

Dynamical MJO Forecast Experiments: Sensitivity to Cumulus Parameterization and Air-Sea Coupling

Xiouhua Fu and Bin Wang

IPRC, SOEST, University of Hawaii at Manoa, Honolulu, HI 96822

ABSTRACT

The dynamical MJO forecast skill in a hybrid atmosphere-ocean coupled model has been assessed against a prominent MJO event that was observed during TOGA-COARE period. The observed event, originated in the western Indian Ocean around January 6, 1993, gradually moved eastward with a phase speed of about 6.2 m s^{-1} , reaching the dateline around February 1. The forecast MJO was found to be very sensitive to model cumulus parameterization and air-sea coupling. Using default cumulus parameterization, the hybrid coupled model reasonably captures the initiation of MJO in the western Indian Ocean, but it propagates too slow ($\sim 4.4 \text{ m s}^{-1}$). Based on previous observational studies with unprecedented humidity profiles obtained by NASA Aqua/AIRS satellite, the potential physical processes responsible for this model caveat have been proposed. After revising the cumulus parameterization accordingly, the coupled model improves the retrospective forecast of the same event one month ahead. Further sensitivity experiment indicates that the speed-up of model MJO is primarily due to the revised convective scheme. On the other hand, interactive air-sea coupling significantly increases the intensity of the forecast MJO.