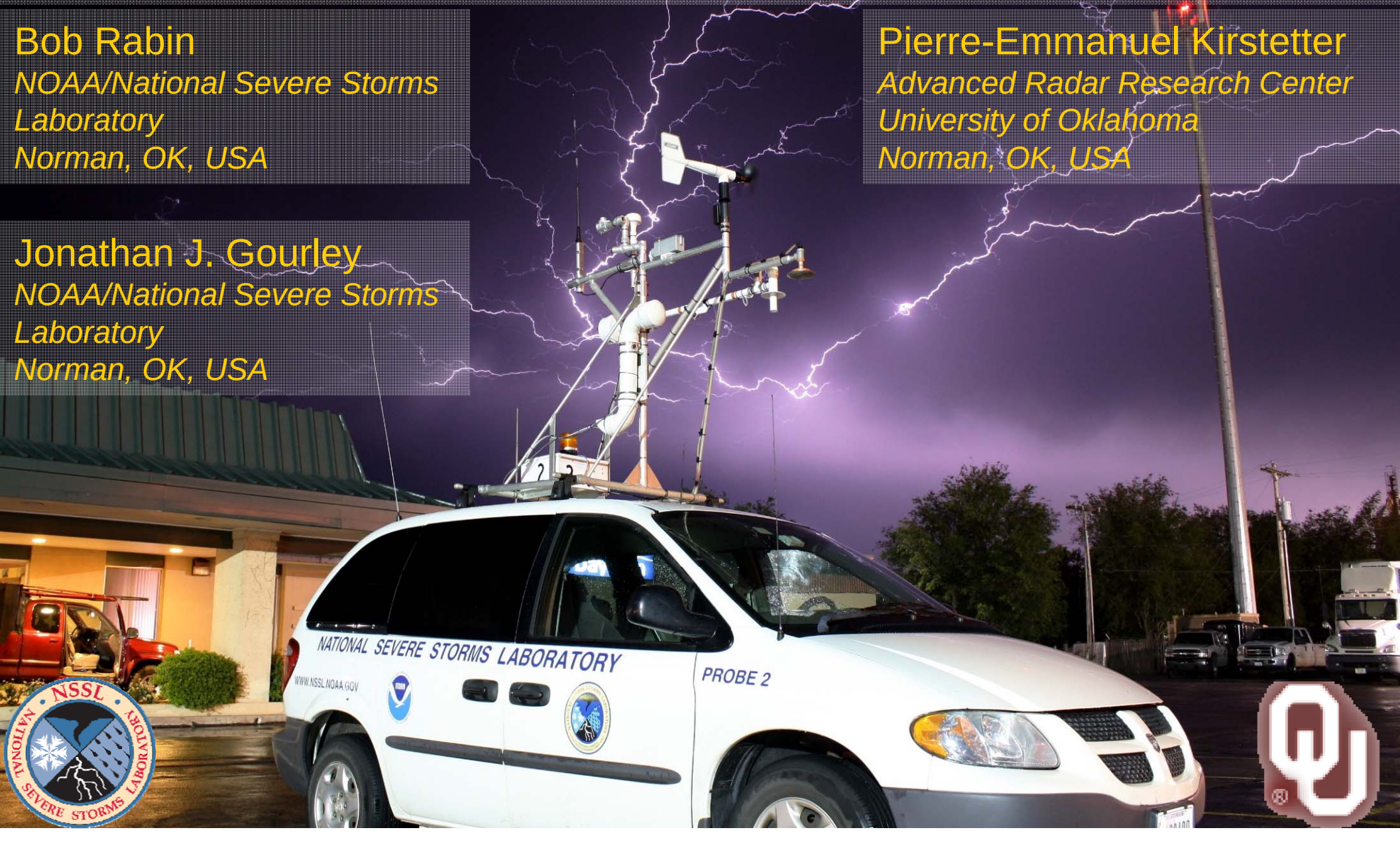
WiMerge: Mosaicking NEXRAD Dual-Pol and GPM DPR Products for Hydrometeor Retrievals and QPE over the CONUS

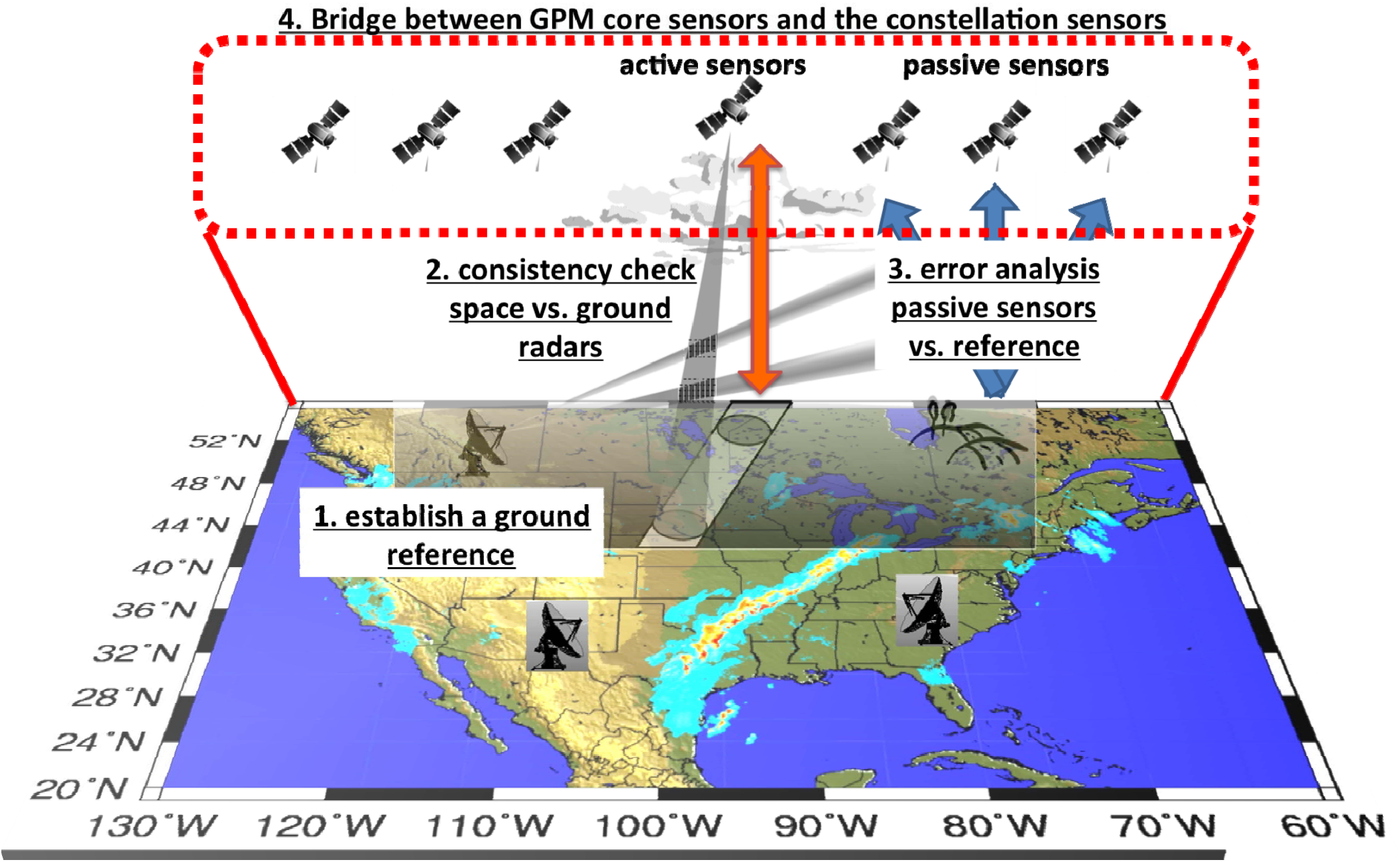
Bob Rabin
NOAA/National Severe Storms Laboratory
Norman, OK, USA

Pierre-Emmanuel Kirstetter
Advanced Radar Research Center
University of Oklahoma
Norman, OK, USA

Jonathan J. Gourley
NOAA/National Severe Storms Laboratory
Norman, OK, USA

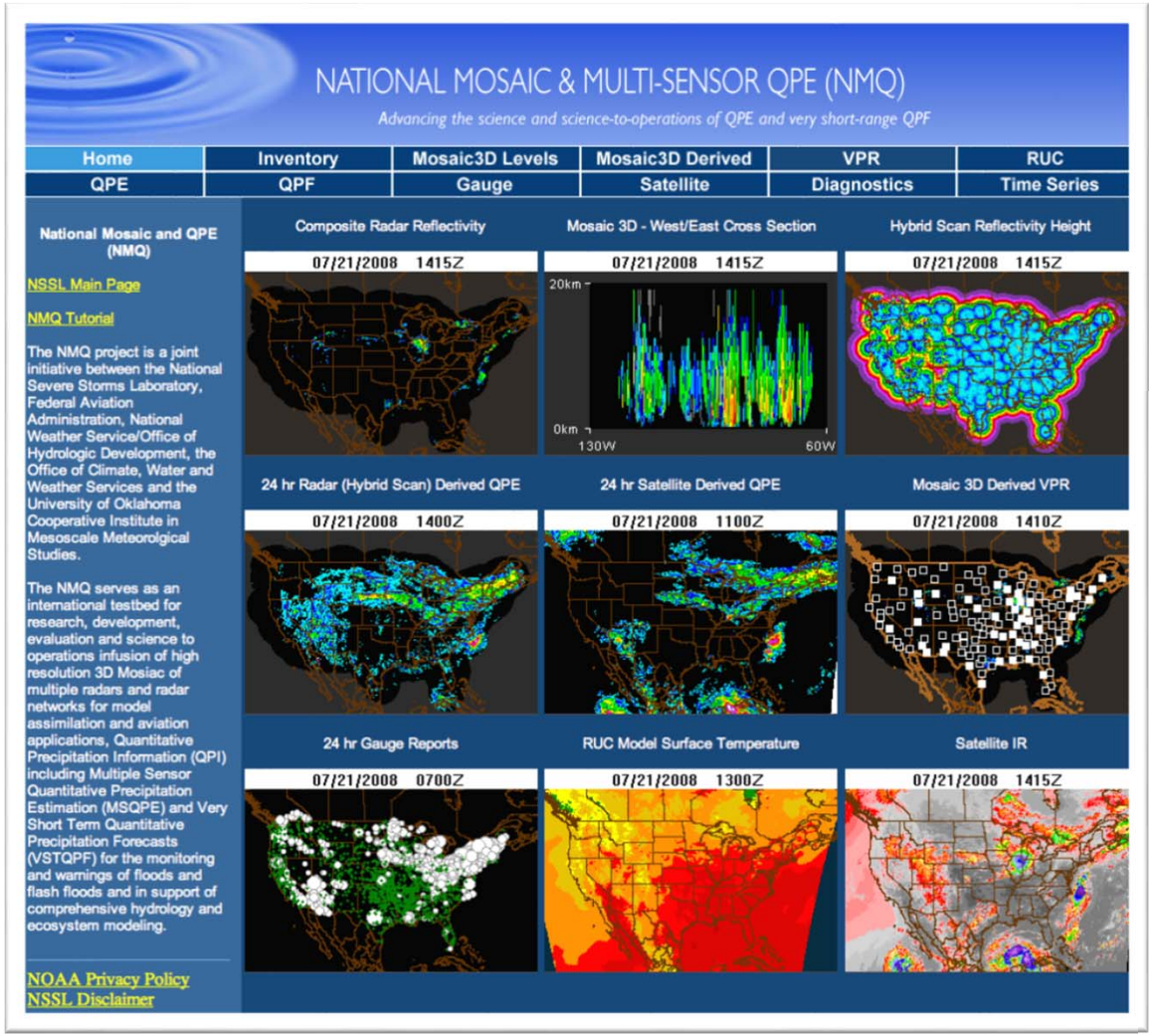


Perspectives:
Global Precipitation Measurement mission



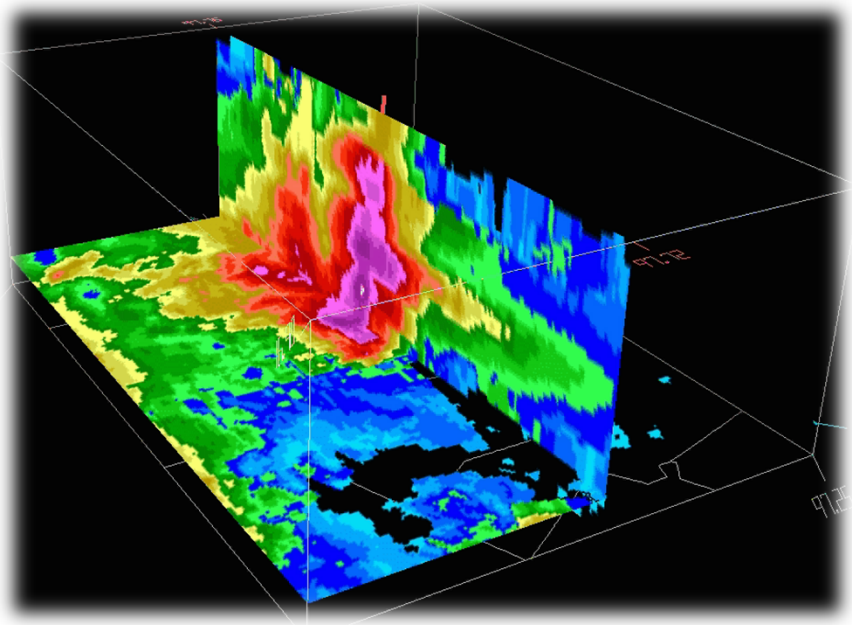
The Framework background: NMQ-Q2

Q2 provides 3D reflectivity mosaics and QPE products over CONUS at 1-km^2/5 min resolution

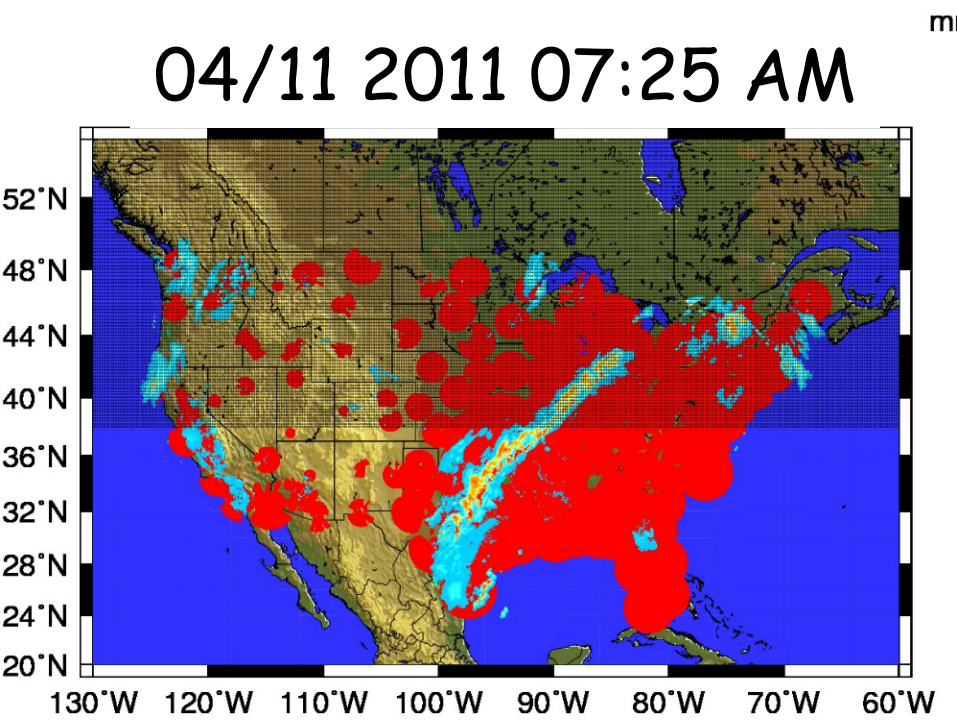


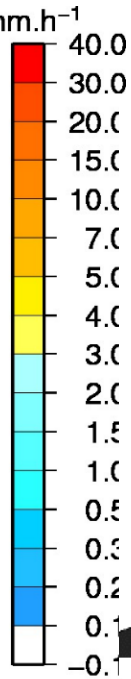
http://nmq.ou.edu

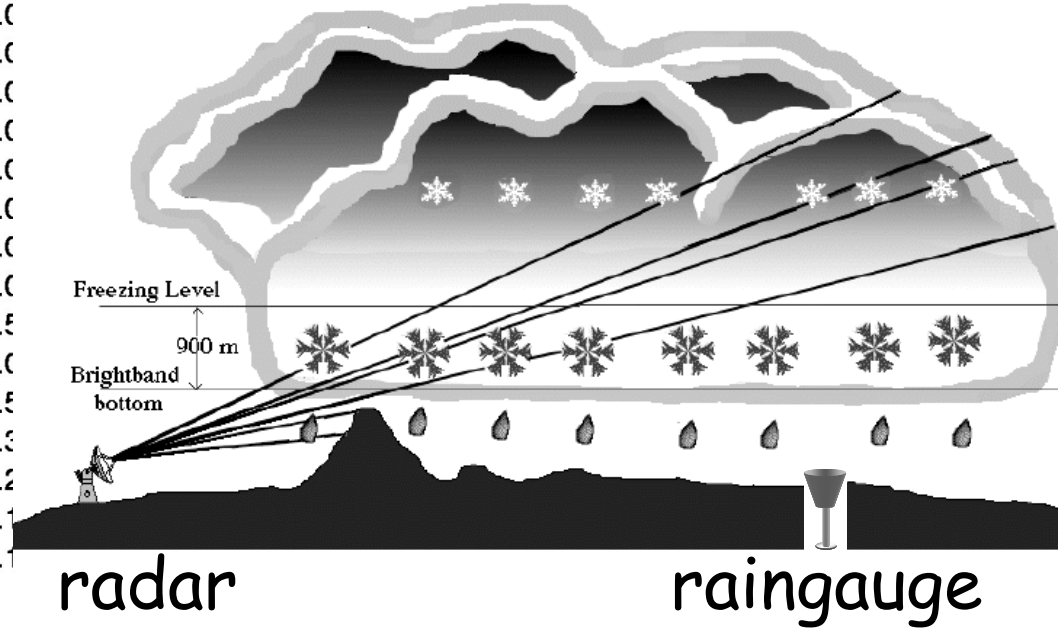
Real-time platform to develop, test, and assess advanced techniques in quality control, data integration and precipitation estimation.



The Framework
#1: reference rainfall



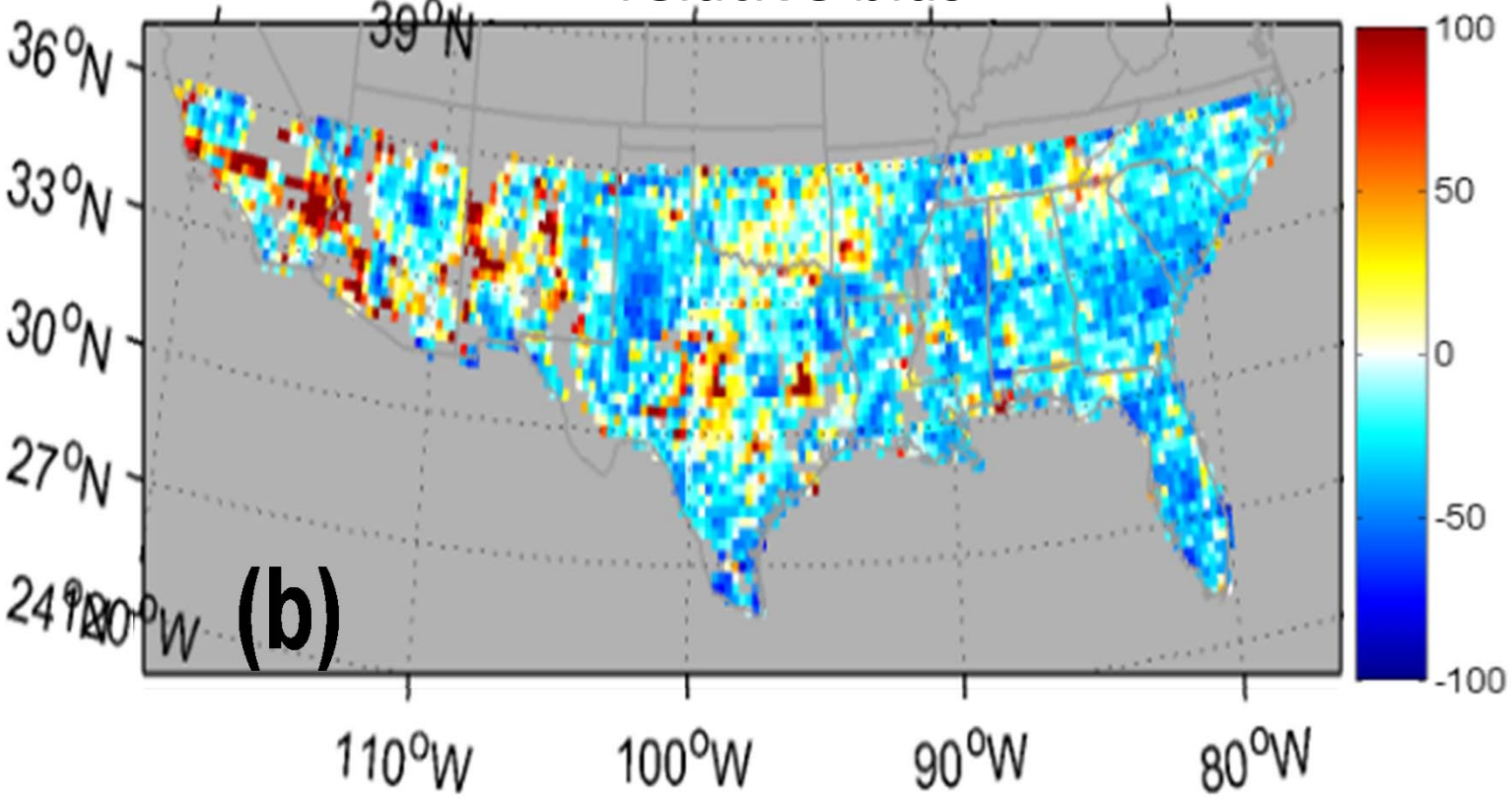




TRMM-PR evaluation with Q2

regional dependencies

relative bias



S. Chen, P.E. Kirstetter, Y. Hong, J.J. Gourley, Y. Tian, Y. Qi, Q. Cao, J. Zhang, K. Howard, J. Hu, and X. Xue, 2012: Spatial Error Structure Evaluation of Precipitation Rates and Types from NASA/JAXA Space-borne Radar against NOAA/NSSL High-resolution National Mosaic Radar Network within TRMM-covered Continental United States.

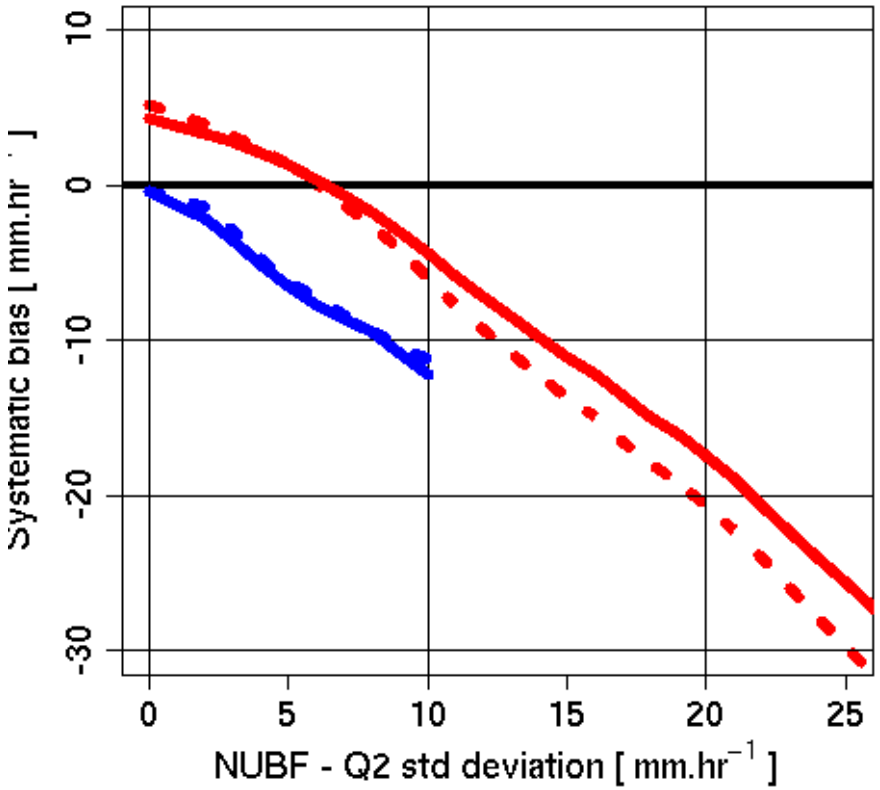
submitted to *Journal of Hydrometeorology.*

Application to various products

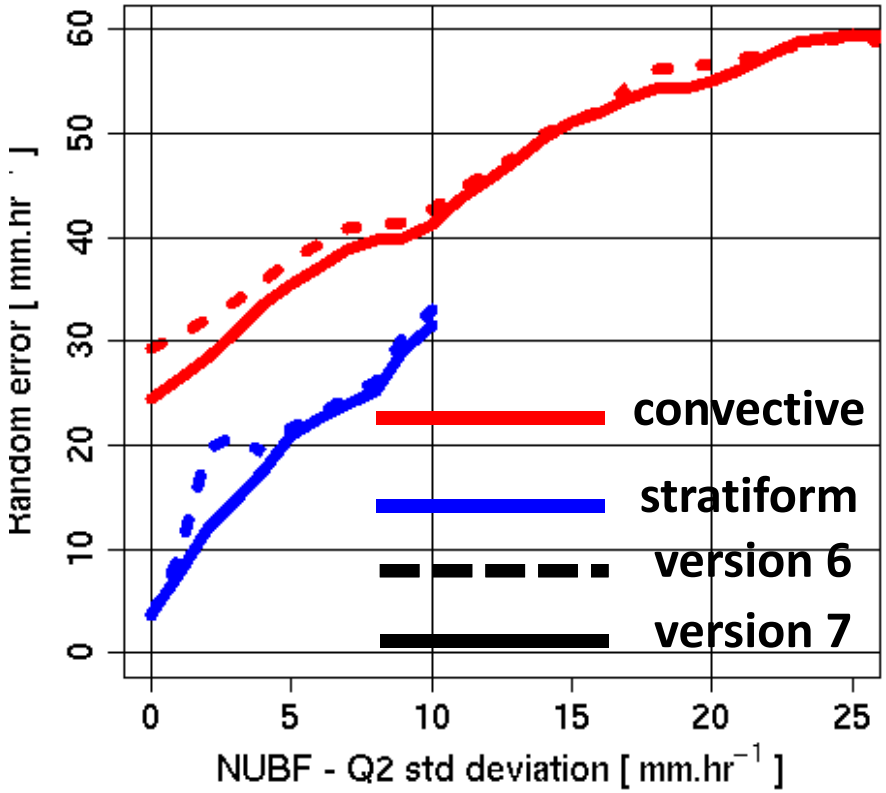
TRMM-PR version 6 vs. version 7

Non Uniform Beam Filling, Rain type classification

systematic bias



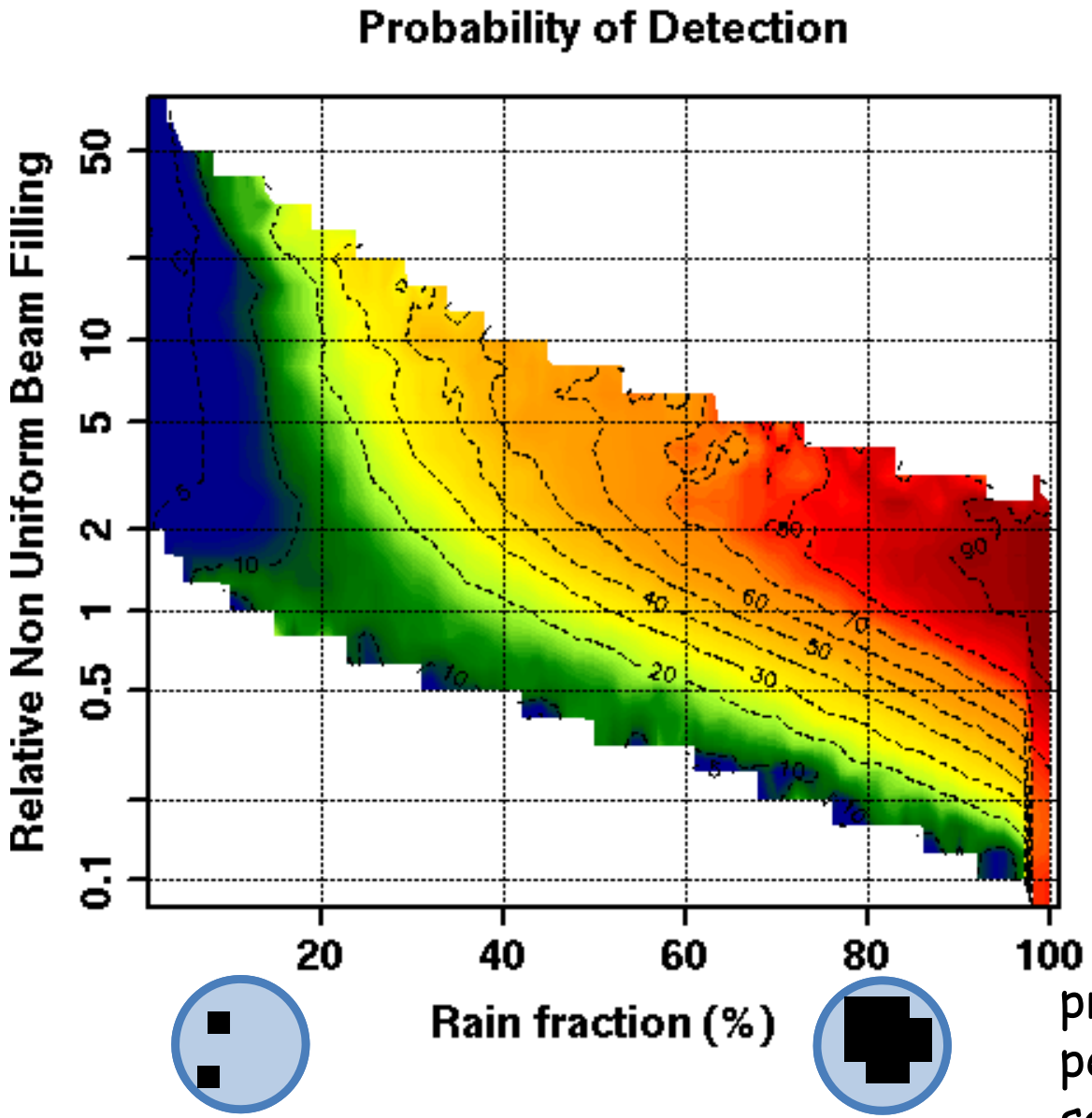
residual random error



Kirstetter, P.-E., Y. Hong, J. J. Gourley, M. Schwaller, W. Petersen, and J. Zhang, 2012: Comparison of TRMM 2A25 Products Version 6 and Version 7 with NOAA/NSSL Ground Radar-based National Mosaic QPE.

Journal of Hydrometeorology. doi:10.1175/JHM-D-12-030.1, *in press*.

The Framework #3:
rainfall <u>detection</u>, classification, quantification

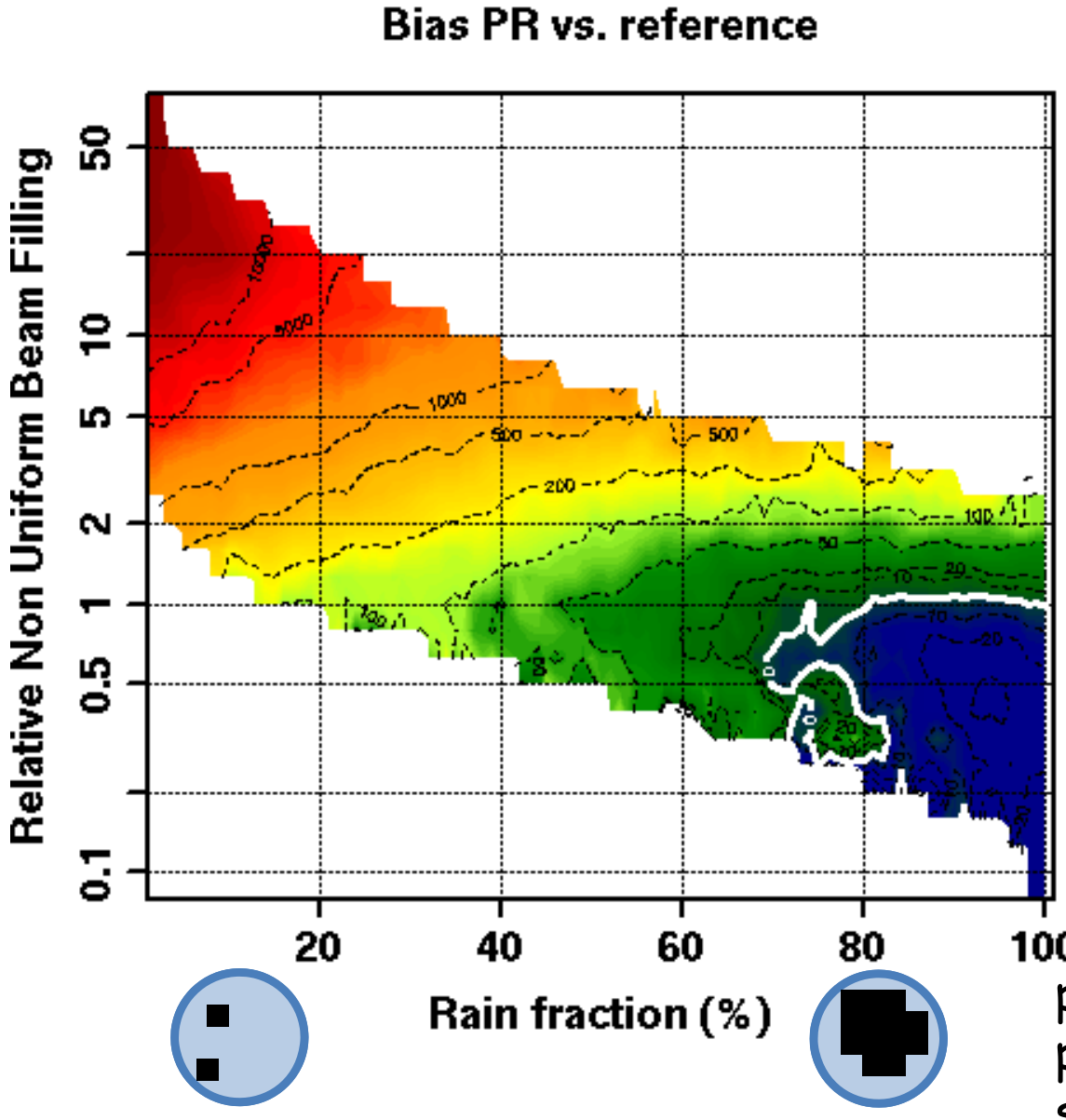


std dev
>>
mean

std dev
<<
mean

product: 2A25 (v7)
period: March-October 2011
sample: 1 600 000

The Framework #3:
rainfall detection, classification, quantification



std dev
>>
mean

std dev
<<
mean

product: 2A25 (v7)
period: March-October 2011
sample: 1 600 000

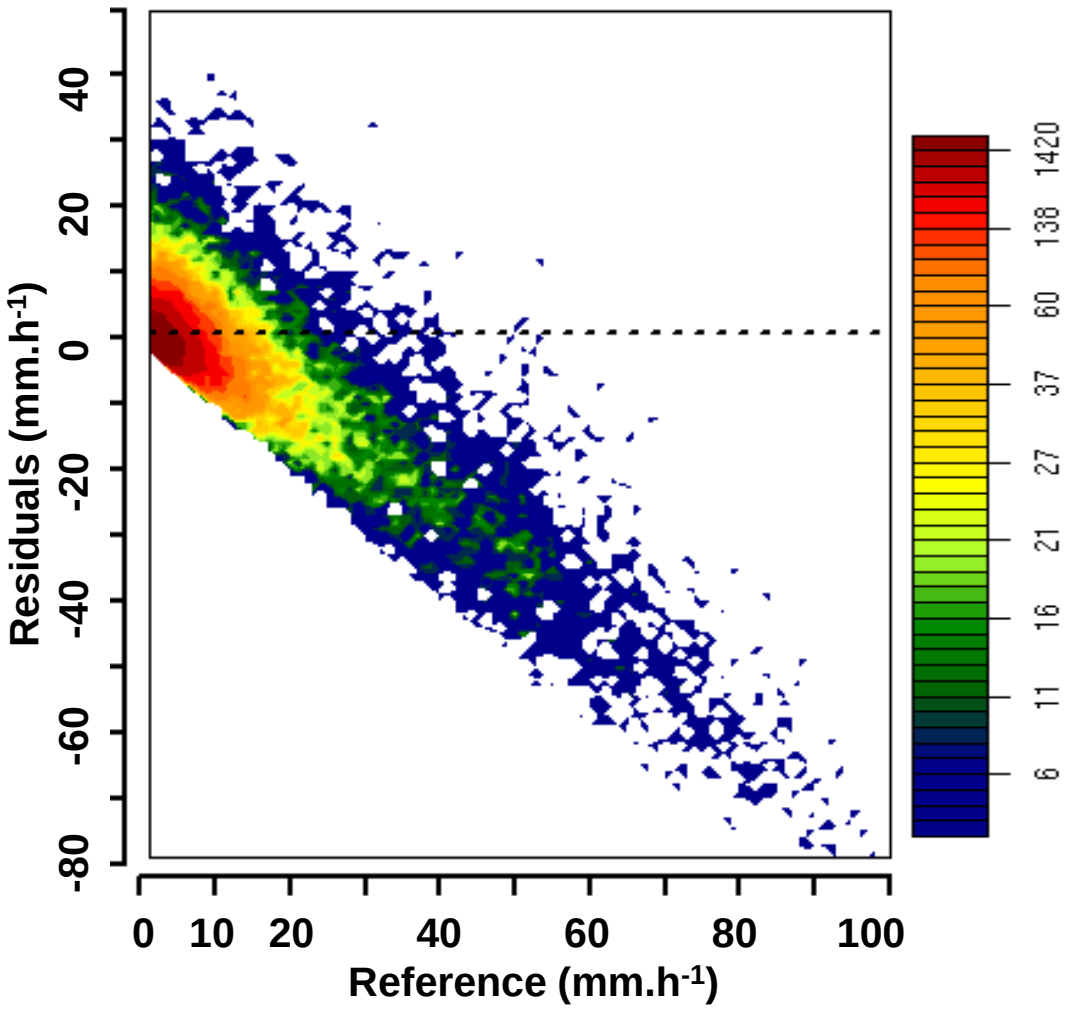
The Framework #3:
rainfall detection, classification, quantification

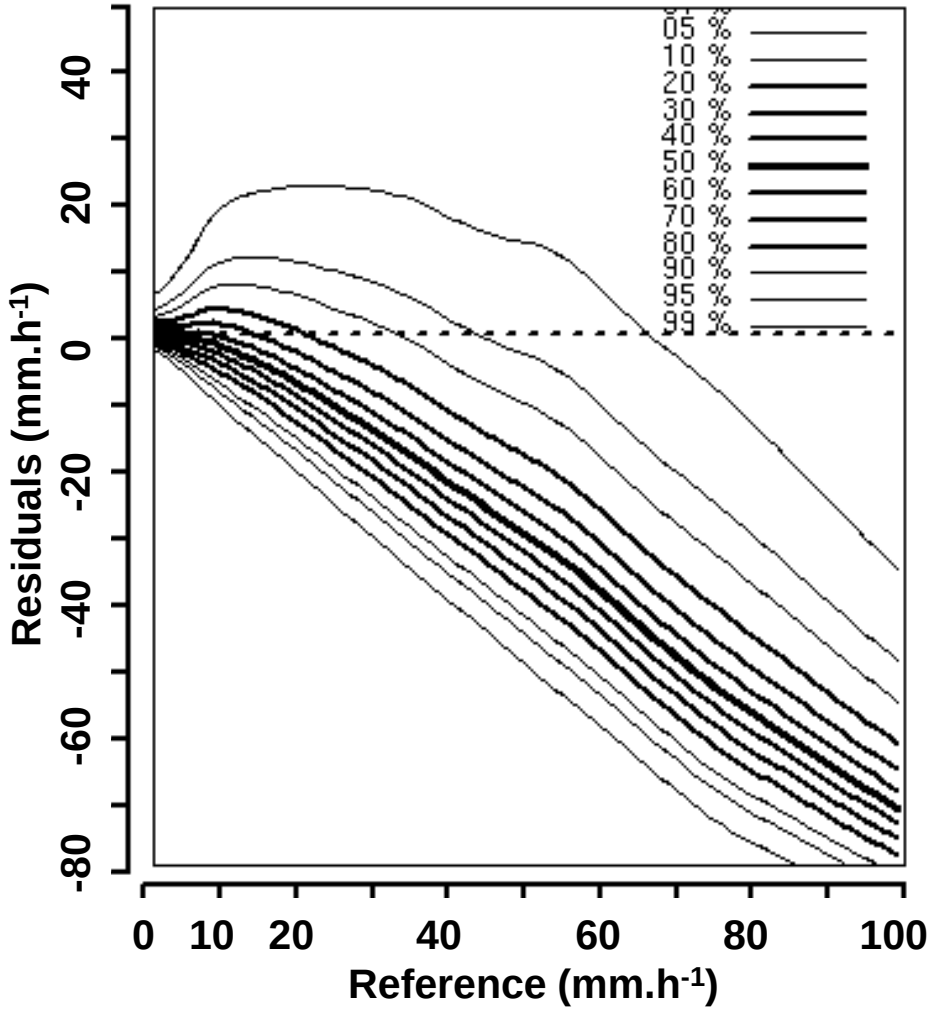
→error modeling

analysis of the PR error (systematic and random part)

residual error : ε(A,t) = R*(A,t) - Rref(A,t)

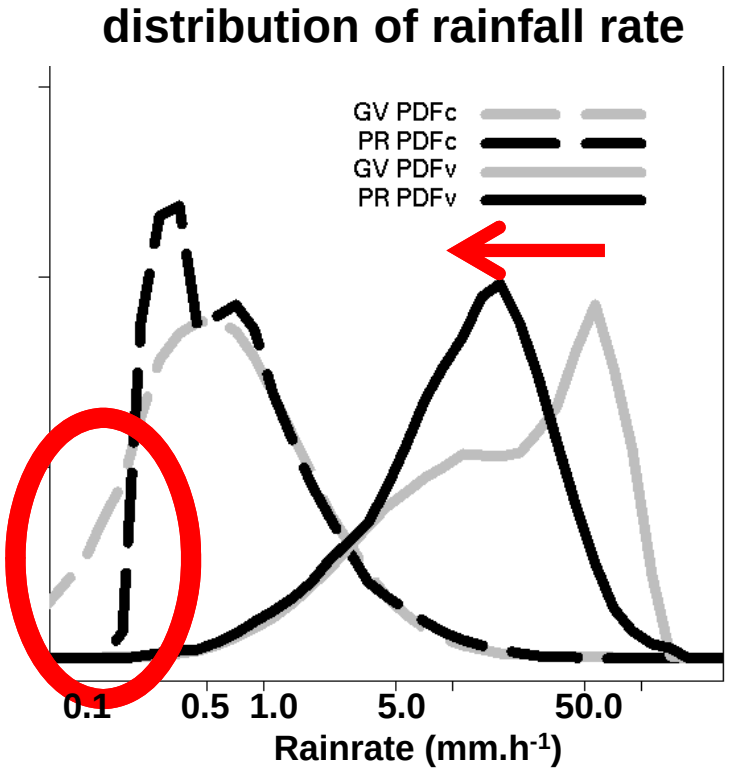
target: characterize the residual QPE error by mean of probability distributions





TRMM-PR evaluation with Q2

probability distribution by occurrence and rain volume



Occurences:

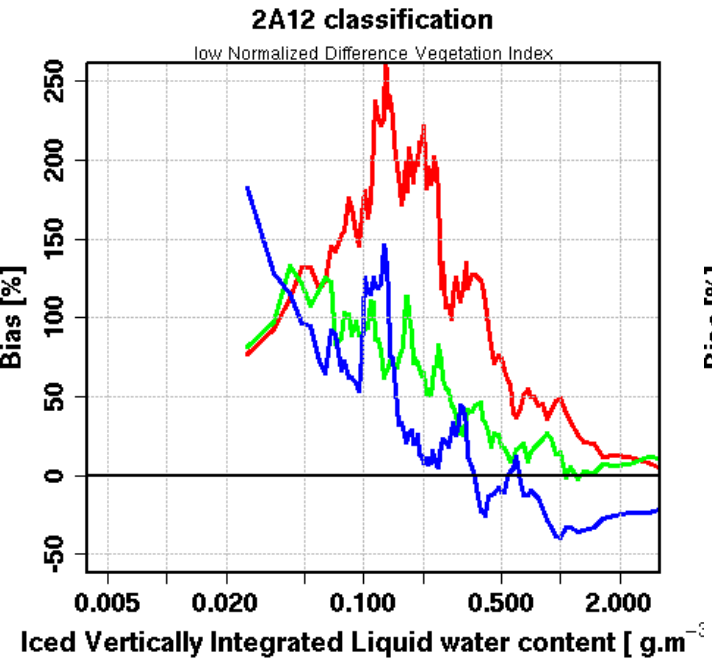
at light rain rates (< 0.3 mm/h) PR has low sensitivity

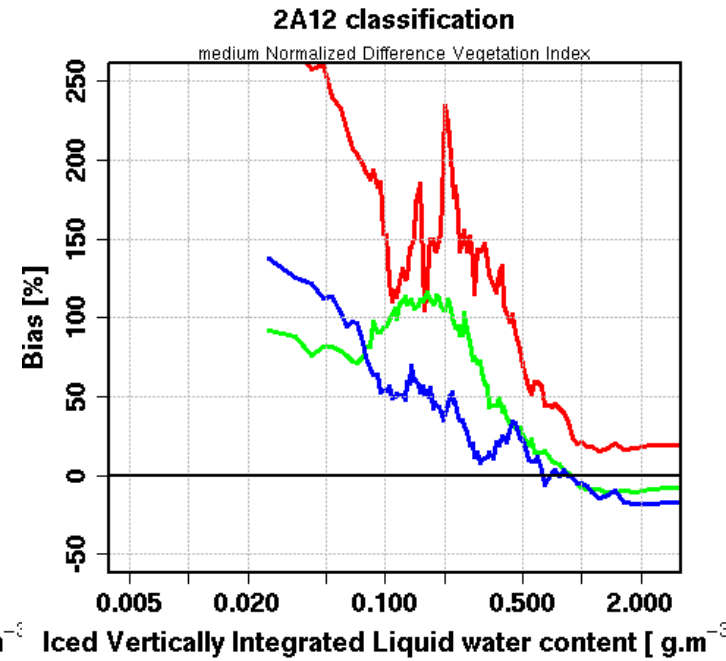
Volume:

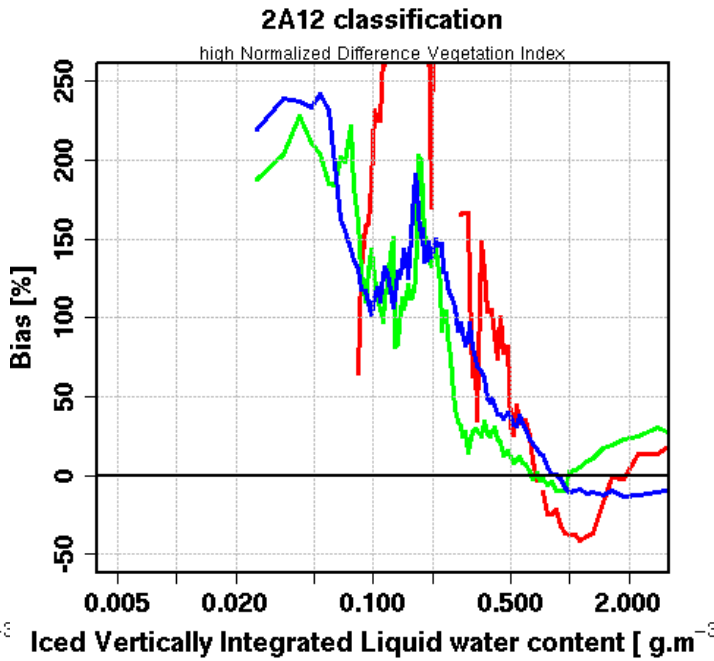
at high rain rates (> 15 mm/h) PR has underestimation issue (attenuation ?)

2A12 quantification: bias

according to different classes of soil wetness and NDVI other cases (general)





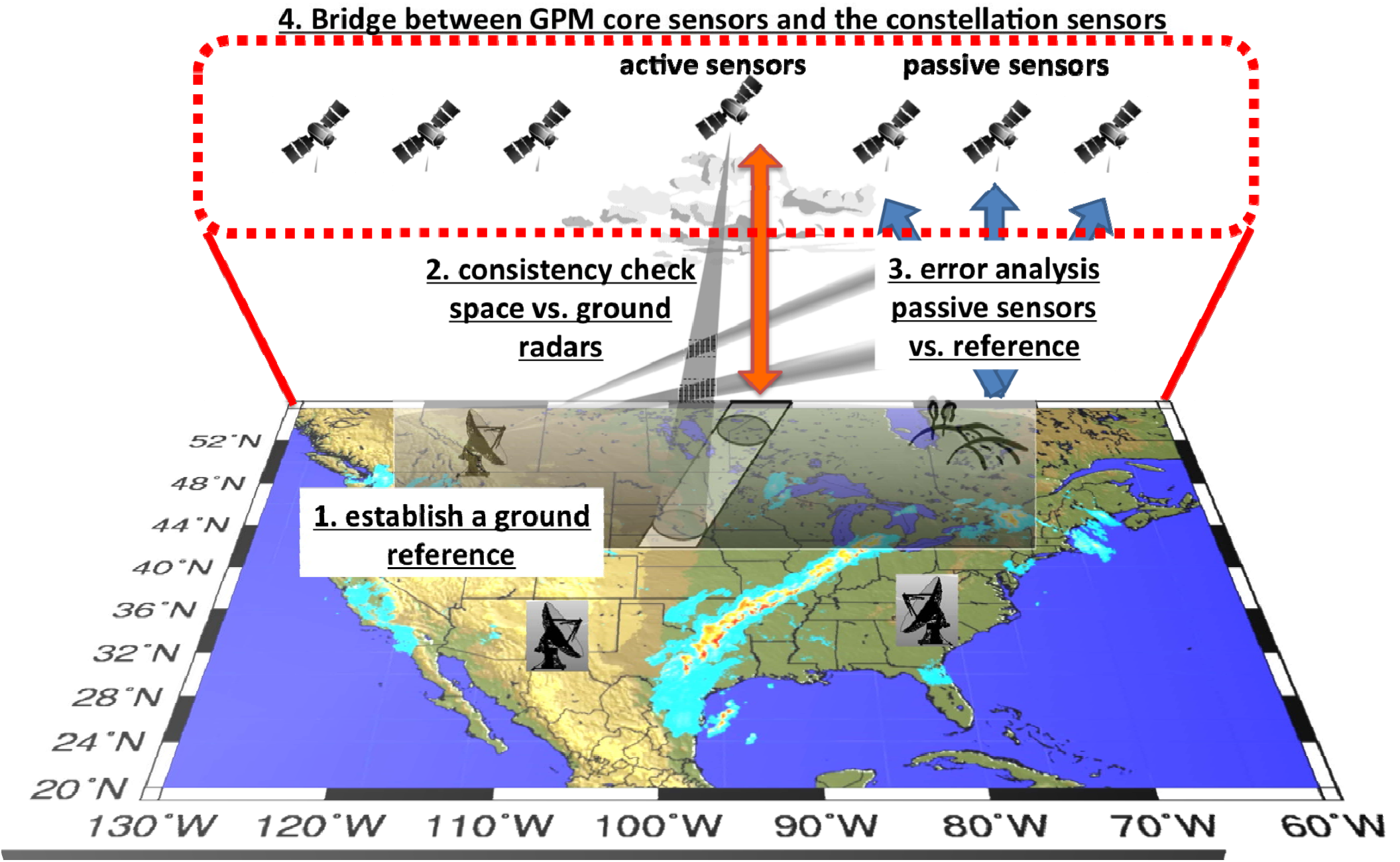


wet

medium soil moisture

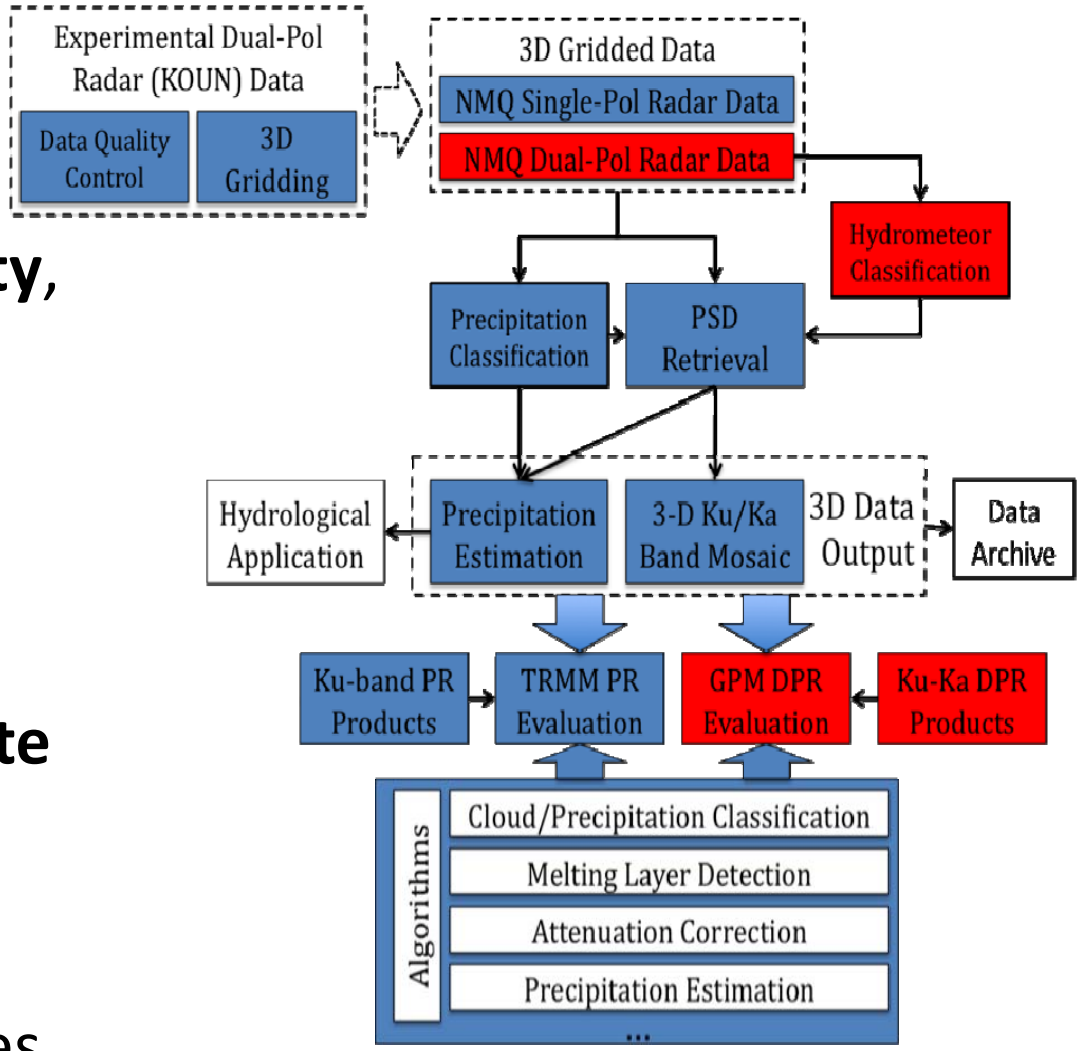
dry

Perspectives:
Global Precipitation Measurement mission



WiMerge: Research and Development of Unified CONUS 3-D Mosaics and QPE products

- The principal objective of the proposed study is to develop merged 3-D mosaics of **reflectivity**, **hydrometeor type**, and **PSD retrievals** over the CONUS by fusing dual-pol radar data from ground and dual-frequency data from space
- Will yield level-II **precipitation rate** and **type** products (1km/5min) using the merged mosaics and further enhanced with passive microwave precipitation estimates



Merging of space and ground radar data relies on the physical consistency through the particle size distribution (PSD) of hydrometeors

Anticipated Outcomes – Avenues for Collaboration

- Combined GPM-NEXRAD Level-II CONUS Mosaics (5 min/1 km)
  - 2D surface precipitation rate
  - 2D surface precipitation type
  - 2D drop size distribution parameters
  - 3D reflectivity
  - 3D hydrometeor classification
- Potential Applications
  - Accurate input for creating Level III products (3B42, CMORPH, MPE, PERSIANN-CCS, HydroEstimator, etc.)
  - Calibration source for NEXRAD algorithms (from DPR)
  - Calibration source for PMW algorithms
  - Quasi-independent validation of GPM algorithms