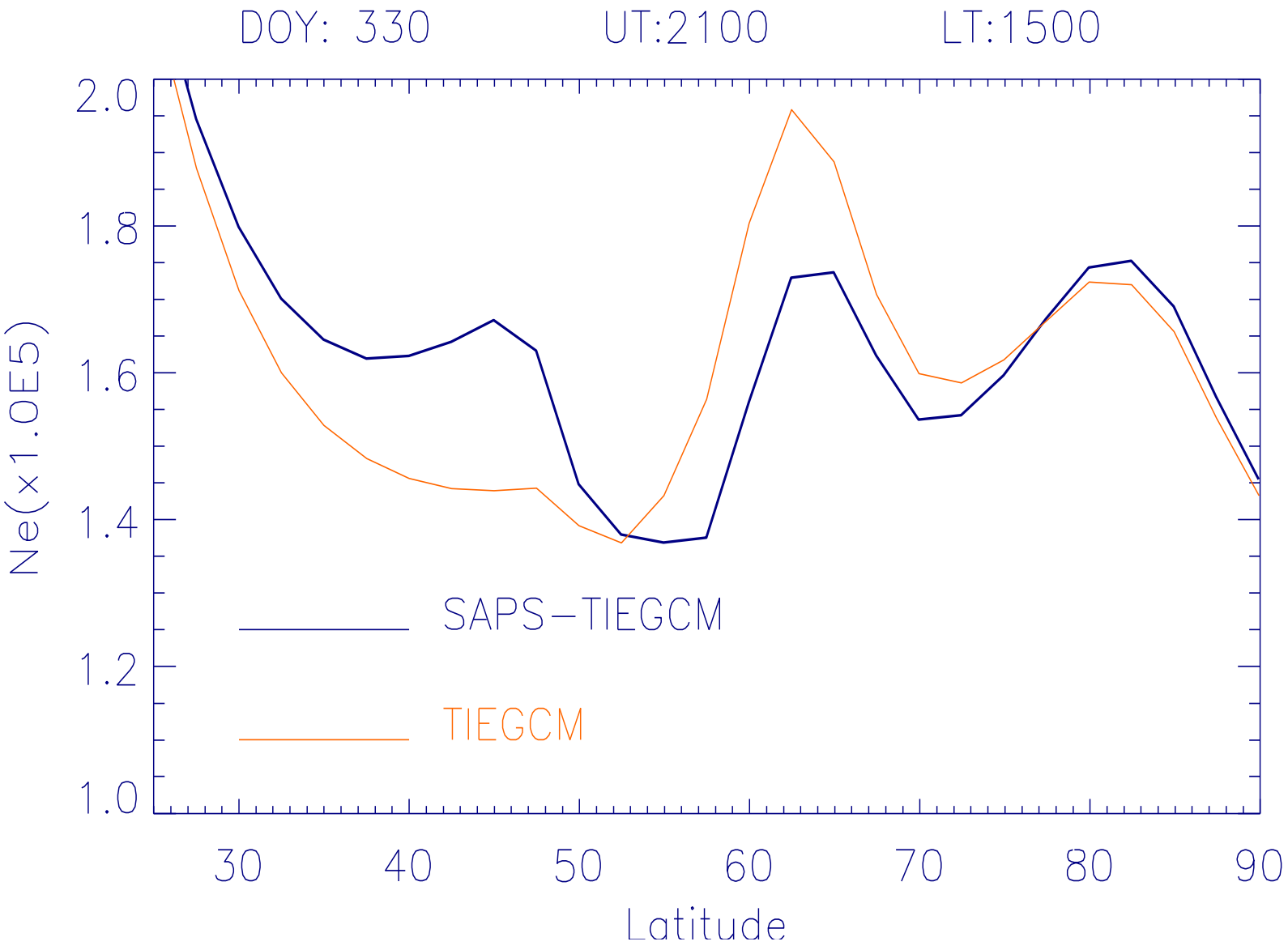




Without Saps

With Saps

Electron Density

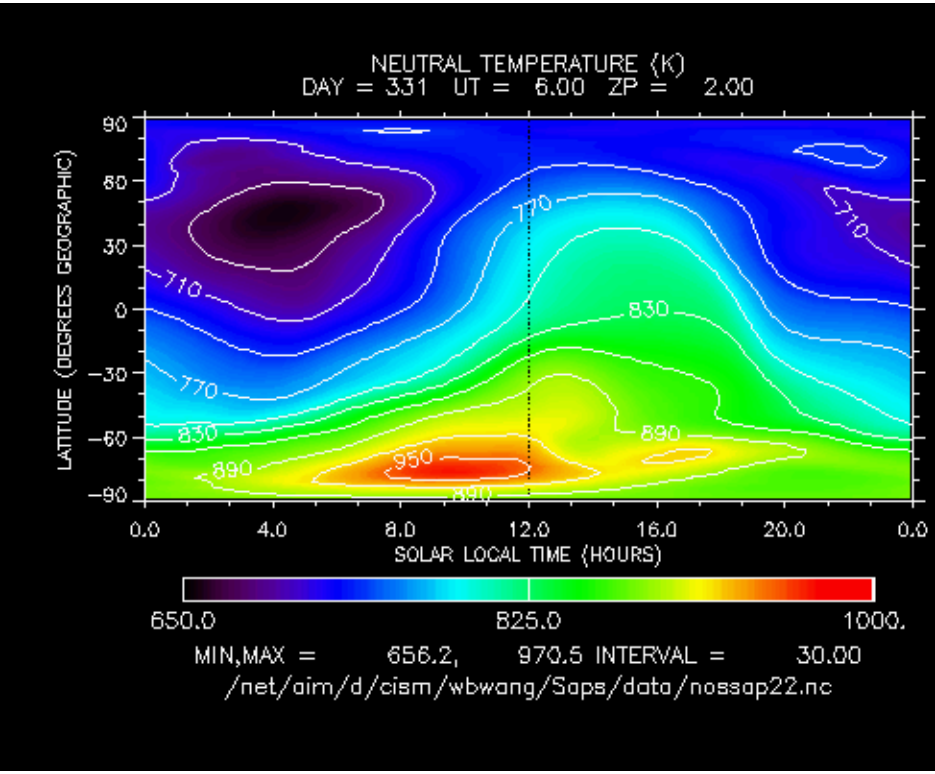


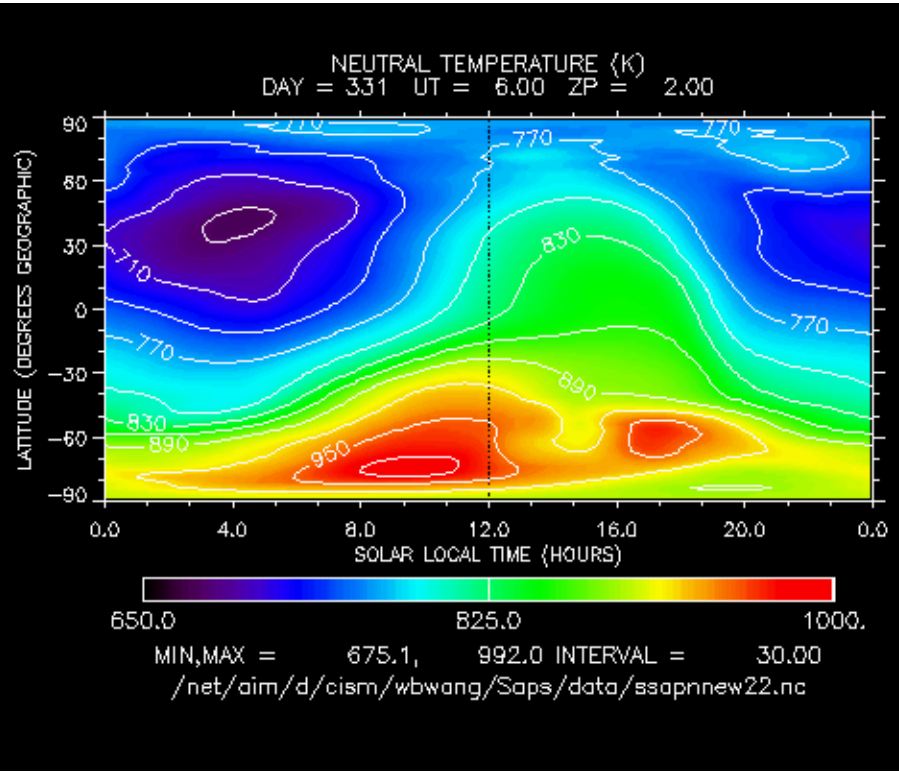
Summary

SAPS have significant impacts on global structures of the thermosphere and ionosphere, changing global neutral wind circulation and enhancing neutral temperatures due to enhanced Joule heating and ion-neutral coupling.

There are also noticeable variations in ionospheric electron densities when including SAPS in the TIEGCM.

Neutral Temperature

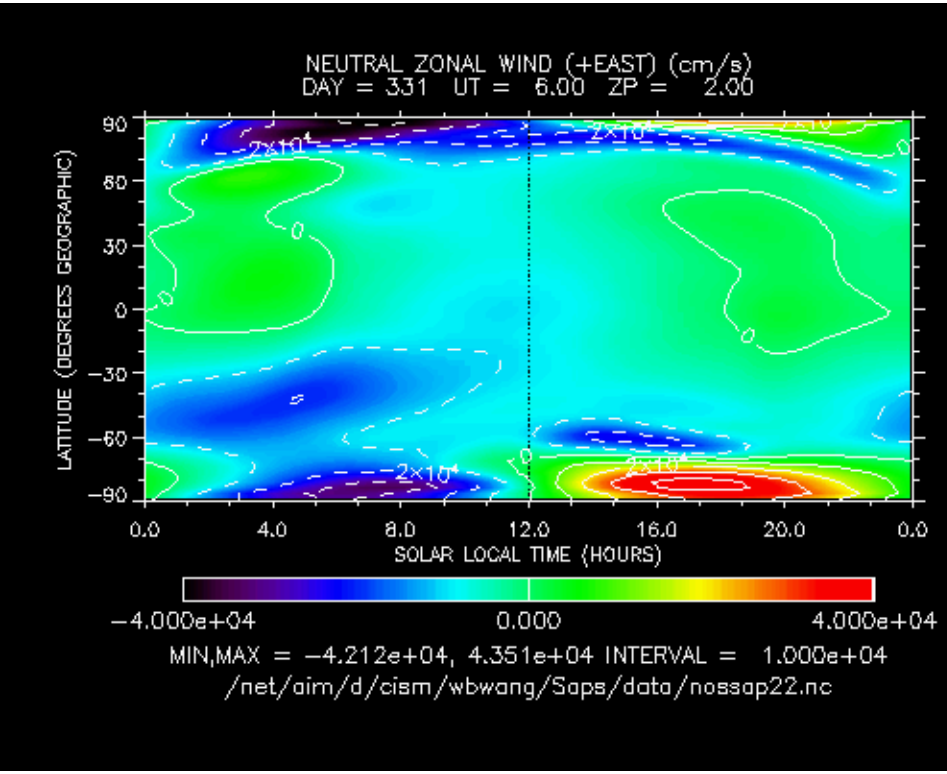


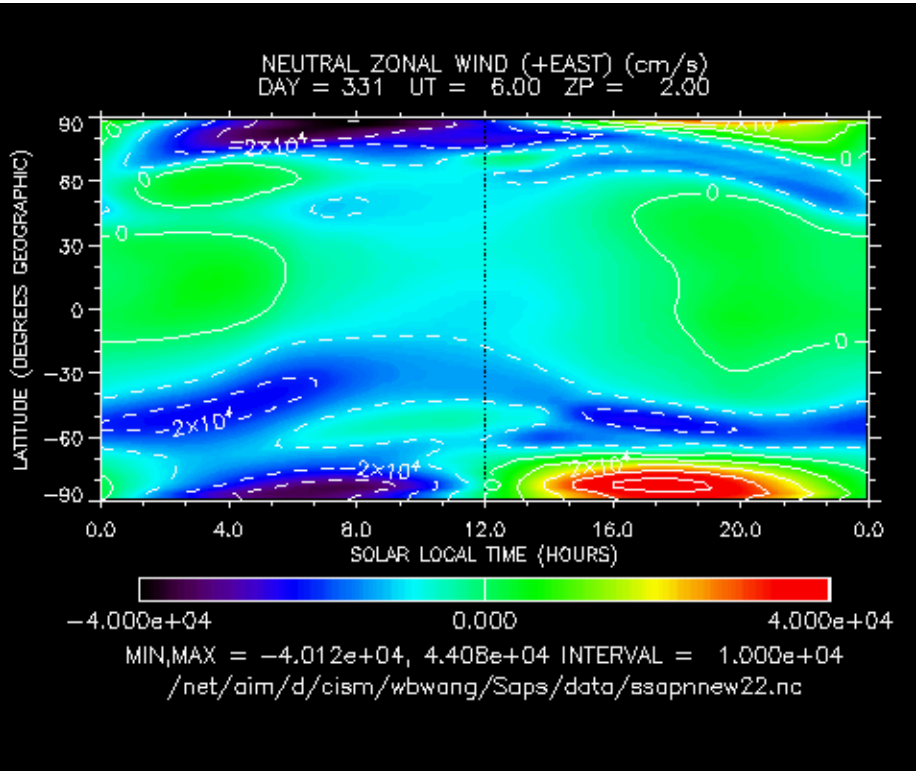


Without Saps

With Saps

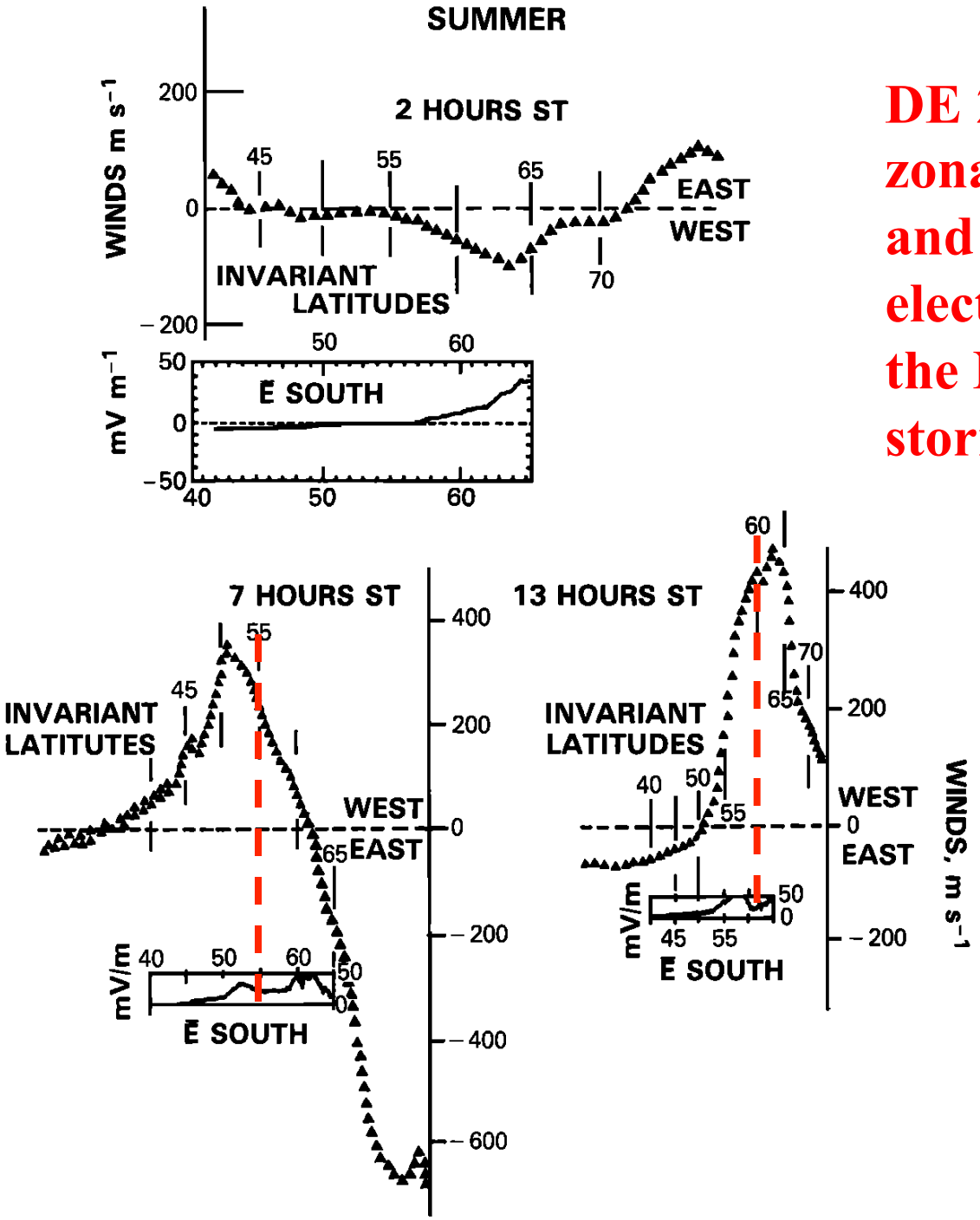
Zonal Neutral Winds





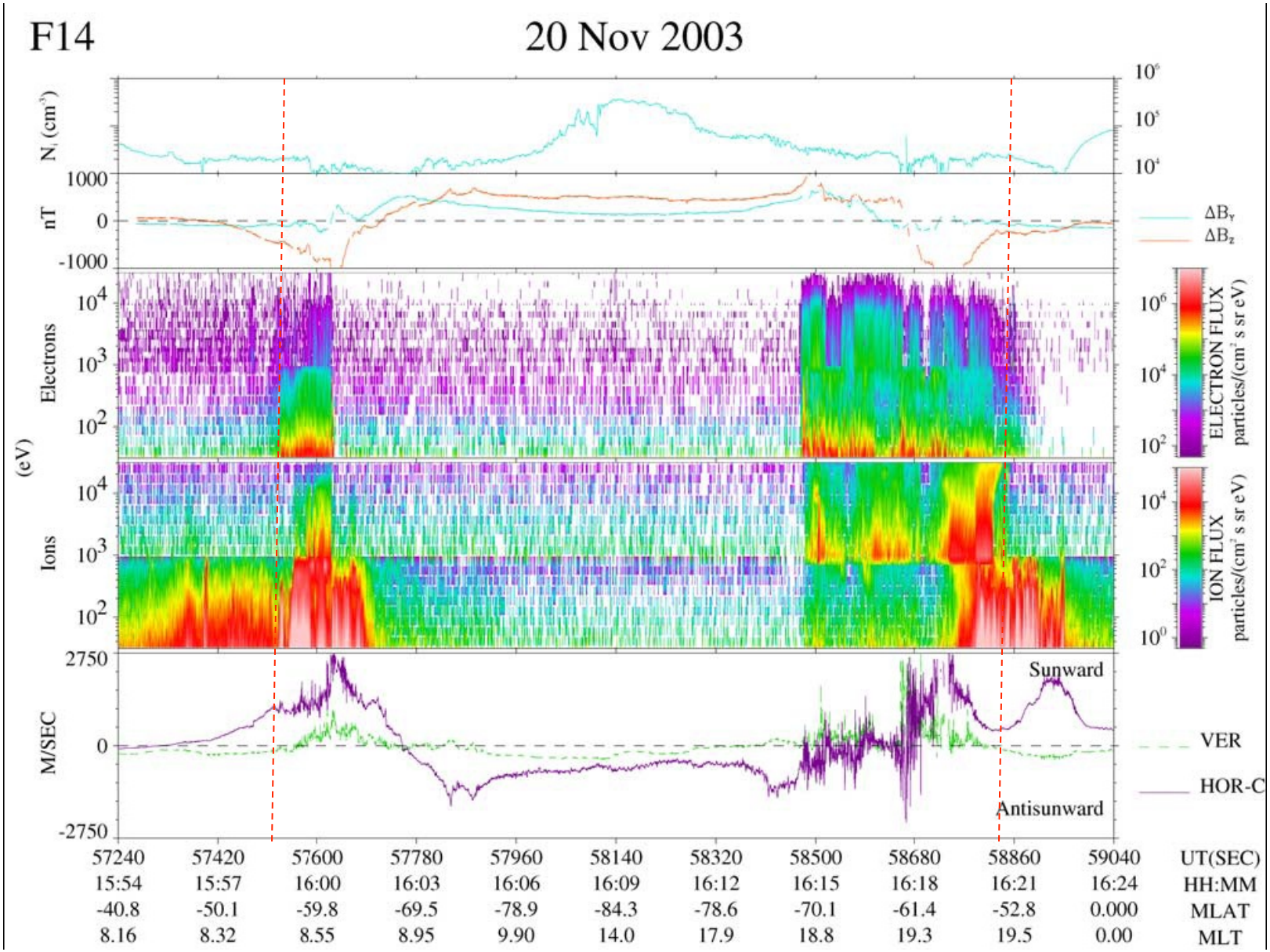
Without Saps

With Saps



DE 2 observations of zonal neutral winds and meridional electric fields during the Nov. 24, 1982 storm

Miller et al., 1990



(Huang and Foster, 2007)