



## **How fast is Arctic climate really changing? An insight from recent past, present day and near future coupled model simulations**

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Three quasi-equilibrium simulations using constant greenhouse gas forcing corresponding to years 2000, 2015 and 2030 have been performed with the global coupled model EC-Earth in order to analyze recent past and possible near future changes in the Arctic climate.

The model simulations indicate an accelerated warming and ice extent reduction in the Arctic in near future conditions compared to the recent past. Both Arctic warming and sea ice reduction are closely linked to the increase of ocean heat transport into the Arctic, particularly through the Barents Sea Opening. Decadal variations of Arctic sea ice extent and ice volume are of the same order of magnitude as the observed ice extent reductions in the last 30 years and are dominated by the variability of the ocean heat transports through the Barents Sea Opening and the Bering Strait.

Despite a general warming of mid and high northern latitudes, a substantial cooling is found in the subpolar gyre of the North Atlantic in the near future simulation. This cooling is related to a strong reduction in the AMOC, which is mainly caused by reduced deep water formation in the Labrador Sea.

The observed trend towards a more negative phase of the North Atlantic Oscillation (NAO) and the observed linkage between autumn Arctic ice variations and NAO are reproduced in our model simulations for selected 30-year periods but are not robust over longer time periods. This indicates that the observed linkages between ice and NAO might not be robust in reality either, and that the observational time period is still too short to reliably separate the trend from the natural variability.