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Linear predictability of Barents Sea ice cover: effects of coupling and resolution

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Wintertime Barents Sea ice cover has been strongly linked to heat transport through the Barents Sea opening and Barents Sea heat content. Previous studies have shown predictability at seasonal timescales with short lead times. However, studies that have used statistical prediction have focused on a small set of predictors in the vicinity of the Barents Sea. Here we will extend the analysis further south following the path of the Norwegian Atlantic Current and show that monthly predictability with lead times up to 1-2 years can be achieved in CMIP6 models using Climate Response Function (CRF's). We further examine the effects of model resolution and coupling in the predictability and compare the results to CRF derived from observations. Our results suggest that higher resolution generally leads to stronger predictability and the fully coupled system provides the most realistic response function. The ocean provides a narrow range of lead times corresponding to an advective timescale, while coupling to the atmosphere broadens the lead times that are important for prediction. Finally, we show that even the upstream sea surface temperatures provide relatively high predictability of the Barents Sea ice cover both in the models and in the observations.

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