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Sahelian precipitation projections and selection of a sub-ensemble of CMIP5 models.

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The future evolution of the West African Monsoon is evaluated with 32 CMIP5 models under the rcp8.5 emission scenario. A hierarchical clustering method, based on the pattern correlation of precipitation changes, is used to classify the models. Four main responses are defined, and range, from an increase to a decrease of rainfall. We find that inter-model differences are mainly explained by (i) the large spread in temperature increase over the Sahara and North Atlantic and by (ii) more or less moisture export at mid-level. A wetter Sahel is associated with a strong increase of temperature over the Sahara (>6°C), a northward shift of the monsoon system and a weakening of the African Easterly jet. A dryer Sahel is associated with subsidence anomalies, an increase of 600 hPa wind speed and a weaker warming over the Northern Hemisphere. In most of the models, the Sahel is projected to become dryer (wetter) during the first months (last months) of the rainy season. We propose several methods to define a sub-sample of models that is able to simulate both the pattern and/or the spread of the precipitation change from the full-ensemble. We argue that the mean biases in precipitation and temperature are not associated with the projection of the monsoon intensity and are not a reliable metric for the model selection. This work was supported by the EU-funded PREFACE (grant agreement 603521) project.