Impact of different initialisation techniques on the skill of global dynamical climate predictions

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Decadal prediction exploits sources of predictability from both the external radiative forcings and the internal variability, the latter by initialising the climate model from observational estimates. When a model is initialised with the observed state at the initial time step (Full Field Initialisation - FFI), the forecast run drifts towards the model climate. Distinguishing between the climate signal to be predicted and the model drift is a challenging task, because the application of a-posteriori bias correction has the risk of washing out part of the variability signal. The anomaly initialisation (AI) technique aims at addressing the drift issue by answering the following question: if the model is allowed to start close to its own attractor (i.e. its biased world), but the phase of the simulated variability is constrained toward the contemporaneous observed one at the initialisation time, does the prediction skill improve? First, the relative merits of the FFI and AI techniques applied to the ocean and sea ice components of a EC-Earth global coupled model will be assessed. Second, the impact of the following improvements to the AI method in terms of forecast drift and skill will be presented: 1) a weight is applied to the observed anomalies, in order to avoid the risk of introducing anomalies whose amplitude does not fit in the range of the internal variability generated by the model; 2) the AI is applied to the temperature and density ocean state variables instead of the temperature and salinity since the temperature and density are the main drivers of the ocean thermodynamics.