EGU22-9299
https://doi.org/10.5194/egusphere-egu22-9299
EGU General Assembly 2022

Dealing with climate data uncertainty for agricultural impact assessments in West Africa

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West Africa is characterized by high variability in climate, has a fast growing population, and is home to a population strongly reliant on rainfed agriculture. The largely weather-dependent agricultural production is now further at risk under increasing climate change. To adequately address climate risks and avoid further pressure on food security, evidence-based information on climate impacts and guidance on the suitability of adaptation measures is required. Simulations of regional impacts of climate change on crop production are strongly influenced by the climate data used as input. The selection of climate forcing data is most influential in regions with high uncertainties in past climate data and where the agricultural production varies greatly under climate variability (Ruane et al., 2021). Both is the case in West Africa, calling for an improved understanding of past and future climate data for its use in agricultural modelling over the region.

In this session we want to contribute to an increased understanding on the usability of different past and future climate data sets for agricultural impact models over West Africa. In a recent study, we compared ten CMIP6 (Coupled Model Inter-comparison Project Phase 6) models and their respective bias-adjusted ISIMIP3b (Inter-Sectoral Impact Model Intercomparison Project Phase 3b) versions against different observational and reanalysis data sets. Focusing on their use for agricultural impact assessments we centred the analysis on climate indicators highly influencing agricultural production and their representation in the different climate data sets.

Results show that the ten CMIP6 models contain regional and model dependent biases with similar systematic biases as have been observed in earlier CMIP versions. Although the bias-adjusted version of this data aligns overall well with observations, we could detect some regional strong deviations from observations in agroclimatic variables like length of dry spells and rainy season onset. The use of the multi-model ensemble mean has resulted in an improved agreement of CMIP6 and the bias-adjusted ISIMIP3b data with observations. Choosing a subensemble of bias-adjusted models could only improve the performance of the ensemble mean locally but not over the whole region. The results of this study can support agricultural impact modelling in quantifying climate risk hotspots as well as suggesting suitable adaptation measures to increase the resilience of the agricultural sector in West Africa.