



## **Future projection of onset and jump of West African monsoon in a high-resolution AGCM**

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The two most important temporal events during the evolution of West African Monsoon (WAM) are the "monsoon onset" and "monsoon jump." The onset of monsoon (local onset) can be defined as the time when the first rains followed by uninterrupted rainy season commences. Typically, WAM begins by intense rainfall over Guinean coast in the April-May, and the precipitation maximum stays here until late June. However, an abrupt shift in the location of rainfall maximum from 5 N to a new quasi-stationary location around 12 N occurs by the end of July or by the beginning of August. This abrupt shift in the location of precipitation maxima from Guinean coast to Sahel region is called "monsoon jump". It is challenging for the GCMs and RCMs to accurately predict WAM onset. The present study uses a high-resolution AGCM, High Resolution Atmospheric Model (HiRAM) developed at GFDL, to investigate the projected temporal changes in WAM onset and jump in a warming climate. Ensembles of simulations are conducted at a spatial resolution of  $\sim 25$  km, with observed SST and SST from the coarse resolution Earth System Model ESM2M developed at GFDL, in the history period (1975-2004). Future projections (till 2050) are also conducted for two Representative Concentration Pathways (RCPs), RCP4.5 and RCP8.5. To validate the ability of HiRAM to simulate temporal evolution of WAM, the historical simulations are compared against ERA-Interim reanalysis and parent ESM. In general, HiRAM simulations better reproduce the overall pattern of progression of WAM onset from south to north and the monsoon jump when compared with their parent ESM.