



Changes in sub-daily precipitation extremes in a global climate model with super-parameterization under CO₂ warming

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Virtually all of the projections for future change of extreme precipitation statistics under CO₂ warming have been made using global climate models (GCMs) in which clouds and, in particular, convective cloud systems are not explicitly resolved, but rather parameterized. In our study, a different kind of a GCM, a super-parameterized Community Atmosphere Model (SP-CAM), is employed. In SP-CAM, all the conventional cloud parameterizations are replaced with a small-domain cloud resolving model (CRM), called super-parameterization (SP). The SP is embedded in each grid column of the host GCM. The resolution of each embedded CRM is 4 km, which is generally sufficient to explicitly represent deep convection, which is mostly responsible for extreme precipitation events. In this study, we use the SP-CAM to contrast to the present and to conventional climate model, CAM, the sub-daily extreme precipitation statistics in response to the sea-surface temperatures (SSTs) and CO₂ levels as projected for the end of 21st century in response to the IPCC AR5 RCP8.5 emission scenario. Different mechanisms for extreme precipitation changes are discussed.