Hi-resolution multi-ensemble statistical downscaling regional climate scenarios in Japan

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The Asia-Pacific regions are increasingly threatened by large scale natural disasters. Growing concerns that loss and damages of natural disasters are projected to further exacerbate by climate change and socio-economic change. Climate information and services for risk assessments are of great concern. Fundamental regional climate information is indispensable for understanding changing climate and making decisions on when and how to act. To meet with the needs of stakeholders such as National/local governments, spatio-temporal comprehensive and consistent information is necessary and useful for decision making.

Multi-model ensemble regional climate scenarios with 1km horizontal grid-spacing over Japan are developed by using CMIP5 GCMs (At most 43 models for RCP8.5 and 30 models for RCP2.6) and a statistical downscaling (Bias Corrected Spatial Disaggregation (BCSD)) to investigate uncertainty of projected change associated with structural differences of the GCMs for the periods of historical climate (1950-2005) and near future climate (2026-2050).

Statistical downscaling regional climate scenarios show good performance for annual and seasonal averages for precipitation and temperature by applying cross-validation in which the scenarios developed in training periods (1980-1992/1993-2005) and validated in another un-selected periods (1993-2005/1980-1992). The regional climate scenarios show systematic underestimate of extreme events such as hot days of over 35 Celsius and annual maximum daily precipitation because of the interpolation processes in the BCSD method.

Each model projected different regional responses because of structural differences between the models. The most of CMIP5 models show qualitatively consistent increase of average and extreme temperature and precipitation. The differences of projected changes of regional climate scenarios between RCP8.5 and RCP2.6 scenarios are not significant for near future climate (2026-2050).

The developed regional climate scenarios will be provided and applied to risk analyses for investigating uncertainty of the climate scenarios. The developed scenarios can be also useful to investigate the added values of statistical/dynamical downscaling methods for locally forced nonlinear phenomena, extreme events.

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