Understanding GPROF Atmospheric Regime-Dependent Biases

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The field of quantitative precipitation estimation (QPE) validation has traditionally focused on the systematic appearance of biases with rain gauge networks or weather radar measurements. This focus has allowed the assessment of the spatial and temporal reliability of those products, as well as the recommendation of future improvements, both on the products themselves and truth networks. Despite this focus being the backbone for model evaluation methodologies, it structurally misses the causes of those biases and therefore the path to model restructuring, improvements, or the evaluation in areas without ground truth information. Although important efforts have been made to disentangle the role of individual drivers on the found biases and the spatio-temporal variability of those biases, there seems to be a gap in the comprehensive inclusion of atmospheric and surface states to correctly discern the marginal and joint contribution of the strongest predictors into precipitation estimation biases. The objective of this work is to find a collection of independent atmospheric states and variables that regionally explain the occurrence and magnitude of the precipitation process, its estimation biases, and their temporal evolution. The expected results from this effort will entail the development of a new paradigm for QPE and QPF evaluation in areas where the absence of validation data inhibits the assessment of those products. The described approach will be developed and tested from the instantaneous GPROF retrievals over the Seatle, Phoenix and Texas-Oklahoma regions. NSSL-MRMS and ERA5 re-analysis will constitute the precipitation and atmospheric ground truthing data sets to further test the performance of the GPM-GPROF retrievals over the three study regions.