An Application of Air-Sea Model Components in the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) Modeling System Over an Indochina Peninsular Sub-region: Impact of high spatiotemporal SST on WRF model in precipitation prediction

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An atmosphere model component, Weather Research and Forecasting (WRF) mesoscale model, and an oceanic model component, Regional Oceanic Model System (ROMS), in the Coupled Ocean-Atmosphere-Wave-Sediment Transport (COAWST) modeling system were used to examine the impact of air-sea dynamics on precipitation prediction. To understand how updating high spatiotemporal SST in the WRF model could potentially improve the model prediction, specifically for precipitation over an Indochina Peninsular (IP) sub-region, three simulations were carried out including (1) a single WRF without SST updating (hereinafter, WRF-alone), (2) WRF with prescribed daily real-time global (RTG) SST (hereinafter, WRF-RTG), and (3) coupling WRF with SST transferred from ROMS to WRF every 10 minutes (hereinafter, WRF-ROMS). Identical WRF physics and dynamic options were employed for all experiments with a horizontal resolution of 27 km, and the oceanic model used a 25 km horizontal resolution and initialized using the outputs of HYCOM. The meteorological fields from NCEP FNL 1° reanalysis were used for driving force of atmospheric model in all experiments, while, in the WRF-ROMS experiment, ocean-atmosphere interaction was transference of momentum and heat fluxes using a flux-conservative remapping scheme in the COAWST modeling system. Each simulation was performed for 98 days starting from 25 June to end of September 2011; the first six days were intended for spin-up time and the remaining 92-day or 3-month (hereinafter, JAS-2011) results were used in the analysis. One interesting aspect of this period is that it included summer monsoon season with occurrences of intense precipitation events over an IP sub-region. Predicted precipitations were compared with daily TRMM and GSMAP. It was shown that mean bias (MB) and interdiurnal variation (IDV) of precipitation in the coupling were much better than those predicted by non-updated SST and prescribed SST.