Several global cloud resolving simulations by NICAM on the Earth Simulator

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Recent computer facilities have been advancing their power explosively. In order to make good use of such machines, Frontier Research Center for Global Change (FR-CGC) has been developing a new high-resolution global atmospheric model in cooperation with Center of Climate System Research (CCSR) in the University of Tokyo. This global model, called NICAM (Nonhydrostatic ICosahedral Atmospheric Model), is intended to be run in very high-resolution for the climate research.

The main aim of the high-resolution simulation is to resolve the cumulus convection explicitly on the entire globe in order to eliminate the ambiguity of cumulus parameterizations. Therefor, our target resolutions are five km or less in the horizontal directions and several hundred m in the vertical direction.

For such very high resolution simulations, we apply the icosahedral grid in the horizontal grid configuration. Although the icosahedral grid has some problems such as the wavenumber 5 problem, grid noise, and so on. However, the icosahedral grid has very high potential in the super-high resolution simulations of the climate or NWP modeling, compared with the spectral method based on spherical harmonics. Recently, several research groups have been reconsidered the icosahedral grid, overcoming difficulties due to the icosahedral grid. We also have been employed a new icosahedral grid, which is modified by spring dynamics, and successfully developed the shallow water model several years ago. On the other hand, we have been developed a new nonhydrostatic scheme that is suitable to long time integrations. Since this scheme is based on the finite volume method, the model guarantees the conservation of mass. Further, by conversion term between the energies the new scheme also guarantees the

conservation of total energy.

In this talk, we introduce the new atmospheric nonhydrostatic global model NICAM and show the recent several results from the global cloud resolving run; Aqua Planet Experiment, short term integration like as numerical weather prediction, perpetual July experiment for investigation of cloud feedback, and so on..