EMS Annual Meeting Abstracts
Vol. 7, EMS2010-259, 2010
10th EMS / 8th ECAC

High resolution climatology
- towards climate change services

Downscaling of extreme precipitation events under climate change conditions

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Extreme precipitation events are of high relevance for wealth and society since they can cause floodings or trigger landslides for example. The main focus of this study is to verify if and how such events will alter under climate change conditions.

In our study we used daily records of precipitation at 50 stations over the complex topography of Austria, covering the observation- and cross validation period 1963-2006. To calculate the adequate time series for the future, considering IPCC's emission scenarios A1B and B1, we applied the analog method. Daily fields of Sea Level Pressure, from the NCAR/NCEP1 reanalysis, served as the prime predictor between the local scale observations and climate simulations (Echam5-MPIOM Model). In addition specific humidity at 700hPa has been used as a precondition for finding SLP analogues. To consider the development of the synoptic situation, we also included the pressure field from 4 days prior to the day of interest, by applying a decreasing weighting sequence on the Principal Components. Daily precipitation amounts for certain return periods (10-,30-, and 50-years) have been determined by fitting a general extreme value distribution to the derived time series, which consist of the three most extreme events per year. These events have been declustered previously.

The results reveal minor to moderate changes in the range of -10% to +20% for 30-year recurrence intervals. In the summer season we see a light increase of about 5% to 12% at most stations. In contrast there is a clear difference during the winter half year between regions located at the northern (light decrease) and southern (moderate increase) side of the alpine ridge. Differences between the emission scenarios are minor, although future changes are slightly more pronounced in scenario B1.

Interesting aspects came along when looking at the results from the cross validation. First, there are only small biases in the summer half year although this is the convective season and large scale pressure patterns reveal only weak gradients. In contrast large biases (20-60%) emerged during the winter half year at stations located in the most eastern part of Austria, for which we have not found an explanation yet. Secondly, this method worked very well at mountain stations in both seasons, which could be a clue that convective events are not relevant for this study, since the Analog Method can't capture such events in particular.