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Evaluation of a CMIP6 multi-GCM ensemble for atmospheric Rivers and precipitation over East Asia

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Abstract

Atmospheric rivers (ARs) are closely related to water resources and hydrological extremes in East Asia (EA) that has been historically events. Thus, projecting the climate change impact on ARs in EA has ecome an important research topic. This study evaluates a CMIP6 multi-model ensemble (MME) for the climatology of ARs, AR-related variables and precipitation over EA in the present-day climate by comparing the MME against those from the ECMWF Reanalysis version 5 (ERA5). The MME represents well the seasonal-regional variations of AR frequency as well as the integrated water–vapor transport, precipitable water and precipitation. The most notable biases are the underestimation of these variables over the western North Pacific where ARs are most active. The MME biases vary regionally with the largest (smallest) biases in southern China (Korea-western Japan); the biases in the highly populated and industrialized mid-latitude EA coastal regions, the main region of interest in the climate change study to follow, are below 10% of the ERA5-derived values. The MME represents the seasonal-meridional evolution of ARs and precipitation related to the EA summer monsoon rainfall over the longitudes of the Korean peninsula (124.5E-130.5E), at least qualitatively, despite underestimation of these for June–August over the latitudes of 30 N-40 N, i.e., much of the early summer monsoon season in Korea. Overall, these results suggest that the CMIP6 MME possesses skill acceptable for projecting the climate change impacts on ARs and precipitation over the population and industrial centers in EA.

Keywords

Atmospheric rivers, Precipitation, East Asia, CMIP6