

Title: The role of Arctic sea ice initialisation in decadal climate prediction: linking the Arctic sea ice loss and the mid-latitude climate

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Initialization of the sea ice loss with anomaly initialization (AI) techniques is not straightforward as negative values cannot be assigned to the sea ice concentration and thickness. To understand how a better initialization of Arctic sea-ice can be translated into near-surface temperature (TAS) skill, a set of decadal prediction experiments are initialized from 2007, after the Arctic ice extent just experienced an unprecedented minimum. In contrast, another set of experiments are initialized from 1993 as winter 1993/94 is one of remarkably cold winters in 1990s in the Northern Hemisphere. In both cases, the winter TAS from the free run (i.e. no observation constraint) are found an offset of 1.5K from ERAI averaged over the high latitudes (60-90N). The sea ice initialisation shows a great improvement in reducing the warm bias of TAS and a good skill in predicting the annual minimum sea ice cover. In turns, the warm bias in the upper 100m ocean temperature is greatly reduced from the Barents Sea. Moreover, the prediction initialized from 2007 shows a relatively good skill in T100 in the subpolar gyre region. Our analysis will focus on linking the Arctic sea ice loss and the mid-latitude winters.