The representation of the 1990s warming of the North Atlantic subpolare gyre in the MiKlip decadal prediction system

Ines Höschel and Ulrich Cubasch

FU Berlin, Institute for Meteorolgy, Berlin, Germany (ines.hoeschel@met.fu-berlin.de)

There is an observed shift in the sea surface temperature (SST) of the North Atlantic subpolare gyre during the 1990s from cooler conditions in the preceding decade to warmer conditions thereafter. This increase of up to 1°C is linked to changes in the mean climate over the North Atlantic, North America and Europe. Therefore, it is suitable to test decadal prediction systems.

We examine, whether decadal prediction ensembles from the German decadal prediction system MiKlip reproduce the shift in SST and the associated impacts on the mean conditions of temperature, sea level pressure and precipitation. A variety of reanalysis and observational data sets are used to also account for uncertainties in the reference data. The initialized predictions are compared with uninitialized predictions in order to detect possible improvements from initialization. Additionally, seasonal analyses of the associated impacts on surface variables as well as lead year dependent investigations are presented.

The initialized decadal predictions are able to reproduce the shift in the 1990s. The observed warming in the North Atlantic subpolare gyre is well simulated in the initialized predictions, while the SSTs decrease in the uninitialized predictions, demonstrating the added value of initialization in the decadal predictions. Nevertheless, the region with the strongest warming in the North Atlantic is shifted eastwards in the simulations and the warming hole is too narrow and shifted northwards compared to observations. The observations show an associated pattern in the Pacific SST, which resembles a la Nina like pattern or a cool phase of the Pacific decadal oscillation. This Pacific pattern is reproduced by the MiKlip-system.