

Modeling MJO Interactions and Impacts in the America's Warm Pool During Boreal Summer

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Abstract

Boreal summer tropical intraseasonal variability in the Western Hemisphere is reviewed, including air-sea interactions, easterly wave and tropical cyclone variability, influence of the Madden-Julian oscillation (MJO), and implications for prediction.

Recent work that uses a regional ocean-atmosphere model to study intraseasonal variability in the eastern Pacific warm pool in summer is highlighted (Small et al. 2010). The atmospheric component of the model is forced by lateral boundary conditions from reanalysis data. Intraseasonal (20–90 day) east Pacific warm pool zonal wind and outgoing longwave radiation (OLR) variability in the regional coupled model are highly and significantly correlated with observations. The strength of the intraseasonal variability in the coupled model, as measured by the variance of outgoing longwave radiation, is close in magnitude to that observed. East Pacific warm pool intraseasonal convection and wind anomalies agree in phase with those from observations, indicating that remote forcing at the boundaries associated with the MJO determines the phase of intraseasonal convection in the east Pacific warm pool. Hovmöller diagrams confirm that the MJO influences intraseasonal variability in this region via dynamical signals that propagate through the western boundary, although the strong deep convection mostly arises within the domain. Sensitivity experiments with the regional atmosphere-only model in which intraseasonal SST variability is removed indicate that convective variability has only a weak dependence on the SST variability, but a stronger dependence on the climatological mean SST distribution.

Remote forcing from the MJO and local convection-circulation feedbacks both appear important to the intraseasonal variability of the Americas warm pool, but ocean-atmosphere coupling has only a small effect. Possible mechanisms of remote forcing are discussed.

Reference

Small, R. J., S.-P. Xie, E. D. Maloney, S. P. deSzoeke, and T. Miyama, 2010: Intraseasonal Variability in the far-east Pacific: Investigation of the role of air-sea coupling in a regional coupled model. *Clim. Dyn.*, in press.