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Contributions of local and large-scale Indian Ocean sea surface temperatures to enhanced East African rainfall

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Links between extreme wet conditions over East Africa and Indian Ocean sea surface temperatures (SST) are investigated during the "short rain" season in October-November. During periods of enhanced East African rainfall, Indian Ocean SST anomalies reminiscent of a tropical Indian Ocean Dipole (IOD) event are observed. Ensemble simulations with an atmospheric general circulation model (AGCM) are used to understand the relative effect of local and large-scale Indian Ocean SST anomalies on above-normal East African precipitation. We quantify the importance of the various tropical and subtropical IOD SST poles, both individually and in combination.

In the simulations, enhanced East African "short rains" are predominantly driven by the local warm SST anomalies in the western equatorial Indian Ocean, while the eastern cold pole of the tropical IOD is of lesser importance. The changed East African rainfall distribution can be explained by a re-organisation of the atmospheric circulation induced by the SST anomalies. A reduction in sea level pressure over the western half of the Indian Ocean and converging wind anomalies over East Africa lead to moisture convergence and increased convective activity over the region.

The seasonal cycle of various indices related to the SST and the atmospheric circulation in the equatorial Indian Ocean are examined to assess their potential usefulness for seasonal forecasting. Direct/indirect effects of the El Niño-Southern Oscillation on the IOD and East African rainfall are also discussed. To the authors' knowledge, this is the first AGCM study to quantify the contributions of characteristic local Indian

Ocean SST anomalies to East African rainfall.