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Statistical downscaling of temperature extremes in the Mediterranean area under future climate change

Alexander Beck, Elke Hertig, and Jucundus Jacobeit
Department of Geography, Augsburg University, Germany (alexander.beck@geo.uni-augsburg.de)

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Alexander Beck, Elke Hertig, Jucundus Jacobeit
Department of Geography; Augsburg University
Alter Postweg 118, 86159 Augsburg
alexander.beck@geo.uni-augsburg.de

Statistical approaches are developed to estimate parameters of climate change in the Mediterranean area with a focus on non-stationarities arising in the relationship between regional climate variables and their large-scale predictors. Hereby particular attention is paid to the analysis of temperature extremes which affect many components of the geosystem and therefore are of particular interest in the scope of future climate change.

The E-OBS dataset (Haylock et al., 2008) delivers gridded data of the maximum temperature on a daily basis for the period from January 1950 till December 2012 with a spatial resolution of 0.25° x 0.25°. In order to analyze the data of different regions, a principal component analysis is performed and the representative grid box, i.e. the grid box with the highest loading, is separated for every principal component. The daily 95%-percentile for every month and season is computed. Additionally, time series with 5 consecutive days exceeding the 95%-percentiles were generated. Furthermore, extreme value distributions like the generalized pareto distribution (GPD) are fitted to the time series. Non-stationarities in the predictors-temperature relationships are analyzed in the percentile-based time series as well as in the parameters of the extreme value distribution. In addition to the analysis of the extreme part of the temperature distribution, analyses will concentrate on the whole distribution in order to get a more complete idea regarding temperature changes in the Mediterranean area. This is achieved by fitting mixture models to the temperature data. Subsequently, a perfect prog downscaling approach is used to to assess future temperature change under enhanced greenhouse gas conditions.

Haylock, M. R., N. Hofstra, A. M. G. Klein Tank, E. J. Klok, P. D. Jones, and M. New (2008), A European daily high-resolution gridded data set of surface temperature and precipitation for 1950 – 2006, J. Geophys. Res., 113, D20119, doi:10.1029/2008JD010201.