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Statistical downscaling of extreme events in the Mediterranean area

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In the context of future projections of climate change, extreme events are considered to be more important than slowly changing mean conditions. In the present study percentile-based indices of extreme temperature and precipitation are derived from station data as well as from high-resolution gridded data for terrestrial areas in the Mediterranean region. As large-scale predictors for statistical downscaling models, geopotential heights, thickness of the 1000hPa/500hPa layer, and atmospheric humidity are primarily considered. Downscaling from these predictors to Mediterranean extremes indices is done by Multiple Regression and Canonical Correlation Analyses. In order to account for non-stationarities of the models, analyses are realised for different calibration periods and corresponding verification periods. Model performance in the verification periods is assessed by means of correlation coefficients between modelled and observed extremes indices as well as by the reduction of variance being similar to the root mean squared skill score. Output from different coupled global circulation models integrated under A1B- and B1-scenario assumptions is used to assess changes of extreme temperature and precipitation due to enhanced greenhouse warming conditions. Results indicate that the downscaling assessments can vary considerably depending on the particular predictors used in the statistical models. Climatic as well as dynamic factors influence extreme conditions and should be considered in a combined manner within downscaling models. Regarding temperature extremes, results imply that changes do not follow a simple shift of the whole temperature distribution to higher values since the intra-annual extreme temperature range is indicated to decrease in most parts of the Mediterranean area during the course of the 21st century. This is due to widespread findings that extreme minimum temperatures in winter will increase stronger compared to extreme maximum temperatures in summer.
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