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Evaluation and Projection of Extreme Precipitation over Northern China in CMIP5 Models

Xi Lu
Sun Yat-sen University, School of Atmospheric Sciences, China (luxi5@mail.sysu.edu.cn)

This study evaluates 32 climate models from CMIP5 compared with a daily gridded observation dataset of extreme precipitation indices including total extreme precipitation (R95p), maximum consecutive five days of precipitation (RX5day) and wet days larger than 10 mm of precipitation (R10mm) over Northern China during the historical period (1986–2005). Results show the majority models have good performance on spatial distribution but overestimate the amplitude of precipitation over Northern China. Most models can also capture interannual variation of R95p and RX5d, but with poor simulations on R10mm. Considering both spatial and temporal factors, the best multi-model ensemble (Group 1) has been selected and improved by 42%, 34%, and 37% for R95p, RX5d, and R10mm, respectively. Projection of extreme precipitation indicates that the fastest-rising region is in Northwest China due to the enhanced rainfall intensity. However, the uncertainty analysis shows the increase of extreme rainfall over Northwest China has a low confidence level. The projection of increasing extreme rainfall over Northeast China from Group 1 due to the longer extreme rainfall days is more credible. The weak subtropical high and southwest winds from Arabian Sea lead to the low wet biases from Group 1 and the cyclonic anomalies over Northeast China, which result in more extreme precipitation.