



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

**L. Donner**

Geophysical Fluid Dynamics Lab/NOAA, Princeton University, Princeton, NJ USA  
[leo.j.donner@noaa.gov]

Cloud-system resolving models (CSRMs) 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. CSRMs include by parameterization cloud microphysics, radiative transfer, and sub-cloud-scale turbulence. Since CSRMs 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 CSRMs to study interactions between deep convection and large-scale flows. The key capabilities of CSRMs in modeling deep convective systems will be reviewed. Limitations of CSRMs related to dimensionality, numerics, and treatment of processes such as radiation, microphysics, and turbulence will be outlined. The uses of CSRMs to evaluate and develop cumulus parameterizations will be summarized, and the direct embedding of CSRMs into GCMs as a multi-scale modeling approach to parameterization will be presented.