Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MIS22-P04 Room:Convention Hall Time:May 23 13:45-15:15

Numerical simulation of tropical disturbances by using GCM-Cloud resolving coupled model

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In general, hydrostatic approximation is suitable for global atmosphere, however, vertical flow is not negligible in the regions occurring active convections such as Typhoons. We developed a new numerical model which coupled the general circulation model "AFES" (Shingu et al., 2001, 2002) and the regional cloud resolving model "CReSS" (Tsuboki and Sakakibara, 2009) for performing global atmospheric numerical simulations which have locally high resolution.

In this study, we simulated the Typhoon No.13 in 2006 by using the coupled model for investigating the effects of the active convections in tropical zone on the temperate zone. The resolutions of AFES is T213L48(T213: about 60km in horizontal on equator, L48: 48 layers in vertical) and CReSS is 1km in horizontal. The domain of CReSS is from 120 degree to 140 degree of east longitude, and from 20 degree to 30 degree of north latitude. Initial time is 00UTC on September 12, 2006, and initial data is Global Reanalysis data (GANAL) provided by Japan Meteorological Agency (JMA). We used mgdSST, which also provided by the JMA, for sea surface temperature, and GTOPO30 (http://edcwww.cr.usgs.gov/landdaac/gtopo30/gtopo30.html) for terrain data in both models.

In the simulation results, there is substantial improvement in forecast accuracy by using the coupled model. For example, the center pressure value of T0613 became lower than the result which provided by AFES simulation. After 09UTC on September 16, 2006, improvements of distributions of rain fall amounts appeared not only the region covered with CReSS but also the outside region which calculated by AFES. If we coupled CReSS and AFES, we can simulate the precipitations and convection associated with Typhoon under using AFES having low resolution for simulations of meso scale phenomena.

In presentation, we will also introduce the contents and flow chart of the coupled model.