



Evaluation of Multiple Regional Climate Models for Summer Extremes of Temperature and Precipitation over East Asia

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The regional climate models (RCMs) have been widely used to generate more detailed information in space and time of climate patterns produced by the global climate models (GCMs). Recently the international collaborative effort has been set up as the CORDEX (Coordinated Regional Climate Downscaling Experiment) project which covers several regional domains including East Asia. In this study, five RCMs (HadGEM3-RA, RegCM4, SNU-MM5, SNU-WRF, and YSU-RSM) participating in the CORDEX-East Asia project are evaluated in terms of their skills at simulating climatology of summer extremes. We examine bias and RMSE and conduct a Taylor diagram analysis using seasonal maxima of daily mean temperature and daily precipitation amount over the East Asia land area from ‘historical’ experiments of individual RCMs and their multi-model ensemble means (MME). The APHRODITE (Asian Precipitation–Highly-Resolved Observational Data Integration Toward Evaluation) datasets on $0.5^\circ \times 0.5^\circ$ grids are used as observations. Results show similar systematic bias patterns between seasonal means and extremes. A cold bias is found along the coast while a warm bias occurs in the northern China. Overall wet bias appears in East Asia but there is a substantial dry bias in South Korea. This dry bias appears related to be a cold SST (sea surface temperature) around South Korea, positioning the monsoonal front (Changma) further south than observations. Taylor diagram analyses show that temperature has better skill in means than in extremes because of higher spatial correlation whereas precipitation exhibits better skill in extremes than in means due to better spatial variability. The latter implies that extreme rainfall events may be better captured although seasonal mean precipitation tends to be overestimated by RCMs. The model performances between mean and extreme are found to be closely related, but not clearly between temperature and precipitation. Temperatures are always better simulated than precipitations for both mean and extreme. Near-term future projections for 2024-2049 from four available RCMs suggest that temperature and precipitation are expected to increase in both mean and extremes over East Asia.