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Error and Uncertainty Quantification in Precipitation Retrievals from GPM/DPR Using Ground-based Dual-Polarization Radar Observations

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The active Dual-frequency Precipitation Radar (DPR) and passive radiometer onboard Global Precipitation Measurement (GPM) mission's Core Observatory extend the observation range attained by Tropical Rainfall Measuring Mission (TRMM) from tropical to most of the globe [1]. Through improved measurements of precipitation, the GPM mission is helping to advance our understanding of Earth's water and energy cycle, as well as climate changes. Ground Validation (GV) is an indispensable part of the GPM satellite mission. In the pre-launch era, several international validation experiments had already generated a substantial dataset that could be used to develop and test the pre-launch GPM algorithms. After launch, more ground validation field campaigns were conducted to further evaluate GPM precipitation data products as well as the sensitivities of retrieval algorithms. Among various validation equipment, ground based dual-polarization radar has shown great advantages to conduct precipitation estimation over a wide area in a relatively short time span. Therefore, radar is always a key component in all the validation field experiments. In addition, the radar polarization diversity has great potential to characterize precipitation microphysics through the identification of raindrop size distribution and different hydrometeor types [2]. Currently, all the radar sites comprising the U.S. National Weather Service (NWS) Weather Surveillance Radar-1988 Doppler (WSR-88DP) network are operating in dual-polarization mode.

However, most of the operational radar based precipitation products are produced at coarse resolution typically on 1 km by 1 km spatial grids, focusing on precipitation accumulations at temporal scales of 1-h, 3-h, 6-h, 12-h, and/or 24-h (daily). Their capability for instantaneous GPM product validation is severely limited due to the spatial and temporal mismatching between observations from the ground and space. This paper first presents the rationale and opportunities of using dual-polarization radar in validation of precipitation retrievals from GPM/DPR. A new dual-polarization radar rainfall algorithm is proposed on this ground and implemented for WSR-88DP radar observations, especially when there are GPM satellite overpasses. In addition, an interpolation scheme is developed in order to map the WSR-88DP radar rainfall estimates that are updated every five-six minutes into instantaneous scale ($\sim$ 1 minute). Detailed comparisons between instantaneous precipitation retrievals from GPM/DPR and WSR-88DP estimates before and after interpolation are investigated from a statistical perspective.

[1] Hou, A., R. Kakar, S. Neeck, and Coauthors, 2014: The Global Precipitation Measurement Mission. Bull. Amer. Meteor. Soc., 95, 701-722.
[2] Chen, Haonan, V. Chandrasekar, and R. Bechini, 2017: An Improved Dual-Polarization Radar Rainfall Algorithm (DROPS2.0): Application in NASA IFloodS Field Campaign. Journal of Hydrometeorology. doi:10.1175/JHM-D-16-0124.1