

Project Details

ROSES ID: NNH07ZDA001N

Selection Year: 2008

Program Element: Focused Science Topic

Topic: Focused science topics for Strategic Goal 4 (Ionosphere-Thermosphere): Determine the sources of daily variability in the thermosphere and ionosphere

Project Title:

Investigations of the Sources and Changes of the Daily Variability of the Thermosphere and Ionosphere

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Project Member(s):

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Summary:

We propose to undertake a comprehensive study of the driving mechanisms of the day-to-day variability of the ionosphere and the seasonal and hemispheric dependence of this variability. While there have been many correlation studies between ionospheric daily variations and solar radiation, solar wind/IMF and lower atmospheric planetary waves, the physical mechanisms driving this variability, the relative importance of these mechanisms, and the seasonal and hemispheric variations of the daily variability have not been fully characterized. We will use the NCAR-Thermosphere, Ionosphere, Mesosphere, Electrodynamics Global Circulation Model (TIMEGCM); Coupled Magnetosphere Ionosphere Thermosphere (CMIT) models, European Center Medium-range Weather Forecast (ECMWF) reanalysis fields, and observations to address these issues. Four scientific investigations will be undertaken:

- 1) The impact of planetary waves on ionospheric daily variability using the high-resolution TIMEGCM with its lower boundary being specified by ECMWF analysis fields. Diagnostic analysis will be performed to investigate which planetary waves can propagate into the thermosphere, and the mechanisms by which these waves drive ionosphere variability.
- 2) The impact of solar radiation, solar wind and magnetospheric conditions on ionosphere daily variability using CMIT models. Diagnostic analysis of model outputs will be carried out to investigate the processes that cause ionosphere variability under these conditions.
- 3) The relative importance of each driving force to ionosphere daily variability. Comparisons between model simulations and observations will be made to examine the adequacy of the physics included in the model to simulate the observed ionosphere variability, and ways to improve the model.
- 4) The effect of seasonal and hemispheric conditions on ionosphere daily variability. This includes the studies: what are the causes of the seasonal variations of the ionosphere daily variability; what are the differences between the variability in the two hemispheres?

Publication References:

Summary: no summary

Reference: Burns, A. G.; Wang, W.; Wiltberger, M.; Solomon, S. C.; Spence, H.; Killeen, T. L.; Lopez, R. E.; Landivar, J. E.; (2008), An event study to provide validation of TING and CMIT geomagnetic middle-latitude electron densities at the F2 peak, Journal of Geophysical Research: Space Physics, Volume 113, Issue A5, CiteID A05310, doi; 10.1029/2007JA012931