

Drought Duration Biases in Current Global Climate Models

Heewon Moon, Lukas Gudmundsson, and Sonia Seneviratne

Institute for Atmospheric and Climate Science, Swiss Federal Institute of Technology in Zurich, Zurich, Switzerland
(heewon.moon@env.ethz.ch)

Several droughts in the recent past are characterized by their increased duration and intensity. In particular, substantially prolonged droughts have brought major societal and economic losses in certain regions, yet climate change projections of such droughts in terms of duration is subject to large uncertainties. This study analyzes the biases of drought duration in state-of-the-art global climate model (GCM) simulations from the 5th phase of Coupled Model Intercomparison Project (CMIP5). Drought durations are defined as negative precipitation anomalies and evaluated with three observation-based datasets in the period of 1901-2010. Large spread in biases of GCMs is commonly found in all regions, with particular strong biases in North East Brazil, Africa, Northern Australia, Central America, Central and Northern Europe, Sahel and Asia. Also in most regions, the interquartile range of bias lies below 0, meaning that the GCMs tend to underestimate drought durations. Meanwhile in some regions such as Western South America, the Amazon, Sahel, West and South Africa, and Asia, considerable inconsistency among the three observation-based datasets were found. These results indicate substantial uncertainties and errors in current GCMs for simulating drought durations as well as a large spread in observation-based datasets, both of which are found to be particularly strong in those regions that are often considered to be hot spots of projected future drying. The underlying sources of these uncertainties need to be identified in further study and will be applied to constrain GCM-based drought projections under climate change.