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Downscaling of Multi-scale AGCM Precipitation Output using Weather Generator

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In 2007, Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT) launched the Innovative Program of Climate Change Projection for the 21st Century (Kakushin21), and have developed a super-high-resolution atmospheric model having 20km spatial and 1-hour temporal resolution (hereafter AGCM20). This is the finest resolution GCM output among those that are available now. However, even though the GCM is running on the Earth Simulator of Japan, which is one of the most developed super computer system in the world, it takes about a year to produce one set of data due to the computational burden of the AGCM20, and only two sets of data is available within the Kakushin21 Project.

Within the Kakushin21 Project, there is another AGCM is running with 60km spatial resolution and 1-hour temporal resolution. This model was designed to be tested under various initial conditions and boundary conditions that are for assessing the model sensitivity. The AGCM60 has three sets of controlled simulation output under the different initial condition, and 12 sets of projection simulation output that is initiated under three initial conditions and four boundary conditions.

This study is aim to downscale the AGCM60 ensemble precipitation output down to 20km spatial resolution using the relationship of the AGCM20 output and the main run output of the AGCM60. Here, the main run output of the AGCM60 was simulated using the same initial and boundary condition to the one of AGCM20 output.

The downscaling method used in this study is based on the weather generator method and it is considering the spatial and temporal characteristics of the output of AGCM20 and AGCM60, as shown in Fig. 1 and 2.

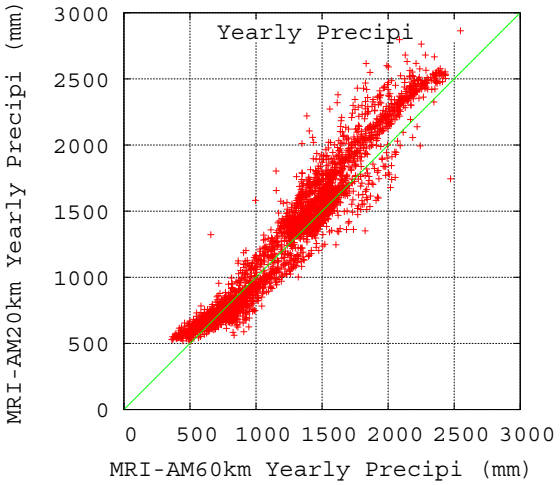

Fig. 1 Comparison of annual precipitation of Japan, using the up-scaled AGCM20 controlled run output and AGCM60 main-run output. The AGCM60 output is underestimated for high precipitation amount comparing to the AGCM20 output.

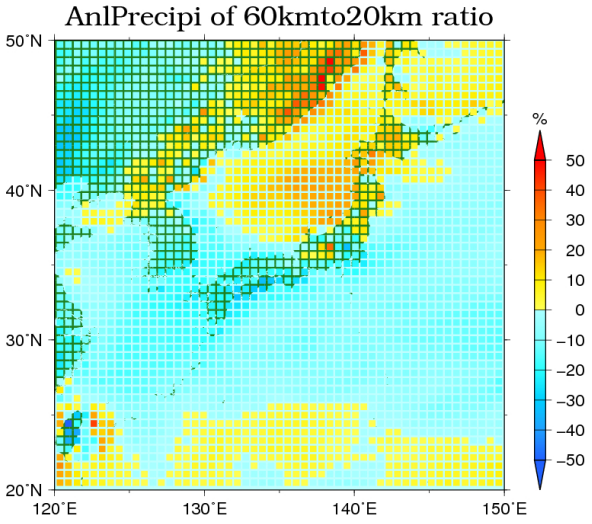

Fig. 2 Ratio of annual precipitation amount from the AGCM60 main run output comparing to the AGCM20 controlled run output.