**Spatial variability of intraseasonal SST-precipitation relationship over the**

**Indian Ocean and South China Sea during the Asian summer monsoon**

- **as in observations and the CFSv2**

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The SST-precipitation relationship in the intraseasonal variability (ISV) over the Asian monsoon region is examined using recent high quality satellite data and simulations from a state of the art coupled model, the Climate Forecast System version 2 (CFSv2). CFSv2 demonstrates high skill in reproducing the spatial distribution of the observed climatological mean summer monsoon precipitation along with its interannual variability, a task which has been a conundrum for many recent climate coupled models. The model also exhibits reasonable skill in simulating coherent northward propagating monsoon intraseasonal anomalies, including SST and precipitation, which are generally consistent with observed ISV characteristics.

Results from the observations and the model establish the existence of a spatial variability in the atmospheric convective response to SST anomalies, over the Asian monsoon domain on intraseasonal timescales. The response is fast over the Arabian Sea, with SST leading precipitation by ~5 days, whereas it is slow over the Bay of Bengal and South China Sea, where SSTs lead precipitation by ~12 days. The intraseasonal SST anomalies result in a similar atmospheric response across the basins, which consists in a destabilization of the bottom of the atmospheric column, as observed from the equivalent potential temperature anomalies near the surface. However, the presence of a relatively strong surface convergence over the Arabian Sea, which accelerates the upward motion of the moist air, results in a relatively faster response in terms of the local precipitation anomalies over the Arabian Sea than over the Bay of Bengal and South China Sea. With respect to the observations, the ocean-atmosphere coupling is well simulated in the model though with an overestimation of the intraseasonal SST anomalies, leading to an exaggerated SST-precipitation relationship. A detailed examination points to a systematic bias in the thickness of the mixed layer of the ocean model, which needs to be rectified. A too shallow (deep) mixed layer enhances (suppress) the amplitude of the intraseasonal SST anomalies, thereby amplifying (lessening) the ISV and the active-break phases of the monsoon in the model.