Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

AAS23-10 Room:101A Time:May 23 16:45-17:00

Cloud resolving ensemble prediction of a local heavy rainfall event on 26 August 2011 observed by TOMACS

Kazuo Saito[1*], Masaru Kunii[1], Sadao Saito[1]

[1]Meteorological Research Institute

On 26 August 2011, a local heavy rainfall event occurred in the Tokyo metropolitan area. In Tokyo and Kanagawa prefectures, very intense rains more than 90 mm hr-1 were observed (Fig. 1a) and several houses were inundated. This heavy rainfall event was caused by a mesoscale convective system (MCS) which was triggered by low level convergence, and its characteristics were captured by a dense observation network deployed by the Tokyo Metropolitan Area Convection Study (TOMACS). Despite its relatively larger spatial scale as a local rainfall in Japan and existence of well-defined low level convergence by a front, operational mesoscale model (MSM) of JMA failed to predict this event. Studies on model physics, predictability, and data assimilation should be conducted to improve the forecasts.

Preliminary numerical experiments for this event have been performed. As a first trial, a downscale ensemble experiment from the mesoscale analysis of JMA was conducted using the JMA nonhydrostatic model (NHM) with horizontal resolutions of 10 km and 2 km. With perturbations from the JMA one-week global ensemble prediction system (WEP) at 12 UTC 25 August, only a few members intensified the rainfall around Tokyo and some fake precipitations appeared in the Hokuriku district.

In NHM, the model cloud amount to compute radiation processes is evaluated from relative humidity considering subgrid scale partial condensation. Magnitude of the subgrid fluctuation is determined by the MYNN3 turbulent closure model. Recently, JMA has changed the lower limit of the fluctuation in their operational local model (LFM) to ameliorate an overestimation tendency of the cloud amount. When the lower limit was changed, surface temperatures increase about 1 C in southern part of the Kanto Plain, and modify the position of low level convergence which triggered the MCS.

Additional mesoscale ensemble experiment was conducted using a mesoscale singular vector method (MSV) based on the adjoint model of NHM. A 2 km simulation using MSV perturbation reproduced the intrusion of sea breezes and associated surface convergence which triggered the mesoscale convective system.

Keywords: local heavy rainfall, mesoscale ensemble prediction, singluar vector, TOMACS