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Quantifying the role of ocean initial conditions in decadal prediction

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The forecast skill of decadal climate predictions is investigated using two different initialization strategies. First we apply an assimilation of ocean synthesis data provided by the GECCO project (Köhl and Stammer 2008) as initial conditions for the coupled model ECHAM5/MPI-OM. The results show promising skill up to decadal time scales particularly over the North Atlantic (see also Pohlmann et al. 2009).
However, mismatches between the ocean climates of GECCO and the MPI-OM model may lead to inconsistencies in the representation of water masses. Therefore, we pursue an alternative approach to the representation of the observed North Atlantic climate for the period 1948-2007. Using the same MPI-OM ocean model as in the coupled system, we perform an ensemble of four NCEP integrations. The ensemble mean temperature and salinity anomalies are then nudged into the coupled model, followed by hindcast/forecast experiments. The model gives dynamically consistent three-dimensional temperature and salinity fields, thereby avoiding the problems of model drift that were encountered when the assimilation experiment was only driven by reconstructed SSTs (Keenlyside et al. 2008, Pohlmann et al. 2009).
Differences between the two assimilation approaches are discussed by comparing them with the observational data in key regions and processes, such as North Atlantic and Tropical Pacific climate, MOC variability, Subpolar Gyre variability.