**The representation of southern African rainfall in coupled climate models: the role of the Angola Low**

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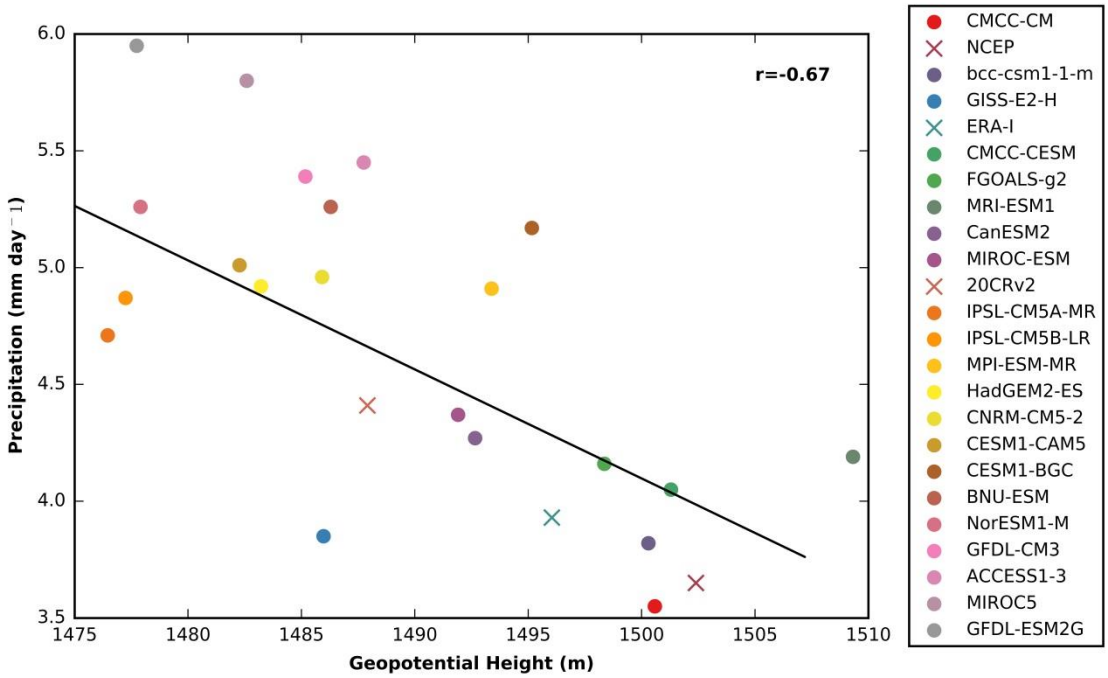
The coupled climate models forming part of the recent coupled model inter-comparison project (CMIP5) systematically overestimate rainfall in southern Africa. The excessive rainfall is particularly problematic in the summer rainy season, when the wettest model overestimates rainfall by 50% compared to observations. In the present study we attempt to understand this bias by looking at the processes which may control the difference between model estimates of precipitation. Specifically, we examine the precipitation climatology with respect to model simulation of an important, yet understudied, regional circulation feature: the Angola Low. We find that between 40-60% of the variability in model rainfall can be accounted for by variability in the model representation of the Angola Low. The Angola Low appears to influence rainfall in the subcontinent by affecting moisture circulation to its southeast. Specifically, models with a deeper low pressure system simulate exaggerated northeasterly and northwesterly fluxes deep into the subtropics. The enhanced northerly moisture pathways in models with deeper lows transport an extra 50 $gkg^{-1}$ $ms^{-1}$ and increase the rate of low-level moisture convergence in the continental interior. The results imply that improving the model representation of the Angola Low will lead to improvements in their simulation of rainfall in southern Africa.




The relationship between December to February Angola Low strength (geopotential height) and 1979-2005 mean southern African rainfall in the region 10-35S;10E-52E. CMIP5 models are indicated by dots, reanalyses by crosses. The Pearson's r-value, top right, is significant at p=0.0009. Note that the linear regression and Pearson's test do not include reanalyses.