Short-term tidal variability in the ionospheric dynamo region over one solar cycle

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Space-borne diagnostics of tides from single satellites like TIMED are limited to larger than monthly mean averages because of the slow orbit precession and the resulting local solar time coverage. Ground-based observations and whole atmosphere models on the other hand strongly suggest a short-term tidal variability on the order of a factor of two within a few days. This paper attempts to address this challenge by presenting a different approach than the conventional wavenumber/frequency Fourier fits to the satellite data: tides are diagnosed from the vertical/longitudinal structure of ascending-descending orbit node differences. Called "tidal deconvolution", this method is applied to SABER temperature observations from the stratopause to the ionospheric dynamo region over one solar cycle. The resulting diurnal amplitudes and phases have an effective time resolution of approximately one week and are for selected time periods compared to short-term tidal diagnostics of NOGAPS-ALPHA, WACCM+DART and eCMAM30. The DW2 component shows a clear signature of wave-wave interaction while intra-seasonal DE3 variability suggests a modulation associated with the Madden-Julian-Oscillation in the tropical troposphere.

Key words: nonmigrating tides, short-term variability, Madden-Julian Oscillation