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Interpolation and analyses of EURO-Cordex data for the characterization of local and regional climate change impact

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Decisions on measures for adapting to possible climate impacts are critical at both regional and local levels of authority. Currently, the data from EURO-CORDEX is only provided at resolutions (0.11 and 0.44 degrees) that are sufficient for climate analysis in larger scale regions. Therefore, there is a need for more detailed climate information that can assist decision making at the county and town levels.

To tackle this challenge, we have developed a tool for the Just Another Modelling System (JAMS; Kralisch et al. 2007) that produces approx. 50 climate characterizing parameters (e.g. average temperature, ice days, climatic water balance, among others) for different time intervals. This tool is combined within the JAMS environment with the J2000g distributed conceptual hydrological model (Krause and Hanisch 2009) to additionally calculate hydro-meteorological parameters, such as actual evapotranspiration, ground water recharge and runoff generation. The resolution of the data was transformed to a higher resolution (250 m) by applying an inverse distance weights (IDW) interpolation. The IDW was combined with an altitude regression approach using digital elevation model data to represent more detailed information of the land surface.

We applied this downscaling approach for the federal state of Thuringia, Germany, which is represented by 371206 model units. An ensemble of 10 different EURO-CORDEX models (0.11 degree resolution) in a time period from 1961 to 2100 and measured data from 1960 to 1990 were analyzed. The climate change impacts were estimated by analyzing the changes between historical periods (1960 - 1990) and future periods (2020 – 2050, 2070 -2100) within the modeled EURO-CORDEX ensemble members.

We also improved our interpolation approach by replacing IDW with kriging; this approach was especially an advantage for the interpolation of irregularly distributed measurement stations. The results were used to estimate the effects of climate change for the federal state of Thuringia and to support Thuringian climate-change mitigation and adaptation strategies. Future work will concentrate on bias correction of the ensemble members using the measured data.

References

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