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Assessing dynamical stratospheric processes in Northern Hemisphere winter simulated with ICON-NWP

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There is strong evidence that diminishing sea ice cover and thus Arctic warming is linked to changes of mid-latitude atmospheric flow patterns. A dynamical stratospheric pathway thereby plays a major role in connecting the Arctic warming to changes in mid-latitude weather and climate via troposphere-stratosphere coupling. As shortcomings concerning the coupling in many models show, a realistic representation of stratospheric processes is crucial for understanding and simulating these linkages.
In this context this work comprises the analysis of an ensemble climatology of seasonal experiments (September – May) from 1979/80 to 2016/17. The model study was carried out with a high-resolution, nonhydrostatic global atmospheric general circulation model in numerical weather prediction mode (ICON-NWP). Aside from quantifying how well the dynamical stratospheric pathway is represented in ICON, this study focusses on the model performance in the stratosphere over seasonal time scales. A key question of this study is, how well ICON-NWP can capture the variability of the stratospheric polar vortex and what are possible model shortcomings that could affect future studies. In this setup the variability of the polar vortex in winter is rather strong, nevertheless the model exhibits some limitations in simulating the two-way troposphere-stratosphere coupling. The verification of dynamical processes in the stratosphere in ICON is a first step towards an improved seasonal prediction of Northern Hemisphere winter patterns.