EGU2020-20368
https://doi.org/10.5194/egusphere-egu2020-20368
EGU General Assembly 2020


# The North Atlantic Oscillation and the Greenland ice sheet in CMIP6

**Ruth Mottram**[1], Susann Ascheneller[2], Florian Sauerland[2], Rasmus Anker Pedersen[1], Peter Thejll[1], Peter Lang Langen[1,2], Fredrik Boberg[1], Martin Stendel[1], Nicolaj Hansen[1,4], and Shuting Yang[1]
[1]Danish Meteorological Institute, Research and Development, København, Denmark (rum@dmi.dk)
[2]Institute for geodosey and geoinformation, University of Bonn
[4]Geodesy and Earth Observation, DTU-Space, Danish Technical University, Lyngby, Denmark

The North Atlantic Oscillation (NAO) is an important control on both northern European weather and Greenland ice sheet surface mass budget via the path of storm tracks that deliver precipitation, particularly in the winter, and by the strength and persistence of the Greenland blocking high that promotes melt in summer. Within CMIP5 models, atmospheric blocking was generally poorly represented regardless of location, we here examine an ensemble of 10 CMIP6 fully coupled earth system models (ESMs) that were available by Summer 2019 in order to examine if model improvements better represent the NAO in CMIP6.

We examine temperature over Greenland and the north Atlantic region as well as NAO position, persistence and strength in winter and summer for each model in the historical scenario. No single model performs well on all characteristics but the UKESM and EC-EARTH3 perform the best when compared to the ERA5 climate reanalysis.

We also show how the NAO is expected to change in 8 of these models under different future climate scenarios. The location of the Icelandic low in particular migrates northwards by varying amounts, likely related to Arctic sea ice changes within the models and with a consequent impact on precipitation.

Downscaling experiments carried out using the HIRHAM5 regional climate model over the Greenland ice sheet show the importance of accurately characterising the NAO in order to correctly estimate both winter accumulation and summer melt and the combination that gives the ice sheet mass budget. Our study emphasises the importance of assessing a range of different climate and weather variables when selecting models to downscale for obtaining ice sheet mass balance. We also note that while some progress has been made in better representing atmospheric blocking in ESMs, largely down to higher resolution in atmospheric models, there is still a substantial improvement required before ESMs can be said to accurately characterise the climate of the North Atlantic region with consequent impacts on ice sheet surface mass budget projections.