

## **A ML/AI Based GMI-only Precipitation Type Classification Algorithm**

Jie Gong, Spandan Das, Chenxi Wang, Dong L. Wu and Liang Liao

Precipitation type (stratiform, convective or other type) is a key parameter for us to make better retrieval of precipitation characteristics as well as to understand the cloud-convection-precipitation (CCP) physical processes. Passive microwave (PMW) sensors were traditionally believed not to be able to accurately tell apart precipitation types. The inclusion of snow/ice-sensitive high-frequency polarized MW channels in the Global Precipitation Measurement (GPM) Core Observatory's Microwave Imager (GMI) and its perpetual collocation with the Dual-Frequency Precipitation Radar (DPR) provide us an excellent testbed for the new machine learning/artificial intelligence (ML/AI) technique in developing a PMW-only precipitation type retrieval algorithm.

Using collocated precipitation type flag assignment from DPR as the "truth", we successfully developed a two-step ML/AI model that can make a GMI-only precipitation type prediction at an accuracy of ~ 85% globally. The GMI-only precipitation type flag not only reproduces DPR's statistics, but also overcomes the strong view-angle dependency artifact that DPR precipitation type flag contains. Further, Using collocated CloudSat precipitation flag, we found GMI captures some of the light precipitation features that DPR is not sensitive to but CloudSat is. This work proves the unique merits that high-frequency (> 89 GHz) polarized channels have.