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Migrating solar diurnal tidal variability during Northern and Southern Hemisphere Sudden Stratospheric Warmings

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In this study, the variability of migrating solar diurnal (DW1) tide in the mesosphere-lower thermosphere (MLT) region during Northern and Southern Hemisphere (NH & SH) Sudden Stratospheric Warmings (SSWs) is investigated using Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) temperature observations and reanalysis-driven Whole Atmosphere Community Climate Model with thermosphere and ionosphere extension (WACCM-X) simulations. The periods examined include four major NH SSWs that occurred during January in 2006, 2009, 2010 and 2013 and two SH SSWs that were recorded in September in 2002 and 2019. Our analysis shows that the observed DW1 tide displays a marked decline in the equatorial region after the onset of NH and SH SSWs. As WACCM-X simulations qualitatively reproduce this feature of DW1 tidal variability common to both NH and SH SSWs, they have been used to examine the possible mechanism that could explain these observations in DW1 tide. It is known that changes in the latitudinal shear of zonal winds at low-latitudes strongly affect the seasonal variation of DW1 tide in the MLT. We explore this mechanism to show that SSW-associated changes in the latitudinal shear in the MLT could be used to explain the observed variability of DW1 tide during NH and SH SSWs.