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# Future changes in dynamical processes triggering major stratospheric warmings

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One of the most important examples of the coupling between the boreal troposphere and stratosphere is major stratospheric warmings (MSWs). They are initiated by an anomalously high injection of tropospheric wave activity into the stratosphere that leads to a weakening of the polar vortex, a deceleration of the westerly polar night jet and a warming at high latitudes. Some studies have identified future changes in the main features of these phenomena such as the frequency or seasonal distribution, but with no clear consensus among them. Thus, a detailed analysis of possible future changes in the triggering mechanisms of MSWs is still needed.
In this study, we examine potential future changes in the nature of the anomalous wave activity that triggers MSWs by means of time-slice simulations under present and projected future conditions using the EMAC Chemistry-Climate-Model. These experiments include climate forcings by halogens, greenhouse gases (GHG), and prescribed sea surface temperatures (SSTs) (including sea ice concentrations).
Following the methodology of Smith and Kushner (2012), we decompose the anomalous vertical wave activity preceding MSWs into its different contributors (i.e. the linear term related to the interference between the climatological stationary waves and wave anomalies; and the nonlinear one, associated with the wave anomalies themselves). First results show that the linear term becomes more important in the future than the nonlinear term and it is predominant in the days prior to the occurrence of the MSWs. Moreover, this increase of the interaction term is primarily due to an intensification of wavenumber-1 wave activity. Given that tropical SST variability, in particular the Pacific one, has been already shown to be linked to an amplification of wavenumber-1 stationary waves, its increase in the future could be a signature of the impact of future changes in tropical SSTs on variations in the occurrence of MSWs. These results will be compared with two transient simulations of the period 1960-2100, carried out with the same model but following the CCMI-specifications for different future scenarios of climate change.