

Tide-tide nonlinear interactions observed in the mid-latitude winter lower thermosphere

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Data obtained from the Wuhan/China MF radar in 2001 are used to study the nonlinear interactions between tides in lower thermosphere. It is observed that diurnal, semidiurnal and terdiurnal tides are the prominent perturbations in the meridional wind component near mid-latitude winter mesopause region, the quarterdiurnal tide is clear, and the 1/4.8-cph tide can even be distinguished. By bicoherence spectrum analysis, it is revealed that most prominent bicoherence peaks stand for phase correlation between tidal harmonics or self-coherence of a single tidal wave. By examining the vertical wavelength time variations, a significant correlation is found between the vertical wavelength of the observed terdiurnal tide and that of the supposed nonlinearly generated one. In the interval of 94.0-98.0 km, there exist not only a certain phase correlation and vertical wavenumber correlation but also a strong amplitude correlation of the oscillatory amplitudes equivalent and oscillatory phases synchronous or reversed between the prominent tides, indicating a tide-tide nonlinear interaction has occurred.