Geophysical Research Abstracts
Vol. 16, EGU2014-2544, 2014
EGU General Assembly 2014

Precipitation in the Mediterranean Area related to Weather Regimes of the North Atlantic-European Domain: A Statistical Downscaling Study

Elke Hertig (1) and Jucundus Jacobeit (2)

(1) University of Augsburg, Physical Geography, Augsburg, Germany (elke.hertig@geo.uni-augsburg.de), (2) University of Augsburg, Physical Geography, Augsburg, Germany (jucundus.jacobeit@geo.uni-augsburg.de)

Over the North Atlantic-European domain the varying states of the atmospheric circulation can be classified into a few recurrent patterns, so-called weather regimes. Winter precipitation anomalies in the Mediterranean area strongly depend on the large-scale atmospheric circulation. Thus, changes in the weather regime characteristics, like variations concerning their mode, location, and strength, have an important impact on the winter precipitation variability over the Mediterranean region. A further increase of the greenhouse gas forcing may change the intensity and geographical patterns of the weather regimes influence on precipitation.
Winter (December-February) precipitation in the Mediterranean area was assessed under the explicit consideration of temporal variations in the weather regimes-precipitation relationships. For this purpose a statistical downscaling approach was applied using generalized linear models (GLMs) based on Tweedie exponential dispersion models. For the detection of non-stationarities in the weather regimes-precipitation relationships, deviations of the statistical model performance in a potentially non-stationary running calibration framework from the performance under stationarity conditions were used, applying cross-validation based on random sampling.
There is substantial variability of the weather regimes and their within-regime characteristics (air temperature, specific humidity, and zonal wind component) in the observational period 1950-2010. Remarkable variations in the anomaly intensities as well as spatial shifts of the anomalies occurred in this period. Considerable variability of the weather regimes can also be seen in the Earth System Model runs under historical and future scenario conditions.
The statistical projections of Mediterranean precipitation until the end of the 21st century under enhanced greenhouse gas conditions show large changes of the individual weather-regime dependent precipitation distributions. Aggregated across the weather regimes and averaged to multi-model means, mainly a reduction of the probability of rain and a rather indifferent pattern regarding the change of the 75% up to the 95% quantiles of precipitation arises. However, results are strongly connected to the specific time period under consideration.
This research project is funded by the German Research Foundation DFG.