Geophysical Research Abstracts
Vol. 20, EGU2018-6752, 2018
EGU General Assembly 2018

Diagnosing Land Surface Controls on Central African Rainfall

David Crowhurst, Simon Dadson, and Richard Washington

Climate Research Lab, School of Geography and the Environment, University of Oxford, United Kingdom (david.crowhurst@keble.ox.ac.uk)

Central Africa is one of three major hotspots of convective rainfall. Modelling studies of land surface controls on rainfall in other tropical regions suggest that erroneous simulation of land surface quantities and coupling processes could contribute to inter-model spread in Central African rainfall. Results from a multimodel experiment further show that rainfall in global climate models (GCMs) might be erroneously sensitive to changes in soil moisture in Central Africa. In wet climates, rainfall should be sensitive to net downward radiation, rather than soil moisture. However, a strong coupling between soil moisture and rainfall is simulated in global climate models from CMIP3 in Central Africa, when theory suggests this should not be true.

In this paper, we begin analysing land-atmosphere coupling in Central Africa across a range of atmosphere-only global climate models from CMIP5. We start by examining inter-model differences in the seasonal cycle and spatial distribution of terms in the land surface water and energy balances in the region.

Inter-model differences in the seasonal cycle of water balance terms are large in the atmosphere-only global climate models, during all seasons. However, rainfall has a bimodal seasonal cycle in most models, with strong peaks during two ‘wet’ seasons. The seasonal cycle of runoff mirrors that of rainfall in some models, but is flat in others. During the wet seasons, rainfall tends to peak either to the west or the east of the Congo Basin in the models. Runoff tends to follow a similar spatial pattern in the models.

Inter-model differences in the seasonal cycle of energy balance terms are also large during all seasons in the atmosphere-only global climate models. However, latent heat flux has a bimodal seasonal cycle in most models, whereas sensible heat flux has a unimodal seasonal cycle in most models. During the wet seasons, latent (sensible) heat flux is maximised (minimised) in the centre of the Congo Basin in most models, in contrast to the locations of modelled peak rainfall.