Important Role of Air-Sea Coupling on MJO Forecasting during DYNAMO/CINDY Period

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Madden-Julian Oscillation (MJO) manifests as a large-scale atmosphere-ocean coupled system in the tropics. The convection and surface winds of the MJO will modify ocean surface heat/momentum fluxes and upper-ocean dynamics and thermodynamics, which will produce coherent sea surface temperature (SST) anomaly in association with the MJO. The SST anomaly, on the other hand, feeds back to help organize the MJO-related convection and circulations. In this study, the impacts of air-sea coupling on MJO forecasting skill during DYNAMO/CINDY period are assessed with a series of sensitive experiments: coupled forecasts, atmosphere-only forecasts driven by persistent, forecasted and observed daily SST. It is found that: i) air-sea coupling extends MJO skill by about one week; ii) atmosphere-only forecasts driven by forecasted daily SST reaches a similar skill as the coupled forecasts; iii) atmosphere-only forecasts driven by observed daily SST reach beyond 40 days, suggesting there exist plenty rooms to improve the air-sea coupling processes in the model. The SST feedback processes and possible model problems in representing air-sea coupling processes will also be discussed. In- situ DYNAMO/CINDY observations will be used in the future to improve the representation of air-sea coupling processes in the models.