

Continental shallow cumulus clouds in E3SM parameterizations against ARM observations and LES

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Fair-weather shallow cumulus (FWSC) clouds are important but still remain a challenge for climate models to simulate. FWSC clouds are tightly coupled with the underlying land surface and strongly respond to diurnal varying surface heat fluxes. In this study, we use a set of golden FWSC days to improve our understanding on sub-cloud layer turbulence and cloud morphologies based on advanced measurements in most recent years at Southern Great Plains (SGP) site by US Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) program. The performance of the single column model of US DOE Energy Exascale Earth System Model (E3SM) is assessed against both ARM data and large eddy simulation results. With this approach, we hope to identify parameterization deficiencies for potential model improvement.

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