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How to increase the quality and the added value of regional decadal predictions for Europe?

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The development of skillful climate predictions on time-scales from one year up to a decade is of great interest since this time span falls within the planning horizon for socio-economic decision makers. Within the German research program MiKlip, four generations of decadal hindcasts have been generated. In addition to the global climate predictions with MPI-ESM, regional downscaling for Europe was performed with the regional climate model (RCM) COSMO-CLM (CCLM) for the period from 1960 to present, because the RCMs in general provide climate information closer to observational datasets and on spatial and temporal scales closer to the needs of potential users. The global prediction system is able to achieve a relatively high predictive skill over the North Atlantic sector. Over continental Europe, the predictive skill varies strongly between different climatological regions with the season and lead-time.

Among the topics the focus is given to these components of the model chain: a) the added value of downscaling in general, and the benefits from b) increasing the GCM resolution, c) increasing the RCM resolution and d) using two RCMs instead of one. It is discussed which aspects of the predictive skill are mostly inherited by the global forcing and which skill-related aspects can be improved by regionalization.

To improve the robustness of climate prediction, the stationarity of decadal predictability over centennial time-scales is analyzed. Special focus here is on the multi-decadal variability of climate extremes, the associated uncertainties and their correlation with teleconnection patterns (e.g. the Atlantic Multi-Decadal-Variability). This analysis permits an improved attribution of the decadal variability to green-house gas induced trends or the slow modes of the natural variability.