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Impact of Tropospherically-Generated Tides on the Mean State of the Ionosphere-Thermosphere System

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It is now widely recognized that vertically-propagating tides exert significant variability on the ionosphere-thermosphere (IT) system. In particular, the impact of tropospherically-generated non-migrating tides on longitudinal variability of the IT system has been a topic of intense research in recent years. However, relatively little is known about how dissipation of these upward propagating waves affects the zonal mean state of the IT system. Herein we report on numerical experiments performed with the National Center for Atmospheric Research (NCAR) Thermosphere-Ionosphere-Electrodynamics General Circulation Model (TIE-GCM) that explore this topic using observationally based tidal lower boundary conditions near 97 km from the Climatological Tidal Model of the Thermosphere (CTMT after Oberheide et al., [2011]) for average solar conditions over a climatological year (i.e. steady-state monthly runs). A robust evaluation of the NCAR TIE-GCM close to the model lower boundary was performed to assess the validity of our results, since the TIE-GCM lower boundary is close to the height regime where many of these upward propagating tides dissipate and exchange energy and momentum with the background IT. Differences between simulations with and without tidal forcing are analyzed to establish the aggregate effects of tidal dissipation on the zonal mean circulation and temperature structure. Numerical experiments are also performed with several different combinations of tides at the lower boundary to identify those components that most effectively alter the zonal mean structure of the IT.