Project Details

ROSES ID: NNH06ZDA001N
Selection Year: 2007
Program Element: Focused Science Topic

Topic: Investigate the Global Distribution, Sources and Effects of Large Electron Density Gradients at Middle and Low Latitudes

Project Title:
Investigation of Tropospheric Ionospheric Interactions

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Summary:
A new large-scale structure has recently been discovered in the equatorial ionosphere. The peak plasma density and separation of the two bands of the equatorial ionospheric anomaly (EIA) were found to vary significantly at equinox, with maxima in 4 sectors around the planet. No known topside driver has such a high spatial frequency, and it has been shown that the wave-4 structure corresponds well with the distribution of atmospheric tides forced mainly by persistent tropical precipitation during equinox. With this observation, a theory was developed that the electric fields are alternately enhanced and suppressed by a combination of these tidal components that propagate upward from the troposphere. This theory will be tested by sythesizing advanced models of atmospheric tides and the ionosphere. We propose to integrate the combined mean and tidal winds of the NCAR GSWM with the NRL SAMI3 model to self-consistently reproduce the dynamo electric fields that generate the dayside ionospheric fountain electric field and EIA. This is a significant modification of the SAMI code that will require close cooperation between the Berkeley and NRL groups. This work is required to understand the coupling between the troposphere and ionosphere that appears to occur globally on a regular basis.

Publication References:

Summary: no summary

Reference: Immel, Thomas J.; England, Scott L.; Zhang, Xiaoli; Forbes, Jeffrey M.; DeMajistre, Robert; (2009), Upward propagating tidal effects across the E- and F-regions of the ionosphere, Earth, Planets and Space, Volume 61, p. 505-512, doi: 10.1186/BF03353167