Mesoscale convective systems in a regional climate model and a global variable resolution model: effects of model resolution and convective parameterizations

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Organized mesoscale convection systems (MCSs) are responsible for ~60% of summer rainfall in the U.S. Great Plains. Deficiency in representing MCSs contributes largely to climate model biases in simulating the diurnal variability of precipitation over the Central US, with important implications to model fidelity in simulating the regional water cycle in many regions influenced by MCSs worldwide. Simulating MCSs is a significant challenge because cumulus parameterizations commonly used in climate models do not represent the organization of convection. Convection permitting regional climate simulations have demonstrated more skill in capturing characteristics of MCSs. In this presentation, we explore convection permitting modeling of MCSs in the U.S. using a regional climate model and a non-hydrostatic global variable-resolution model. In the former, we examine the sensitivity of regional simulations of MCSs to model resolutions across the gray zone and to convection and cloud microphysics parameterizations. For the latter, the Model for Prediction Across Scales (MPAS) is used to explore convection permitting simulations of MCSs using regional refinement to represent MCSs and their interactions with the large-scale circulation. Sensitivity experiments are used to addressing the challenge of representing convection across gray zone resolutions in the MPAS global variable resolution modeling framework.