Cross Validation of GPM-DPR Dual-frequency Measurements with Ground Radar Dual-polarization Measurements

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In February 2014, the Global Precipitation Measurement (GPM) mission was jointly launched by NASA and JAXA. The Dual-Frequency Precipitation Radar (DPR) on board the GPM core observatory is the second space-borne precipitation radar following the successful Tropical Rainfall Measurement Mission Precipitation Radar (TRMM-PR). The DPR measures precipitation from space by providing high resolution 3-D dual frequency data over a wide range of latitude ($65^oN - 65^oS$). It operates at both frequency channel of 13.6 GHz (Ku-band) and 35.5 GHz (Ka-band). The advantages of this new Ka-band observation are being able to retrieve accurate information on particle size distribution resulting from non-Rayleigh scattering effects, higher detection sensitivity for winter precipitation such as snow/light-rain and most importantly to accurately estimate phase transition height in different kinds of precipitation (stratiform and convective).

Melting layer detection and rainfall type classification are the two main features of the DPR profile classification module. The dual-frequency classification method relies on the microphysical properties which uses the difference in reflectivity measurement at the two frequencies, a quantity termed as 'dual-frequency ratio measured' (DFRm). The slope and shape of this DFRm vertical profile enables in detecting the melting layer region more precisely. (M. Le and V. Chandrasekar, "Hydrometeor Profile Characterization Method for Dual-Frequency Precipitation Radar Onboard the GPM", Geoscience and Remote Sensing, IEEE Transactions, Volume: 51, Issue: 6, Jun 2013.)

Ground validation of the space based observations from DPR is a critical part of the GPM mission as it helps in evaluation and development of the dual-frequency ratio (DFR) based algorithms used for microphysical retrievals. This study presents validation of DPR melting later detection with simultaneous dual-polarized measurements from ground radars. Comparison results are presented from multiple ground radar locations in the continental United States. Simultaneous observations of different types of precipitation between DPR and ground radar are carefully selected. Hydrometeor classification (Renzo Bechini and V. Chandrasekar, 2015: A Semisupervised Robust Hydrometeor Classification Method for Dual-Polarization Radar Applications. *J. Atmos. Oceanic Technol.*, **32**, 22–47.) is performed on ground radar observations and cross compared with DPR results. The comparisons show good agreement and the results are presented.