

Resolution dependence of diurnal cycle of tropical precipitation in a global high-resolution simulation

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<!--?xml version="1.0" encoding="UTF-8" standalone="no"?-->We carried out the global high-resolution atmospheric simulations with five horizontal resolution from 14km to 0.87km. The Nonhydrostatic Icosahedral Atmospheric Model (NICAM; Satoh et al. 2014) was used for this study and both simulations and analysis are conducted on the K computer. In the tropical region (15S-15N), the result shows clear resolution dependence of the diurnal precipitation cycle over the land. Relatively weak precipitation peak appeared at late night in the result of the coarse resolution. The peak becomes stronger and its time becomes faster with increasing the horizontal resolution. The resolution dependence of temporal changes in the averaged environmental variables over the tropical land, such as CAPE, PBL height, cloud base height, and precipitable water, were analyzed. The result shows that the activation of the convections become earlier, especially in the simulations with grid spacing less than 2 km. This result suggests that the difference of convection activity around the noon at the different horizontal resolution affects timing of the peak of the daily precipitation. The early morning peak of tropical precipitation cycle over the ocean was also well reproduced, with lesser resolution dependence.

Keywords: GCM, precipitation, high resolution simulation