



Comparison of Stratospheric Sudden Warming definitions in reanalysis data.

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Stratospheric Sudden Warmings (SSWs) are characterized by a weakening of the polar vortex and a pronounced rise of the stratospheric polar temperature during the winter season. However, multiple definitions and climatic variables have been used in the literature to diagnose the occurrence of SSWs, yielding discrepancies in the detection of the events. Since SSWs are rare events, the lack of consensus in the definition is expected to cause changes among the resulting SSW climatologies.

In this study, we have identified the occurrence of SSWs for the extended-winter season of the ERA-40 and ERA-Interim Reanalysis period (1958-2013) according to a suite of representative definitions. Some of them are based exclusively on the zonal-mean zonal wind, while others also include the zonal-mean temperature latitudinal gradient. SSWs can be also defined attending to certain indices such as the northern annular mode (NAM) or the stratospheric zonal index (SZI). Following the original definitions given in the literature, different thresholds and criteria (e.g., latitudinal averages, pressure levels) have been demanded across definitions.

We have analyzed the influence of the detecting method on several parameters associated with SSWs, such as frequency, temporal distribution, or the impact on tropospheric climate. The results show strong differences in the climatological mean winter frequency among certain detection methods. The evolution of the SSW parameters and the downward propagation of the anomalies from the stratosphere to the troposphere are also method-dependent. In particular, certain methods are not able to capture the tropospheric response following the SSW occurrence. Our results provide a guide to select the most representative definitions, avoiding redundancies, for constructing a SSW catalogue from reanalysis data and/or climatic model simulations.