

Abstract

The Ionospheric Connection Explorer, ICON, runs a model of the near space environment. The simulations will consist of electrodynamic interactions of the thermosphere and ionosphere. ICON will understand the connection between the Earth and the space environment. TIEGCM will be used to see how large-scale waves control the ionosphere at low latitudes, while other models will analyze the alterations in the ionosphere and the coupling processes.

The largest geomagnetic storm occurred during Memorial Day weekend 2017. This event is a focus for the ICON mission, in measuring the competing effects of terrestrial and solar drivers of space weather. The mission can already simulate storms because models are used to provide a broader picture of events of which ICON can only partially observe. The recent storm allows us to test the interfaces that provide the data from repositories to the models that run at SSL, and to test the models to see how well they simulate the storm effects. Further, these simulations provide a capability to provide simulated geophysical data on geographic coordinates for the instrument suite that was running through that weekend in its final test.

TIEGCM-ICON

- 3D, time-dependent representation of coupled ionosphere and thermosphere
- Driven by tidal perturbations derived from ICON observations
- HME and AMIE

Prepare input file

Run model simulations

- Set correct run dates
- Set AMIE inputs
- Set GPI input

- Daily perturbations
- Set output input file as new start file
- Restart process until all days are complete

- Examines effect of lower boundary on system to provide guidance for interpreting future ICON model results
- Solves:
 - Momentum
 - Energy
 - Continuity equations

Acknowledgements



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Results

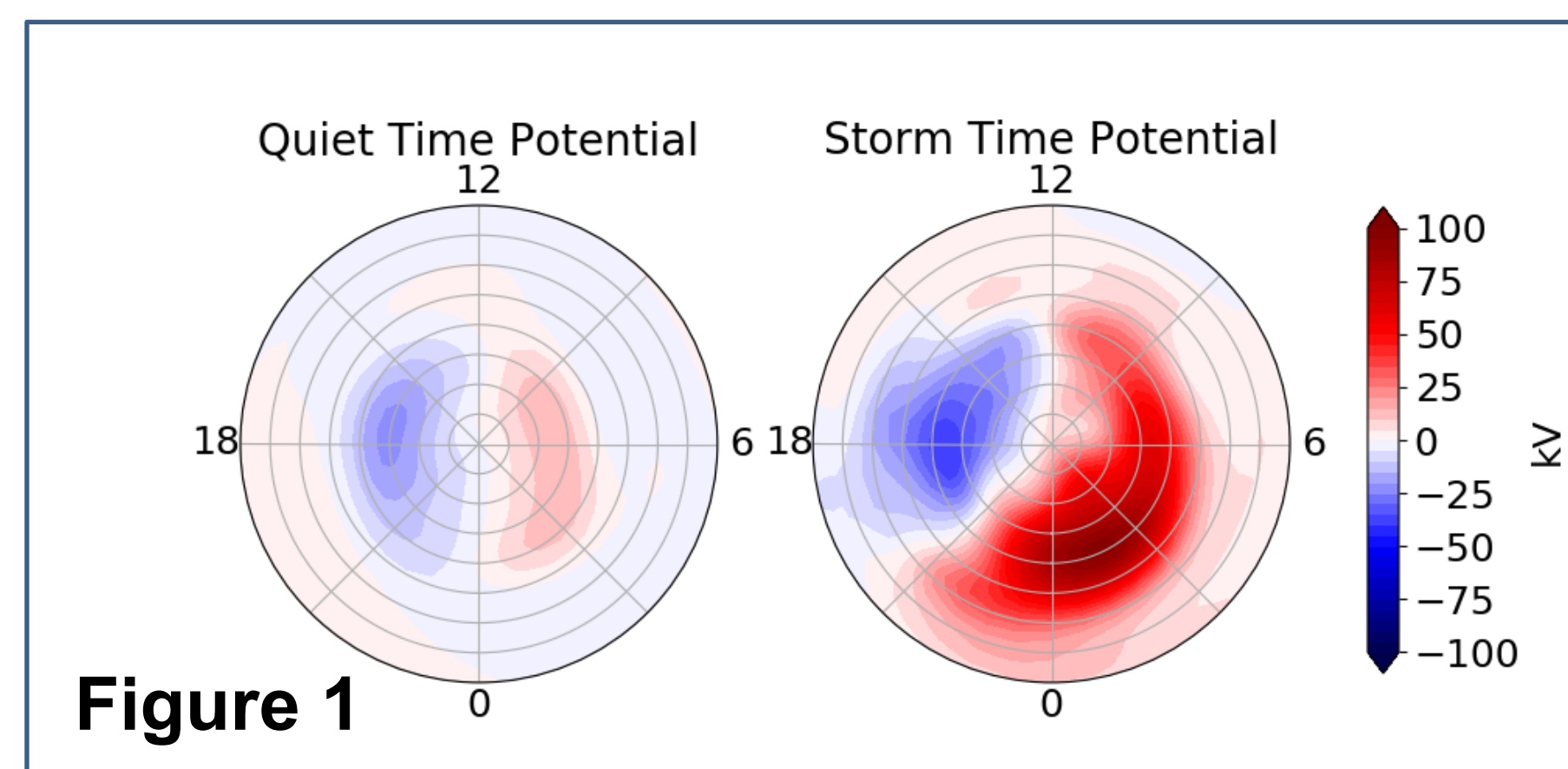


Figure 1: Cross-Cap Potential during quiet and storm activity

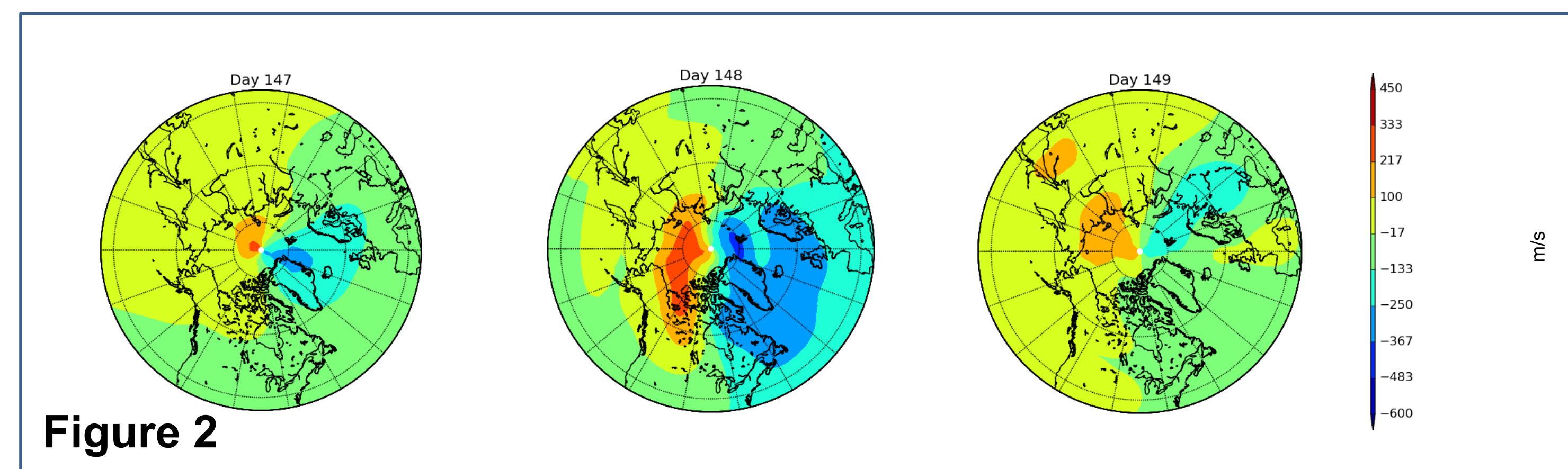


Figure 2: Polar plots showing the north meridional winds before, during, and after the storm

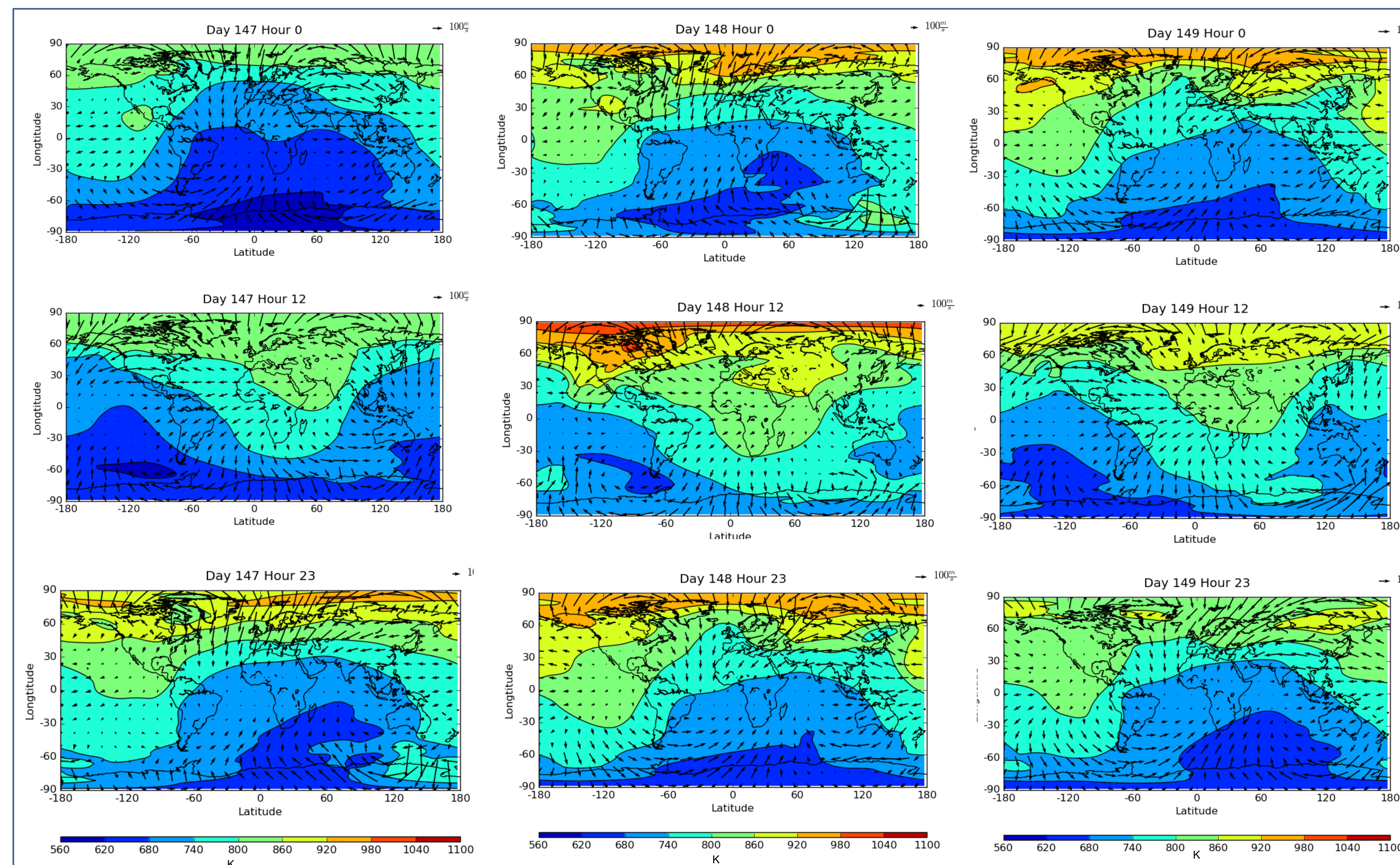


Figure 3: Global contour plots showing the normal temperature and wind differences before, during, and after the Memorial Day weekend geomagnetic storm.

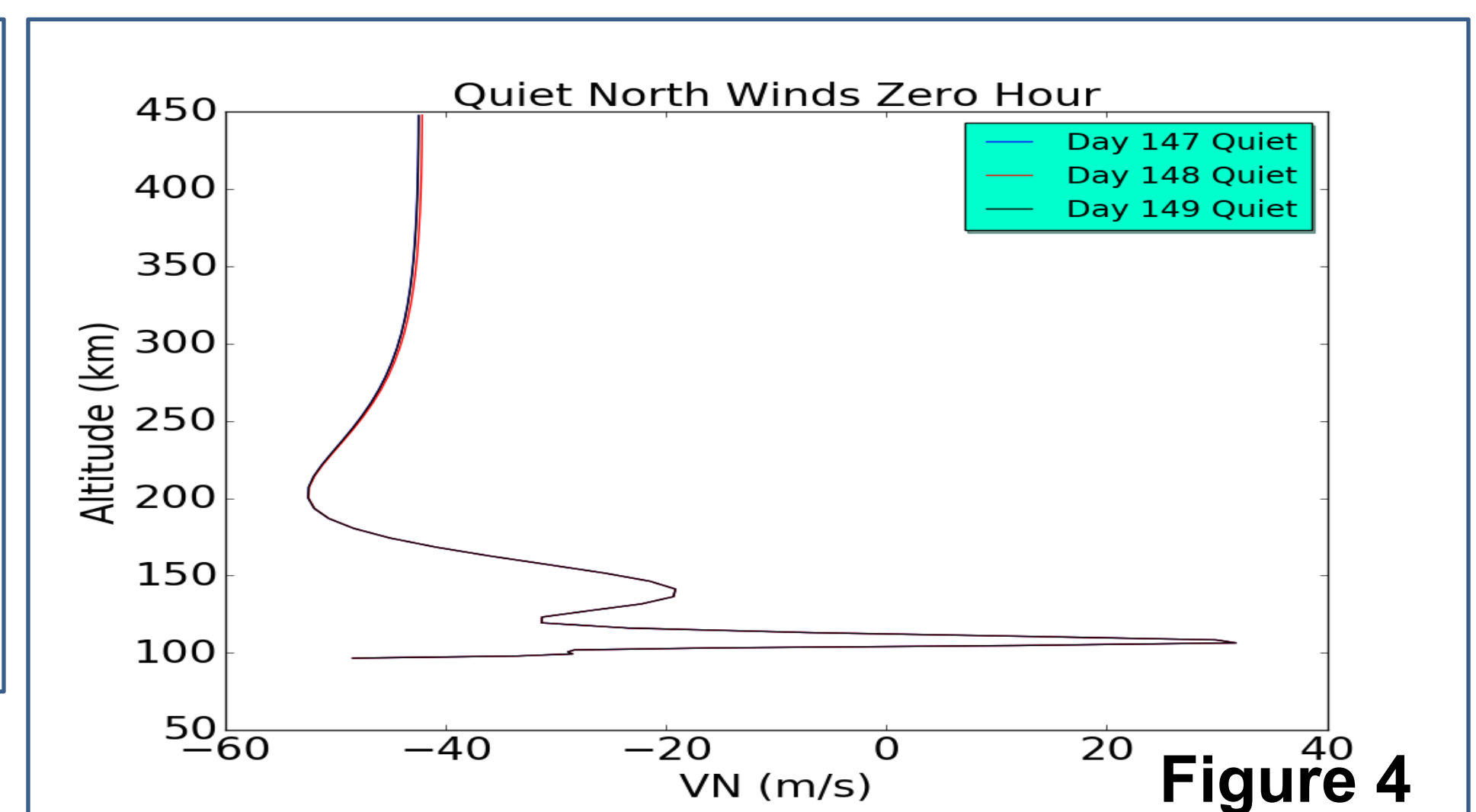


Figure 4

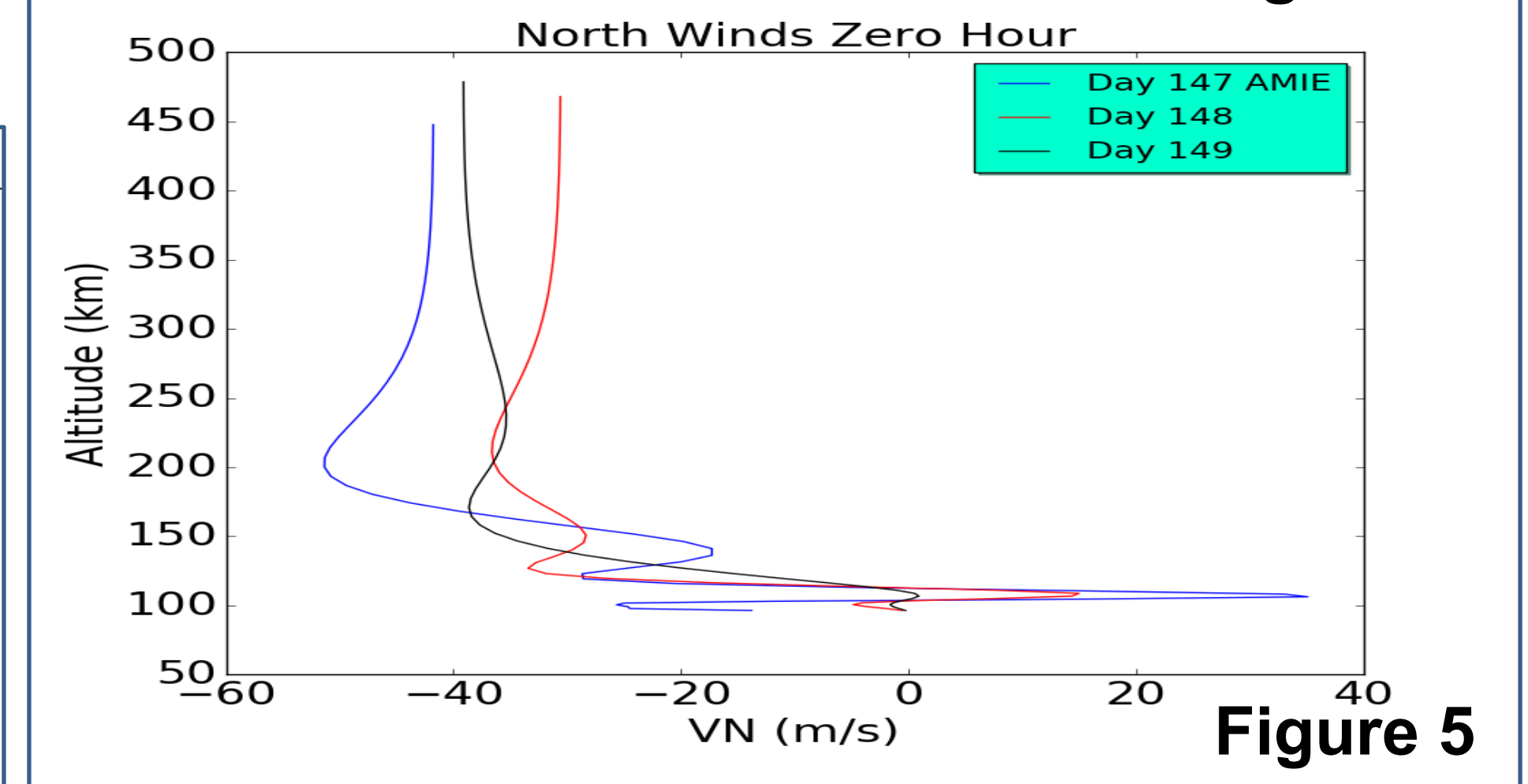


Figure 5

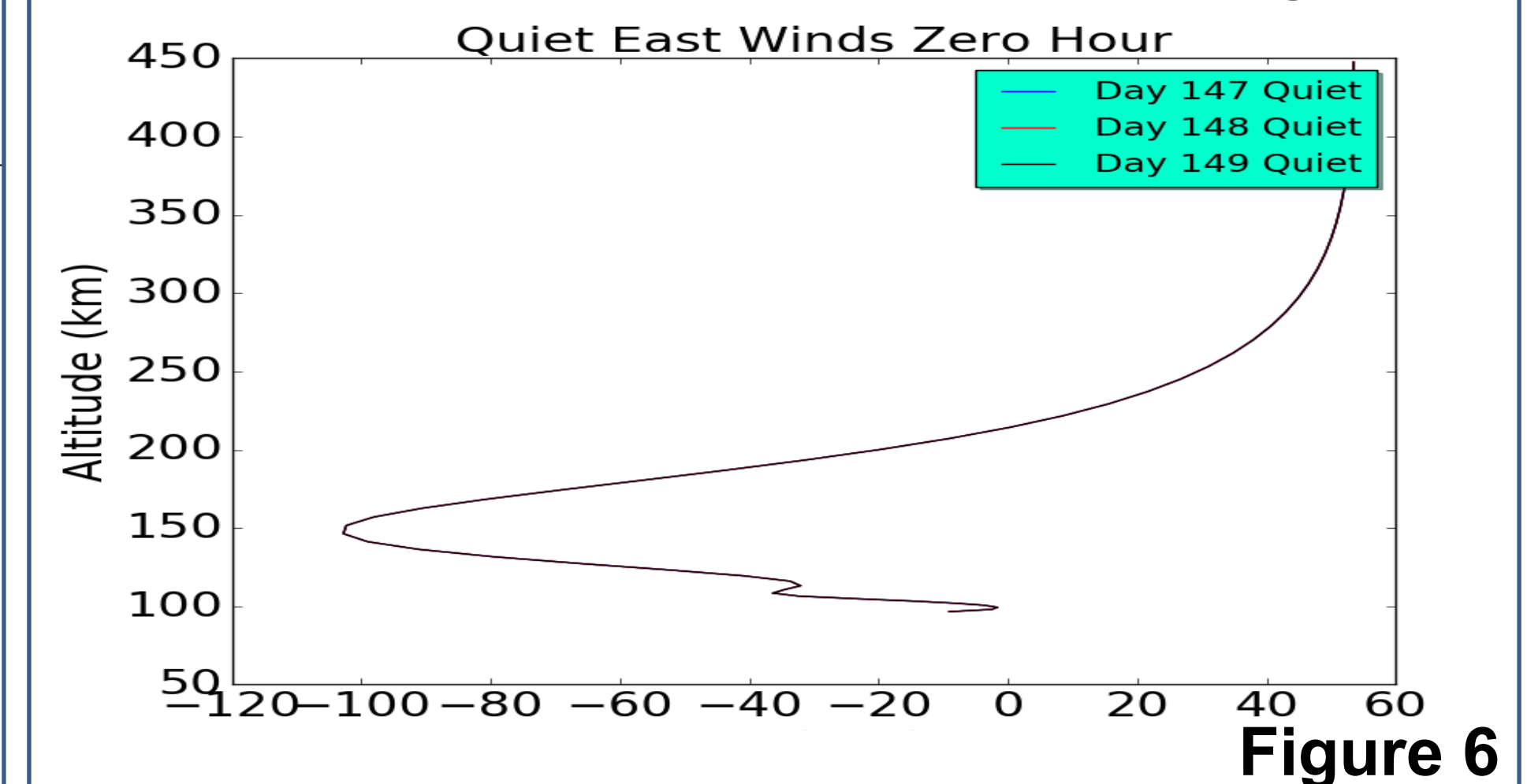


Figure 6

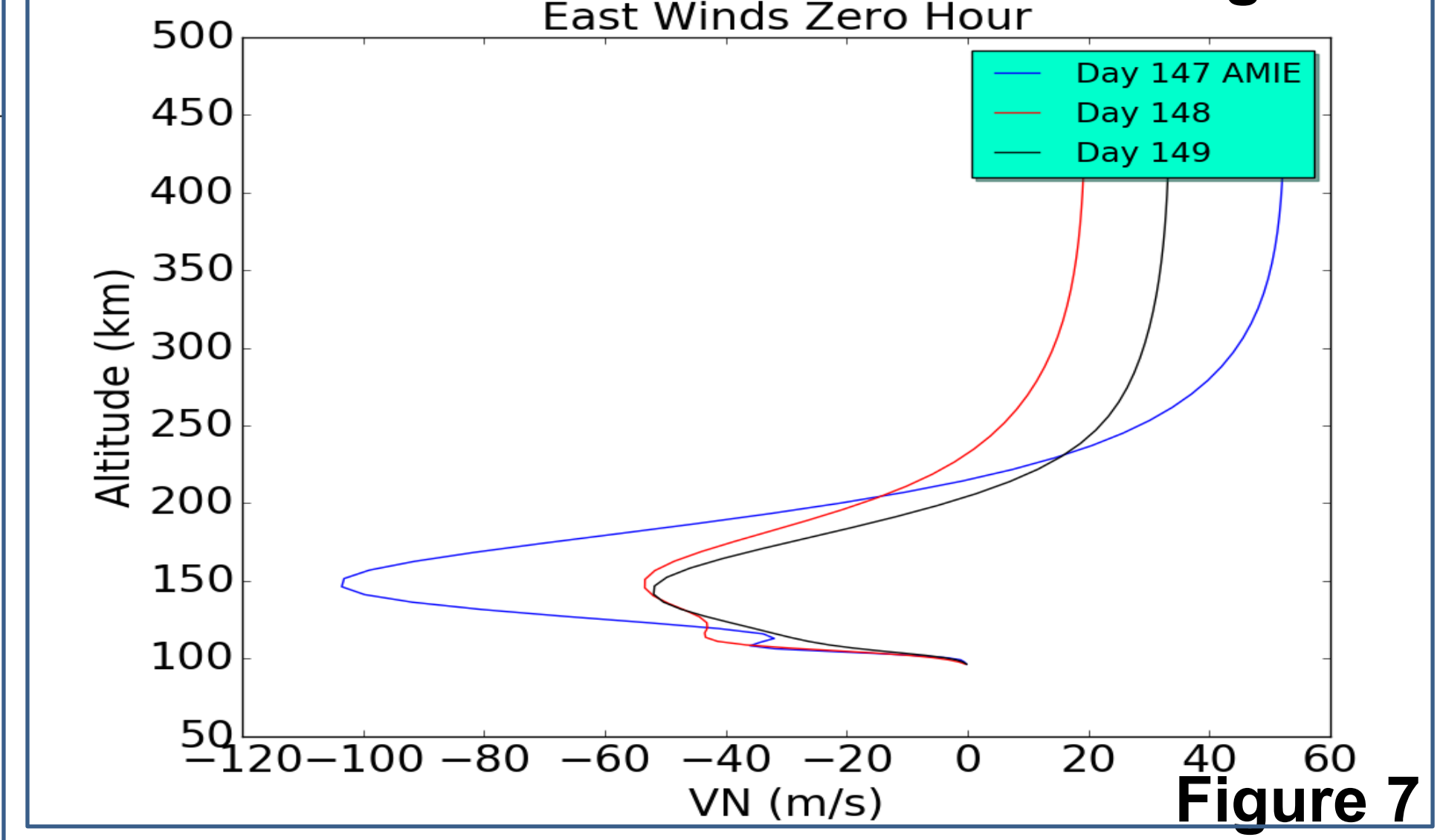


Figure 7

Figure 4-7: North and Eastern meridional wind profiles during quiet and storm activity.

ICON-ic View



ICON will launch November 2017 with the purpose of understanding the physics of the near space environment, and the tug-of-war between it and the earth environment. It will deliver consistent data measured in the ionosphere in its 27 degree orbit. As the orbit is limited, models such as TIEGCM-ICON and AIME will be used to provide a full picture of the ionosphere. The simulations run proved the models' data to be accurate.

References

- Maute, A. (2017), Thermosphere-Ionosphere-Electrodynamics General Circulation Model for the Ionospheric Connection Explorer: TIEGCM-ICON, *Space Sci. Rev.*, doi:10.1007/s11214-017-0330-3.
- NCAR (2016), TIEGCM Users Guide, *TIEGCM Users Guide*. Available from: <http://www.hao.ucar.edu/modeling/tgcm/tiegcm2.0/userguide/html/>
- Rider, K., T. Immel, E. Taylor, and W. Craig, (2015), ICON: Where earth's weather meets space weather, *2015 IEEE Aerospace Conference*, Big Sky, MT, pp. 1-10 doi: 10.1109/AERO.2015.7119120