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# Quasi-two day wave related variability in the background dynamics and composition of the mesosphere / thermosphere, and the ionosphere

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Dissipating planetary waves in the mesosphere and lower thermosphere (MLT) region may cause changes in the background dynamics of that region, subsequently driving variability throughout the broader thermosphere / ionosphere system via mixing due to the induced circulation changes. We report the results of case studies examining the possibility of such coupling during the northern winter in the context of the quasi-two day wave (QTDW) - a planetary wave that recurrently grows to large amplitudes from the summer MLT during the post-solstice period. Six distinct QTDW events between 2003 and 2011 are identified in the MLT using SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) temperature observations. Concurrent changes to the background zonal winds, zonal mean column O/N2 density ratio, and ionospheric total electron content (TEC) are examined using datasets from TIDI (TIMED Doppler Interferometer), GUVI (Global Ultraviolet Imager), and GIMs (Global Ionospheric Maps), respectively. We find that in the 5 - 10 days following a QTDW event, the background zonal winds in the MLT show patterns of eastward and westward anomalies in the low and mid-latitudes consistent with past modeling studies on QTDW-induced mean wind forcing, both below and at turbopause altitudes. This is accompanied by potentially related decreases in zonal mean thermospheric column O/N2, as well as to low latitude TECs. The recurrent nature of the above changes during the six QTDW events examined point to an avenue for vertical coupling via background dynamics and chemistry of the thermosphere / ionosphere not previously observed.