

Improvements in Simulating the Relationship between ENSO and East Asian Summer Rainfall in the CMIP5 Models

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There is a significant relationship between the preceding winter El Niño–Southern Oscillation (ENSO) and the subsequent East Asian summer rainfall (EASR), and this relationship is helpful for seasonal forecasting in East Asia. This study investigated the relationship between the preceding winter ENSO and EASR in the Coupled Model Intercomparison Project Phase 5 (CMIP5) models and compared the results with those from the CMIP3 models. In general, the CMIP5 models capture the ENSO–EASR relationship more realistically than the CMIP3 models. For instance, approximately two-thirds of the CMIP5 models capture the ENSO–EASR relationship, while less than one-third of the CMIP3 models capture the relationship. Further investigation suggests that the improvement could be attributed to simulating the physical processes of ENSO's impact on the EASR more realistically in the CMIP5 models, particularly the effect of ENSO on tropical Indian Ocean SST and the effect of Indian Ocean SST anomalies on the atmospheric convection over the Philippine Sea. However, there is large diversity in the ENSO–EASR relationship in the CMIP5 models, and most of the models underestimate the relationship. This underestimation comes from the underestimation of the physical processes, particularly from the underestimated impact of the atmospheric convection over the Philippine Sea on the EASR. The CMIP5 models that capture the ENSO–EASR relationship well/bad also show high/low skill in representing the physical processes.

Keywords: East Asian summer rainfall, ENSO, CMIP5 model