



## **On the Response of the African Monsoon Precipitation to Land Use Change in Regional Model Simulations**

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Land use and land cover (LULC) over Africa have had substantial change over the last sixty years. This study examines the effect of these changes on African monsoon system and Sahel precipitation using an ensemble of WRF V3.4 regional model simulations that vary in their land-surface and cumulus parameterization schemes. While the magnitude of the response covers a broad range of values, almost all the simulations, but especially those that reproduce the observed climatology, show a decline in Sahel precipitation due to the long term expansion of pasture and crop land at the expense of trees and shrubs. Assessment of the degree of realism of each simulated response using various observations of precipitation, surface temperature, surface moisture and fluxes suggests that the observed historical land cover change can cause 10% to 15% decline in mean summer precipitation over the Sahel.

The relationship between the responses to LULC change to the climatologies of the model control simulations is examined. Simulations that respond to LULC change strongly are climatologically warmer and drier and hence land-atmosphere interactions play a dominant role. Much of the change in precipitation is related to changes in circulation, particularly to the response of the intensity and latitudinal position of the African Easterly Jet which respond to the change in meridional surface temperature gradients.