Ionospheric Density Irregularities, Turbulence, and Wave Disturbances during the Total Solar Eclipse over North America on 21 August 2017

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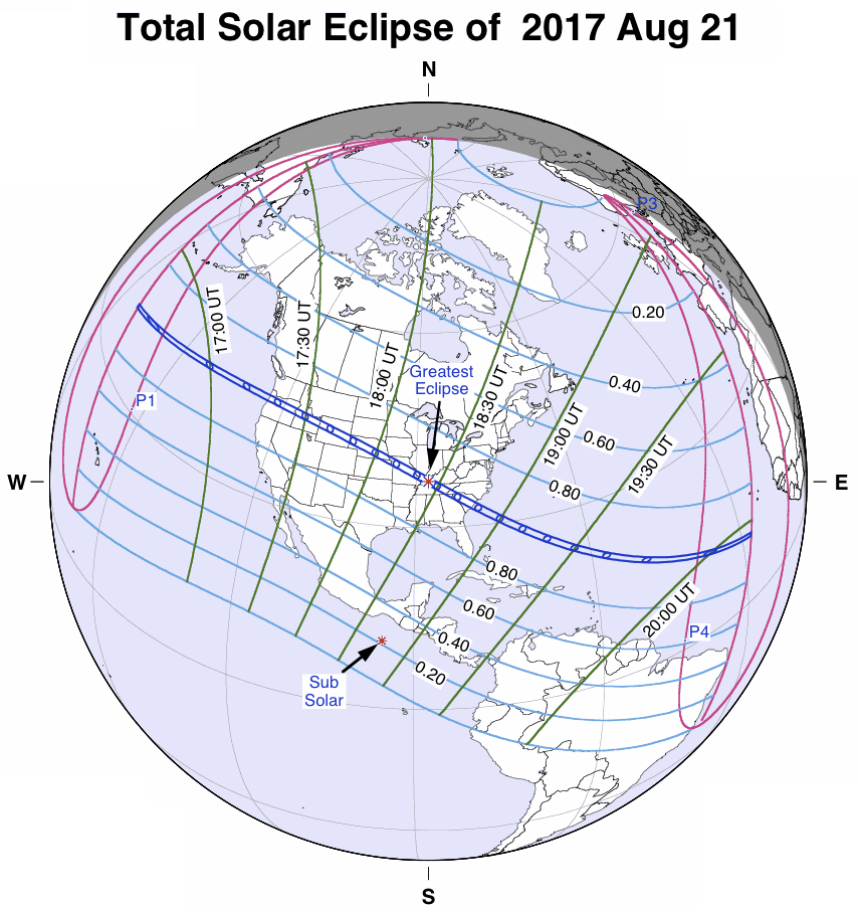
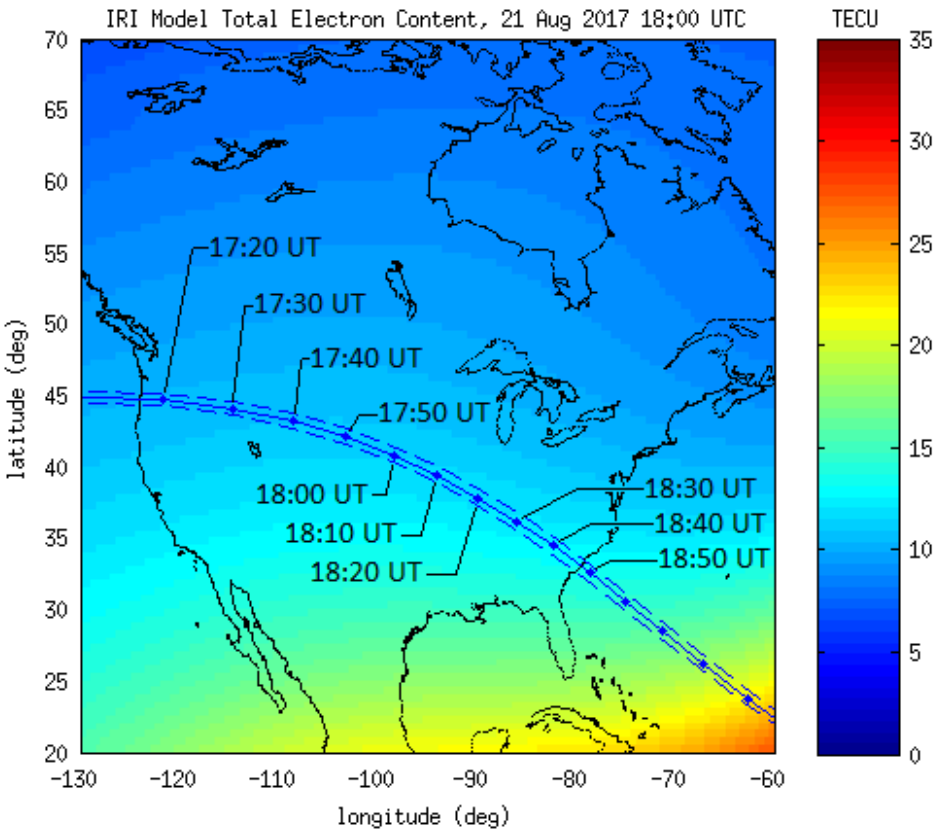
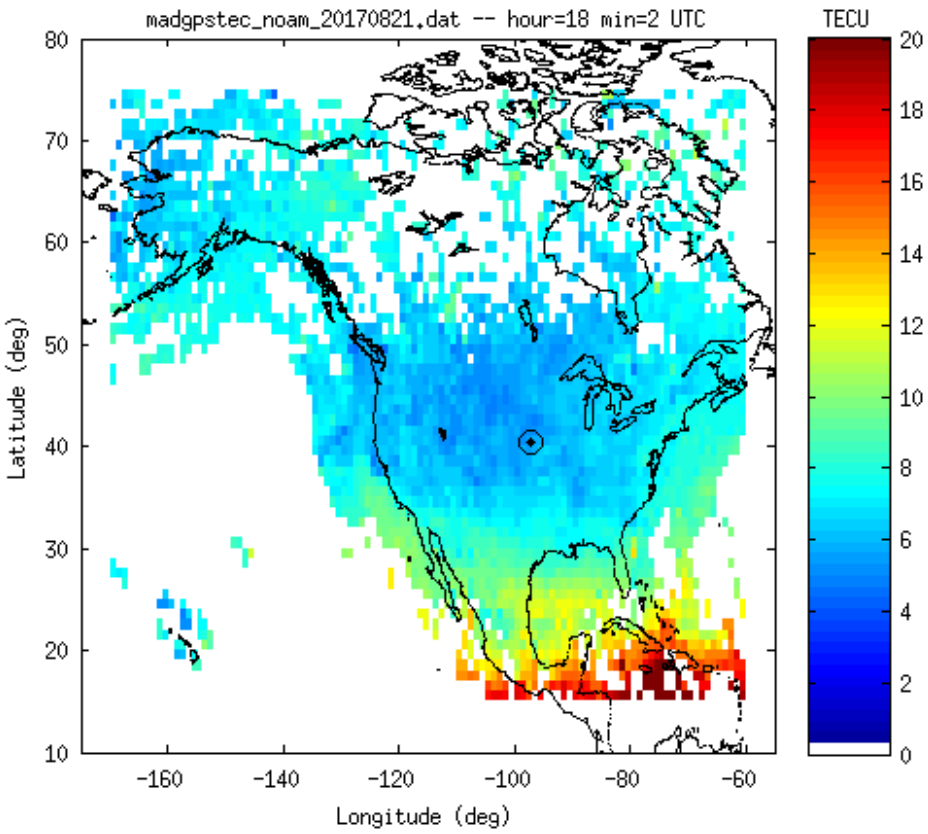
Executive Summary



- We studied some ionospheric effects associated with the passage of total solar eclipse over North America on 21 August 2017.
- Data from ionosonde as well as GPS TEC measurements were analyzed in the study.
- 45% reduction in TEC, 33% reduction in foF2, and a 50% reduction in foE occurred during the eclipse.
- Midlatitude spread-F echoes and wave disturbances were observed during the 21 August 2017 North American total solar eclipse.

A Total Solar Eclipse during Solar Minimum

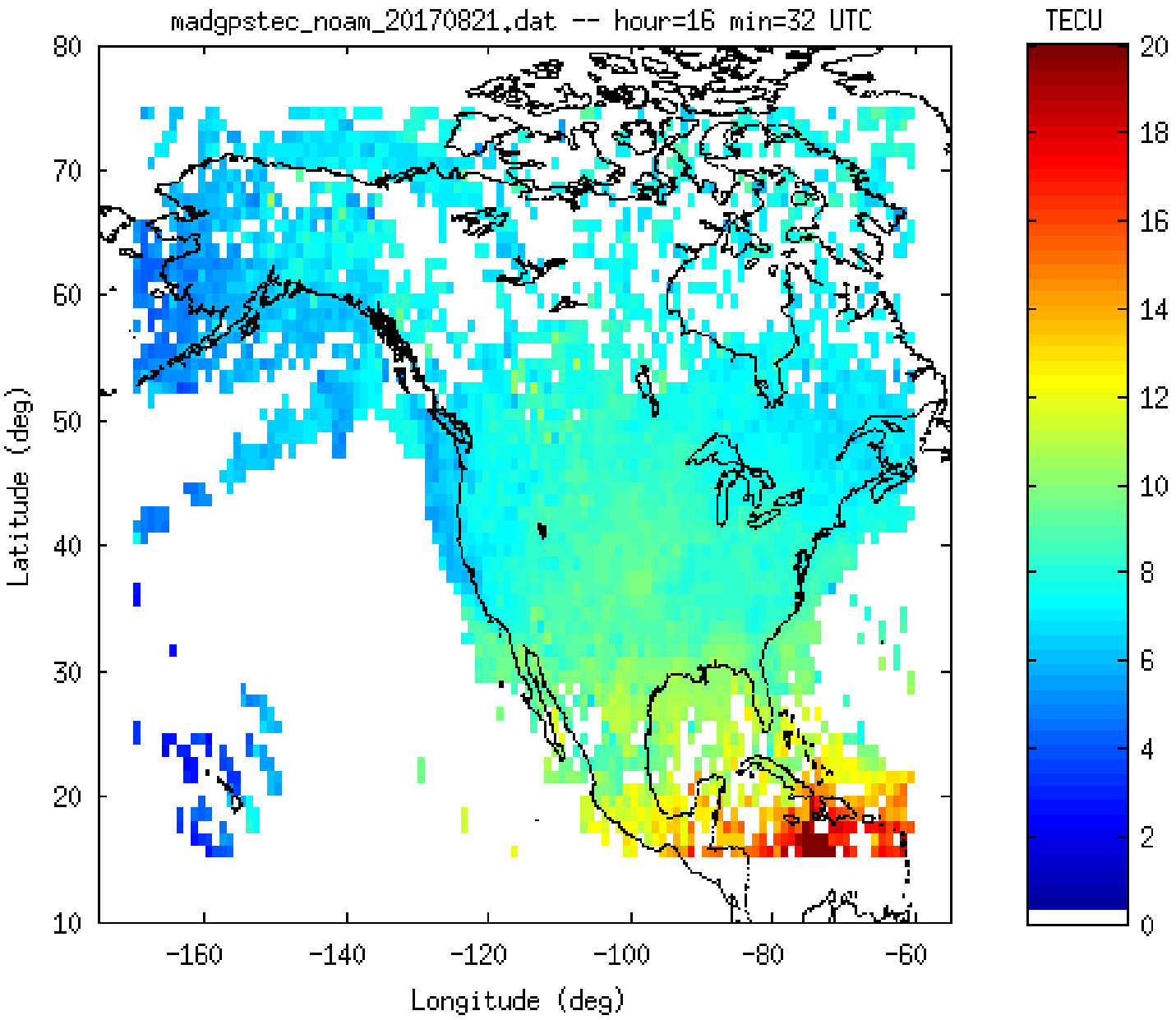




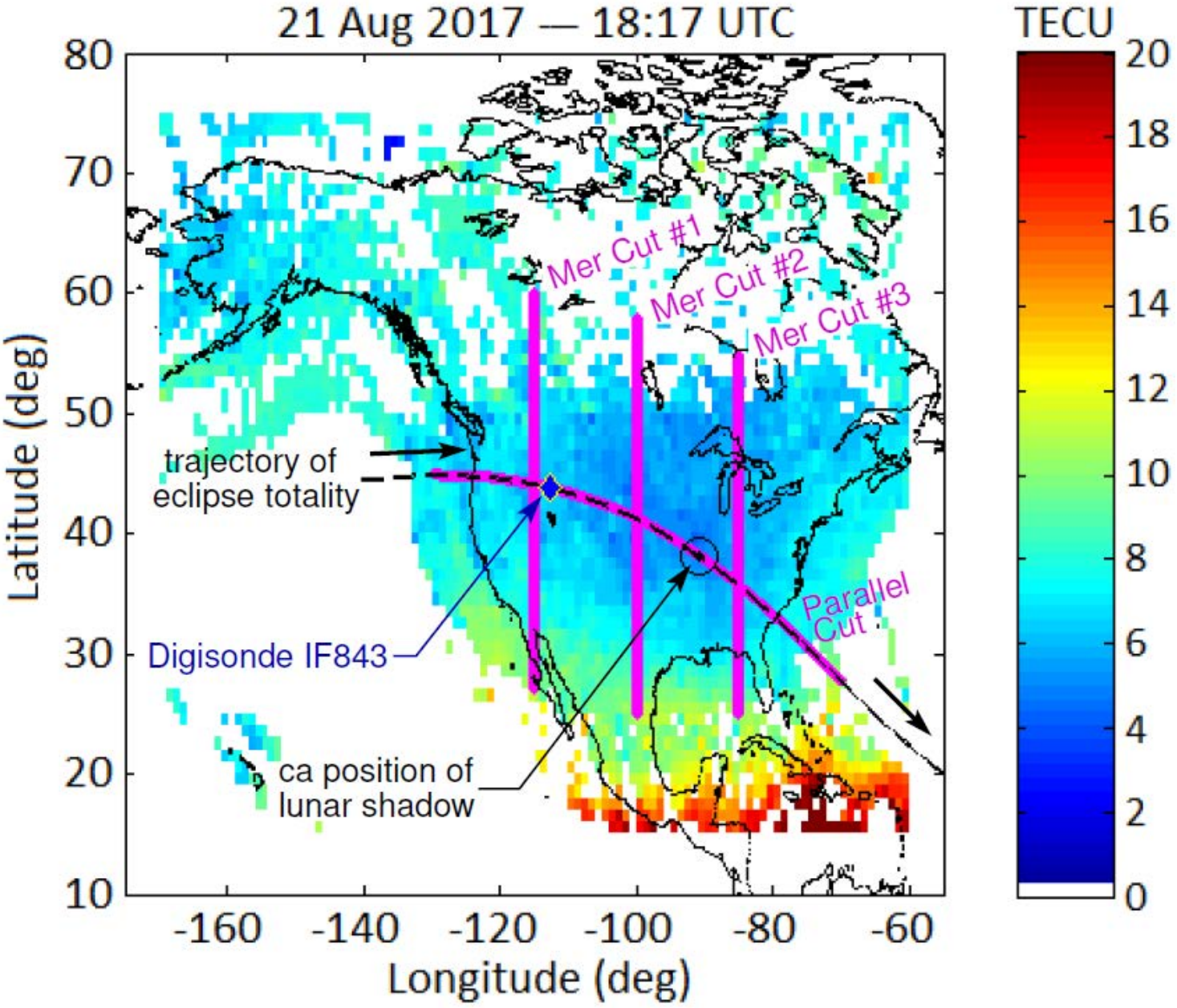
The 21 August 2017 total solar eclipse: a total solar eclipse over a midlatitude region during a generally quiet geomagnetic condition at a solar minimum.

Left: Background TEC over North America on 21 Aug 2017 from IRI-2012 model
Right: Gridded GPS TEC data over North America on 21 Aug 2017 from Madrigal

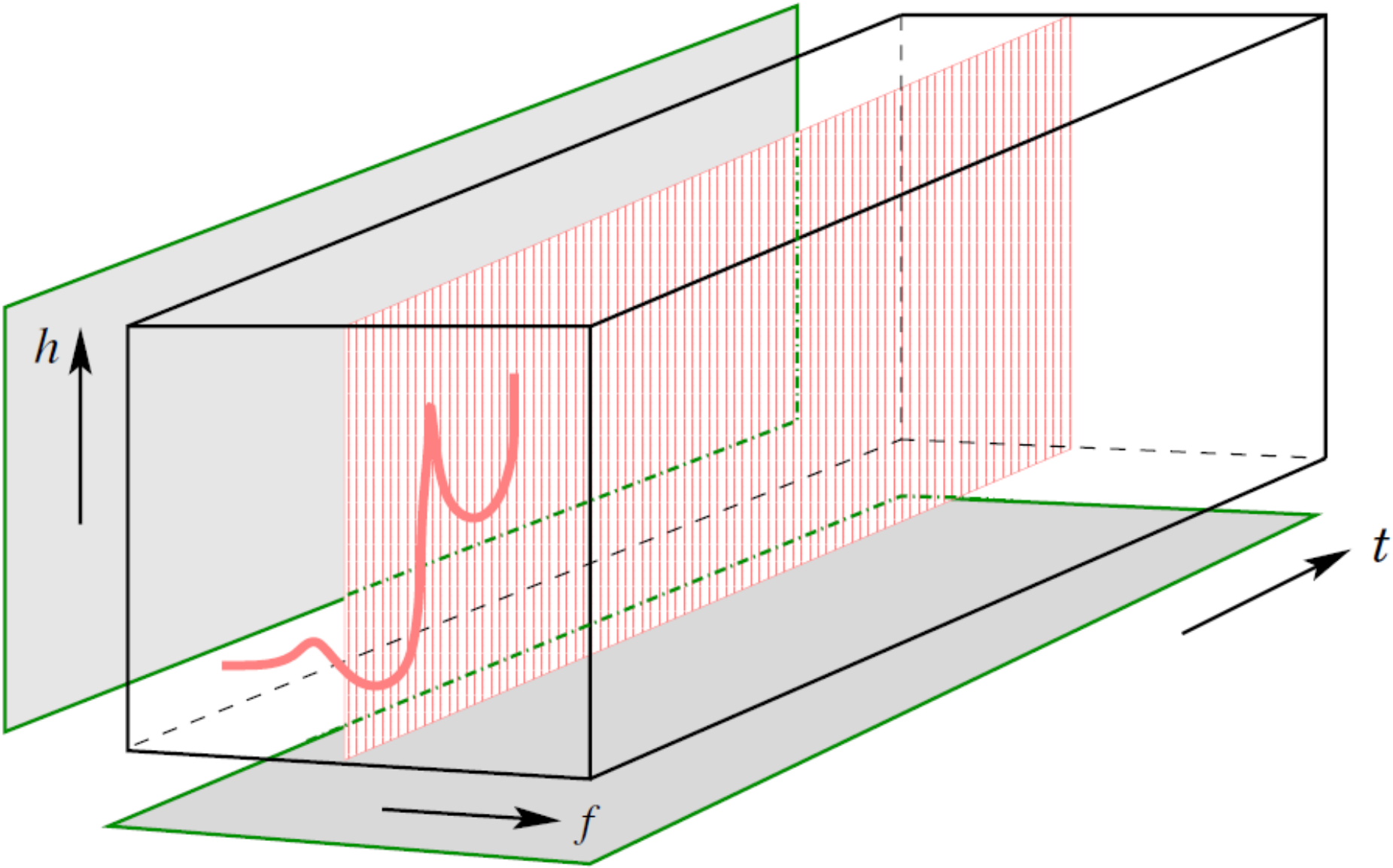
Visible Effects of the Total Solar Eclipse in TEC



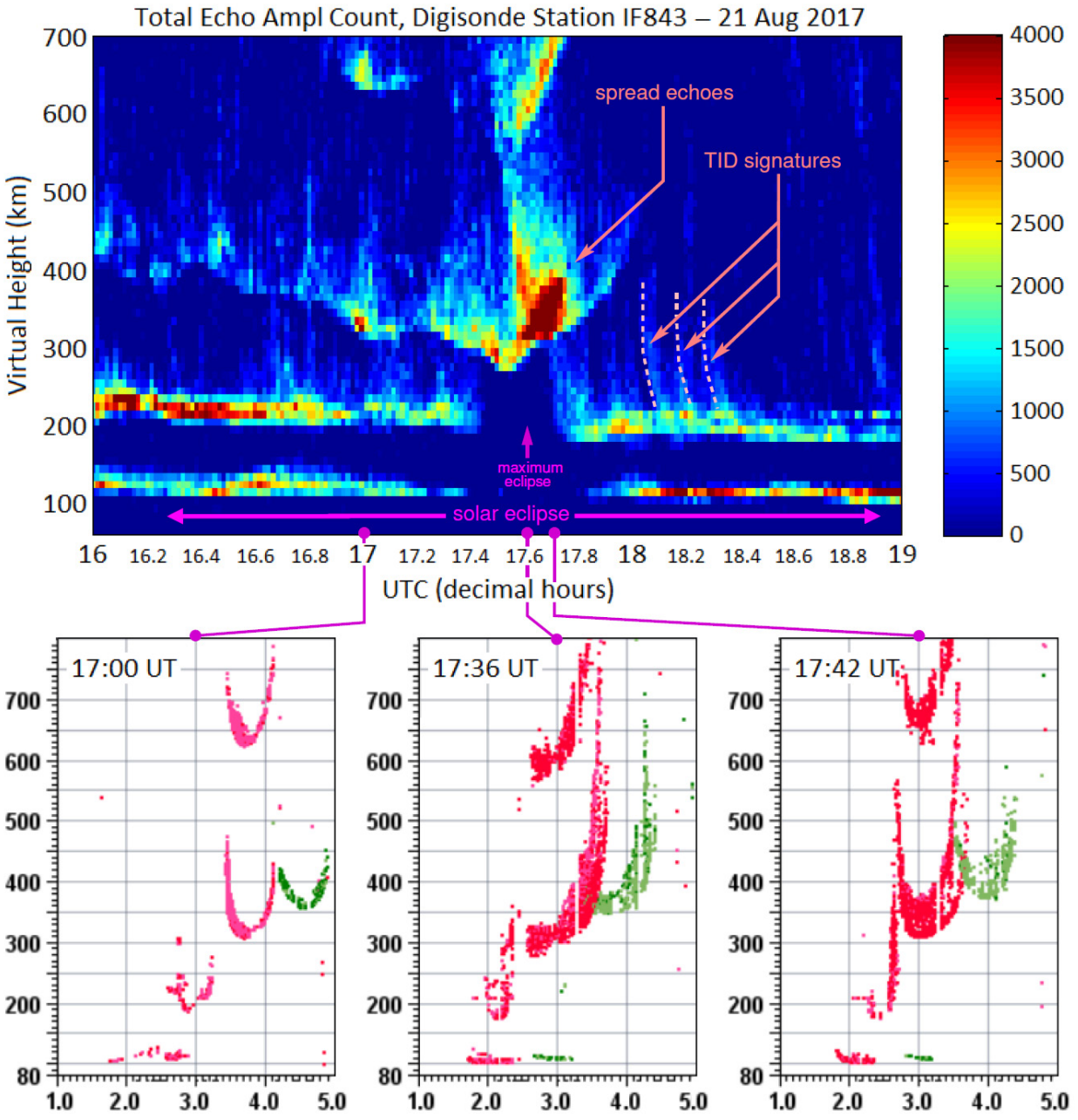
Setup for the Ionosonde and TEC Data Analysis



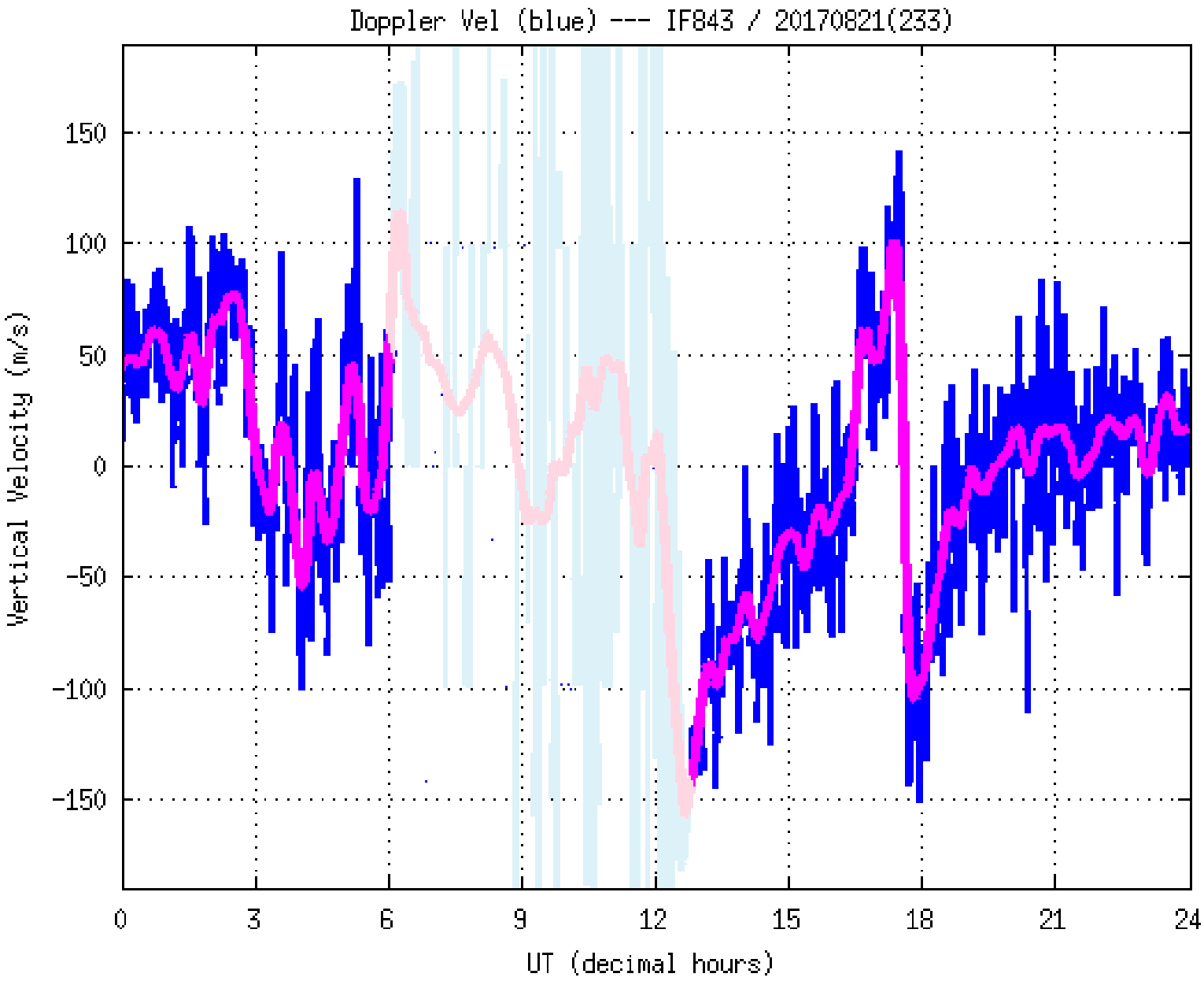
Ionosonde Data Analysis: FTI/RTI Summary Plots



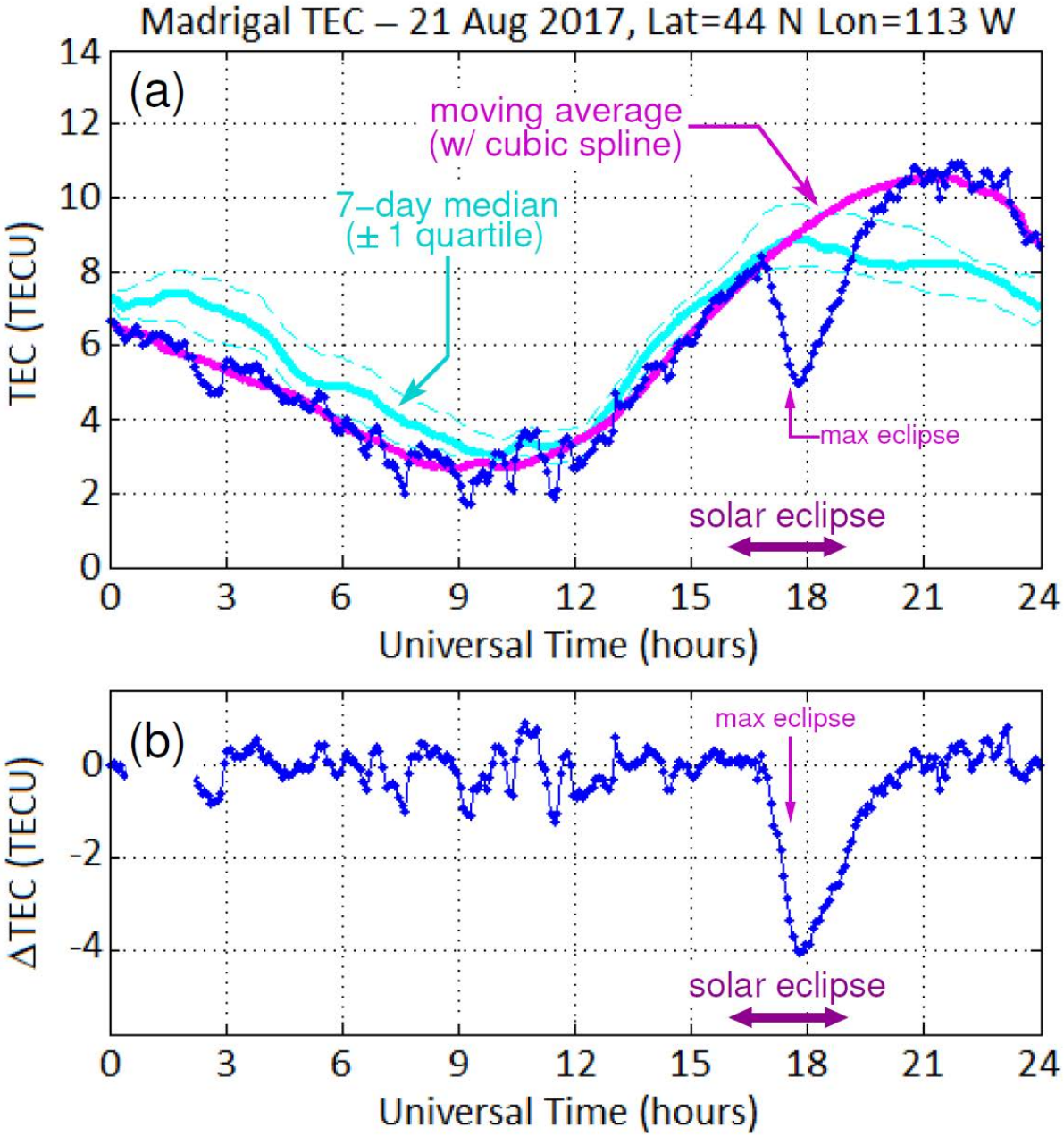
Spread-F Echoes and TIDs during Solar Eclipse



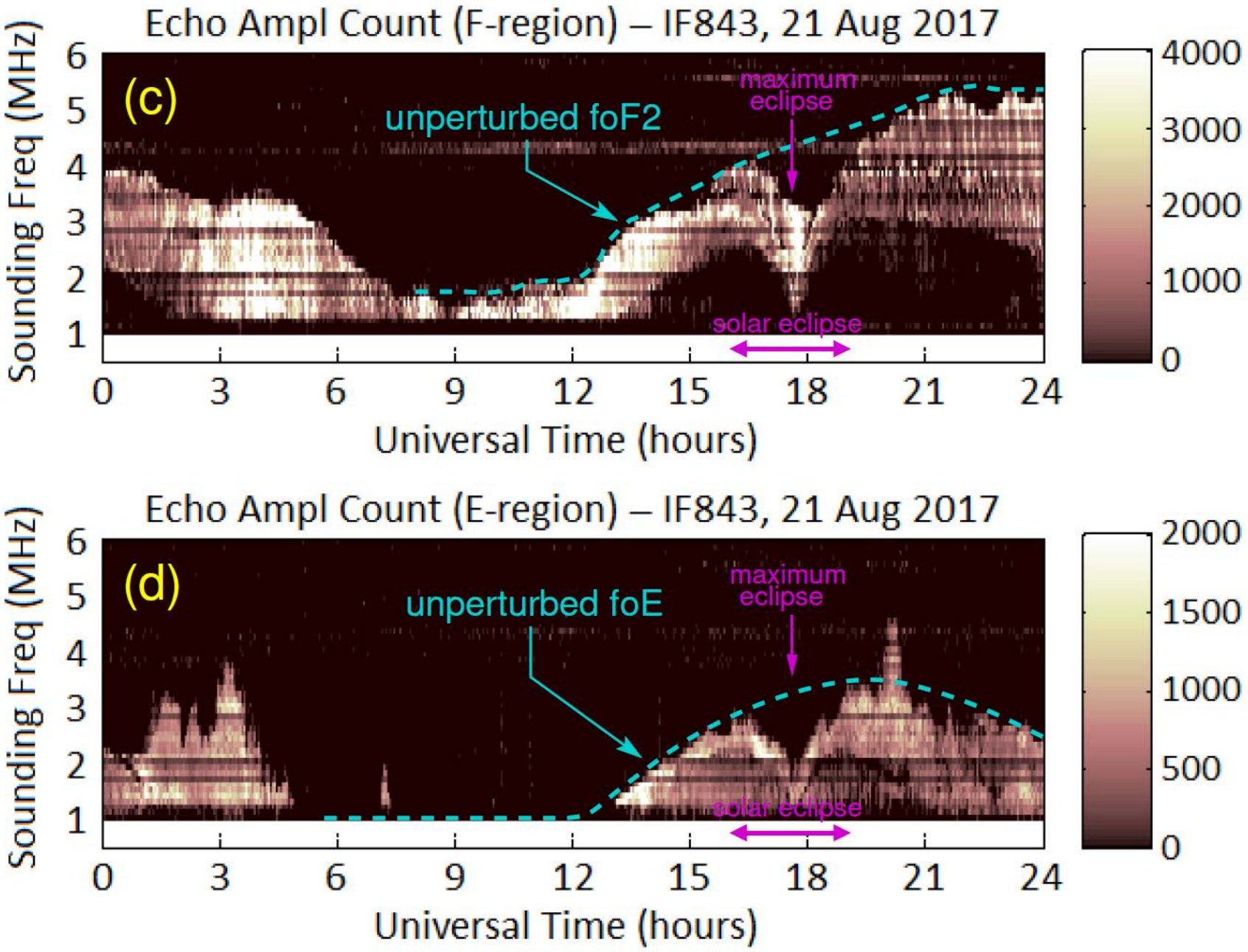
Doppler Vel. from Ionosonde during the Eclipse



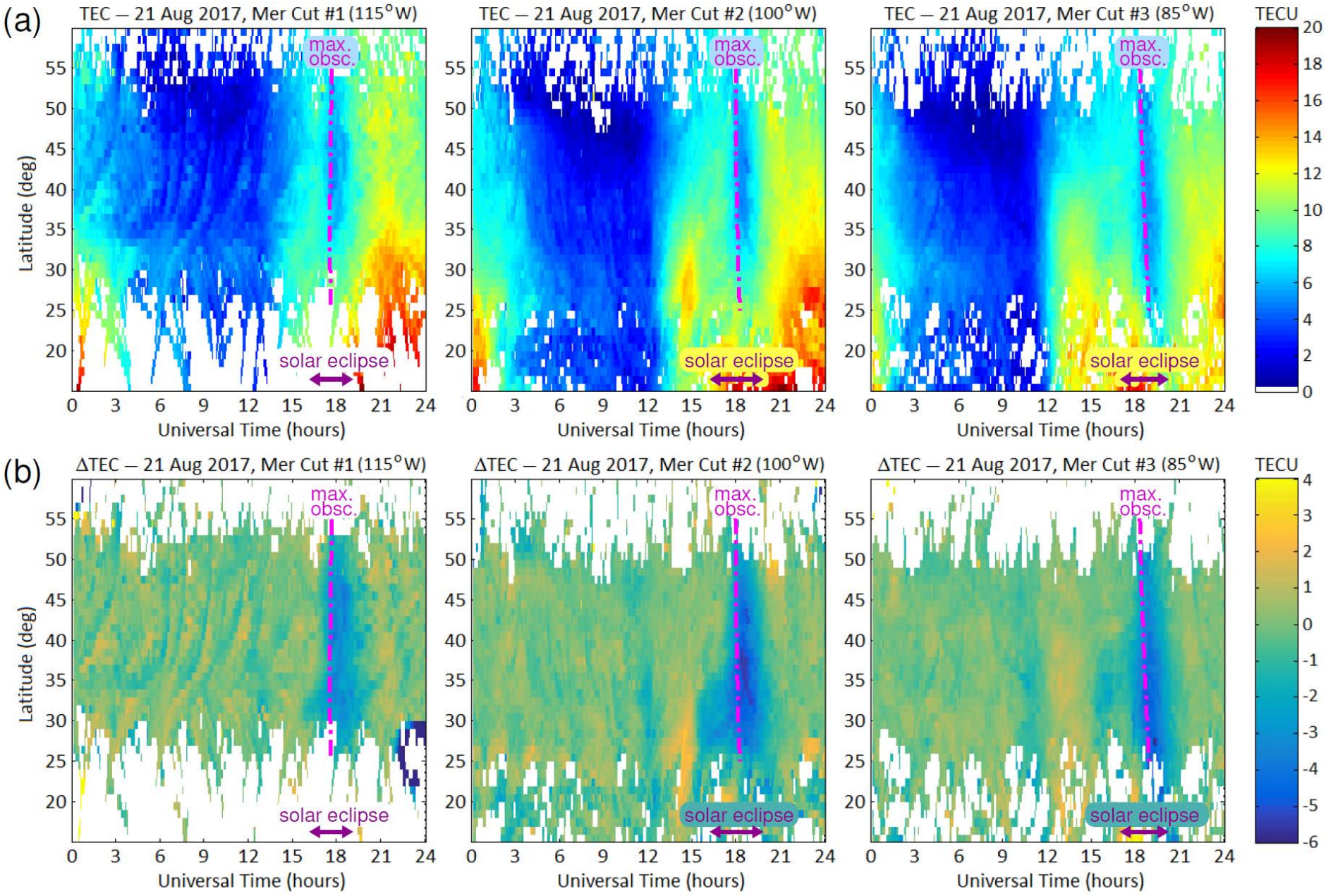
TEC Reduction during the Total Solar Eclipse



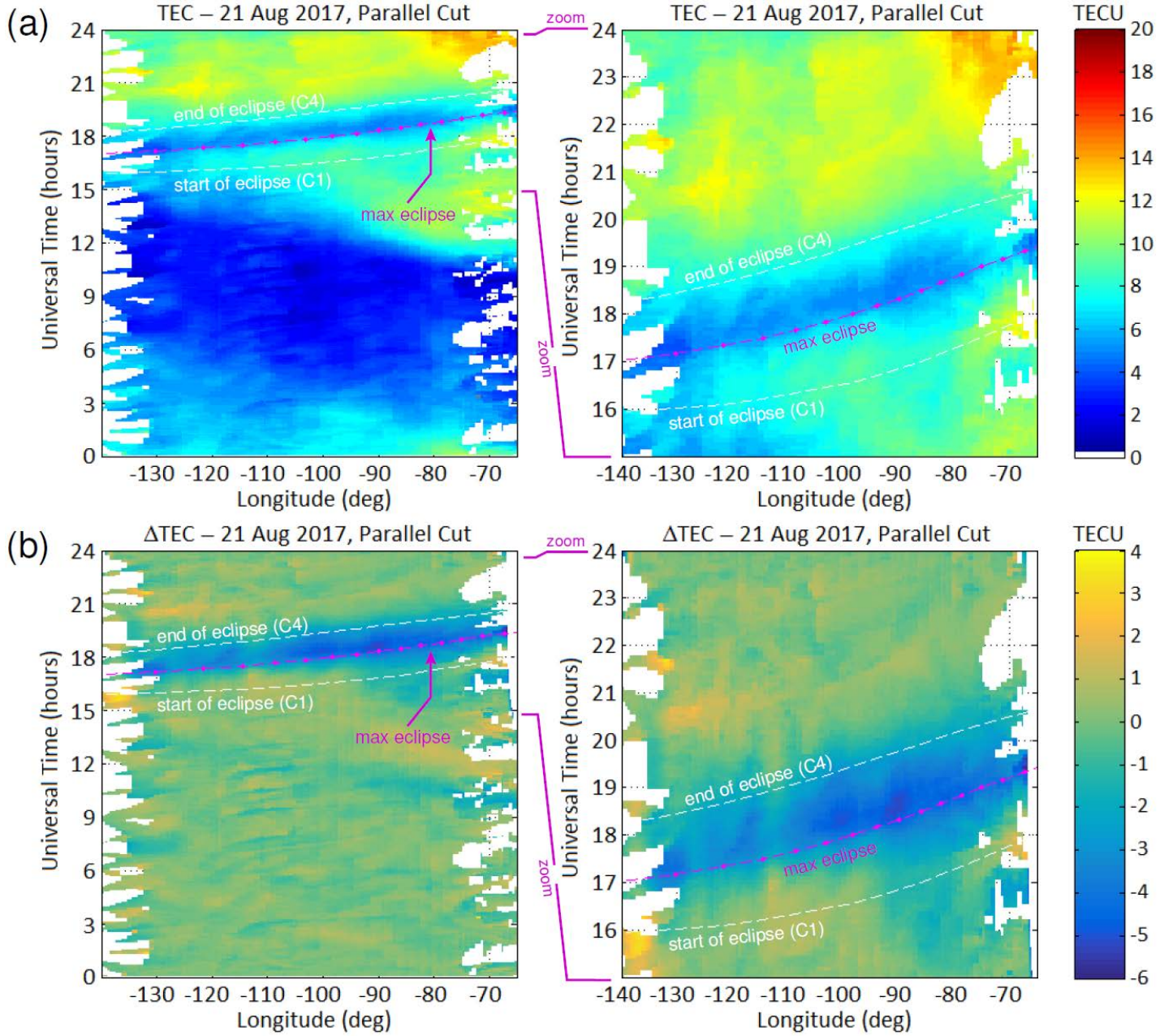
Reductions in foF2 and foE during Solar Eclipse

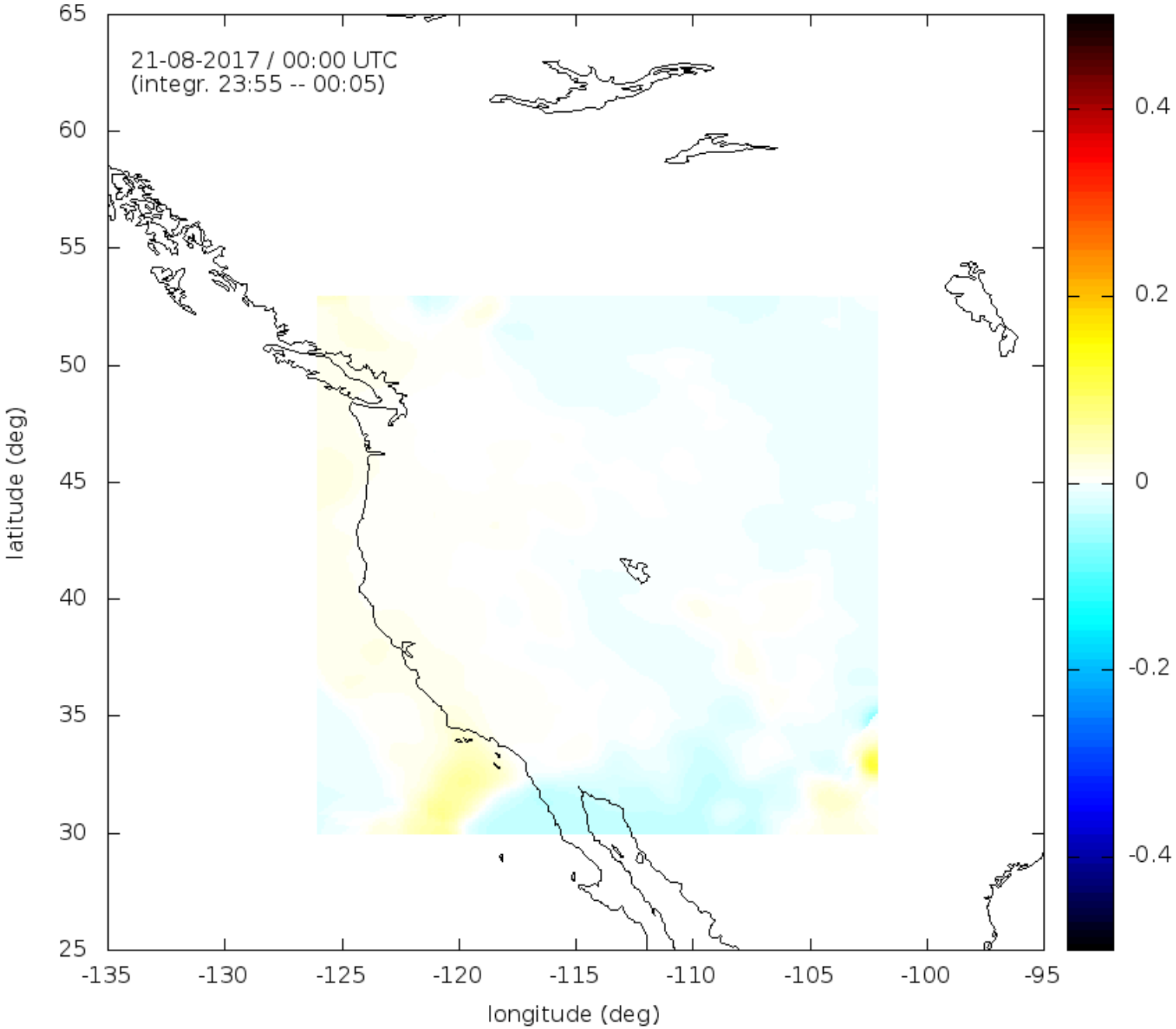


TEC Reductions along Different Longitudes

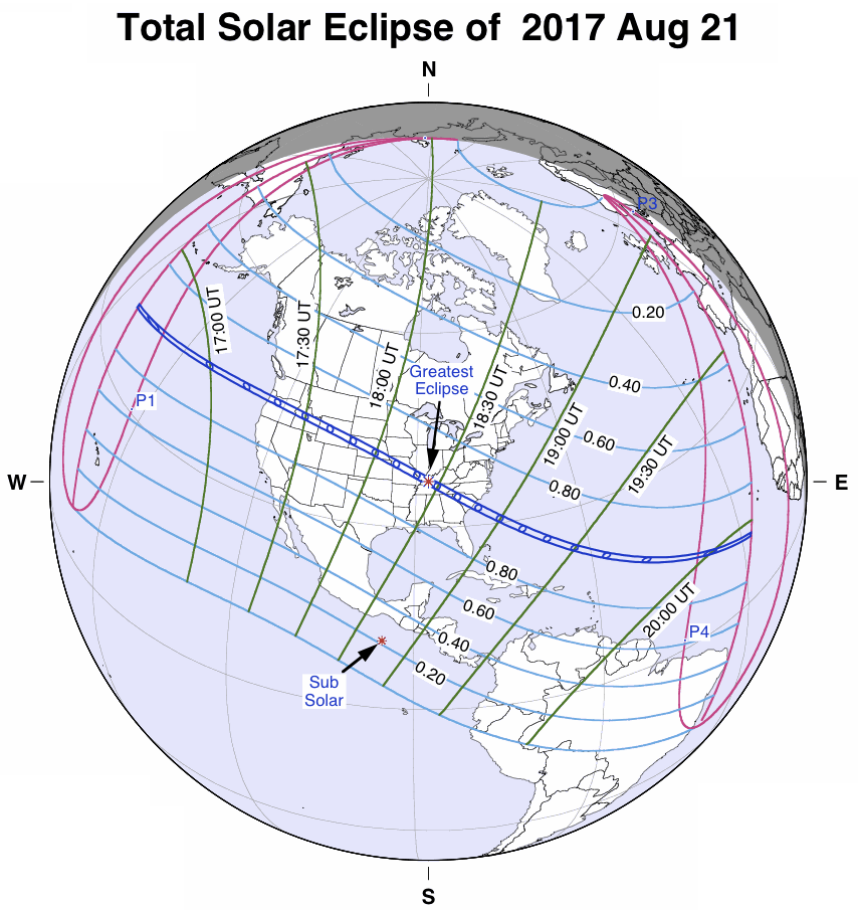


TEC Reductions along the Totality Trajectory




Perturbations in Equiv Vert TEC --- TECP (TECU)
21-08-2017 / 00:00 UTC
(integr. 23:55 -- 00:05)
65
60
55
50
45
40
35
30
25
-135
-130
-125
-120
-115
-110
-105
-100
-95
latitude (deg)
longitude (deg)
0.4
0.2
0
-0.2
-0.4

Summary and Conclusions



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