

On the sensitivity of sudden stratospheric warmings to previous stratospheric conditions

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Sudden stratospheric warmings (SSW) are among the most dramatic events in the Earth's atmosphere. In a matter of few days, the polar vortex is severely disrupted, polar temperatures in the stratosphere increase several tens of degrees, and the zonal mean wind changes from westerly to easterly. The interest of SSW events ranges from their effects on the dynamic and thermal circulation of the mesosphere, to the strong dynamical coupling with the troposphere leading to extended anomalous weather regimes in the North Atlantic/European sector.

We use the Whole Atmosphere Community Climate Model version 4 (WACCM4) to explore the role of the state of the stratosphere on the successive development of a SSW. We configure a set of experiments in which the tropospheric wave-forcing evolution associated with a modeled SSW is maintained, and we slightly change the stratospheric conditions in a range of times and regions before the development of the SSW. We will show that adding a small perturbation in key regions of the stratosphere may lead to crucial changes in the wave propagation conditions, which prevents the triggering of the SSW. Our results stress the importance of vortex preconditioning prior to SSW events.

Key words: SSW, vortex preconditioning, wave-driving, WACCM.