Geophysical Research Abstracts, Vol. 7, 03217, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03217

Future changes of extremes in temperature and precipitation around the Mediterranean basin

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A variable-grid atmospheric general circulation model, the LMDZ, with local zoom over the Mediterranean is used to investigate future changes of climate extremes around the Mediterranean basin. Three time slices are chosen to correspond respectively to the end of the 20^{th} century (control climate), the middle and the end of the 21^{th} century (future scenarios). Global forcing (SST and sea-ice extension) are extracted from four global ocean-atmosphere fully coupled models performed in IPSL, CNRM, GFDL and NCAR respectively. All the four models were run under the IPCC/SRES A2 emission scenario. All our time-slice simulation last for 30 years to reach a good statistic level. The use of four different global forcing allows to assess the dispersion of results. A certain confidence can thus be deduced. Extremes are expressed in terms of return values for a given time period derived from a Generalized Extreme Value distribution that was fitted to a sample of seasonal maximums or minimums by L-moments method.

For the temperature extremes, the changes are similar for the four global model scenarios. Spatial distribution of temperature extremes at the end of the 21^{th} century has the same feature as those in the middle of the century, but with lager magnitudes. Changes in temperature extremes are due mainly to changes in the location of the extreme value distribution. Minimum temperature extremes increase more largely than maximum ones in winter. In summer changes in cold and warm extremes display, in average, an analogous increase everywhere, except some regions in North Africa where return values of the extreme minimum temperature decrease. Changes in extreme precipitation exceed substantially the corresponding changes in the mean values and are related to changes in the location, scale and even shape of the distribution function. There is no evident spatial resemblance of precipitation extremes among four integrations in the middle of the 21^{th} century, while at its end the extremes produced by IPSL and CNRM models have some common features. In general, over the most part of the considered region the return values of extreme precipitation increase in winter and decrease in summer.