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Is African rainfall forced from the Pacific on multidecadal timescales?

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Urban development in Africa is expanding exponentially leaving freshwater supplies depleted and fertile land susceptible to erosion. As long-term instrumental records of erosion and rainfall are scarce, forecasting is prone to large uncertainties, hampering mitigation efforts. We provide the fist evidence for Pacific decadal forcing of rainfall over Africa by analysing a number of coral cores from Madagascar, including a long 300 year record. Analysing the climate archives of giant corals using novel spectral luminescence scanning, complemented by high resolution geochemistry, allows for deconvolving natural and anthropogenic erosion, revealing long-term rainfall variability and the response to modern global warming. Coral records show a significant increase in river runoff over Eastern Madagascar since 1980 that is coupled to the accelerated warming of the central Indian Ocean and overprinted by periods of mid 20th century deforestation linked to social upheaval. Decadal climate variability and Indian Ocean warming appears as prominent causes of runoff variability in a far field response to the 50-70 year Pacific Decadal Oscillation (PDO). Positive PDO phases are associated with increased Indian Ocean temperatures, responsible for increased rainfall and soil runoff in Madagascar, and decreasing precipitation over Southern Africa. Since the 1976 switch to a positive PDO phase, runoff has increased at an unprecedented rate coupled to the accelerated warming of the Indian Ocean. However, because of the recent shift towards a negative PDO phase, rainfall over the region is expected to level off or even decline, while Southern Africa rainfall will likely increase.