

# Evaluation of errors in precipitation over Japan reproduced by the non-hydrostatic regional climate model (NHRCM)

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We evaluated the performance of a non-hydrostatic regional climate model with a grid spacing of 2 km, hereafter referred to as NHRCM02, in simulating precipitation in the present climate (from 1980 to 2000) of Japan. This model is based on Japan Meteorological Agency non-hydrostatic model (JMANHM) and does not include convective parameterization. We compared the precipitation reproduced by NHRCM02 with that observed, and calculated errors such as systematic error (bias) and root mean square error (RMSE). We also examined the errors of precipitation simulated by the driving model for NHRCM02, hereafter referred to as NHRCM05, which has a grid spacing of 5 km and includes the Kain-Fritsch convective parameterization.

The RMSE for the annual precipitation averaged over Japan simulated by NHRCM02 was less than that obtained from the NHRCM05 simulation. The difference in RMSE between the two simulations was statistically significant at the 95% level, indicating that the model performance was improved by using a higher resolution model. On the other hand, the magnitude of bias for the annual precipitation from NHRCM02 was also reduced compared with that of the NHRCM05, but their difference was not statistically significant at the 95% level.

Heavy precipitation reproduced by NHRCM02 and NHRCM05 was also evaluated. The 99th percentile of hourly precipitation in the period of a year was averaged over 20 years and used as an index of heavy precipitation. The results obtained was similar to those for the annual precipitation. That is, the RMSE for the index averaged over Japan simulated by NHRCM02 was less than that obtained from the NHRCM05 simulation, which was statistically significant. The magnitude of bias for the index from NHRCM02 was reduced compared with that of the NHRCM05, but their difference was not statistically significant.