Geophysical Research Abstracts
Vol. 18, EGU2016-17121, 2016
EGU General Assembly 2016

Using rain-on-snow events to evaluate the quality of bias correction to represent complex inter-variable dependencies

Ole Rössler (1), Thomas Bosshard (2), and Rolf Weingartner (1)

(1) Oeschger Centre of Climate Change Research, Hydrology Group, Institute for Geography, Uni Bern, Bern, Switzerland (ole.roessler@giub.unibe.ch), (2) SMHI, Norrköping, Sweden

A key issue for adaptation planning is the information of projections about changes of extremes. Climate projections of meteorological extremes and their downscaling are a challenge on their own. Yet - at least in hydrology – meteorological extremes are not necessarily hydrological extremes. These can also result from a sequence of days with only moderate meteorological conditions, too. This sequences are called “storylines”.
In climate change impact assess studies it is relevant to know, whether these meteorological storylines are represented in regional climate models, and how well can bias correction preserve or improve the representation. One storyline leading to hydrological extremes are rain-on-snow events, and more specifically rain-on-snowfall events. These events challenge the regional climate model and the bias correction in terms of representing absolute values and inter-variable dependences. This study makes use of the rain-on-snow-storylines to evaluate the performance of regional climate models and a bias correction method in reproducing complex inter-variable dependencies.
At first, we applied a hydrological model to a mesoscale catchment in Switzerland that is known to be effected by rain-on-snow events. At second, the ERA-Interim driven regional climate model RCA4.5 – developed at SMHI – with a spatial resolution of 0.11 * 0.11 degree was used to drive the hydrological model. At third, bias-correction of the RCM was done applying the distribution based scaling (DBS) bias-correction method (Yang et al., 2010) developed at the SMHI. The bias-corrected data then also served as driving input data to the hydrological model. Based on the simulated runoff, as well as simulated precipitation, temperature, and snow pack data, an algorithm to detect rain-on-snow events was applied. Finally, the presence or absents of rain-on-snow events for the three different climate input data, ERA.RCA4.5, DBS corrected ERA.RC4 and observed climate, are evaluated within the time period of 1990-2010.
The hydrological model performance in terms of rain-on-snow representation indicate some room for improvement. Still, the comparison of the different climate data driven model runs revealed an overestimation of the occurrence frequency of rain-on-snow events applying ERA.RCA4.5 that can partly be corrected using DBS. The study finally discusses the potential of this framework to evaluate the quality to represent complex inter-variable dependencies based on a new indicator in future downscaling technique validations.