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A decade climatology of terdiurnal tides using TIMED/SABER

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Atmospheric tides are important for coupling the lower and middle atmosphere with the thermosphere and ionosphere, and for driving neutral and plasma density variability in the latter. Terdiurnal tides are recognized as an important contributor to this variability, but their study from a global perspective has not been as comprehensive as their diurnal and semidiurnal counterparts. In this study we globally characterize the solar terdiurnal tide in the 80-110 km region of Earth's atmosphere through analysis of 10 years of temperature measurements made by the SABER instrument on the TIMED spacecraft. The Sun-synchronous ("migrating") component (TW3), which is longitude independent, achieves maximum amplitudes of order 5K (10K) at 90 km (110 km), not too different than the 7-15 K amplitudes that are typical of the migrating diurnal and semidiurnal tides in this region. Significant longitude variability ($\sim$20-25%) in terdiurnal temperature amplitudes also exists, which is decomposed into zonal wavenumber components. The largest of these (TE1, TW4, TW5) reveal distinct seasonal-latitudinal and height versus latitude patterns, and inter-annual consistency. In addition, it is demonstrated that these particular components vary in ways that suggest that they originate from nonlinear interactions between diurnal and semidiurnal tides, specifically between DE3 and SW2 for TE1, between DW2 and SW2 for TW4, and between DW1 and SW4 for TW5. We also demonstrate that the terdiurnal tides derived here are not influenced to any significant degree by aliasing due to the presence of other waves.