



Interannual to decadal variability of the arctic stratosphere since 1922

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One of the most important features of stratospheric circulation variability is the pronounced interannual variability of the northern polar vortex. This variability is understood to be caused to a considerable part by the interaction between planetary-wave forcing from the extratropical northern troposphere and the mean flow in the stratosphere. In addition, forcing from the tropical troposphere and stratosphere as well as other forcing factors such as volcanic aerosols in the stratosphere, solar variability, and changes in stratospheric ozone contribute.

Due to limited data availability, the analysis of the variability of the northern polar vortex was mostly studied for the past 25-50 years. In this paper we use historical upper-air data as well as statistical reconstruction techniques in order to extend the data record back into the past. We present an 85-yr long monthly time series of the strength of the northern polar vortex in the lower stratosphere. Interannual to decadal variability in this record is compared to records of El Niño/Southern Oscillation, solar variability, the phase of the Quasi-Biennial Oscillation (a 65-yr record) and volcanic aerosols. We find that each of these factors, all which are independent from the reconstructions, contributes significantly to the interannual to decadal variability in the strength of the northern polar vortex. Implications with respect to analysing stratosphere-troposphere coupling in the northern extratropics are discussed.