Decadal Prediction of Subpolar North Atlantic ocean heat content

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Decadal/multidecadal predictability of the North Atlantic Climate system as a whole is strongly tied to variations in sea-surface temperature and upper ocean heat content. in situ observations and ocean reanalyses show multidecadal changes in subpolar North Atlantic ocean heat content with a marked lag between the surface 0-700m layer and the intermediate 700-2000m layer. The descent of heat content anomalies from surface to intermediate depths is now known to occur predominantly in narrow regions adjacent to the boundaries of the Irminger and Labrador Seas, with an important role for mesoscale eddy processes. This raises the question whether current decadal prediction systems at eddy permitting or lower resolution are capable of capturing the timing and magnitude of the vertical heat exchange in this climatically important region. Here we investigate how well the state-of-the-art Depresys4 decadal climate forecast system simulates and predicts the evolution of surface and intermediate depth ocean heat content anomalies over the period 1960-2015. We further divide the heat content anomalies into a component which does not affect the density to first order, and a component which does affect the density, and evaluate the prediction skill in each component separately. As well as investigating the whole subpolar North Atlantic, we subdivide the domain into eastern and western regions which have different dynamic/thermodynamic regimes and extend the analysis to the subtropics.