Investigating West African Climate Variability Using RegCM3

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Abstract

Since late 1960s, there have been extreme climate events (droughts, desertification and flood), which have impacts on agriculture, water resources, health etc over West Africa.

Climatic variability is a principal factor of fluctuations in West African food production and rainfall is the most limiting climatic factor in agriculture and water resources. Therefore, the understanding of climatic variability characteristics is important to promote food production and adequate water resources.

Climate studies over the region have in the past been based on empirical / statistical techniques which do not accurately understand the processes that produce climate. Recent studies over the region have added available global climate models in research and operations. These models are inadequate in providing mesoscale details associated with regional models.

Therefore, we are using the ICTP Regional Climate Model (ICTP RegCM3), which is capable of explaining climate processes and can provide better results. The model however shows a tendency to overestimate rainfall amounts along the Guinean coast, particularly around mountainous areas, and to underestimate it over the Sahel. The increased rainfall along the coast is due to an enhanced low level convergence of the moist southwesterly winds along the coast leading to a reduction of the moisture content in the atmosphere. The decrease over the Sahel could be associated with the weakening of the land-sea temperature gradient and hence the decrease in the low level southerly flows. The spatial and temporal variations in temperature are well captured by the model except for slightly cold bias over the costal region due to an overestimation of precipitation. The changes in wind pattern are also consistent with the observed meridional oscillation of the monsoon trough. We conclude that the use of RegCM3 for the study of West African climate variability and physical processes offers useful information.