Analyzing the preconditioning of major SSWs in ECMWF assimilations

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Major Sudden Stratospheric Warmings (SSWs) can develop differently. By analyzing ERA-40 reanalysis data Bancalà et al. (2012) showed that, although most of the major SSWs follows increased activity of the zonal wavenumber-1, a quarter of these events are caused by an amplified zonal wavenumber-2. To identify which zonal wavenumber is responsible for the poleward eddy heat transport thus the major SSW, the planetary waves are analyzed during the pre-warming phase to distinguish between wavenumber-1 (W1) and wavenumber-2 (W2) events. This approach, which classifies the warmings based on the preconditioning of the polar vortex, differs from that adopted by Charlton and Polvani (2007) that distinguishes the SSWs according to the post-warming phase. Results for ERA-40 data have clearly revealed this difference, showing rather different W2/W1 ratio compared to the splitting/displacement ratio of Charlton and Polvani, which means that not all wavenumber-1 events lead to a vortex displacement. In this study, the preconditioning criterion will be applied to the ERA-Interim data in order to determine how the W2/W1 ratio changes if a different data assimilation is considered. Also we will investigate if the inclusion of 10 additional reanalysis years significantly changes this relationship. Comparison between the ECMWF data assimilations will then be performed to determine possible discrepancies between ERA-40 and ERA-Interim datasets (i.e. the NH winter 1994/1995). We believe that this classification can be a good diagnostic tool to investigate major SSWs in the different data assimilations but also for addressing the ability of CCMVal and CMIP5 models to simulate the preconditioning of major SSWs realistically.