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A coupled GCM-cloud resolving modeling system to study precipitation processes

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Recent GEWEX Cloud System Study (GCSS) model comparison projects have indicated that cloud-resolving models (CRMs) agree with observations better than traditional single-column models in simulating various types of clouds and cloud systems from different geographic locations. Current and future NASA satellite programs can provide cloud, precipitation, aerosol and other data at very fine spatial and temporal scales. It requires a coupled global circulation model (GCM) and cloud-scale model (termed a super-parameterization or multi-scale modeling framework, MMF) to use these satellite data to improve the understanding of the physical processes that are responsible for the variation in global and regional climate and hydrological systems. The use of a GCM will enable global coverage, and the use of a CRM will allow for better and more sophisticated physical parameterization. NASA satellite and field campaign cloud related datasets can provide initial conditions as well as validation for both the MMF and CRMs.

The Goddard MMF is based on the 2D Goddard Cumulus Ensemble (GCE) model and the Goddard finite volume general circulation model (fvGCM), and it has started production runs with two years results (1998 and 1999). In this talk, I will present:

(1) A brief review on GCE model and its applications on precipitation processes (microphysical and land processes), and

(2) The Goddard MMF and the major difference between two existing MMFs (CSU MMF and Goddard MMF), and preliminary results (the comparison with traditional GCMs).