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Dynamical differences between two types of Stratospheric Sudden Warming and the impact on tropospheric state in China

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In this study, 34 Stratospheric Sudden Warming (SSW) events are objectively identified during 1958–2011 with the NCEP/NCAR reanalysis data. The dynamical characteristics prior to sudden warming events are strongly correlated with the type of sudden warming. Vortex displacement events are nearly always preceded by more upward-transporting planetary fluxes over North Atlantic and less fluxes over the North Pacific basin compared to the Vortex split events. In addition, for the displacement events, there are more wave 1 eddies and less wave 2 eddies transported from troposphere to stratosphere compared to climatology, but for the splitting composite, both wave1 and wave 2 show strong amplification. The negative Northern Annular Mode (NAM) signals could propagate downward to the lower troposphere just in small number of Vortex displacement events. While in most of vortex splitting events, NAM signals could propagate downward effectively. Relative impacts on tropospheric circulation and associated anomalies of climate are compared, using both reanalysis data and observation data from China. More cold air outbreaks from North pole after vortex splits, resulting in the extra negative temperature anomalies in southwest of China.