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Multiscale Simulation of Precipitation over East Asia by Variable Resolution CAM-MPAS

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Traditional global climate models (GCMs) with coarse uniform resolution (UR) usually have deficiency in simulating realistic results at regional scale, while experimental global high-resolution models show benefits but also raise much computational burden. In recent years, variable resolution (VR) models with unstructured mesh are found to provide comparable results at regional scale and require less computational resources. In this study, the variable resolution CAM-MPAS model with the MPAS (Model for Prediction Across Scales) dynamical core coupled with CAM5 (Community Atmosphere Model Version 5) physics package is used to evaluate the effect of 30 km regional refinement over East Asia on the precipitation simulation. Our results show that the CAM-MPAS model can reasonably reproduce the annual and seasonal precipitation over East Asia, and the MPAS-VR simulation shows reduced mean bias and improvements in seasonal cycle, intensity distribution, and interannual variation compared with the low resolution MPAS-UR simulation. Furthermore, the major contribution to the improvements over the Tibet Plateau in the MPAS-VR experiment comes from the increase of the grid spacing rather than the terrain resolution.