Future Assessments of Temperature and Precipitation Extremes in the Mediterranean area

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Based on daily station time series. temperature and precipitation extremes are defined by means of particular percentiles (the 5th and 95th for daily minimum and maximum temperatures, respectively, and the 95th for daily precipitation).

Statistical relationships of the extremes indices to the large-scale atmospheric circulation are established for the period 1950-2006. This is done by applying stepwise multiple regression analysis and canonical correlation analysis with the Mediterranean extremes indices as dependent variables and s-mode principal components of large-scale atmospheric fields as independent variables. For Mediterranean temperature extremes geopotential heights of the 500hPa-level, thickness of the 1000hPa-500hPa-layer, and relative humidity of the 700hPa-level are selected as large-scale predictors, whereas for precipitation extremes specific humidity of the 850hPa-level, vorticity of the 1000hPa-level, and an atmospheric stability index are additionally considered.

The analyses are realised for different calibration periods in order to consider non-stationarities in the relationships between large and local scales. Model performance is tested in the corresponding verification periods not only by means of the correlation coefficients between modelled and observed extremes indices, but additionally by means of the RV-value (reduction of variance) being similar to the root mean squared skill score. All statistical models with RV>0 pass the verification procedure and constitute a statistical model ensemble which is subsequently used for the assessment of extremes indices under future climate conditions.

For the assessment of regional changes of climate extremes in the Mediterranean area model output of two different coupled general circulation models (ECHAM5/MPI-OM and HadCM3) for two different emission scenarios (SRES A1B and SRES B1) is used, resulting in assessments from a total of 9 simulation runs (including some ensemble members).