

An Ultra-high Resolution Numerical Weather Prediction with a Large Domain: Case Study of the Izu Oshima Heavy Rainfall Event in October 2013

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This study aims to examine whether an ultra-high resolution numerical weather prediction (NWP) model with a large model domain is able to produce a more accurate forecast. A heavy rain event induced massive debris flow in Izu Oshima, October 2013 was simulated with “K” computer.

The following five factors of the NWP model were investigated. (1) grid spacing (2 km and 500, 250 m), (2) boundary layer physics (Mellor-Yamada-Nakanishi-Niino [MYNN] level 3, and Deardorff [DD]), (3) model domain size, (4) lateral boundary conditions (LBCs), and (5) terrain data

The turbulence closure models greatly influenced on the position of the rainband. The experiments with DD simulated the rainband at the similar position to the observation than that of the experiment with MYNN. The sensitivity experiments on the domain size and LBCs, in Izu Oshima case showed the importance of having the large domain and the inclusion of cloud microphysical quantities in the LBCs. The finer grid model with the accurate terrain representation improved the precipitation distribution in the island.

These results demonstrate that the very high-resolution NWP model with the large domain has the ability to better predict the meso scale rain band and associated precipitation.

Keywords: heavy rainfall, high-resolution, JMA-NHM, K computer