

EGU21-1769

<https://doi.org/10.5194/egusphere-egu21-1769>

EGU General Assembly 2021

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## The mid- to high-latitude migrating semidiurnal tide: Results from a mechanistic tide model and SuperDARN observations

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Simulations of the solar thermal migrating semidiurnal (SW2) tide in the mesosphere-lower-thermosphere (MLT) are compared against meteor wind observations from a longitudinal chain of high-latitude SuperDARN radars. The simulations span two full years and are performed using a 3D non-linear mechanistic primitive equation model. In our model, the background Middle Atmosphere is specified to daily mean zonal mean winds and temperatures from the Navy Global Environmental Model - High Altitude (NAVGEM-HA) meteorological analysis system. Thermal tides are forced from the surface to the thermosphere using 3-hourly temperature tendency fields from the Specified Dynamics Whole Atmosphere Community Climate Model With Thermosphere and Ionosphere Extension (SD-WACCMX). Our model accurately reproduces the observed seasonal cycle in the SW2 amplitude and phase, with the exception of summertime amplitudes being overestimated. Sensitivity studies reveal the impact of the seasonal variations in the background atmosphere and tidal forcing. The tropospheric forcing response is found to be highly sensitive to the seasonal variations in the background atmosphere, leading to strong amplification during the summer and mid-winter months. In contrast, the stratospheric forcing response is found to be much less sensitive to the background atmosphere, while being similar in magnitude to the tropospheric forcing response. Based on simulations using a zero-wind atmosphere, the impact of seasonal variations in the tidal forcing is found to be very small for both the tropospheric and stratospheric forcing response. Furthermore, the inclusion of an idealized surface friction profile is found to delay the phase of the tropospheric forcing response, which can strongly impact the simulated tide at MLT altitudes. Both the tropospheric forcing response and the surface friction specification are identified as being possible factors contributing to summertime amplitudes being overestimated.