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A regional decadal prediction system for Europe – Extremes and user-relevant variables

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Regional climate predictions on timescales from one year up to one decade are gaining importance, as this timeframe falls within the planning horizon of politics, economy, and society. Within this context, the decadal predictability of extremes like heat waves, heavy precipitation or windstorms is of particular interest for potential users of climate information. In the framework of the German MiKlip consortium (www.fona-miklip.de) a global decadal prediction system based on the Max-Planck-Institute Earth System Model (MPI-ESM) was developed, and several hindcast ensemble generations were produced. Additionally, MiKlip established for the first time a regional component for the decadal prediction system. Dynamical downscaling with the regional climate model COSMO-CLM is used to generate the hindcast ensembles for Europe with a spatial resolution of 0.44° ($\sim$ 50km). The present study analyses the skill of the regional prediction system, focusing on extremes and user-relevant variables. The analyzed quantities are related to temperature extremes, heavy precipitation, wind and the agronomy sector. Variables based on temperature (e.g. frost days, heat waves) show high predictive skill, even for longer lead times. The skill patterns for Europe are spatially robust. On the other hand, decadal predictions for precipitation related indices (e.g. heavy precipitation causing floods in large European river catchments) are less skillful, and the skill patterns are much more heterogeneous. Quantities related to the agronomy sector (e.g. growing season length) are skillful, especially those related to temperature.
Overall, we identify decadal predictive skill at the regional scale for extremes and user-relevant variables and not only for global yearly mean temperatures. These results might thus be of importance for impact-related modelling at the regional scale.