



Sahel rainfall variability and response to greenhouse warming

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A statistical analysis as well as ensemble integrations with an atmospheric GCM indicate that interannual variations in Sahel rainfall are related to variations in the geopotential height at 925 hPa (Φ_{925}) over the Sahara. The Φ_{925} variations are affected by the global distribution of surface air temperature (SAT). An increase in SAT over northern Africa and Eurasia, relative to the surrounding oceans, decreases Φ_{925} over the Sahara and thereby increases the Sahel rainfall.

We hypothesize that through this mechanism greenhouse warming will cause an increase in Sahel rainfall, because the warming will be more prominent over the summer continents than over the oceans. This has been confirmed using an ensemble of 62 coupled model runs forced with a business as usual scenario. The ensemble mean increase in Sahel rainfall between 1980 and 2080 is about 1-2 mm day⁻¹ during July-September. This modest increase strongly reduces the probability of prolonged droughts.