# COMBINE KU AND KA BAND OBSERVATIONS OF PRECIPITATION AND RETREIVALS FOR GPM GROUND VALIDATION

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**ABSTRACT**

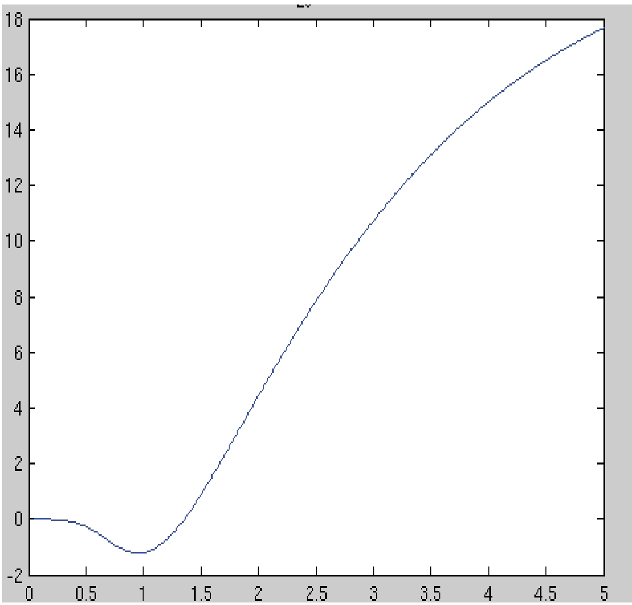
GPM is a science mission with integrated application goals for advancing the knowledge of the global water/energy cycle variability as well as improving weather, climate and hydrological prediction capabilities through more accurate and frequent precipitation measurements around the globe every 2 to 4 h. The GPM mission concept is centered on the deployment of a Core Observatory satellite with an active dual-frequency (Ku and Ka band) precipitation radar and a passive GPM Microwave Imager (GMI). The dual-frequency precipitation radar (DPR) aboard the GPM core satellite is expected to improve our knowledge of precipitation processes relative to the single-frequency radar used in TRMM PR by providing greater dynamic range, more detailed information on microphysics, and better accuracies in rainfall and liquid water content retrievals. The dual-frequency returns will also allow us to distinguish regions of liquid, frozen and mixed-phase precipitation. Overall, the combination of Ku and Ka bands should significantly improve the detection thresholds for light rain and snow relative to TRMM.

Validation is an integral part of all satellite precipitation missions. Ground validation helps to characterize errors, quantify measurement uncertainty, and most importantly, provide insight into the physical and statistical basis of the retrieval algorithm. A Dual-frequency (Ku and Ka band) and dual-polarization ground radar will be built in near future to perform cross validation with GPM. Dual-polarization ground radar is a very powerful validation tool that can be used to address a number of important questions that arise in the validation process, especially those associated with precipitation microphysics and algorithm development.

This paper presents a new algorithm to retrieve parameters of the drop size distribution from dual-frequency and dual-polarization ground radar. This algorithm combines the traditional dual-frequency approach used in space borne radars [1] and the dual-polarization approach used in ground based radars [2]. The space borne radar retrieval algorithms have relied on the variability of dual-frequency ratio (DFR) with the drop median diameter (D0),Fig1,whereas the ground based dual-polarization radars have used the differential reflectivity (Zdr) to retrieve D0, Fig 2 . This algorithm will provide more accurate Do in rain using combined DFR and Zdr information. The estimated attenuation of Ku and Ka band, and differential attenuation of Ku band are obtained from these retrieved drop size distribution parameters. The proposed algorithm is evaluated based on simulated Ku and Ka band realistic

observations, for rain, melting layer and ice parts, synthesized from S-band measurements collected by (CSU-CHILL) radar.

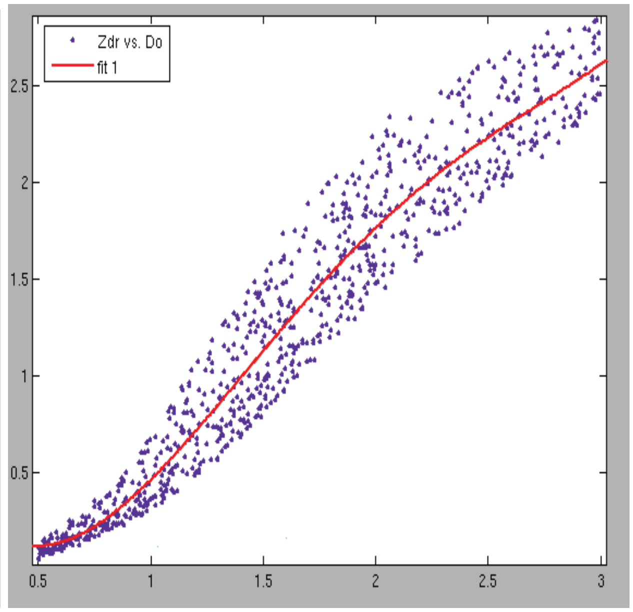
DFR (Ku-Ka) VS Do




Do mm

Fig 1 Dual-frequency ratio between Ku and Ka band versus Do

Zdr VS Do at Ku




Do mm

Fig 2 Differential reflectivity Zdr versus Do scatter plot at Ku band

**REFERENCES**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