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Projected changes in the relationship between Precipitation, African Easterly Jet and African Easterly Waves under global Warming.

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Abstract An ensemble of regional climate analysis projections is carried out with Theoretical Physics Regional Climate Model (RegCM4) over West Africa domain. The RegCM4 is driven by three CMIP5 Global Climate Models (GCMs) under two greenhouse gas concentration pathways such as RCP8.5 and RCP4.5 at 25 km of grid spacing to assess regional changes in temperature, precipitation and West African Monsoon (WAM) dynamical features. In particular, we examine and inter-compare the models performance with theirs ensemble-mean in simulating the mean climatology and the response of African Easterly Jet (AEJ) and African Easterly Waves (AEWs) to increasing greenhouse gas concentrations by the end of the 21st century. The covariance analysis is used to investigate the nature of the relationship between WAM features and precipitation. Using an ensemble of regional climate models, much of model simulations project a widespread change of precipitation associated with decreased of AEJ (in term of location and intensity) and AEWs activity in the 2–10 days period and affecting their relationship. The seasonal mean precipitation events decrease in the future scenarios with largest and more extensive drying condition over the Sahel and wetter condition over the Gulf of Guinea while some models project a drier condition along the both region. This dry condition delayed the onset of the rainy season, anticipated the retreat of the rainbelt and reducing and strengthening of the Intertropical Convergence Zone (ITCZ) band. The change is consistent in all global and regional model projections, although with different spatial detail. The results suggested that changes in AEJ and AEW characteristics could play a critical role in shaping the response of WAM to elevating anthropogenic greenhouse gas (GHG) forcing.