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Uncertainties in the Arctic sea ice cover in ocean reanalyses: are current ice-ocean reanalyses suitable for initializing sea ice forecasts?

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The dramatically declining Arctic ice cover observed in recent years has prompted a growing interest in resource exploration and marine traffic. This has in turn led to an increasing demand for reliable ice prediction capabilities on timescales from hourly to seasonal. The predictability of sea ice cover on seasonal timescales has been a topic of much interest in recent years with skill being demonstrated by various systems. Of particular note, several studies have found that the predictability of seasonal ice extent anomalies is strongly dependent on the initial ice thickness distribution. This highlights a weakness in almost all ice forecasting systems in that they do not include the explicit assimilation of ice thickness observations. Moreover, it remains to be seen how the predictability of the seasonal ice cover depends on the representation of various physical processes and model details, such as spatial resolution and the inclusion of an ice thickness distribution. Here we present a few results from the Ocean ReAnalyses Intercomparison Project (ORA-IP), with a focus on the Arctic sea ice fields reconstructed by state-of-the-art global ocean reanalyses. Differences between the various reanalyses are explored in terms of the effects of data assimilation, model physics and atmospheric forcing on properties of the sea ice cover, including concentration, thickness and velocity. In spite of an expected agreement in the reconstructed concentration fields due to the assimilation of surface data, a large spread in sea ice thickness is found within the ensemble of reanalyses. Through this intercomparison, we aim to highlight deficiencies and discuss best practises in state-of-the-art systems toward answering the question: Are current ice-ocean reanalyses suitable for initializing seasonal forecasts of the sea ice cover?