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Indian Ocean rainfall variability simulated using an atmospheric only and a coupled general circulation model. The role of the ocean in determining ENSO teleconnections and the IOD.

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To better understand the process controlling the rainfall variability in the Indian Ocean basin, we perform a series of 10-member ensembles for the period 1950-1999 using:

1) An AGCM (SPEEDY) forced by observed SSTs (HadISST);

2) The AGCM forced by climatological SSTs in the Indian Ocean and observed SSTs elsewhere;

3) The AGCM coupled to an ocean model (MICOM) in the Indian Ocean basin;

4) The AGCM forced with monthly SST values from the coupled model.

We explore the teleconnections between ENSO and the rainfall variability and we find a better agreement with the observed signal whenever the ocean-atmosphere coupling is in place. Over the Indian subcontinent, a decrease in precipitation is associated to positive phases of ENSO only when SSTs are generated by internal ocean dynamics.

If the AGCM is forced by the SST fields from the coupled integration, the variability of the atmospheric internal dynamics appears significantly enhanced, compared to the fully coupled runs. The patterns of the teleconnections found in the coupled system are, however, preserved.

We also analyze the internal variability of the Indian Ocean, and we investigate the role of the Indian Ocean Dipole in determining the precipitation anomalies over the Indian basin during the monsoon season and over East Africa in the fall. Again the

teleconnection patterns in the runs with SSTs created by a dynamical ocean are in good agreement with the observations, while a signal of opposite sign is found over the Indian peninsula for prescribed HadISSTs. The IOD appears as a mode of variability internal to the Indian Ocean in the coupled runs, while is connected to the ENSO signal in the ensemble with prescribed HadISST.