Cloud-system resolving models (CSRM) and their roles in understanding interactions between convection and large-scale flows

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Cloud-system resolving models (CSRM) explicitly resolve the non-hydrostatic dynamics of deep convection over domain sizes comparable to the resolution of atmospheric general circulation models (GCMs) used for numerical weather prediction and climate simulation. CSRM includes by parameterization cloud microphysics, radiative transfer, and sub-cloud-scale turbulence. Since CSRM explicitly model the interactions between the scales of convection and an (imposed) large-scale flow, they are a valuable tool for studying interactions between convection and large-scale flows, and, as computational resources increase, a practical strategy for improving parameterizations for deep convection in GCMs.

The presentation will review the current uses of CSRM to study interactions between deep convection and large-scale flows. The key capabilities of CSRM in modeling deep convective systems will be reviewed. Limitations of CSRM related to dimensionality, numerics, and treatment of processes such as radiation, microphysics, and turbulence will be outlined. The uses of CSRM to evaluate and develop cumulus parameterizations will be summarized, and the direct embedding of CSRM into GCMs as a multi-scale modeling approach to parameterization will be presented.