

Theme: The Indian Summer Monsoon and the role of the Indian Ocean in its variability

Impact of Global Warming on ENSO-Monsoon Teleconnection in the Coupled Models.

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Although there is irrefutable statistical evidence that El Niño-Southern Oscillation (ENSO) variability in the Pacific Ocean produces a response in the Asian monsoon variability, the Indian Ocean is also a crucial factor in determining the monsoon variability over the Indian subcontinent. The large variability and strong coupled ocean-atmosphere-land interactions over the Indian Ocean produce significant perturbations which affect climate variability on intra-seasonal to interannual time scales. It is still under debate as to whether these interactions are unique and inherent to the Indian Ocean or simply a manifestation of ENSO phenomena in the tropical Pacific. The more frequent occurrence of the Indian Ocean Dipole (IOD) events and the weakening of the ENSO-Monsoon relationship during the last two decades have generated considerable interest in their possible interactions. Recent studies indicate that ENSO and IOD may have complimentary effects on the monsoon (i.e., periods of low (high) ENSO-Monsoon correlation feature high (low) IOD-Monsoon correlation). Studies also project Asian monsoon as a self-regulating coupled Ocean-Atmosphere system.

This study investigates the role of Indian Ocean sea surface temperature (SST) variability in the variability of Indian monsoon using the coupled ocean-atmosphere general circulation models (CGCM) of CMIP. The study involves two components: (i) validation of the model simulations using observations and (ii) assessment of climate change and its impact on the monsoon region and ENSO-monsoon teleconnections. Realistic simulation of the observed climatology and variability of monsoon climate over India and the SST over the Indian and Pacific Oceans is crucial in addition to simulation of teleconnections. While work and discussion under other sub-projects may provide useful input, here an independent analysis is planned for the benefit of continuity in work and discussion. The validation of the model simulations will be carried out using historical observations of monthly and seasonal rainfall and temperature over India, winds at 850 and 200 hPa from NCEP/NCAR reanalysis, and SST fields (HadSST) from the Climate Research Unit (CRU), U.K. The model data required to carryout this study are listed below.

- (i) Surface Fields: Monthly rainfall, maximum and minimum temperature.
- (ii) Ocean Fields: Monthly SST and Sea level data.
- (iii) Upper-air Fields: U, V, Z, Q and T at 850, 500 and 200 hPa
- (iv) Data on Land-Sea mask for each model.
- (v) Necessary software for using the data.

All the global gridded fields for entire period of the simulation from all the CMIP models are required for this study.