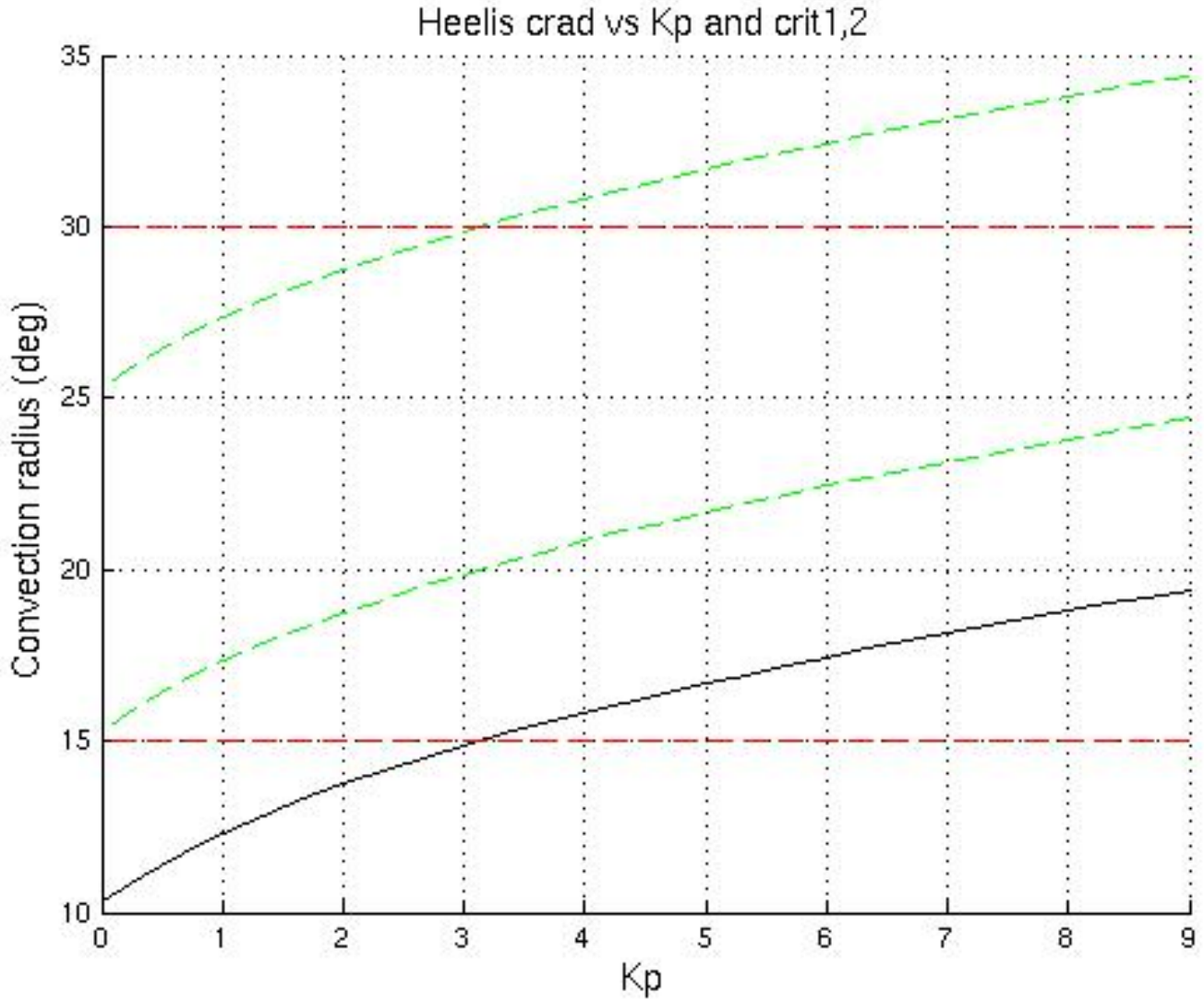
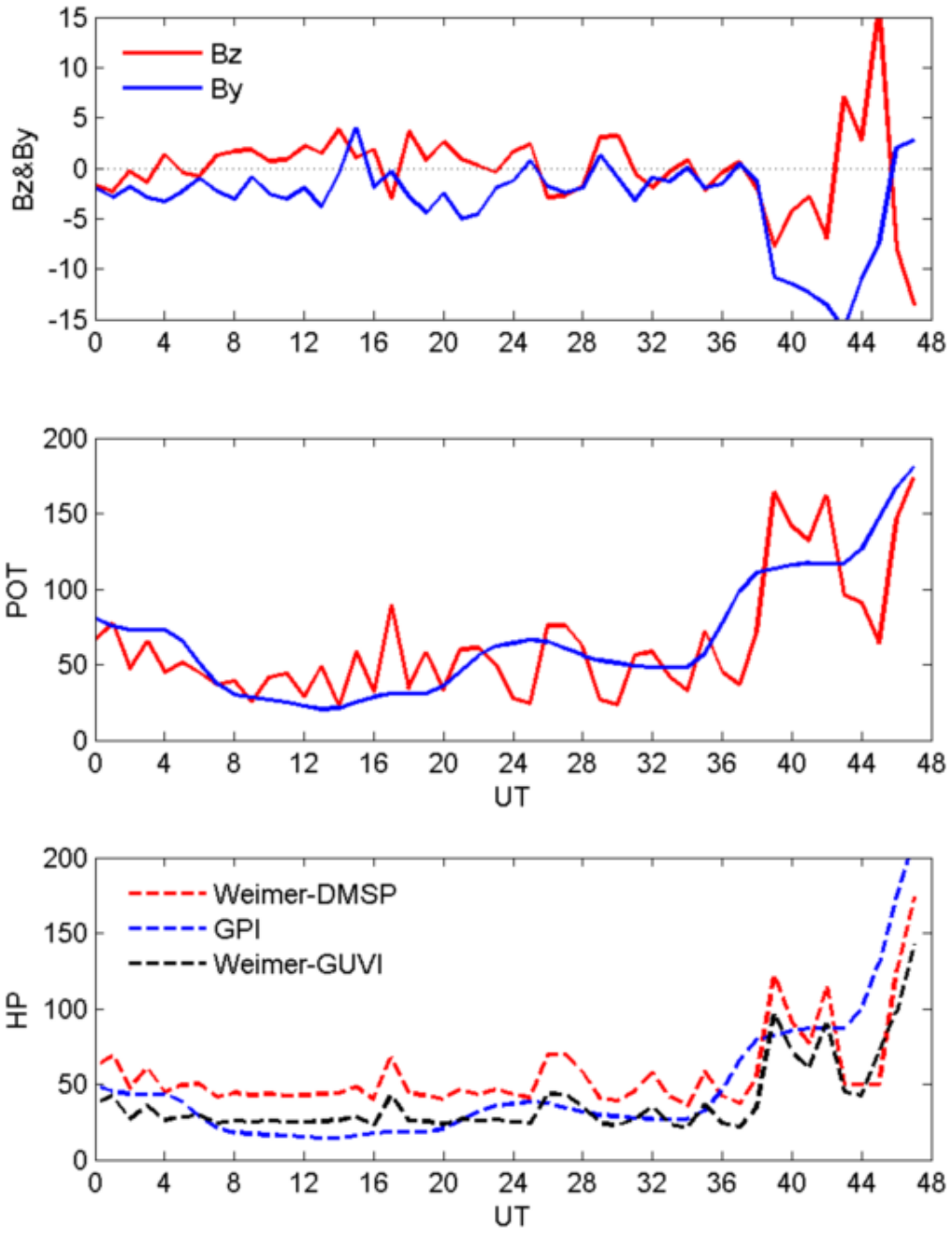
CEDAR ETI Challenge Runs

1)TIE-GCM Version 1.93 plus dynamic crit1,2 and GUVI HP=f(Bz,V)
2)120 sec step, save every 20 min
3)Weimer 2005 with hourly IMF (5 min for Dec 2006)
4)With and without seasonally dependant eddy diffusion at lower boundary
5)Some with ht-integ TEC, QJ_Tn

Convection Radius (Crad) vs Kp



Red are current crit(1,2) constant values, green are proposed dynamic values.
For convection radii>20 deg with 4.2 deg offset to 0 MLT, can dilute Vi magnitudes.



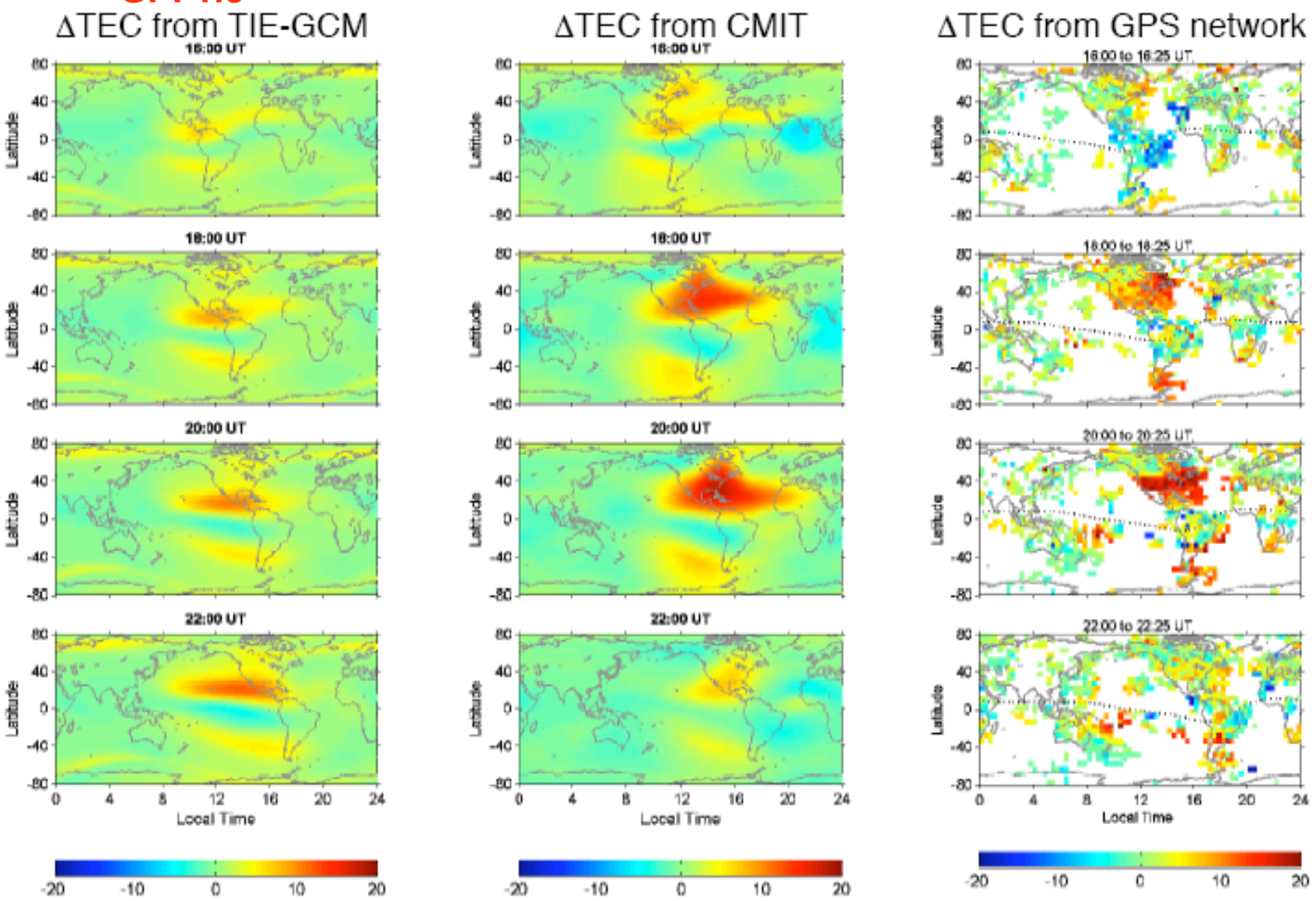
Dec 13-14, 2006
(06347-348)
Large neg By 16-22 UT
5 min IMF (Challenge >12UT)

Vsw >600 km/s (large)
Weimer 2001 radius of convection is smaller for large Vsw than the 2005 model where the radii are 20-25 degrees of latitude.

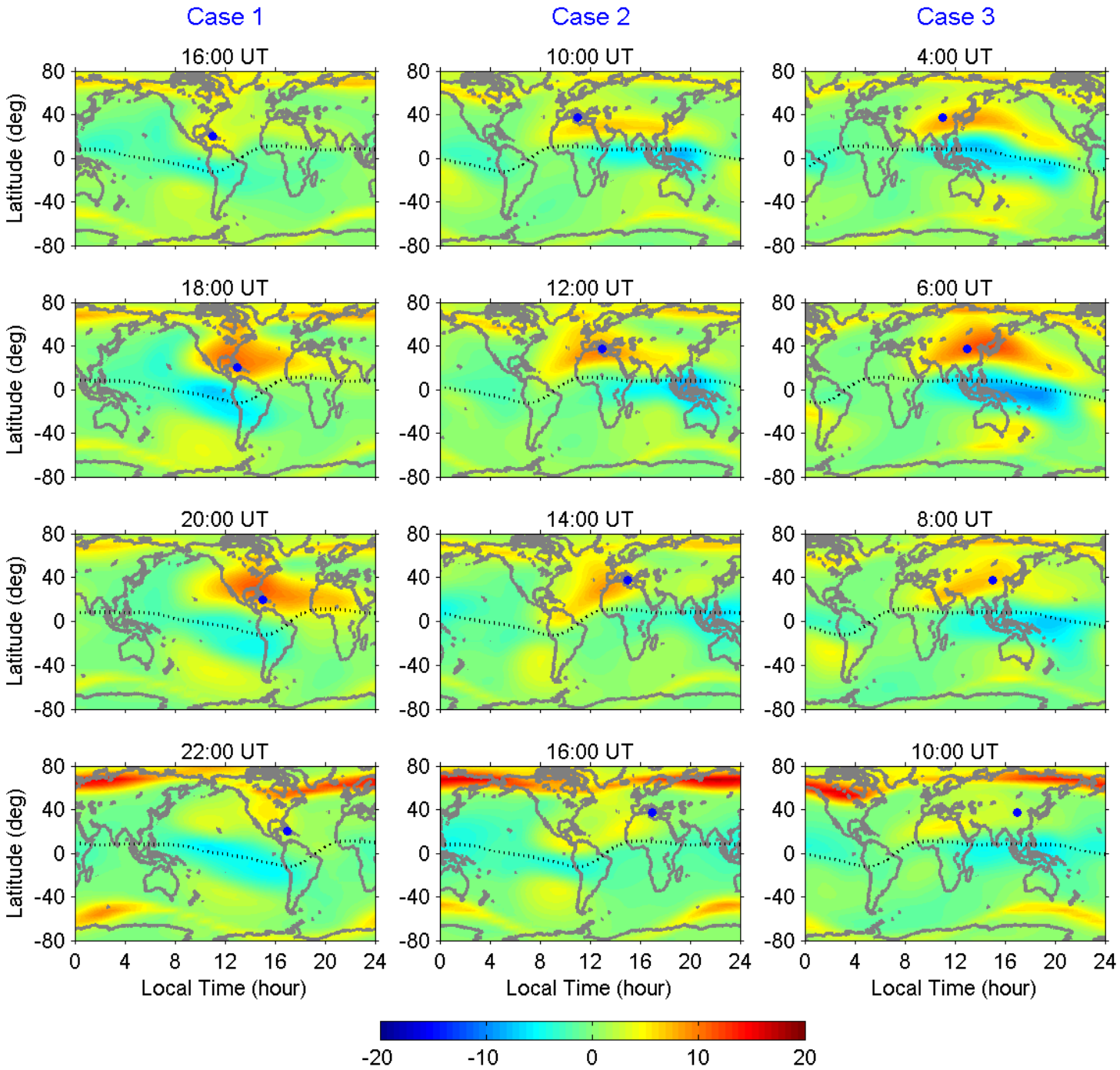
From Jiuhou Lei

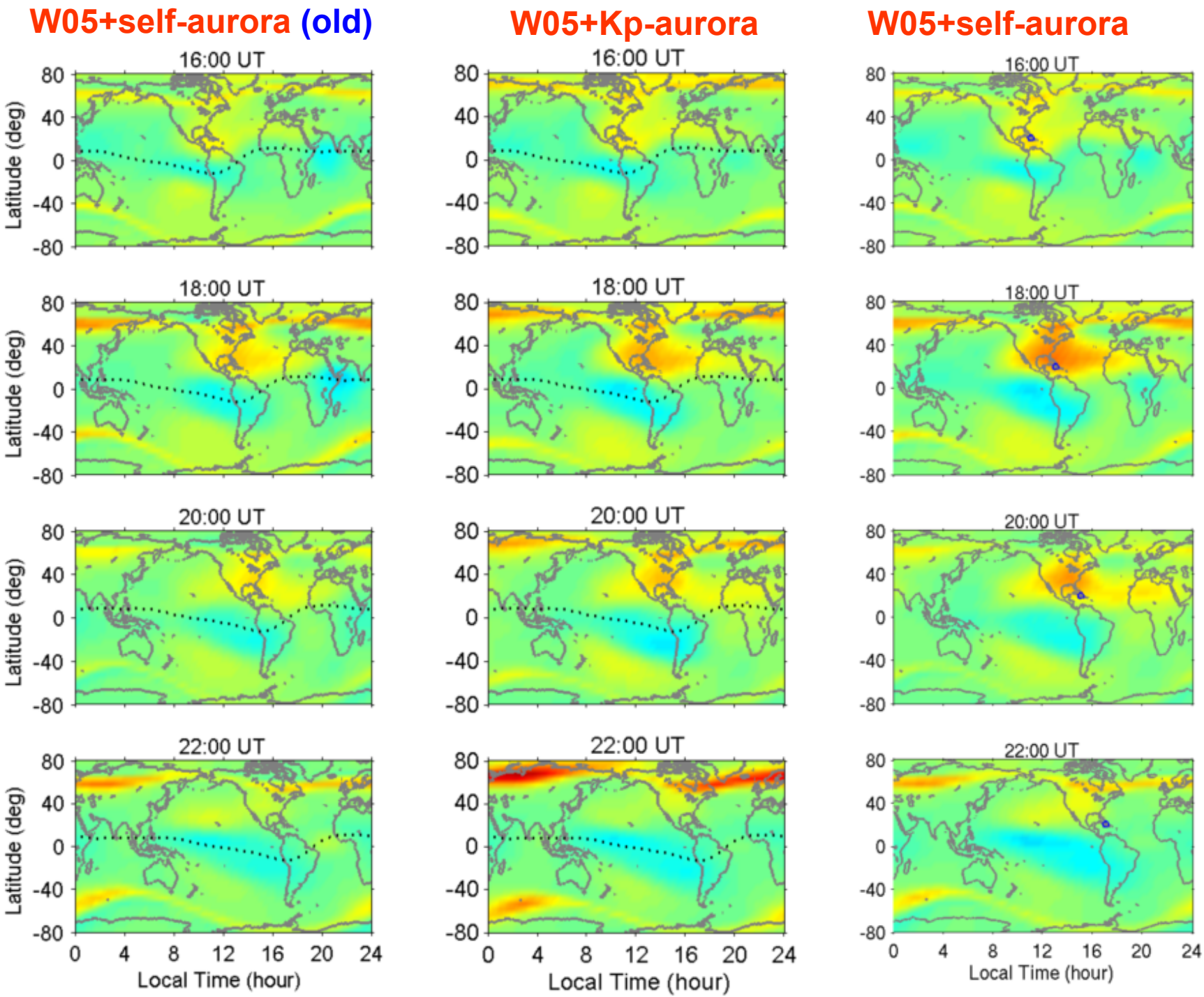
2006 AGU storm

GPI 1.8

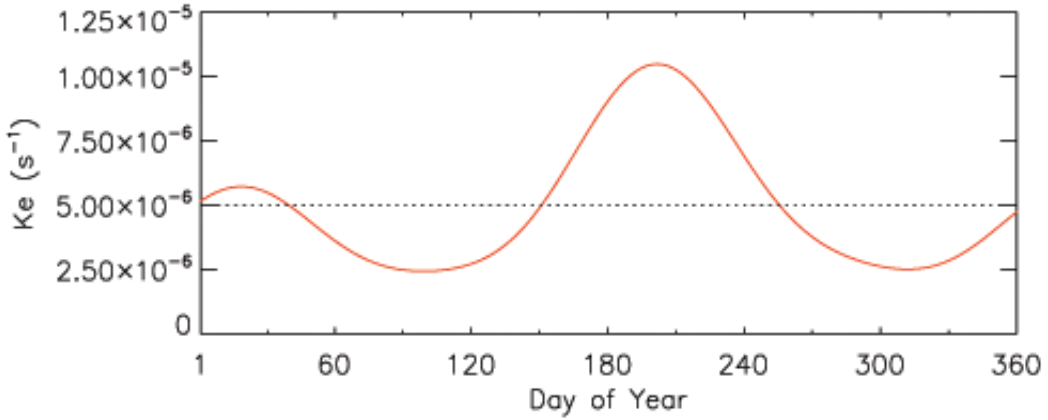


Weimer
2001


Case 1
Case 2
Case 3
16:00 UT
10:00 UT
4:00 UT
18:00 UT
12:00 UT
6:00 UT
20:00 UT
14:00 UT
8:00 UT
22:00 UT
16:00 UT
10:00 UT
Latitude (deg)
80
40
0
-40
-80
0
4
8
12
16
20
24
Local Time (hour)
-20
-10
0
10
20


W05+self-aurora (old)
W05+Kp-aurora
W05+self-aurora
16:00 UT
18:00 UT
20:00 UT
22:00 UT
Latitude (deg)
80
40
0
-40
-80
0
4
8
12
16
20
24
Local Time (hour)

Seasonal Eddy Diffusion (L Qian)



348 ^ so TEC increases

Thermosphere effects:

Decrease of mass density and column O/N2 near solstices, particularly near June solstice (especially days 170-220, or 195+/-25)

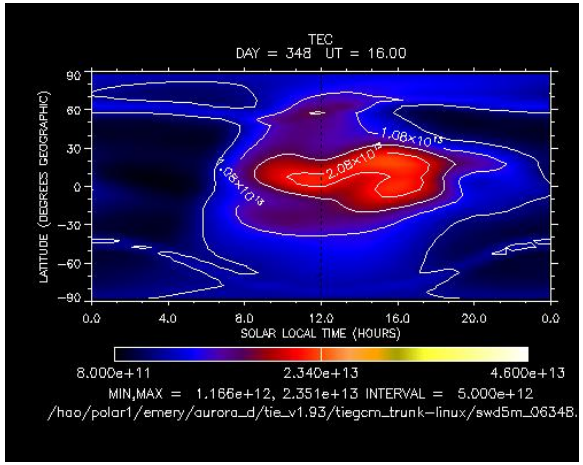
Increase of mass density and column O/N2 near equinoxes.

Ionosphere effects:

decrease of nmf2 and TEC due to reduced column O/N2 near 150-250,0-40

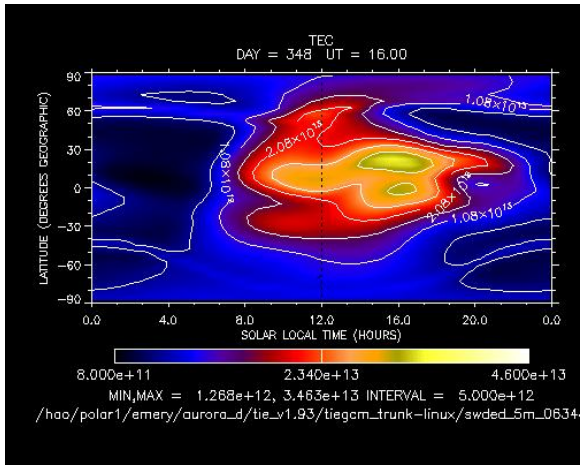
increase of nmf2 and TEC due to enhanced column O/N2 near equinoxes

Const



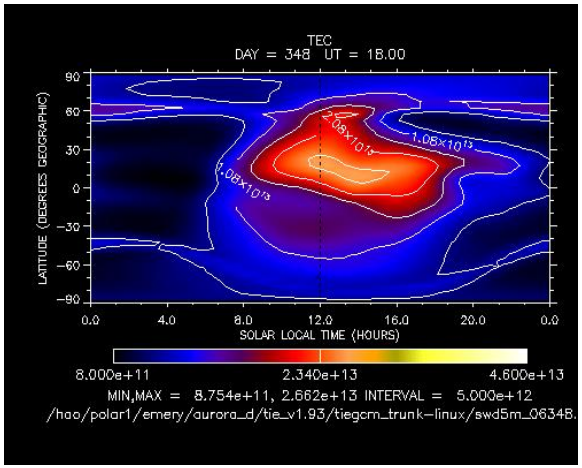
UT

16

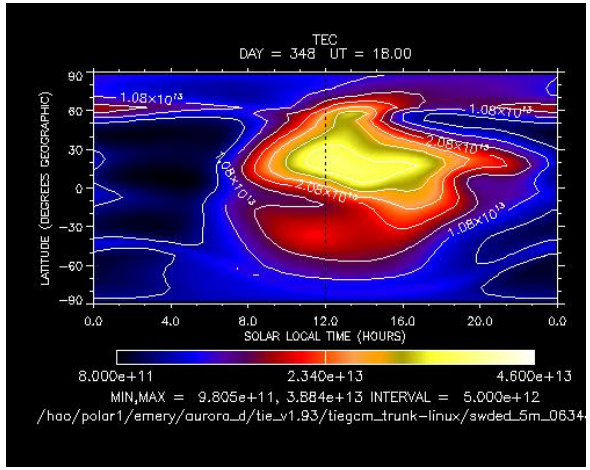


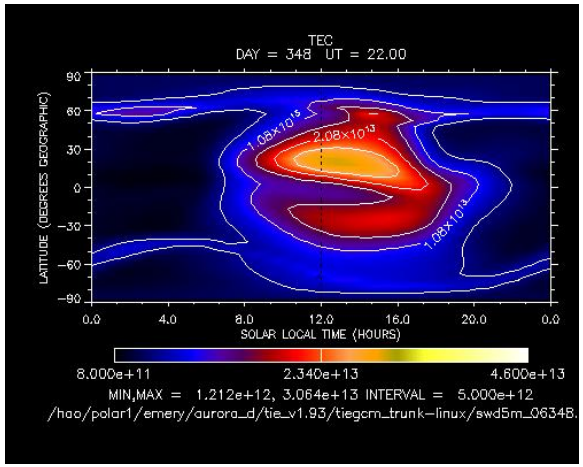
06348

Variable eddy diffusion shows larger TEC than ‘Const’ because of enhanced column O/N2

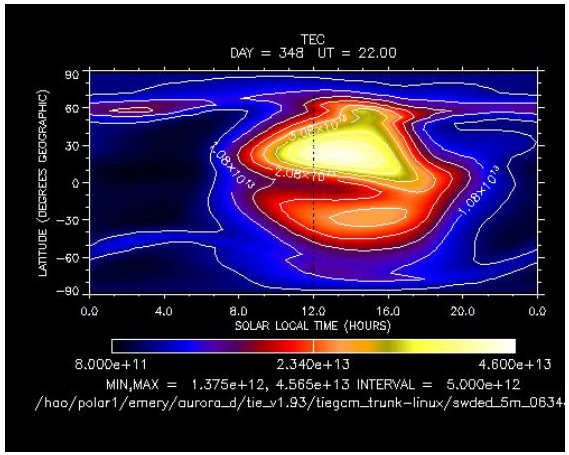


18



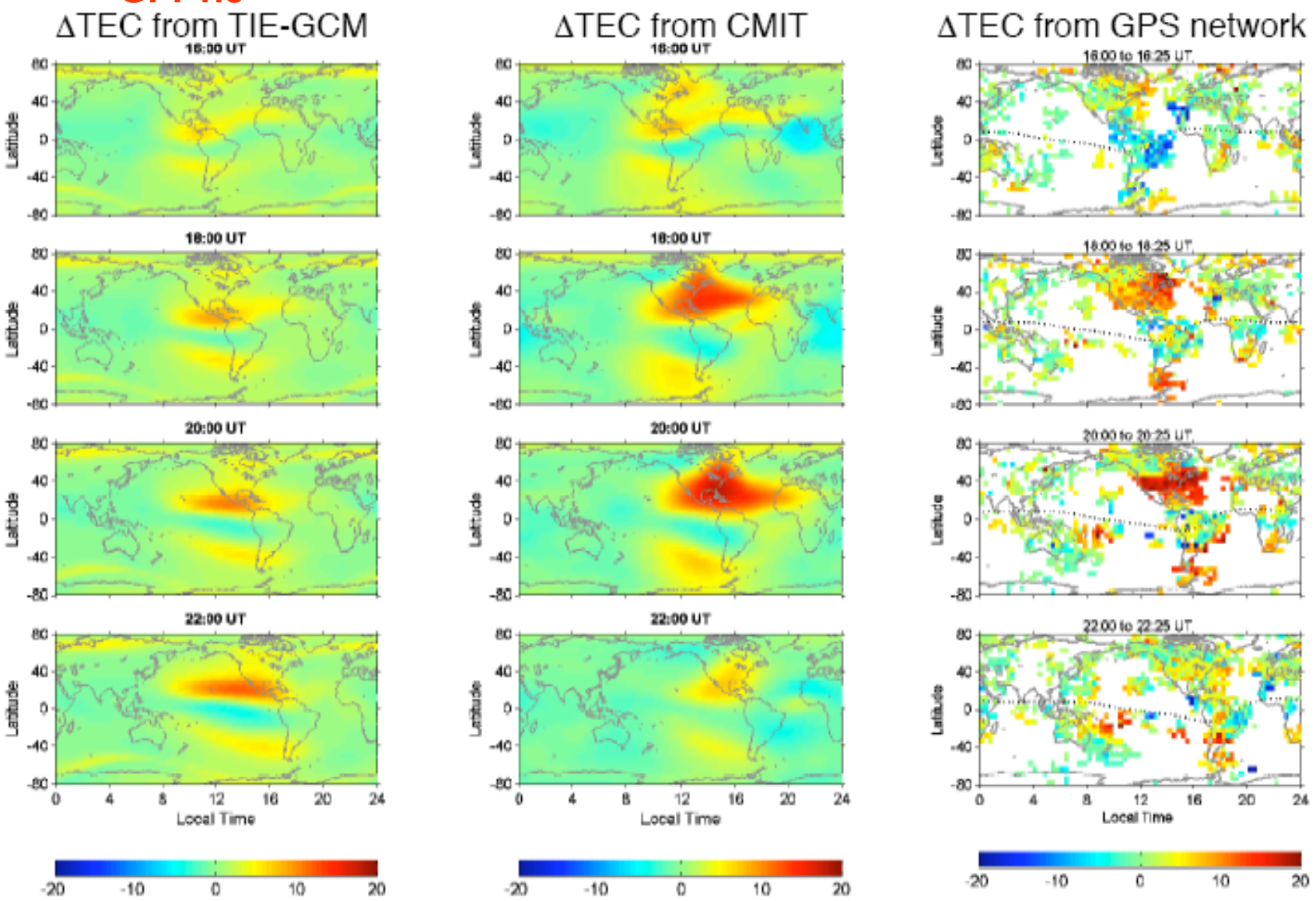


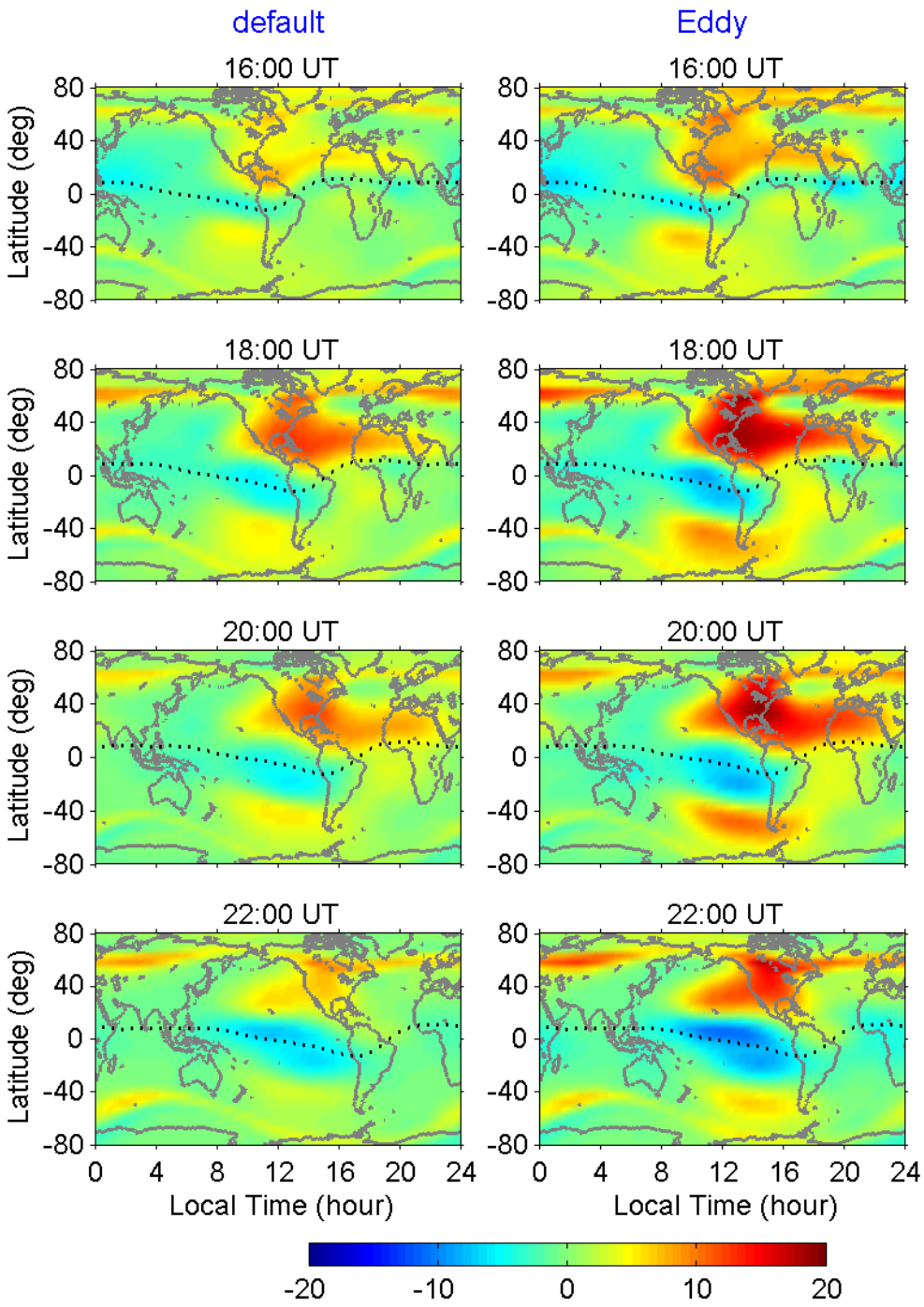
22



2006 AGU storm

GPI 1.8

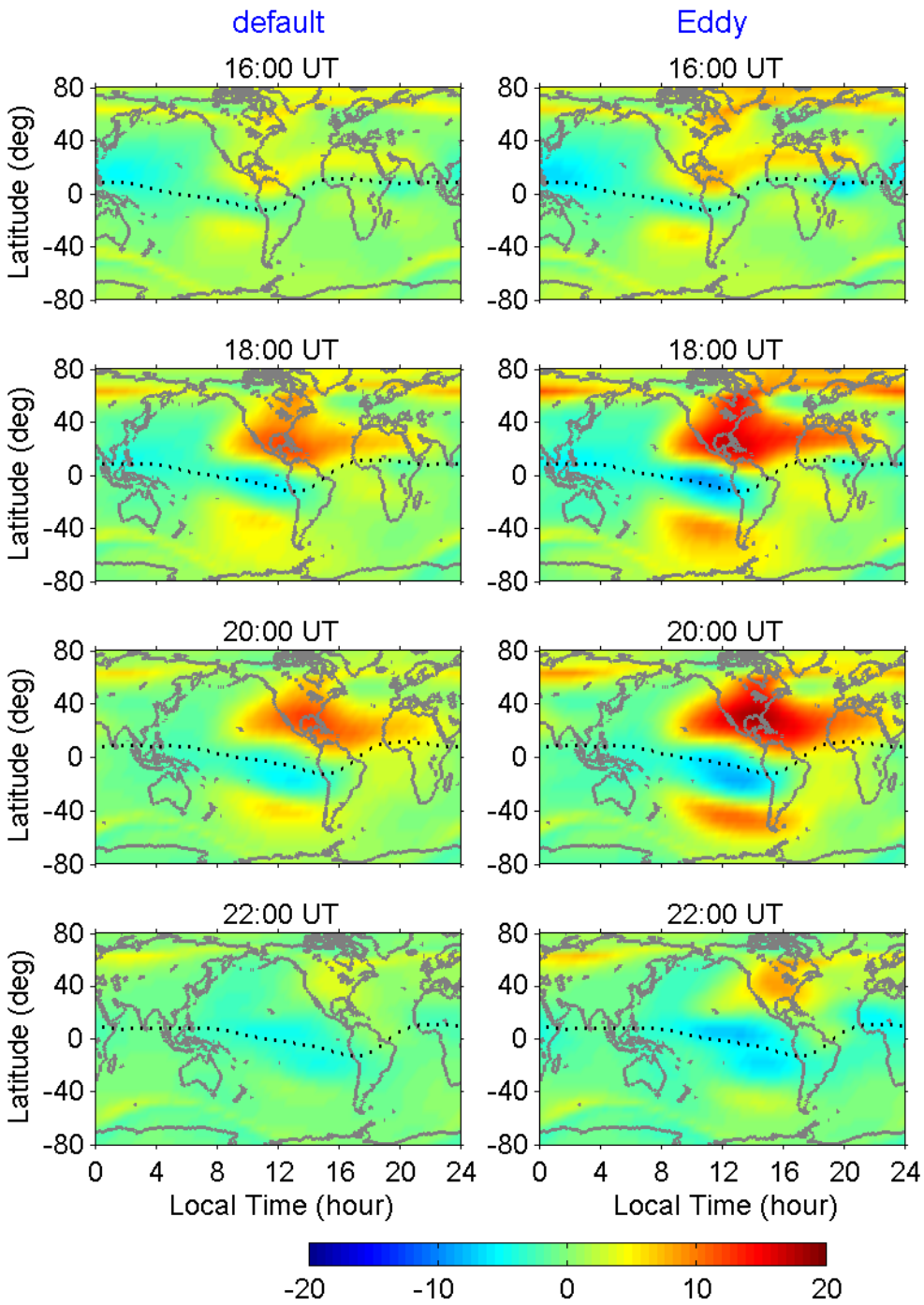




Delta(TEC) of
06348 - 06347 TEC
5 min IMF
Weimer 2005
Version 1.93
With Dynamic crit1,2

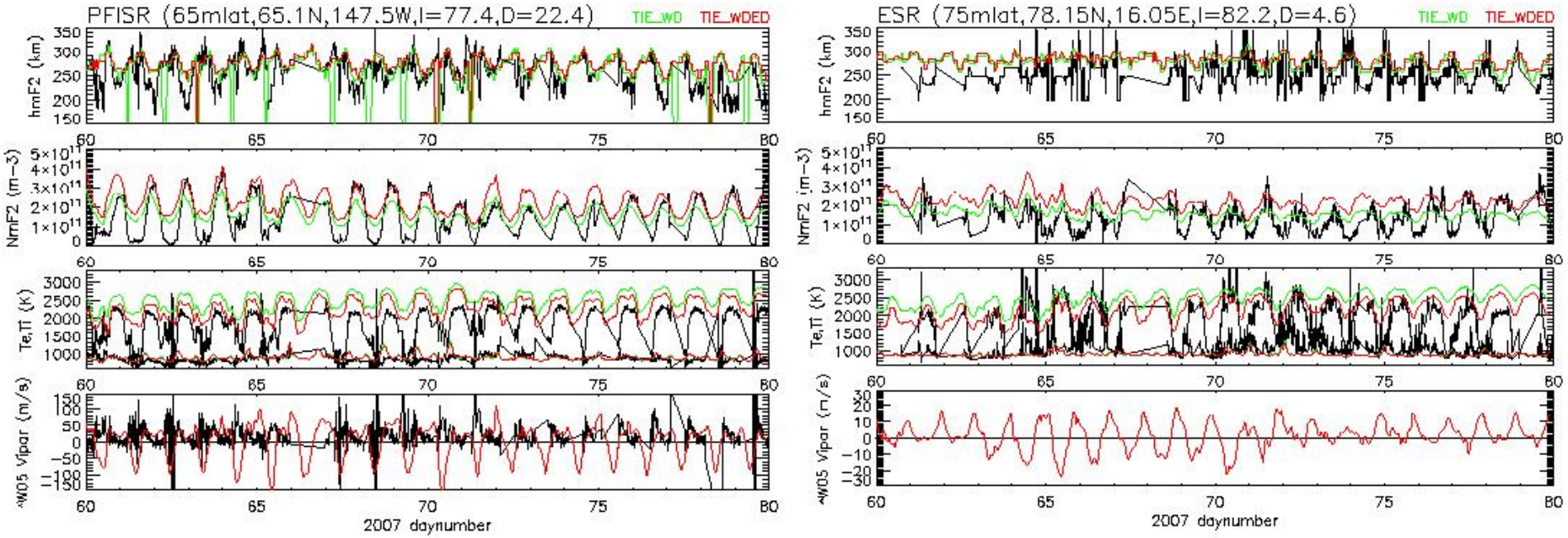
Eddy (more TEC for day 348) shows more delta(TEC) in change from quiet day 347, and so is closer to obs for all times but 16 UT where obs show relative decrease in TEC in low and mid-latitudes.

From Jiuhou Lei



1 hr IMF – not as good as 5 min IMF, especially for UT =16 and 22 UT

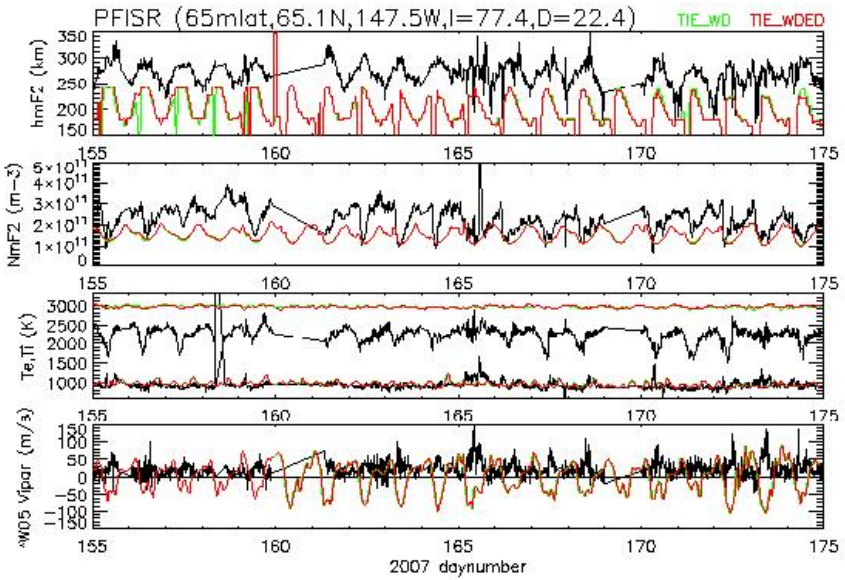
Spring ISR Ne, Te,i IPY Variations

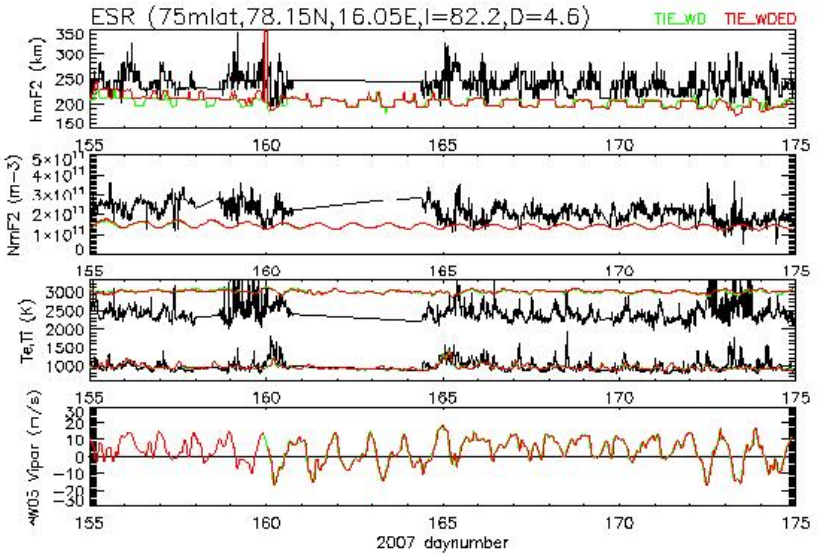


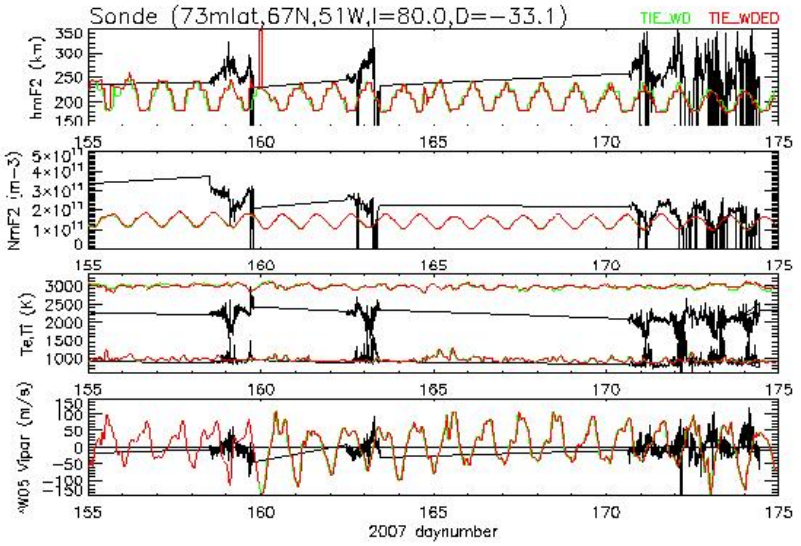
Spring eddy larger Nmf2 and smaller Te at high NH latitudes. Obs agree better with variable eddy Te and const eddy NmF2 for PFISR and ESR. Model NmF2 and Te a little larger than observations.

ISR data courtesy of Jan Sojka's CD and ISR colleagues for IPY project.

Early Summer ISR IPY Vars

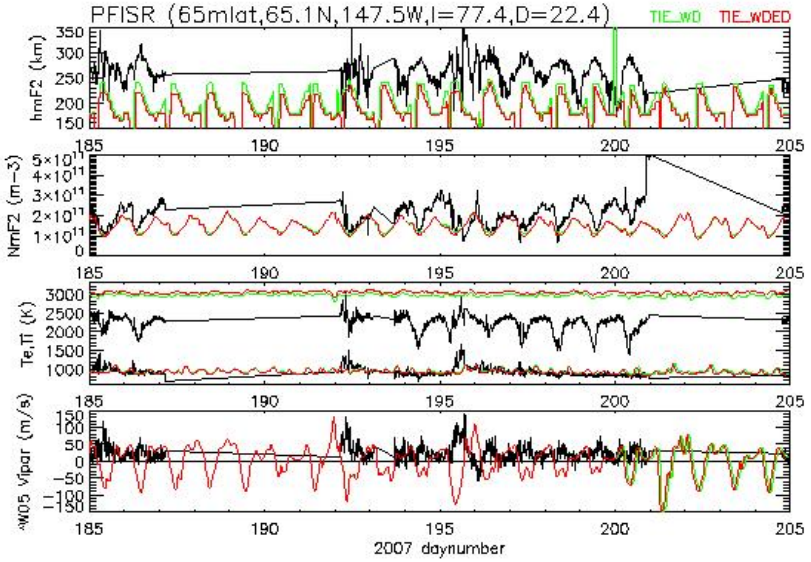


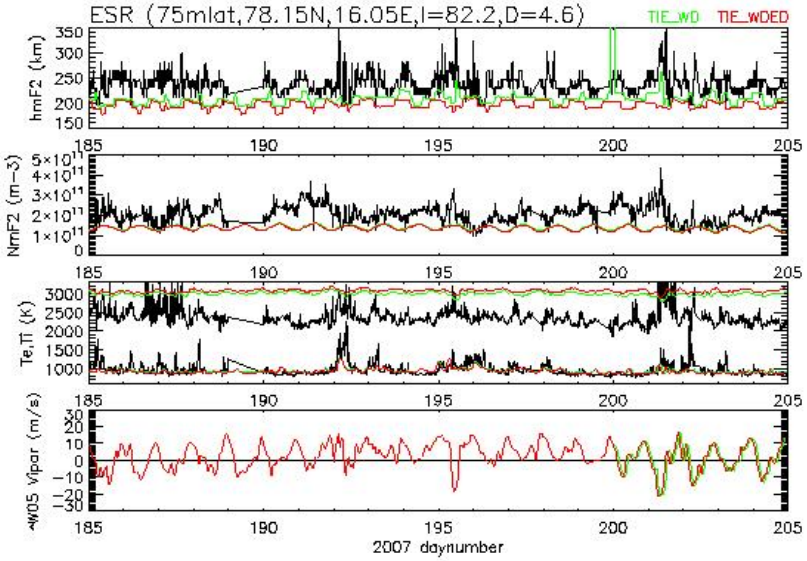




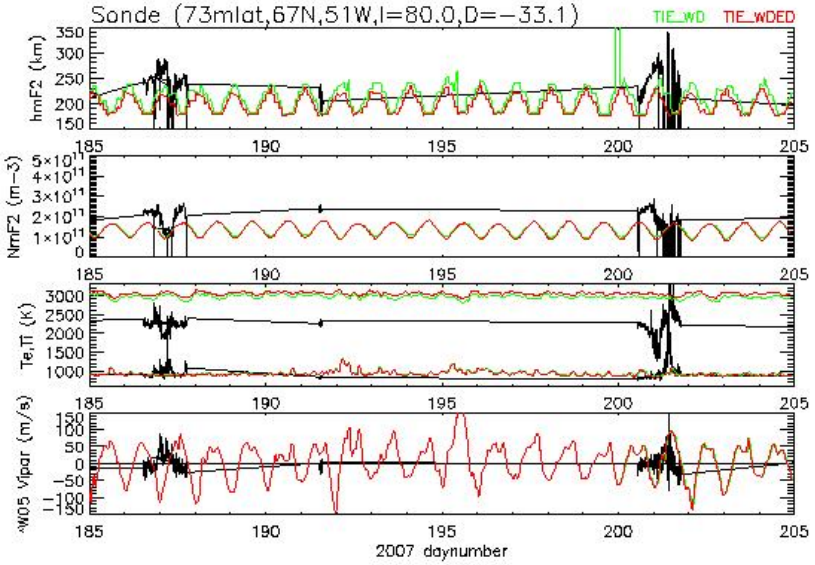
Early summer days 155-175 eddy and const eddy diffusion about the same at high NH latitudes where NmF2 values are lower than observations and Te values are higher. hmF2 observations are higher than the models for all stations. Vi observations are really comparing with Weimer 2005 Vi. (Same for Fall days 240-260 when seasonal eddy near constant at lower boundary.)

Late Summer ISR IPY Vars

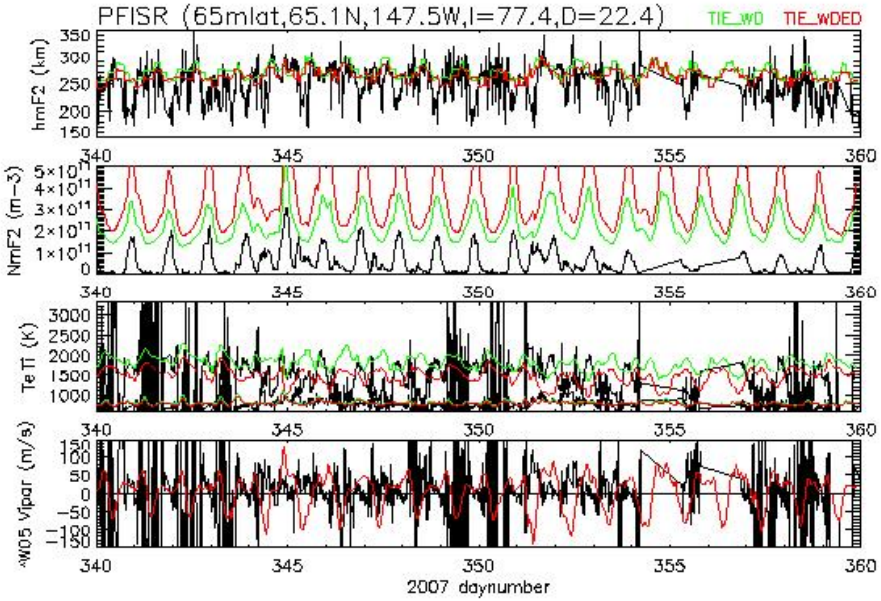


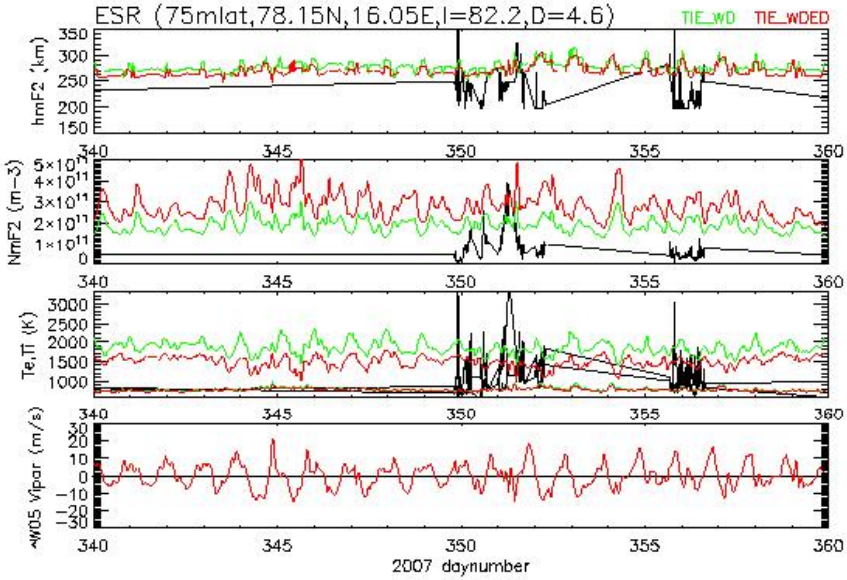


Late summer days 185-205 should have higher Ne (and lower Te) with const eddy diffusion, which shows slightly in high-latitude Te, but is not apparent in NmF2, although hmF2 is higher than the eddy case. Both model results have much higher Te, lower NmF2, and lower hmF2 than observations, although the variable eddy results are 'better'.

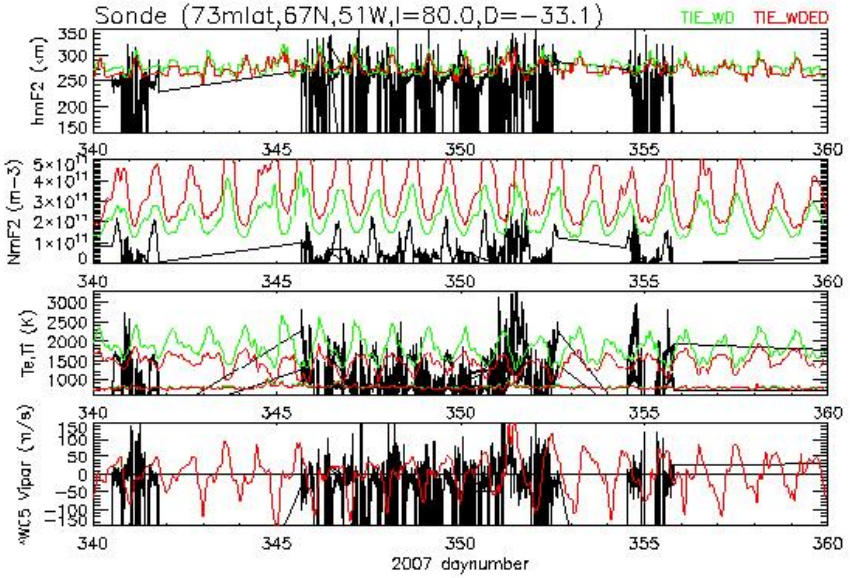


Winter ISR Ne, Te,i IPY Vars

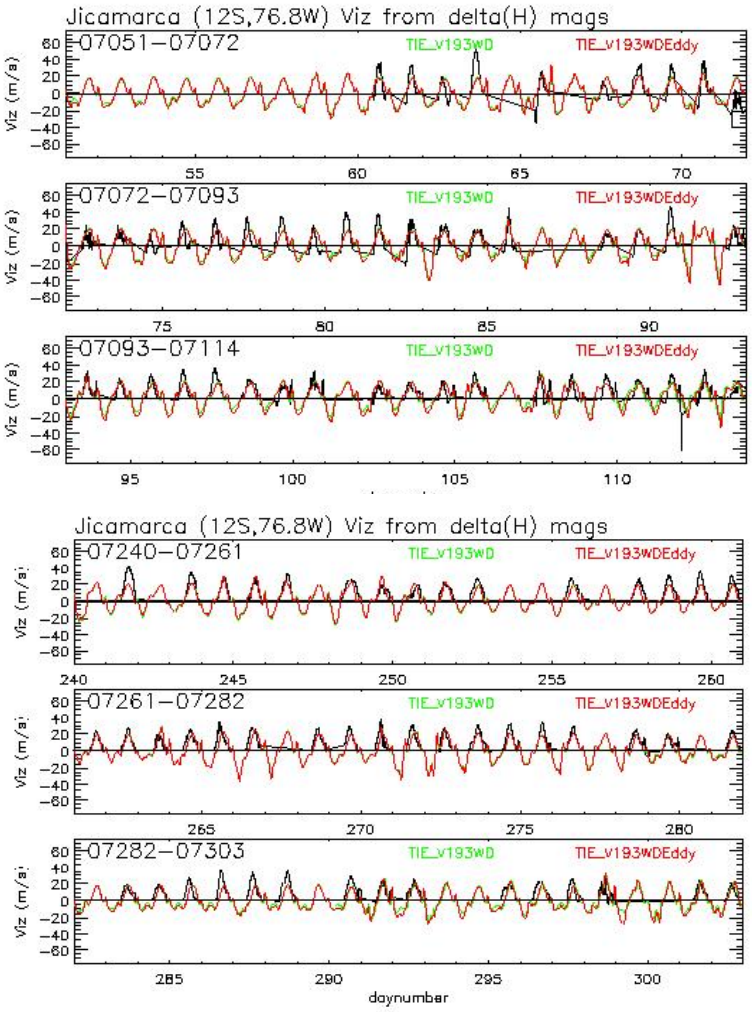


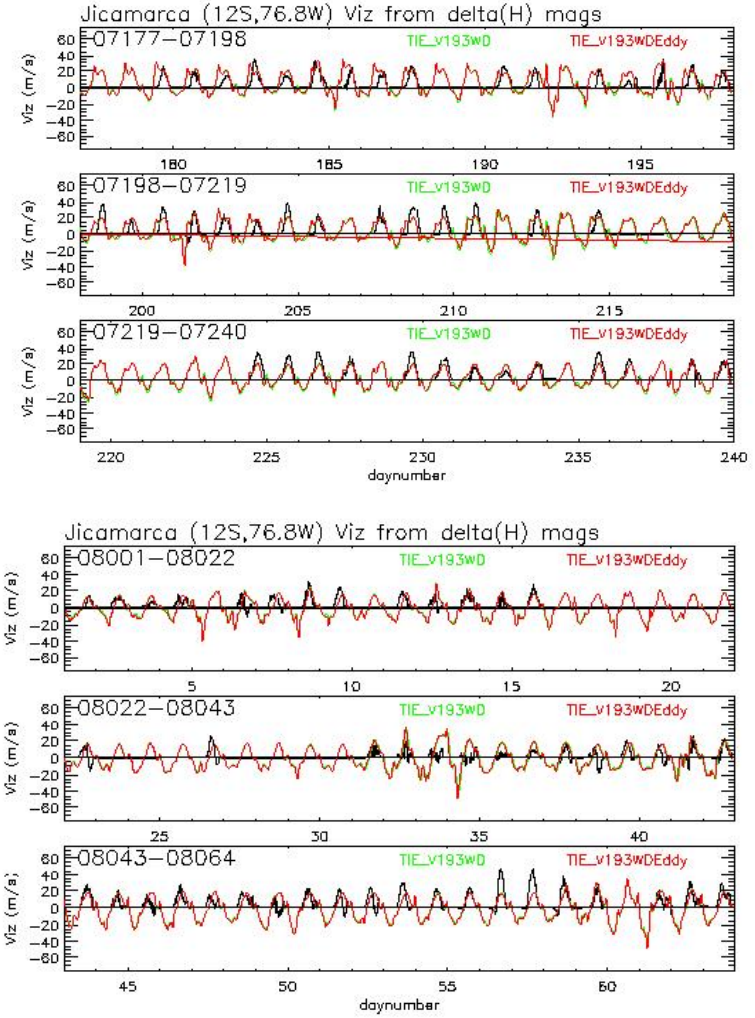


Winter eddy has higher NmF2 values and lower Te values than the constant eddy diffusion at high NH latitudes. The observations show much lower NmF2 values but Te values are only a little high. The model has a stronger inverse relationship of Te and Ne than obs and model Te are too high in general.



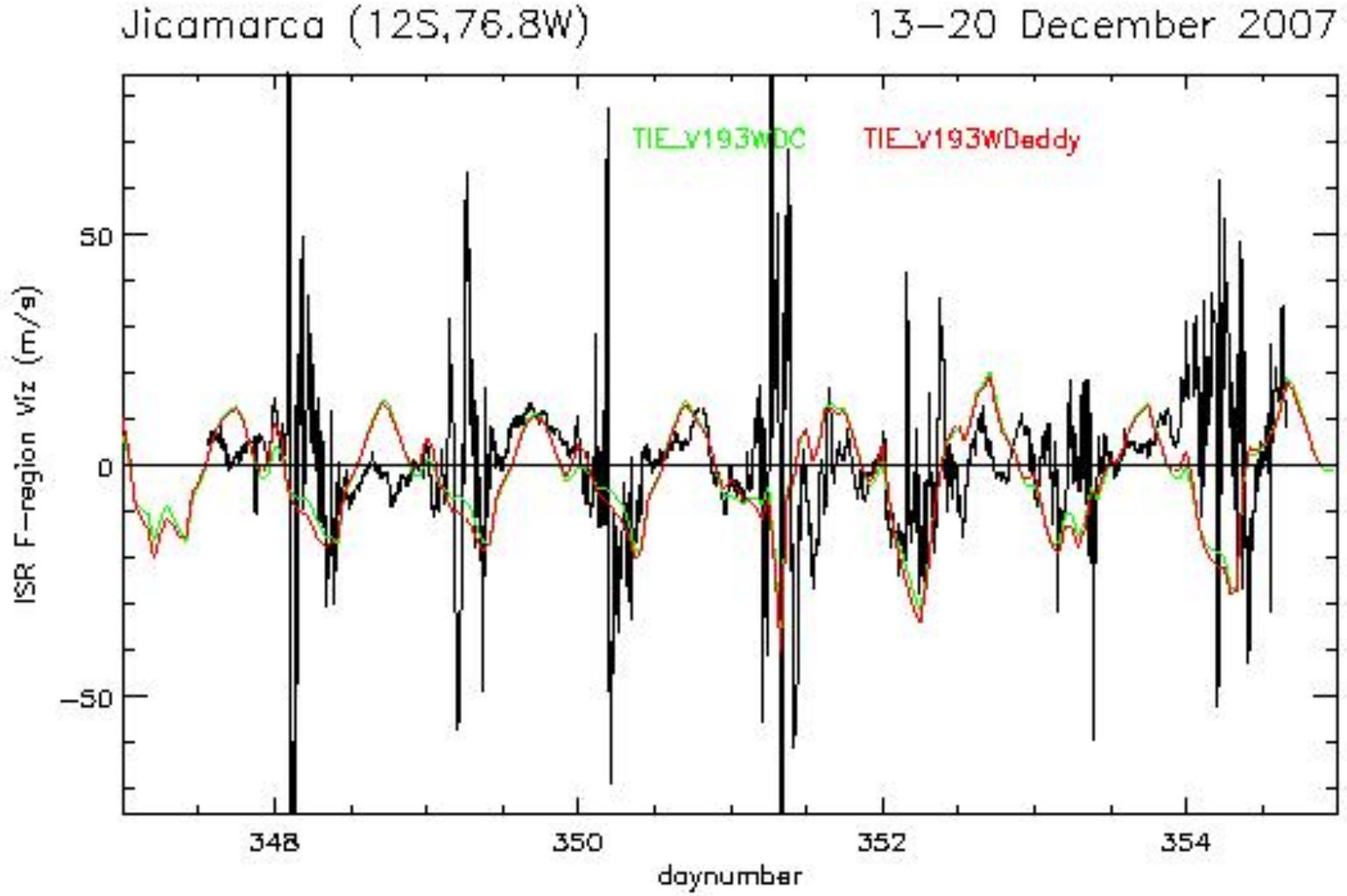
Seasonal 150 km Viz at Jicamarca





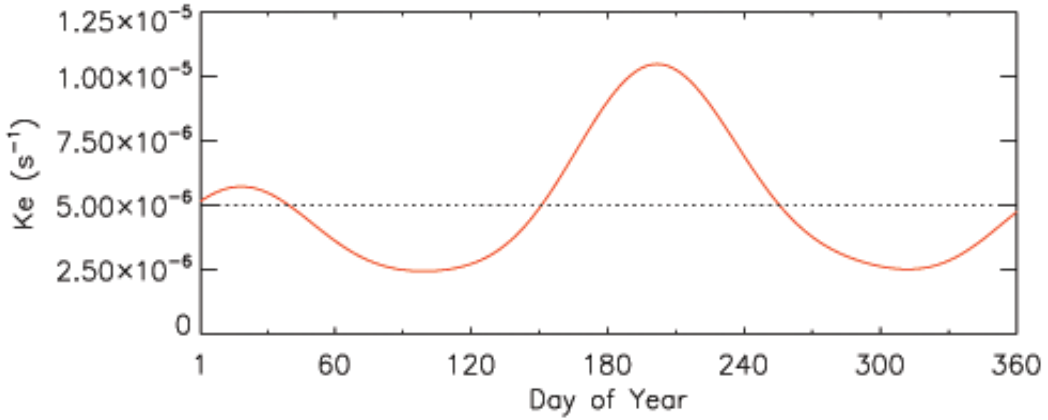
Daytime Viz same for seasonal eddy and constant eddy diffusion and in good agreement with magnetometer Viz except in summer when upward velocities start earlier in the day in the models. Seasonal eddy larger post-sunset and at night except ~177-240 where reverse is true. *Data courtesy of Dave Anderson.*

ISR F-Region Viz Jicamarca



Post-sunset peak better (larger) with variable eddy diffusion, but pre-midnight drifts often upwards instead of downwards, so constant eddy diffusion is ‘better’ except on day 350.

Seasonal Eddy Diffusion (L Qian)



Effects:

Decrease of mass density, column O/N2, NmF2, TEC and range of equatorial nighttime drifts near June solstice (especially days 170-220, or 195+/-25) and increase in Te.

Increase of mass density, column O/N2, NmF2, TEC, and range of equatorial nighttime drifts most other periods, with decrease in Te.

Summary of TIEGCM Results

- Dynamic crit1,2 better than constant critical latitudes especially in the active conditions studied.

- Variable eddy diffusion at the lower boundary model results are a little better than the constant eddy diffusion in comparisons with high-latitude ionospheric parameters and magnetic latitude vertical drifts.

- Model Te at high latitudes is too high all seasons.