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Properties of stratospheric warming events during northern winter.

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During wintertime the polar mid-stratosphere is characterized by the setting up of westerly winds around the pole; the so-called polar vortex. The polar vortex is one of the most variable features of the zonal-mean circulation of the earth atmosphere, due to a highly non linear interaction between planetary-scale Rossby waves and the zonal flow.
Indeed, the interaction between the upward tropospheric propagating waves and the polar vortex leads to a zonal flow weakening, implying a large day to day vortex variability. In the most dramatic cases the polar vortex breaks down, the stratospheric polar flow can reverse its direction and the temperatures can rise locally by more than 50K in a span of a few days. Such phenomena are known as Sudden Stratospheric Warmings (SSWs) and constitute, since their discovery, the most impressive dynamical events in the physical climate system. There are however situations where the polar vortex does not break down, but temperatures increase dramatically.

In this study, we propose a global characterization of stratospheric warmings situations based on a temperature threshold in the 50-10hPa layer, in order to assess the properties of daily stratospheric temperature variability during the northern winter. The originality of this approch consists in evaluating the wintertime positive temperature anomalies in terms of intensity and duration. We will show that there is a wide spectrum of warming types. The major SSWs are the most extreme, but there are other events that share some common properties with the major ones. Though neglected, these latter warmings may play a key role in the coupling of the stratosphere-troposphere system.