

# Projection of the change in future weather extremes using nonhydrostatic cloud-resolving regional models

**K. Kurihara**

Meteorological Research Institute

1-1 Nagamine, Tsukuba, Ibaraki 305-0052, Japan

E-mail: [kkurihar@mri-jma.go.jp](mailto:kkurihar@mri-jma.go.jp)

Under the Innovative Program of Climate Change Projection for the 21st Century (KAKUSHIN Program), we conduct projection of the change in future weather extremes, especially precipitation extremes, over Japan using nonhydrostatic regional models (NHM) with horizontal resolutions of 5km (5km-NHM) and 1km (1km-NHM) on the Earth Simulator (ES).

To evaluate changes in precipitation extremes due to global warming, the 5km-NHM is run during warm season (from June to October) in the near future (2015-2039) and the end of 21<sup>st</sup> century (2075-2099) based on the A1B scenario with initial and boundary conditions from results of 20-km resolution AGCM. Although the horizontal resolution of 5-km is the highest one even on the ES to be used in climate simulation, it is still not enough to represent meso- $\gamma$ -scale weather phenomena which often cause extremely heavy precipitation over Japan. To obtain further details of extreme events, the 1km-NHM is run for many selected events (about top 10 %) of heavy precipitation projected by the 5km-NHM.

During the first two years of the program, we make verification of the model, preliminary projections and model development and improvement for use in full projection experiments executed in the last three years of the program. We performed perfect boundary experiments in warm season from 2002 to 2006 with initial and boundary conditions extracted from 20km-mesh operational regional analysis data by the Japan Meteorological Agency. The verification of the result totally shows good performance of the 5km-NHM in reproducing climatic characteristics of the amount and distribution of not only mean precipitation but also extremes. However, a defect is seen that the precipitation amount tends to be overestimated along shorelines and mountain slopes where air with high humidity often flows from the ocean. On the other hand the 1km-NHM does not have such defect and gives more realistic distribution of the heavy precipitation.

Preliminary projections in the near future (2026-2035) and the end of 21<sup>st</sup> century (2086-2095) are underway. Assessment study of the impact of climate change on disaster risk due to flood, inundation, strong wind associated with typhoons and storm surge are also underway by an impact assessment group with the use of 5-km and 1-km NHM results.