THE ROLE OF LAND USE CHANGES IN WEST AFRICAN DROUGHT

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Abstract

This study investigates the feedbacks between land cover and the monsoon in West African using a regional climate model (RegCM3). A series of multi-year simulations are performed using reanalysis boundary conditions under three idealized vegetation states (potential, desertified, and deforested). Both desertification and deforestation tend to increase the monsoon flow over the Guinean region, although due to different mechanisms. Desertification increases the flow mainly by increasing the meridional temperature gradient; however, it reduces rainfall over the desertification region but increases rainfall south of it. On the other hand, deforestation increases the monsoon flow mainly due to the reduced surface friction experienced by the flow over the Guinean region; however, it reduces rainfall over the entire West African region, but with less impact over the Sahel region. The study further shows that desertification and deforestation also increase the speed and humidity of the mid-tropospheric easterly flow, south of the African easterly jet (AEJ). Consequently, the flow transports more moisture away from West Africa region, at the expense of the low-level moisture, hence makes less moisture available for rainfall over the region.

Overall, this study suggests that the ongoing desertification and deforestation in West Africa may be major contributors to the persistence of the observed drought over the region.

Prediction of Onset and Sensation of rainfall over West African using RegCM3 dataset. Part I: Accessing the impact of recent model development

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Abstract

RegCM3 has undergone series of developments in the last two years. We have used the recent version of model to produce a 21-year (1980-2000) climate dataset at 50 km resolution over West Africa, mainly, to study the dynamic of onset and sensation of rainfall over the region.

Comparisons of the dataset with those from previous model version show that the developments have further improved capability of the model in simulating the West African climate. More specifically, the inland penetration of the ITD is better simulated; in agreement with observation, the northernmost position now extends to 20^{o}N in August. The rainfall magnitude also agrees better with observation; the wet bias along the coast and dry bias in the Sahel region are gone. Interesting, the discontinuity in northward progression of maximum rainfall zone, usually seen in observation, is well simulated in the present version. However the model still show the tendency to overestimate rainfall over the mountains. Areas for further improvement in the model will be discussed in the workshop.

In addition, the ongoing work on the application of the dataset for prediction onset and sensation of rainfall over West African region will be discussed in the workshop.