

## Future changes and uncertainties in Asian precipitation simulated by ensemble experiments with high-resolution MRI-AGCMs

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This study focuses on projecting future changes in mean and extreme precipitation in Asia, and discusses their uncertainties. Time-slice experiments using a 20-km-mesh atmospheric general circulation (AGCM) were performed both in the present-day (1979-2003) and the future (2075-2099). To assess the uncertainty of the projections, 12 ensemble projections (i.e., combination of 3 different cumulus schemes and 4 possible different sea surface temperature (SST) patterns) were conducted using 60-km-mesh AGCMs. For the present-day simulations, the models successfully reproduced the pattern and amount of mean and extreme precipitation, although the model with the Arakawa-Schubert (AS) cumulus scheme underestimated the amount of extreme precipitation. For the future climate simulations, in South Asia and Southeast Asia, mean and extreme precipitation generally increase, but their changes show marked differences among the projections, suggesting some uncertainty in their changes over these regions. In East Asia, northwestern China and Bangladesh, in contrast, mean and extreme precipitation show consistent increases among the projections, suggesting their increases are reliable for this model framework. Further investigation by analysis of variance (ANOVA) revealed that the uncertainty in the precipitation changes in South Asia and Southeast Asia are derived mainly from differences in the cumulus schemes, with an exception in the Maritime Continent where the uncertainty originates mainly from the differences in the SST pattern.

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