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Skill assessment of a multi-system ensemble of initialized 20-year predictions

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Decadal predictions have advanced greatly in recent years: not only have they become operational worldwide and have been demonstrated to be skillful in various aspects of climate variability, including predicting changes in the atmospheric circulation and in the occurrence of extremes several years ahead, but —as such— they are also being used increasingly in climate services. Climate adaptation and policy making, however, also require climate predictions that go beyond the 10-year horizon. For climate information beyond 10 years into the future, uninitialized climate projections, which completely miss any predictability stemming from internal variability, have been the only available product. Trying to account for this lack of information in climate projections regarding any predictable components of internal variability, methods to constrain climate projections using information from large ensembles of initialized decadal predictions have been developed and have been shown to reduce the uncertainty and increase the skill of climate projections, even beyond the 10-year horizon. The demonstrated benefits of such indirect methods to account for predictable internal variability indicate that the latter remains significant beyond the 10-year limit of decadal predictions. Hence, directly harnessing this predictability through running initialized 20-year predictions emerges as a strategic endeavour.
In this study a novel, multi-system ensemble of initialized extended-decadal predictions is assessed. These predictions consist of a grand ensemble of 71 members derived from 6 forecast systems. They are initialized every 5 years from 1960 onward and run ahead for 20 years. Our analysis uses an elaborate drift- and bias-correction method that accounts for the correct representation of trends. Importantly, we show significant skill against observations for a number of variables (fields and indices), even in the second decade of the forecasts. The origin of such predictability is discussed together with the limitations of these 20-year predictions. The respective experimental protocol was defined in the framework of the ASPECT EU project and has been proposed as a tier-2 Decadal Climate Prediction Project (DCPP) protocol for the Coupled Model

Intercomparison Project phase 7 (CMIP7).