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Indian Monsoon, Indian Ocean Dipoles and ENSO

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The relationships between the Indian Summer Monsoon (ISM) and the El-Niño Southern Oscillation (ENSO) have been widely documented for over 100 years. Indeed, the Southern Oscillation (SO) itself was first documented by Walker (1923) in his search for ISM rainfall predictors. Since this pioneering work, the links between ISM and ENSO have been documented in many observational and modeling studies and are still a controversial matter.

Meanwhile, some recent studies have suggested the existence of coupled dynamics in the Indian Ocean, which may be independent of ENSO and give rise to strong interannual climate anomalies in the Indian areas. The recently rediscovered Indian Ocean SST dipole mode (Saji et al., 1999; Webster et al., 1999), which peaks during boreal fall and is linked to rainfall anomalies in East Africa is one such phenomena. Another SST dipole mode in the southern Indian Ocean, seasonally phase-locked to the austral summer, has also been documented by Behera and Yamagata (2001). Such subtropical events are found to produce significant climate anomalies in southern Africa during boreal spring. However, the links between these spring/fall dipole events and the ENSO/ISM system are still unclear.

In this talk, we show observational and modeling evidences that both spring and fall SST dipole modes have some significant relationships with ISM and ENSO. It is suggested that these spring/fall dipole events play an important role in the variability of the Indo-Pacific Tropical climate, and interact with both ISM and ENSO. Moreover, the present study illustrates that the Indian Ocean plays an active role rather than a passive one in the interannual variability of the tropical climate. For example, consideration of the southern Indian Ocean during boreal spring may help to predict the anomalous state of the next Indian monsoon in mid-late summer (July, August, September).

References

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