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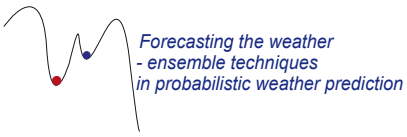

Assessing the skill of decadal predictions

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Decadal predictions bridge the gap between seasonal forecasts and climate change projections. The time scale of years to decades is of high relevance for stakeholders and decision makers in many sectors, such as infrastructure planning, water resource management, energy production, insurances, agriculture, and others.

Despite indications of potential predictability on the decadal time scale, and despite recent efforts in establishing a large data-base of decadal hindcasts (e.g. EU FP6 ENSEMBLES project), the quantification of prediction skill remains a challenging task due to a range of conceptual problems, such as the small number of independent samples (current hindcast data cover the second half of the 20th century) and the scarcity of ocean observations.

Another challenge is related to the fact that multi-annual to decadal variability is not only affected by the initial conditions of the oceans, but also by the boundary condition imposed by greenhouse gas concentrations. Indeed, to understand the sources of decadal predictability, skill needs to be separated into two components: (i) the skill originating from the trend due to anthropogenic forcing, and (ii) the skill originating from the remaining natural fluctuations. This requires that choices are made on how to separate these two components, i.e. on how to detrend the data. It is the aim of this study to assess the impact of the detrending method on skill, and based on this to assess how well state-of-the-art decadal prediction systems perform in predicting these two components.

These questions are addressed by using the decadal predictions of the ENSEMBLES project. Near-surface temperature hindcasts of five coupled ocean-atmosphere models have been verified against ERA-40/Interim reanalysis data. Different methods of data detrending have been applied, including linear fits to observation and model data, and regressions on CO_2 concentrations. The results indicate that the choice of detrending method has only minor effect on the global scale, but can lead to substantial differences in the skill estimates obtained for specific regions, particularly in regions of high natural interannual variability. This needs to be considered when assessing and interpreting the predictability of natural variability on a regional level, even more so since our analyses indicate that most of the skill in the decadal forecasts is related to the trend.