Simulation of Local Air-Sea Interaction in the Great Warm Pool and its Influence on Asian Monsoon

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An ocean mixed layer model was coupled to an atmospheric general circulation model (AGCM) with the aim to investigate the effect of local air-sea interaction on Asian summer monsoon (ASM). When local air-sea interaction was allowed in the great warm pool [GWP, i. e., oceans with annual mean sea surface temperature (SST) above 28 ℃ across Indian Ocean and the western Pacific], the simulated ASM climatology presents a substantial improvement in both the precipitation distribution and monsoon onset timing compared to the AGCM control run. To illustrate the main physical processes responsible for such a change, another AGCM sensitivity experiment was conducted, in which SST within the GWP was derived from output of the coupled run whereas SST outside the GWP are identical to the AGCM control run. Intercomparison results indicate that air-sea interaction modulates SST efficiently via wind-evaporation and cloud-radiation processes for most parts of the GWP, which in turn influences atmospheric circulation and precipitation pattern. In Bay of Bengal for example, SST reaches its annual peak before the monsoon onset and increases the atmospheric instability and moisture convergence above it, providing a favourable background for the development of deep convection. After the monsoon onset, however, increased surface wind speed and deceased incoming solar radiation flux lead to the colder *in situ* SST, lower humidity, and weaker convection. Hence properly representation of local air-sea interaction is crucial in mimicking and predicting the ASM in the coupled model.