



Validation of Hail Identification Algorithm for GPM DPR (version 7)

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Extreme precipitation such as hail has raised interest due to its huge impact to human activities. In the new version of GPM DPR algorithm (version 7), a new Boolean hail product is developed to identify hail along a vertical profile. The main feature of this algorithm is for the first time, offers the potential of retrieving a uniform and homogeneous hail dataset on the global scale from radar sensors. The algorithm is built upon the precipitation type index (PTI). PTI is a value calculated for each dual-frequency profile with precipitation observed by GPM DPR. The dual-frequency ratio slope with respect to height, the maximum of reflectivity and storm top height are three key ingredients composing PTI value.

PTI has been shown to be effective in separating various precipitation types such as snow, graupel and hail profiles [1][2][3]. In this research, we focus on validation of hail identification algorithm by analyzing and cross-validating hail observations from various sources including individual hailstorm and on a global scale. Our algorithm will be validating with hailstorms observed by ground validation radar NEXRAD, GMI based hail identification and multiple scattering effect from Trigger module output of DPR level-2 algorithm. The global scale analysis is essential for satellite-based products. We validation this hail product with various global hail maps using radar, radiometer-based algorithms and reports.

[1] Le, M and V. Chandrasekar, Graupel and Hail Identification Algorithm for the Dual-frequency Precipitation Radar (DPR) on the GPM Core Satellite. *J. Meteor. Soc. Japan*, Vol. 99, 2021.

[2] Le, M. and V. Chandrasekar, Ground Validation of Surface Snowfall Algorithm in GPM Dual-Frequency Precipitation Radar. *J. Atmos. Oceanic Technol.*, no 36, pp. 607–619, 2019.

[3] Le, M. and V. Chandrasekar, A New Hail Product for GPM DPR Algorithm. IGARSS', 2021, Jul 12th ~ 16th, Brussels.