3.4 Effects of model physics and resolution on surface winds and air-sea fluxes in MJO

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One of the challenges in prediction of the Madden-Julian Oscillation (MJO) is its convective initiation and eastward propagation over the Indian Ocean. Numerical weather models often poorly represent both the convective structure and surface winds associated with the MJO. In this study, an atmosphere-ocean coupled model is used to simulate an MJO event that was well observed during the DYNAMO field campaign. The atmospheric component, WRF-ARW v3.6.1, is configured with 36 vertical levels and three nested domains of 36-, 12-, and 4-km, with the inner nest explicitly resolving convection. The ocean component is a 0.08° resolution HYCOM v2.2.32 with 32 vertical levels. The initial and lateral boundary conditions come from ECMWF and HYCOM analyses, respectively. Two simulations are run, one without the 4-km inner nest (not explicitly resolving convection), and the other with the inner nest included.

The results show that the 4-km inner nest simulation better captures the observed region of stratiform precipitation and near-surface westerly winds that characterize MJO propagation. However, there is a high bias in air-sea fluxes that may contribute to higher rainfall rates when compared to TRMM observations. The impact of varying convective velocity over water is evaluated through the adjustment of air-sea flux bias.