How well are major stratospheric warmings represented in reanalyses?

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Major sudden stratospheric warmings (SSWs) are one of the most abrupt phenomena of the boreal wintertime stratospheric variability, whose effects extend far from the stratosphere affecting surface weather. Given their relevance, a typical and simple test for assessing the ability of climate models to reproduce the stratospheric variability is just to analyze the model representation of these phenomena. However, this is usually assessed with just one reanalysis, but the number of reanalyses has increased in the last decade and their own biases can affect the model evaluation.

In this study, we compare the representation of the main aspects of SSWs across reanalyses. The examination of their main characteristics in the pre- and post-satellite periods reveals that reanalyses behave very similarly in both periods. However, discrepancies are larger in the pre-satellite period than afterwards, particularly for the NCEP/NCAR reanalysis. A good agreement among reanalyses is also found for triggering mechanisms, tropospheric precursors and the surface fingerprint. All datasets reproduce similarly the specific signatures of wavenumber 1 (WN1) and wavenumber 2 (WN2) SSWs. Differences in blocking activity prior to WN1 and WN2 events between reanalyses are much smaller than across blocking definitions.