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Lower Atmosphere Sources of Thermosphere Ionosphere Structure and Variability

Timothy Fuller-Rowell (1,2), Rashid Akmaev (2), Fei Wu (1,2), Houjun Wang (1,2), Mihail Codrescu (2), Tzu-Wei Fang (1,2)

(1) CIRES Center for Space Weather, University of Colorado, Boulder, USA (tim.fuller-rowell@noaa.gov, 303-497-3645), (2) Space Weather Prediction Center, Boulder, USA

The conventional sources of ionospheric structure and variability are changes in solar radiative output and geomagnetic activity, together with the subsequent response of the thermosphere and ionosphere system and interaction between the components. In the past, the extreme events of storms and flares have captured much of the interest, but most of the time there is not a flare or geomagnetic storm in progress, so it is predicting the day-to-day changes that are required, e.g. is the ionospheric total electron content going to be higher or lower tomorrow? With the recent development of whole atmosphere models (WAM), some attention is now being directed towards quantifying the impact of wave forcing from the lower atmosphere. Features such as the midnight temperature maximum can now be simulated realistically in WAM, and the physics behind the four-cell ionospheric and electrodynamic longitude structure is attracting significant interest. It has also been suggested that episodic lower atmosphere events, such as stratospheric sudden warmings (SSW), impose a strong signature on the ionosphere. A SSW can be simulated in WAM but following a real event will require data assimilation, in order to confirm a real physical connection between changes in the dynamics in the lower atmosphere and the thermosphere ionosphere response.