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The Dominant Impact of the Indian Ocean Dipole on the Extreme Climate Events of East Africa

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In 2006 fall, the season of short rains in East Africa, more than one million people were affected by incessant rainfall and associated flooding in Somalia, Kenya and neighboring countries. This extreme event that caused large scale damage and human sufferings was accompanied by a climate mode in the Indian Ocean known as the Indian Ocean Dipole. This is an inherent ocean-atmosphere coupled variability in the Indian Ocean shown to affect the climate of the Indian Ocean rim countries. The evolution of the IOD involves feedbacks between winds and SSTs through upper equatorial ocean dynamics. It is observed that significant IOD events evolve in absence of El Niño/Southern Oscillation (ENSO) events though an apparent correlation between IOD and ENSO, owing to 30% of concurrences, sometime implicate that IOD events are ENSO dependent. Through changes in the Walker circulation and water vapor transport, a positive IOD event causes drought in Indonesia and Australia, and flood in eastern Africa. This finding from the observational data of relatively shorter period is well supported by a long record of simulated data derived from the SINTEX-F coupled model. The IOD impact on the East African region overwhelms that of the ENSO during the short rains season that coincides the peak season of the IOD. From the observational records and the model simulations, it is found that the extremes in short rains are actually related to the IOD irrespective of the presence/absence of ENSO in the event years.

This link in the present climate, as realized from observed data and SINTEX-F, is examined further for the future climate using 6 climate models from the IPCC SRESA2 scenario experiments. It is found that the changes in the mean condition in the Indian Ocean actually favor dipole-like variability in the Indian Ocean. As a result most of

these six models indicate increasing rainfall over East Africa in the latter part of the 21st century as compared to the first part. This has an implication for designing appropriate disaster management system for the East African region to minimize the climate impact.