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Evaluating performances of one-year simulation by using 3.5 km mesh global nonhydrostatic model

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Recent advancement of supercomputing enables us to conduct a climate simulation by using a global model with horizontal grid spacing of a few kilometers. We may need to tune the model in order to conduct a reliable simulation. In order to test feasibility of a few kilometer climate simulation in near future, we conducted one-year simulation from June 2004 to May 2005 by using Nonhydrostatic Icosahedral Atmospheric Model (NICAM) with horizontal grid spacing of 28 km, 14 km, 7 km, and 3.5 km, and evaluated their simulation performances. In general, global models have shown weak wind speed of tropical cyclones compared to its central sea level pressure due to insufficient horizontal resolution. As expected, the 3.5 km simulation showed improvement of this bias. As for simulated mean state, globally annual mean precipitation tended to be decreased with finer horizontal resolution in NICAM. Compared with observation (Global Precipitation Climatology Project V2.2; 2.71 mm day^{-1}), 7 km and 3.5 km simulations underestimated the global mean precipitation (2.54 mm day^{-1} and 2.67 mm day^{-1}), while 14 km and 28 km simulations overestimated (2.84 mm day^{-1} and 2.78 mm day^{-1}). The 3.5 km simulation showed the best performance for reproducing globally annual mean precipitation. However, the 3.5 simulation showed underestimation of the South Pacific Convergence Zone. In order to conduct a reliable simulation, we need to improve performance of the 3.5 km global model. This demands extensive computing resources. The supercomputer Fugaku will give us extensive computing resources for addressing this issue.