EMS Annual Meeting Abstracts
Vol. 8, EMS2011-720, 2011
11th EMS / 10th ECAM

Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Synoptic Downscaling of precipitation extremes in the Mediterranean area

S. Seubert (1), S. Fernández Montes (2), E. Hertig (1), and J. Jacobeit (1)
(1) Institute of Geography, Augsburg, Germany , (2) Department of Applied Physics, Almeria, Spain

Statistical downscaling is widely used for transferring large-scale circulation variability into anomalies of local-scale climate variables. This approach with its widespread range of techniques (e.g. linear or non-linear models, transfer functions, synoptic techniques, neural networks, weather generators) for downscaling climate parameters like precipitation and temperature is well established besides dynamical downscaling by Regional Climate Models. Both dynamical and statistical methods are encountering particular challenges with respect to climatic extreme events and their variability at the tails of the underlying probability distribution. However, especially the synoptic Downscaling approach based on circulation-type classifications gives insight into dynamics of large-scale patterns accompanying local extreme events and thereby leads to a better understanding of the driving mechanisms.

This study in context of a current Project funded by the German Research Foundation (DFG) is concentrated on precipitation and temperature extremes in the Mediterranean area in a changing climate (KLIWEX-MED). In this context different synoptic techniques, like the Analogue-method and various weather-type classifications, were tested for their ability of downscaling Mediterranean extremes from large-scale circulation patterns under climate change conditions. Analyses were based on long-term datasets like daily station data mainly for the Western, Northern-Central and Eastern Mediterranean area (ECA-D, EMULATE & GLOWA-Jordan projects, Aemet) and a set of daily resolved predictor variables extracted from 20th-Century Reanalysis V2 data (1871-2009).

At first the performance of specific large-scale variables (geopotential heights, sea-level pressure, relative and specific humidity, moisture flux and vorticity) in representing the (seasonally aggregated) daily precipitation variability and the related extremes is evaluated via the Analogue-Method. The main focus is on extracting the most adequate predictors/predictor combinations being able to describe extreme conditions in circulation better than others. Afterwards, the selected circulation variables are used for running SANDRA (Simulated Annealing and Diversified RAndomisation) classifications weighted with daily precipitation sums and daily extreme precipitation of comparable stations. The resulting circulation classes are split into sub-samples of dry, wet, and extreme conditions, and instead of modelling with the mean precipitation sums of each class, modelling is accomplished with specific dry, wet or extreme values for each class. This strategy maintains the daily variability in the modelled time series and therefore allows to apply the “extreme”-threshold defined in the calibration period also in the validation period. The resulting model quality is assessed on the interannual time scale in terms of correlation coefficients and root-mean-square errors between observed and modelled extremes. Additionally, extreme distributions for the whole calibration/validation periods are compared via Kolmogorov-Smirnov tests.