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Model drift dependence on the ocean initialization in the CNRM-CERFACS ""near-term"" forecast exercise

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In climate predictability studies, earth-system models are affected by important drifts at the beginning of the forecast that may alter the performance of the model in terms of skill. Several approaches have been proposed to reduce the model drift in decadal forecast integrations such the anomaly initialization and surface initialization. The goal is to find initial conditions as close as possible to the model attractor but also compatible with the observations. In this work we present a methodology to obtain the initial conditions for decadal forecast experiments using the CNRM-CERFACS coupled system. The method is based on a three-dimensional newtonian damping in temperature and salinity of the ocean component towards the NEMOVAR (FP7 EU COMBINE project) ocean reanalysis beyond the mixed layer, while surface temperature and salinity are restored towards reanalysis using a flux derivative term. The rest of the components (atmosphere, sea-ice, continents) are freely coupled. Two ocean nudging experiments have been performed to initialize the decadal forecasts. For the first one (GLOB) the nudging is applied everywhere except in the equatorial band [1^{o}S, 1^{o}N] to avoid spurious effects on vertical velocity wind. For the second one (EXTROP), nudging is applied within [15^{o}S, 15^{o}N]. Following the CMIP5 protocol, three members are performed for each initial date from both GLOB and EXTROP initial conditions, giving two set of decadal experiments. Results show that GLOB forecasts have a stronger initial shock in comparison to EXTROP ones. This initial shock leads to the formation of El Niño events, whatever the initialization date, due to imbalance between surface wind and thermocline tilts. This have considerable consequences for the model drift and skill.