



A Lagrangian analysis of seasonal and interannual variability in Greenland precipitation sources

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Precipitation is important for studying the polar region climate, not only because it affects the mass balance of the polar ice sheets but also because the isotopic composition of the precipitable water stored in ice cores can be used to reconstruct the climate of the past. Therefore, in order to use global climate models to investigate the climate of polar regions, it is essential for the models to correctly represent precipitation variability and the related source regions of the precipitable water.

This study investigates the variability of the moisture source regions for Greenland on both interannual and seasonal timescales between 1980-2016, using an offline trajectory model (ROTRAJ) forced with reanalysis data (ERA-Interim) and compares these results with the output from the global Community Earth System Model CESM. Using the reanalysis data, it is found that there exists a strong seasonal variability in the moisture uptake locations for the precipitation observed over Greenland. During winter, moisture sources are mainly located over the Atlantic Ocean, while during summer the largest contributor of moisture for Greenland precipitation is the North American continent. Interestingly, the detailed source locations in winter are highly dependent on the large-scale circulation patterns, while in summer source regions are more constant and mainly vary in strength.

We will end with a comparison of these findings with CESM model output and discuss the implications of the found moisture source variability for using this global climate model to investigate the polar climate.