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The role of ocean heat transport from the Atlantic into the Arctic Ocean on sea ice variability

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The decrease of Arctic sea ice affects the future climate in the Arctic and beyond. Therefore, it is important to understand the drivers of sea ice variability and trend. Previous model studies found that the summer sea ice is mainly driven by atmospheric processes (incoming radiation and albedo feedback) and the winter sea ice extent by ocean processes (ocean heat transport from Atlantic into Arctic Ocean, e.g. applying Community Earth System Model large ensemble simulation). In our study, we analyse a historical simulation with the UK Earth System Model (UKESM1) performed for CMIP6 from 1850 to 2014 and ocean – sea ice simulations forced by atmospheric reanalysis data with the same ocean model NEMOv3.6 and sea ice model CICEv5.1. The UKESM simulation confirms previous findings showing that the ocean heat transport between Norway and Svalbard (Barents Sea Opening; BSO) is strongly correlated with the winter (and annual) sea ice extent in the Barents Sea and the whole Arctic. However, there is no correlation in the atmospheric-forced simulations suggesting that the interaction between atmosphere and ocean is crucial. We will present sensitivity simulations showing the impact of atmospheric forcing data on the BSO heat flux and analyse the role of atmospheric processes (large scale circulation, cloud formation) on winter sea ice conditions.