

## **Assessing the Impact of Precipitation Vertical Structure in the Satellite Precipitation Retrievals.**

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Quantitative Precipitation Estimates (QPEs) from satellite sensors play a major role in understanding the global water cycle. However, due to limited sensors capabilities, assumptions made in retrieval algorithms, and incomplete understanding of precipitation microphysics, satellite-based QPEs are prone to detection and estimation errors. Therefore, understanding the physical basis of these errors is critical to the current retrievals for different applications and improving the next-generation algorithms. This study aims to improve the understanding of retrieval errors by identifying the link between the vertical structure of precipitation processes and satellite products errors. A machine-learning-based model is developed to identify distinct clusters of precipitation structures using ground observations (i.e., reflectivity profiles from ground radars). The identified clusters are first linked to different morphological and microphysical properties. Then, the morphological properties of the precipitation profiles are mapped to the retrieval errors. The spatial and seasonal dependence of the errors to precipitation vertical structure will be investigated and presented. The methodology is applied to GPROF AMSR2 precipitation retrieval over the continental United States. The reference data for this purpose is obtained from the ground-based radar observations provided by the Multi-Radar/Multi-Sensor (MRMS) product. Initial results suggest a strong link between retrieval's negative bias and precipitation structure.