



Response of the dynamical coupling between the stratosphere and troposphere in a changing climate: An Atmosphere-Ocean General Circulation Model study

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Stratospheric changes are linked to tropospheric variability which acts as a forcing mechanism for the stratosphere. Hence, future changes in tropospheric variability are expected to influence stratospheric dynamics and temperature. In the other direction, stratospheric changes directly impact the troposphere. Statistical analysis of long-term observations revealed a link between the strength of the stratospheric polar vortex and the dominant modes of tropospheric variability, like the Northern Annular Mode (NAM) or Arctic Oscillation (AO), and the North Atlantic Oscillation (NAO). Variations of the NAM are associated with weather anomalies over the continents. Hence, any future changes in stratospheric greenhouse gas (GHG) concentrations and composition that influence the intensity of the stratospheric polar vortex have the potential to affect surface climate.

We present here an analysis of the troposphere-stratosphere dynamical coupling in an atmosphere-ocean General Circulation Model (AO-GCM) that includes the troposphere and full stratosphere. It will be shown that the observed characteristics of the vertical coupling are very well reproduced in a reference simulation of the model. In addition, multi-year periods of the past and future from a transient model integration with prescribed GHG increases according to the IPCC AR4 A1b scenario will be compared to examine whether the main features of the vertical dynamical coupling will be modified in a changing climate.