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Evaluation of the Bias Correction Concept with Multiple GCM Outputs

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1. Introduction

Bias correction of GCM output is a widely utilized scheme in the field of climate change impact assessment research. The general concept of the bias correction is to remove the systematic bias from the GCM output by comparing the controlled simulation results with historic observations. It is assumed that this systematic bias from the controlled simulation will be the same for future climate simulations. In this study, we have examined the validity of this important assumption underlying the basic concept of bias correction by comparing the precipitation output from two different types of climate models. By assuming the precipitation output from a regionally-specified climate model as a true value for the present and future climate conditions, it was able to estimate the variation of model bias in the GCM precipitation output under the two different climate conditions.

2. Purpose and Methodology

MRI of Japan has developed a cloud system–resolving regional climate model with 5km of spatial resolution (hereafter RCM5km) based on the Japan Meteorological Agency's non-hydrostatic weather prediction model. The RCM5km runs using the boundary conditions from the AGCM20km, and it simulates the atmospheric conditions of present and future summer seasons (June–October) of the region covering Japan and the Korean Peninsula (25°N−40°N and 125°E−145°E). Evaluation of the RCM5km output provides strong agreement with a rain gauge–based daily precipitation dataset for June−August, and the probability density distribution of daily precipitation amounts is also well matched to what is observed.

In our experiment, the summer season precipitation output from the RCM5km is assumed to be the true value for the present and future climate conditions, and the systematic bias in the precipitation output from the AGCM60km was evaluated. This experimental design provides unique evaluating conditions, in that we can examine the systematic bias differences between the controlled run and the future projection. Both AGCM60km and AGCM20km, which provide the boundary conditions for the RCM5km, run with the same A1B emission scenario, yet AGCM60km runs on the variant SST boundary conditions. In the next section, we will illustrate the bias differences in the present and future climate conditions, and the conventional bias correction method will be applied to the AGCM60km precipitation output for evaluating the validity of the bias correction concept.

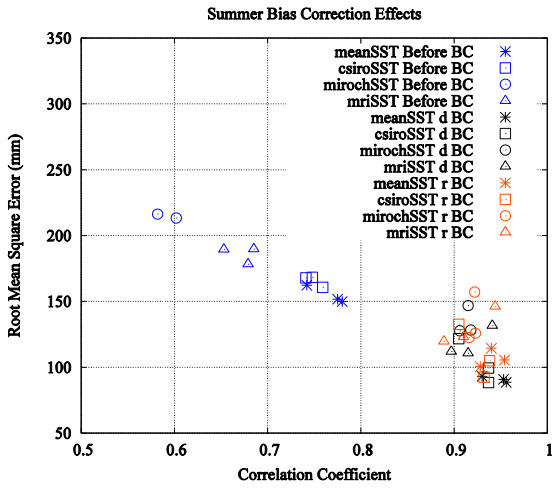

Figure 1. Variation in correlation coefficients and root mean square errors before and after the bias correction for future summer precipitation