Dynamical downscaling of extreme events for climate change adaptation

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Extreme climate events have been observed in the world in association with the climate change due to global warming. Furthermore, the damage of the events have become more serious and diversified. In Japan, people often suffer from extreme summer heat wave, heavy rainfall or snow. Consideration of mitigation and adaptation strategy toward the climate change have become in great need even in the local governments as well as the national governments. Social Implementation Program on Climate Change Adaptation Technology (SI-CAT) develops reliable technologies for near-term climate change projection that apply to reviewing and formulation climate change countermeasures by local governments and assessing the effectiveness of the countermeasures against climate change impacts in Japan. In this framework, we conducted dynamical downscaling experiments with spatially high resolution to reproduce regional climate information. We examine the performance of the regional climate model NHRCM to represent severe rainfall events occurred around Gifu and Nagano region.

In order to evaluate the model, we conducted the experiments with the grid interval of 20-km, 5-km, and 2-km using JRA55 reanalysis data. The results showed that observed severe rainstorms were clearly represented especially with the fine-grid model. The spatial distribution of snow depth becomes more realistic by using finely resolved model during winter monsoon season in the Japan Sea side. Although validation of precipitation over mountainous region was very difficult due to lack of observation in the mountains, the runoff analysis based on model results with the grid interval of 5-km indicated that projected precipitation was overestimated.

Considering the feature of NHRCM based on the historical data, we conducts the downscaling experiments using database for Policy Decision making for Future climate change (d4PDF) to detect the climate change impact on this region. We will contribute to adaptation planning through validation of the extreme rainfall events in the warmer climate.