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Exploring Stratospheric-Tropospheric dynamical coupling associated with Stratospheric Sudden Warmings.

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Stratospheric Sudden Warmings (SSWs) dominate the variability in the Northern Hemisphere wintertime stratosphere. In the most dramatic cases, stratospheric temperatures can rise by 40-50 K and the stratospheric polar flow can reverse its direction in the span of a few days. These warming events result from the interaction between upward tropospheric propagating waves and the polar vortex. Owing to this interaction the zonal flow weakens and the stratospheric circulation becomes highly asymmetric, allowing for a strengthening and an equatorward displacement of the polar vortex. This displacement could be accompanied by a distortion and even in some cases a splitting of the vortex. The SSW evolution is arbitrarily characterized according to its intensity, and partitioned as major or minor event if the decrease in zonal wind at 60°N is sufficient to reverse the wind.

SSW events play a key role in the coupling of the stratosphere-troposphere system. For instance, cold air outbreaks such as the recent one that struck the northern American continent could be related to a significant displacement and distortion of the stratospheric polar vortex. Nonetheless, the impact of the stratospheric warming events on the troposphere is poorly known and not well understood. In this context, we propose to identify both major and minor SSWs in atmospheric reanalysis to evaluate and discuss the potential impact of such pathological polar situations on the troposphere. Indirectly, this work will provide a inter-comparison of the ability of reanalysis to depict SSWs.