Quasi-two-day wave coupling of the middle atmosphere and Ionosphere-Thermosphere

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In this talk, the coupling mechanisms of the middle atmosphere and ionosphere-thermosphere via the quasi-two-day planetary waves (QTDW) will be reviewed. Results from TIME-GCM numerical simulations and satellite observations will be presented. First of all, the QTDW winds in the lower thermosphere modulate the dynamo electric fields in the E-region ionosphere. The modulated electric field is transmitted into the F-region along the magnetic field and leads to quasi-two-day oscillations in the ion drift and electron densities. The second mechanism is via the dissipation of the QTDW in the lower thermosphere and acceleration of the mean wind. The driven poleward meridional circulation enhances the mixing of constituents in the lower thermosphere. Through molecular diffusion, the decrease of the O mixing ratio and the increase of the N_2 and O_2 mixing ratios propagate from the lower thermosphere into the upper thermosphere. As a result, the mean O/N_2 ratio and electron density near the ionospheric F_2 peak is reduced by about 16-20% at low and mid latitudes. The third mechanism is through the interaction between the QTDW and migrating tides in the mesosphere and lower thermosphere. This interaction reduces the amplitude of the migrating diurnal tide in the lower thermosphere in neutral winds and also generates sum and difference secondary waves in the lower thermosphere and E-region ionosphere. As a result of the changed migrating diurnal tide and sum/difference secondary wave, vertical ion drift and electron density vary with local time at different longitudes. The sum and difference secondary waves can cause additional oscillations in vertical ion drift and ionospheric electron densities.

Key words: quasi-two-day wave, dynamo, general circulation, wave-wave interaction,coupling