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

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Perspectives:
Global Precipitation Measurement mission

1. establish a ground reference

2. consistency check space vs. ground radars

3. error analysis passive sensors vs. reference

4. Bridge between GPM core sensors and the constellation sensors

active sensors passive sensors
The Framework background: NMQ-Q2

Q2 provides 3D reflectivity mosaics and QPE products over CONUS at 1-km²/5 min resolution.

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

http://nmq.ou.edu
The Framework
#1: reference rainfall
Application to various products  
TRMM-PR version 6 vs. version 7 
Non Uniform Beam Filling, Rain type classification

Journal of Hydrometeorology. doi:10.1175/JHM-D-12-030.1, in press.
The Framework #3: rainfall detection, classification, quantification

Probability of Detection

- std dev >> mean
- std dev << mean

- Rain fraction (%)
- Relative Non Uniform Beam Filling

product: 2A25 (v7)
period: March-October 2011
sample: 1 600 000
The Framework #3: rainfall detection, classification, quantification

Bias PR vs. reference

std dev >> mean

std dev << mean

product: 2A25 (v7)
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The Framework #3: rainfall detection, classification, quantification

→ error modeling
- analysis of the PR error (systematic and random part)
- residual error: \( \varepsilon(A,t) = R^*(A,t) - \text{Ref}(A,t) \)

**target:** characterize the residual QPE error by mean of probability distributions
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)
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active sensors
passive sensors
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