Climate-modes initialization for decadal predictions

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The initialization approach for decadal climate predictions is designed, which aims at reducing initialization shocks by projecting initial conditions onto the climate modes derived from the prediction system (MiKlip Project). The ocean-only modes are calculated as statistical modes based on the empirical orthogonal function (EOF) analysis from temperature and salinity anomalies fields of the ensemble of historical simulations produced with MPI-ESM (15 members, Octobers from 1958 to 2005). The filtered in this way ORAS4 temperature and salinity anomalies are tested on retaining sufficient amount of variance explained and correlation skill as compared to the original ORAS4 anomalies, and introduced into the MPI-ESM model using the nudging procedure (Octobers over 1960-2015). Hence, the results show that variance explained in filtered initial conditions is rather low (35-66%), this suggests that modes of variability of the reanalysis are not exactly compatible with the modes from the prediction system. On the other hand, final expression of filtered initial conditions is sensitive to the underlying weighting and normalization defined during EOF analysis; for this experiment we used weighting by the contribution to density changes. The initialized yearly (over 1960 to 2015) from the nudging run hindcast ensembles (10 members, 5-year long) show indications of improved prediction skill for surface air temperature (both in terms of mean squared error and correlation coefficients) in the eastern Pacific Ocean for lead years 2-5, as compared to the traditional anomaly initialization scheme.