

## **Effects of the physical process ensemble technique on simulation of the summer precipitation over China**

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The effects of the physical process ensemble technique on simulation of the summer precipitation over China have been studied by using a 12-member physical process ensemble of simulations based on a P- $\hat{U}$  regional climate model with 9 vertical levels (P $\hat{U}$ RCM9). Results show that there are obvious differences among the simulations of the summer precipitation over China from different individual ensemble members. The simulated precipitation over China is sensitive to different cumulus convection, radiation transfer and land surface process parameterizations. These differences lead to large uncertainties in the simulation results. The standard deviation of the simulated summer precipitation departure percentage over West China is larger than that over East China, signifying that the simulated precipitation over East China has higher reliability and consistency than that over West China. The Talagrand diagram shows that the ensemble system has reasonable dispersion in the simulated summer mean precipitation over East China. All evaluating indices of the summer ensemble mean precipitation over East China are better than most single simulations. Physical process ensemble technique reduces the uncertainties of the model physics in precipitation simulation and improves the simulation results as a whole. Further, adopting the optimized ensemble mean method can obviously improve the performance of P $\hat{U}$ RCM9 model in simulation of the summer precipitation over East China.