



Influence of vegetation cover on extreme rainfall over southern Africa. Part 1: Idealised experiments using a global and regional climate model.

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In a changing climate, changes in rainfall variability and, in particular, extreme rainfall events are likely to be of far more significance for environmentally vulnerable regions such as southern Africa. Widespread poverty, an extensive disease burden and pockets of political instability across the subcontinent has resulted in a low resilience and limited adaptative capacity to climate related shocks and stresses.

It is generally accepted that sea-surface temperatures (SSTs) play an important role in modulating rainfall variability, thus the majority work to date has focused on these mechanisms. However past research suggests that land surface processes are also critical for rainfall variability. Therefore the primary aim of this work is to undertake simplistic idealised experiments using both a regional and global climate model, to test the sensitivity of rainfall variability and extremes to land surface changes over southern Africa.

In this paper we present results from idealized regional and global climate model (RCM and GCM, respectively) experiments forced with varying vegetation cover. In one experiment, the desert conditions observed over southwestern Africa were extended to cover the entire subcontinent. In the second experiment, savanna conditions were imposed over all of southern Africa, representing an increase in vegetation for most areas except the equatorial regions. The results agree with what would be theoretically expected; a decrease in rainfall occurs in the desert run, due to a reduction in available moisture, less evaporation, less vertical uplift and therefore higher near surface pressure. Conversely an increase in rainfall occurs in the savanna run, because of an increase in available moisture giving an increase in latent heat and therefore surface temperature, increasing vertical uplift and lowering near surface pressure. These experiments, however, are only preliminary, and form the first stage of a wider study into how vegetation influences rainfall extremes over southern Africa. Future work is currently underway, using more realistic vegetation types (under various scenarios of future climate change).