

Vertical Propagation of Gravity Waves in the Thermosphere Simulated by GAIA

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Abstract:

It has been recognized that gravity waves play an important role on the momentum and energy balance in the thermosphere. In this study, the effects of upward propagating gravity waves on the general circulation of the thermosphere are investigated using a whole atmosphere-ionosphere coupled model (GAIA). The GAIA contains the region from the ground surface to the upper thermosphere (about 500km altitude), so that we can simulate excitation of gravity waves in the lower atmosphere and their upward propagation of gravity waves from the lower atmosphere to the thermosphere. The high horizontal resolution of the neutral atmospheric part of GAIA is about 0.5 degree longitude by 0.5 degree latitude, and this model can simulate wide ranges of gravity waves in their thermosphere. Our simulation results indicate that gravity wave activity in the thermosphere has significant temporal and latitudinal variations. In this study, we focus our attention on gravity wave activity in the winter thermosphere. Our simulation result indicates that some of gravity waves in the winter thermosphere is originated from the polar night jet in the stratosphere/mesosphere. Moreover, the impacts of thermospheric gravity waves on variability in the ionosphere are investigated.

Key words: Gravity wave, Vertical coupling process, whole atmosphere model