**Advancing the Retrieval of Latent Heating for PMM using Improved Simulations of Convective, Synoptic, and Cold Season Systems and their Associated Microphysical and Precipitation Processes**

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**Abstract**

The proposed modeling and algorithm development effort begins with the improved simulation of a range of precipitating cloud systems, from weak, isolated rain showers to intense MCSs to large-scale synoptic snow storms, and their related precipitation structures and cloud microphysical processes. The proposal will use data from several major field campaigns (i.e., C3VP, MC3E, LPVEx, GCPEx, IFloodS, IPHEX, OLYMPEX, TWP-ICE, DYNAMO, GoAMAZON, ICE-POP and other winter events) to validate/improve the cloud processes in high-resolution (1000 to 200 m) numerical models for NASA PMM; their data will then directly be used to expand/improve the performance of the now Goddard Convective-Stratiform-Synoptic Heating (CSSH) algorithm for the TRMM/GPM era. The main areas of proposed research are:

(1) Utilize GV products to evaluate the microphysics used in the cloud-resolving (Goddard Cumulus Ensemble or GCE) and regional-scale (i.e., NASA Unified Weather Research and Forecasting, NU-WRF) models and improve their performance by resolving identified deficiencies,

(2) Conduct high-resolution (both horizontal and vertical) model simulations for a variety of different cloud and precipitation systems from different geographic locations using improved microphysics schemes from (1) with an emphasis on ice-phase and mixed-phase precipitation systems in middle and high-latitudes,

(3) Use the high-resolution simulated cloud and precipitation properties (including hydrometeor distributions and their microphysical characteristics, latent heating (LH), eddy transport and radiation) to advance PMM (TRMM and GPM) LH algorithm development, specifically the current operational CSH (now CSSH) and SLH algorithms, and their validation (i.e., via synthetic consistency checks),

(4) Collaborate with the SLH algorithm team by simulating the same cases (i.e., winter systems over the US East Coast, off the coast of California, and the Japan Sea) and sharing the data needed for the new CSSH and SLH algorithm look-up tables, and

(5) Investigate the sensitivity of simulated LH structures and precipitation processes for various microphysical schemes (i.e., 4-ICE, 2-moment and spectral bin).