Geophysical Research Abstracts
Vol. 21, EGU2019-10595, 2019
EGU General Assembly 2019

Comparison of bivariate copula-based bias correction of regional climate model (RCM) precipitation and temperature

Faranak Tootoonchi (1), Jan Haerter (2), Claudia Teutschbein (1,3)

(1) Uppsala University,Department of Earth Science, Sweden , (2) Niels Bohr Institute, University of Copenhagen, Copenhagen, Denmark, (3) Centre of National Hazards and Disaster Science (CNDS), Uppsala, Sweden

Future climate scenarios simulated by Regional Climate Models (RCMs) are often used as input to hydrological models to study the effects of a changing climate on our water resources. Yet, RCM models face crucial biases such as systematic wet or cold biases during winter caused by an inadequate parameterization or by an inaccurate representation of physical processes in the RCMs. In order to overcome these biases, different statistical methods have been suggested in the scientific literature that employ a transformation algorithm to re-scale RCM outputs. Some of these methods (e.g. univariate methods that adjust only one RCM-simulated variable at a time) are comparatively easy to implement while others (e.g., multi-variate correction that guarantees consistency in spatiotemporal fields and different climate variables) are more complex and require advanced statistical knowledge and more computing power. The adequacy of each bias correction method varies depending on several factors such as the studied watershed, the applied RCM model or the utilized climate variable.
In this study, we assess how well several bivariate copula-based methods can correct for biases in precipitation and temperature time series simulated by an ensemble of 11 different RCMs for five Swedish catchments under varying climate conditions. Univariate quantile mapping is used as a benchmark model. Because observations cannot be used to assess the performance of these methods under future climate conditions, we here use a pseudo-reality approach, which draws conclusions using RCM simulations as proxies assuming that the RCM simulations are independent from each other and are plausible realizations of the actual future climate. From our RCM ensemble, each model at its time is selected to represent observations, against which the rest of the (bias-corrected) RCM simulations are then validated. After cycling this procedure over all permutations, cross-validation statistics are used to compare the relative ability of the analyzed methods in capturing future climatic conditions.
We discuss potential issues and trade-offs of copula-based methods and present an evaluation of each bias-corrected climate variable in terms of its statistical properties such as annual mean, seasonal variation, and frequency of extreme events.