

Toward realistic simulation of low-level clouds using a multiscale modeling framework with a third-order turbulence closure in its cloud-resolving model component □

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This study presents preliminary results from a multiscale modeling framework (MMF) with an advanced third-order turbulence closure in its cloud-resolving model (CRM) component. In the original MMF, the Community Atmosphere Model (CAM3.5) is used as the host general circulation model (GCM), and the System for Atmospheric Modeling with a first-order turbulence closure is used as the CRM for representing cloud processes in each grid box of the GCM. The results of annual and seasonal means and diurnal variability are compared between the modified and original MMFs and the CAM3.5. The global distributions of low-level cloud amounts and precipitation and the amounts of low-level clouds in the subtropics and middle-level clouds in mid-latitude storm track regions in the modified MMF show substantial improvement relative to the original MMF when both are compared to observations. Some improvements can also be seen in the diurnal variability of precipitation.