

MJO Simulations/Hindcasts with NICAM

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Abstract

We have been developing a global cloud-system resolving model (GCRM), NICAM (Sato et al. 2008). Several series of hindcast experiments targeting MJO and monsoon ISV events have been performed (Miura et al. 2006, 2009; Oouchi et al. 2009; Taniguchi et al. 2010), using horizontal mesh sizes of 3.5 to 14 km. Recently, tropical cyclogenesis of Fengshen (17-27 June, 2008), which occurred after a weak ISV during the YOTC IOP, was simulated. This talk summarizes our view on the ability of the GCRM and the physics essential to reproduce the ISV, and the problems that we encountered. We also propose effective use of our simulation data in the community.

One of the findings was that the model reproduced the general aspects of the MJO and monsoon ISV events even with the use of 14-km mesh sizes in most cases. At the same time, we are aware that the global cloud-resolving approach does not immediately remove all the biases. Some diagnostics of the simulated MJO events have been made, although the length of the simulations does not currently allow for full evaluations.

Joint analysis of GCRM simulation data and field observation measurements is a productive method to get insight into the targeted events. We have been in tight collaboration with observational teams in JAMSTEC. Hindcast experiments of the MJO event observed during the MISMO project, which aimed to capture the onset mechanism of the MJO over the Indian Ocean, was executed (Miura et al. 2009), and simulations of the next field campaign (CINDY2011/DYNAMO) are also planned. Typhoon Fengshen passed over the observational array of the field campaign (PALAU2008) in its genesis stage.

The GCRM simulation is useful to investigations of scale interactions, such as the relationship between the equatorial waves, diurnal variation of convection, tropical cyclogenesis and the Monsoon ISV. In the physical context, diabatic heating rate, cold pools, transport of heat, moisture, and momentum by convection which are explicitly calculated in the global domain are of relevance. Recently, we have updated the model physics (cloud microphysics, land surface, ocean mixed layer, and turbulence), and investigate the sensitivity of the model performance to the physical processes. The simulations of Typhoon Fengshen were executed with the renewed physical packages. The simulations were initialized using the ECMWF YOTC operational data retrieval on 00UTC 15 June, 2008. The results suggest significant impacts of vertical transport of moisture on the behavior of the simulated convection. Latest works on the above issues (e.g., Dr. Oouchi, in this workshop) will be presented.