Nudging atmosphere and ocean reanalyses for seasonal climate predictions

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Seasonal climate forecasts based on state-of-the-art climate models have been developed recently. Here, we critically discuss the obstacles encountered in the setup of the ECHAM6/MPIOM global coupled climate model to perform climate predictions on seasonal to decadal time scales. We particularly focus on the initialization procedure, especially on the implementation of the nudging scheme, in which different reanalysis products are used in the atmosphere (e.g.ERA40), and the ocean (e.g., GECCO).

Nudging in the atmosphere appears to be sensitive to the following choices: limiting the spectral range of nudging, whether or not temperature is nudged, the strength of the nudging coefficient for surface pressure, and the height at which the planetary boundary layer is excluded from nudging.

We find that including nudging in both the atmosphere and the ocean gives improved results over nudging only the ocean or the atmosphere. For the implementation of the nudging in the atmosphere, we find the most significant improvements in the solution when either the planetary boundary layer is excluded, or if nudging of temperature is omitted. There are significant improvements in the solution when resolution is increased in both the atmosphere and in the ocean.

Our tests form the basis for the prediction system introduced in the abstract of Müller et al., where hindcasts are analysed as well.