



On the relationship between ENSO, Stratospheric Sudden Warmings and Blocking

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Using the 1958-2010 period of the ERA-40 and ERA-I reanalyses, we examine the influence of El Niño-Southern Oscillation (ENSO) on different aspects of Stratospheric Sudden Warmings (SSWs) and atmospheric blocking, including the blocking precursors of SSWs.

Our results reveal that SSWs are preceded by blocking patterns over different regions depending on the ENSO phase. Euro-Atlantic and western Atlantic blocks tend to precede SSWs during El Niño (EN), whereas Eastern Pacific and Siberian blocks are the preferred precursors of SSWs during La Niña (LN) winters. This ENSO signal on the blocking precursors of SSWs is larger than that obtained in previous studies by stratifying the SSWs into splitting and displacement SSWs.

It is also found that the regional blocking precursors of SSWs during each ENSO phase have different impacts on the upward propagation of planetary-scale wave number 1 and 2, and hence determine ENSO differences in the wave number signatures of SSWs. SSWs occurring during EN are preceded by amplification of wave number 1, whereas LN SSWs are predominantly associated to wave number 2 amplification. This leads to an unbalanced frequency of wave-1 and wave-2 SSWs between opposite ENSO phases. However, there is not a strong preference for splitting or displacement SSWs during any ENSO phase due to a lack of correspondence between wave-2 and splitting SSWs. In particular, during EN, splitting SSWs do not show a wave-2 pattern.