Generation mechanisms of convections by gravity waves

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Because convective storms sometime cause mudslides or floods, it is important to understand the generation and development mechanisms of the convections. In this study, the generation mechanisms of the convections by gravity waves (GWs) were investigated using the outputs of Non-hydrostatic model (NHM).

Numerical simulations using NHM were performed from the initial conditions produced from JRA25 data. Initial time was 12UTC 28 2008. Downscale experiments were further performed with the grid intervals of 5 km and 1 km.

Figure 1a is the rainfall distribution reproduced by 5km-NHM. A convective band extending southeastward was generated at the eastern side of Sumatra Island. Figure 1b is the distributions of rainfall and temperature at P=1000hPa, reproduced by 1km-NHM. Convection **A** was generated on the eastern side of the convective band where was convergence zone of north-westerly and westerly flow (Fig. 2a). When convection **A** was generated, the cold pool did not exist near the convection **A**. The convections were generated at the eastern side of the band successively.

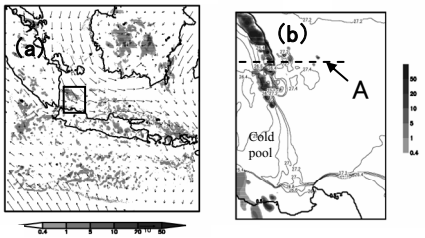

Fig. 1 (a) Rainfall region reproduced by 5km-NHM. Initial time is 18UTC 28 Jan. 2008. Rainfall region and temperature at 1000hPa at (b) 22:30UTC 29 reproduced by 1km-NHM. Domain of (b) is indicated by rectangle in (a). Initial time of 1km-NHM is 15UTC 29.

Figure 2 shows the time sequence of vertical wind, temperature and dew-point deficit (T-Td) at P=850hPa along the broken line in Fig. 1b, which crossed the convection A. Convection A was generated when GW was propagated from the east. When GW was propagated, temperature was decreased and dew-point deficit became smaller.

The updraft of GW makes the atmosphere cooler and moister which are favorable conditions for the generation and development of convections. This result indicates that the generation point and timing of the convection were influenced by GW.

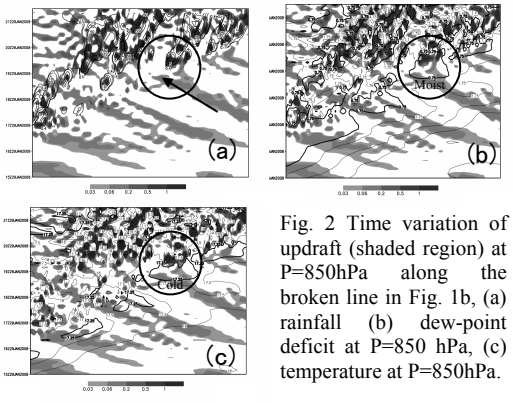

Fig. 2 Time variation of updraft (shaded region) at P=850hPa along the broken line in Fig. 1b, (a) rainfall (b) dew-point deficit at P=850 hPa, (c) temperature at P=850hPa.