Studies at MRI toward the mesoscale NWP for disaster prevention

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1. Introduction

Operational mesoscale NWP at the Japan Meteorological Agency (JMA) was started in March 2001 with a horizontal resolution of 10 km. In 2004, the model was replaced with the JMA nonhydrostatic model (NHM; Saito et al. 2006), and the horizontal resolution was enhanced to 5 km in 2006 (Saito et al., 2007). Accuracy of quantitative precipitation forecast of the JMA mesoscale NWP for weak to moderate rains has been considerably improved in recent years by advances of the numerical model and data assimilation techniques.

Despite the recent remarkable progress, operational mesoscale NWP is still not enough to precisely predict the heavy rainfalls, especially for those which occur in the unstable atmospheric condition without synoptic or orographic forcing. Spatial and temporary scales of such the events are generally small compared with the current operational NWP/observation systems, and evolution of the mesoscale convective system is sometimes very sensitive to small perturbations in initial conditions.

2. Studies at MRI

To overcome above problems, several studies have been conducted at the Meteorological Research Institute (MRI). Relevant studies include development of a cloud-resolving data assimilation system (Kawabata et al., 2010), assimilation of mesoscale remote-sensing observation data especially GPS-derived water vapor data (Shoji et al., 2009; Seko et al., 2010a; 2010b). As for development of a mesoscale ensemble prediction system (MEPS), MRI participated in the international MEPS inter-comparisons conducted by the WWRP Beijing Olympics 2008 Research and Development Project (B08RDP). MRI/JMA's system showed relatively good performances in predicting weak to moderate precipitation and surface conditions, but the detection rate of intense rains remained as a future subject (Kunii et al., 2010; Saito et al., 2010).

3. Plans toward the cloud resolving NWP

Toward the dynamical and probabilistic forecasts of local heavy rainfalls, a plan of super high performance NWP with the cloud resolving ensemble data assimilation has been proposed to use the next generation super computer, which is under construction by RIKEN in Kobe. The goal is to show the feasibility of the future cloud resolving NWP system which updates forecast/analysis errors dynamically. A field campaign in the Tokyo metropolitan area with a dense observation network is also planned by NIED (National Research Institute for Earth Science and Disaster Prevention) and MRI in 2011-2013 as an international test-bed for deep convection.

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