Status and outlook of a high-resolution climate simulation using NICAM toward CMIP6 HighResMIP

*Chihiro Kodama[1], Tomoki Ohno[2], Akita T Noda[1], Hisashi Yashiro[3], Yohei Yamada[1], Masuo Nakano[1], Tatsuya Seiki[1], Tomoe Nasuno[1], Ying-Wen Chen[1], Tomoki Miyakawa[2], Masaki Satoh[1,2], Masato Sugi[4]

1. Japan Agency for Marine-Earth Science and Technology, 2. Atmosphere and Ocean Research Institute, the University of Tokyo, 3. RIKEN Advanced Institute for Computational Science, 4. Meteorological Research Institute

Climate simulation using a global model with a mesh size of *O* (10 km) becomes more common than ever thanks to the rapid advancement in high performance computer. Such a fine-mesh global climate simulation represents atmospheric multi-scale phenomena ranging from large-scale circulation to meso-scale features associated with convection, front, severe rainfall, atmospheric gravity wave and so on in a seamless manner. Tropical cyclone is an excellent example of multi-scale interactions. Its generation, development and track are strongly influenced by larger-scale mean state and disturbances. To this end, we have performed a first-ever AMIP-type climate simulation using a 14-km mesh non-hydrostatic global atmospheric model, NICAM, without convection scheme and shown a good performance in the simulated climatology of tropical cyclone as well as a wide variety of atmospheric phenomena including tropical wave and precipitation (Kodama et al. 2015). We have also found some significant climate biases which might hinder a reliable projection of future climate.
Here we will present a status and an outlook of a high-resolution climate simulation using the latest version of NICAM. A series of new climate simulations under a framework of CMIP6 HighResMIP (High Resolution Model Intercomparison Project) and DynVAR (Dynamics and Variability Model Intercomparison Project) are planned. An impact of the horizontal resolution on weather and climate phenomena will be investigated by preforming the model with a mesh sizes of 14, 28 and 56 km. Physics schemes including cloud microphysics, gravity wave drag, aerosol and land model are under updating and/or tuning to improve the simulated climatology. As an example, a better performance in the simulated top-of-the-atmosphere radiation balances is found in the latest version of NICAM with a new cloud microphysics scheme, which was validated by a satellite measurement with a focus on cloud-precipitation processes (Roh and Satoh 2014). In addition, some fresh results from a series of short-term sensitivity experiments will be presented and discussed in this talk.

Keywords: high-resolution climate simulation, CMIP6 HighResMIP, sensitivity experiments, climate bias, tropical cyclone

