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On the bias correction of forcing global model data for regional climate simulations over West Africa

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With the advances in high-performance computing, regional climate simulations have been taken to higher and higher resolution over the last decades. Whilst a higher spatial resolution implies a more accurate representation of the terrain and the land surface properties, it does not automatically lead to better results of the model. This limitation stems from several facts: the bias of the driving global model data, the bias inherent in the regional climate simulation, and the validity of physical parameterizations at high resolution. These limitations and the high costs associated with an increase of the resolution of the model have lead to a shift in paradigm towards ensemble modeling and have highlighted the importance of bias-correction of the driving global model data.

In this study, we compare the effects of two different bias-correction methods of the driving global circulation model (GCM) data on the results of regional climate simulations over West Africa. For both methods, ERA Interim Reanalysis data serves as reference for a past 10-year period (e. g., 1990–2000). The bias-correction of the GCM data is applied for the following 10-year period (e. g., 2000–2010). This data is used to drive regional climate simulations over West Africa at a moderate resolution of 18 km. Data collected from climate stations in West Africa along with satellite-gauge merged precipitation products such as the 0.25×0.25 degree TRMM (Tropical Rainfall Measuring Mission, Version 3B43) and the 1×1 degree GPCP 1DD (Global Precipitation Climatology Project) are used to validate the regional climate simulations. Particular importance is given to the accuracy of the predicted rainfall amount and the onset of the rainy season, key elements for decision makers and the people of West Africa.