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Modes of European decadal climate variability: Impact and predictability of anomalies and extremes

Hendrik Feldmann, Natalie Laube, Benjamin Buldmann, Julia Mömken, Joaquim Pinto, and Christoph Kottmeier

Kalrsruher Institut für Technologie, Institut für Meteorologie und Klimaforschung, Karlsruhe, Germany (natalie.laube@kit.edu)

The German research program MiKlip develops a decadal climate prediction system including a regionalization module using the MPI-ESM as global prediction model and COSMO-CLM (CCLM) for the regional downscaling over Europe. Several generations of decadal hindcast ensembles from 1960 – 2017 have been generated to assess the skill of the prediction system. An additional ensemble extending the hindcast period over the whole 20th century was performed to cover more than one period of the Atlantic Multidecadal Oscillation (AMO), the leading mode of decadal climate variability in the North-Atlantic sector. Previous studies have identified a significant skill several years ahead over Europe for multi-year means of temperature, wind and precipitation.

This work investigates how far this skill extends to climate anomalies and extremes, which are of high interest for potential users of this type climate information. Therefore, the variability of heat-waves, extreme precipitation, flooding and wind-storms and their relation to large-scale teleconnection pattern (e.g. AMO, NAO a.o.) was analysed to estimate the contributions of internal modes of variability compared to the climate trend and to estimate the predictive potential.

We discuss examples on the predictive skill for temperature, precipitation and wind related extremes affecting Europe.