

Mechanisms leading to cold European winter extremes and the role of troposphere-stratosphere interactions

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The study aims at investigating driving factors of European winter climate variability with a focus on cold winter extremes. The results of past studies provided evidence that Atlantic sea surface temperatures and arctic sea ice concentrations partly govern European winter climate variability. Ensemble simulations with climate models of different vertical resolutions also suggest that the stratosphere plays a role in propagating anomalies related to continental cold spells in the higher mid-latitudes. In the present work we take advantage of newly performed pre-industrial control, historical, and scenario simulations in order to examine processes which drive European winter climate variability. The investigation centers on the role of troposphere-stratosphere interactions in the development of European extreme cold spells. Sensitivity experiments with different vertical resolutions of the climate model are analyzed. Statistics of major stratospheric warming and weak polar vortex events are presented and related to cold European winter extremes.