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Impact of Atmosphere and Sub-Surface Ocean Data on Decadal Climate Prediction

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We present a set of idealised model experiments that investigate the impact of assimilating different amounts of ocean and atmosphere data on decadal climate prediction skill. We start by assimilating complete (full-field) monthly average temperature and salinity (T & S) data. We show that when the ocean data is assimilated to full depth we successfully initialise the meridional overturning circulation (MOC) and produce skillful predictions of global ocean heat content. When we only assimilate the upper 2000m of ocean data, as currently provided by the Argo array, we find only a small reduction in forecast skill compared to the full depth case. The most significant reduction occurs in the Southern Ocean. In the case of assimilating sea surface temperature alone the predictions have much less skill, particularly in the extra-tropics. We also find that assimilating six hourly atmospheric observations significantly improves the forecast skill within the first year, but has little impact thereafter. In an extension to these experiments we simulate the real distribution of Argo floats, as opposed to assimilating full field data. We present preliminary results that compare the resulting potential forecast skill against a simulation with a pre-Argo distribution of ocean observations.