Planetary Wave-Tide Interactions and Consequences in the Middle and Upper Atmosphere

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Vertically-propagating waves represent the primary mechanism for transmitting lower atmosphere variability to the upper atmosphere and ionosphere. Over the past decade, significant observational knowledge has accumulated with regard to average (e.g., monthly) climatologies of tides and planetary waves (PW) below about 100 km. However, despite ground-based evidence that tides vary considerably over time scales of days to weeks, often at PW periods, more global characterizations of PW-tide interactions have been lacking. In this paper we employ a relatively new technique to provide evidence for PW-tide interactions in satellite measurements made by the TIMED/SABER instrument below 110 km and the GOCE satellite accelerometers near 260 km. We focus on evidence for tidal interactions with the quasi-2-day and 6-day waves, and the ultrafast Kelvin wave with period near 2.5-3.0 days. We furthermore demonstrate how secondary waves produced by such interactions combine with the primary waves to add additional variability and complexity to the atmospheric system.

Key words: waves, tides, planetary, nonlinear, interactions