

# GCOM-W1 AMSR2 Precipitation EDR Update

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STAR JPSS Annual Meeting

# Overview

- Review of NOAA GCOM-W Precipitation EDR
  - GPROF<sub>2010V2</sub>
- Areas for Improvement
  - Precipitation detection over the Western US
  - SST Product Dependence
- Evaluation of GPROF<sub>2017</sub>

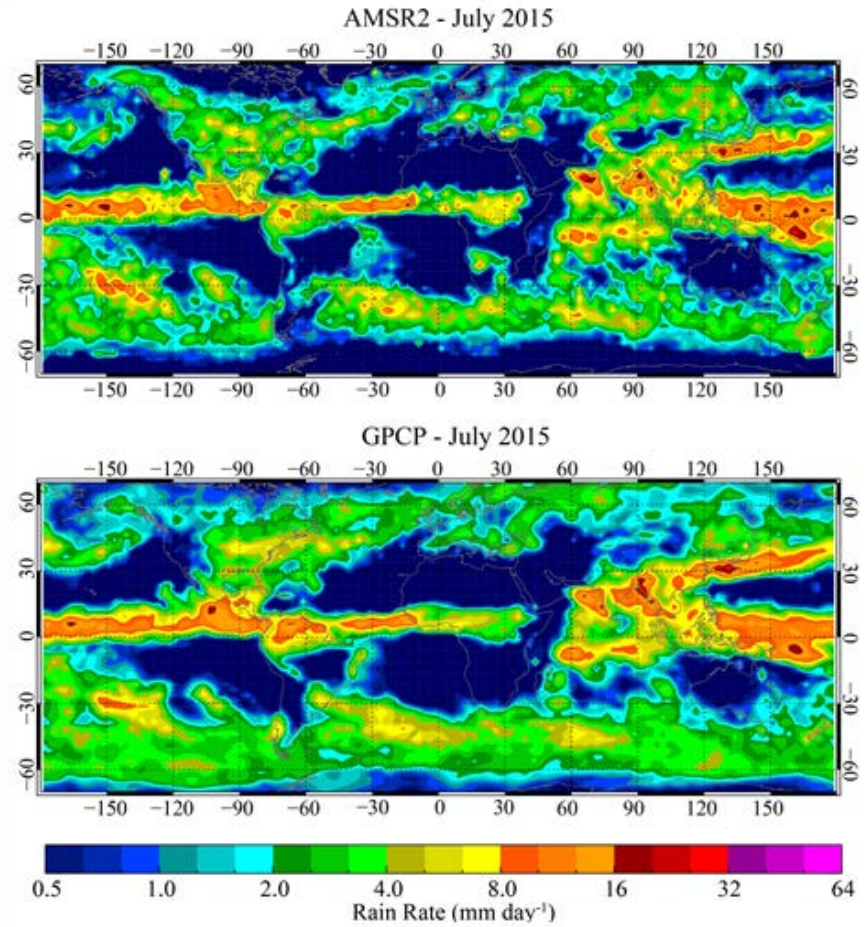
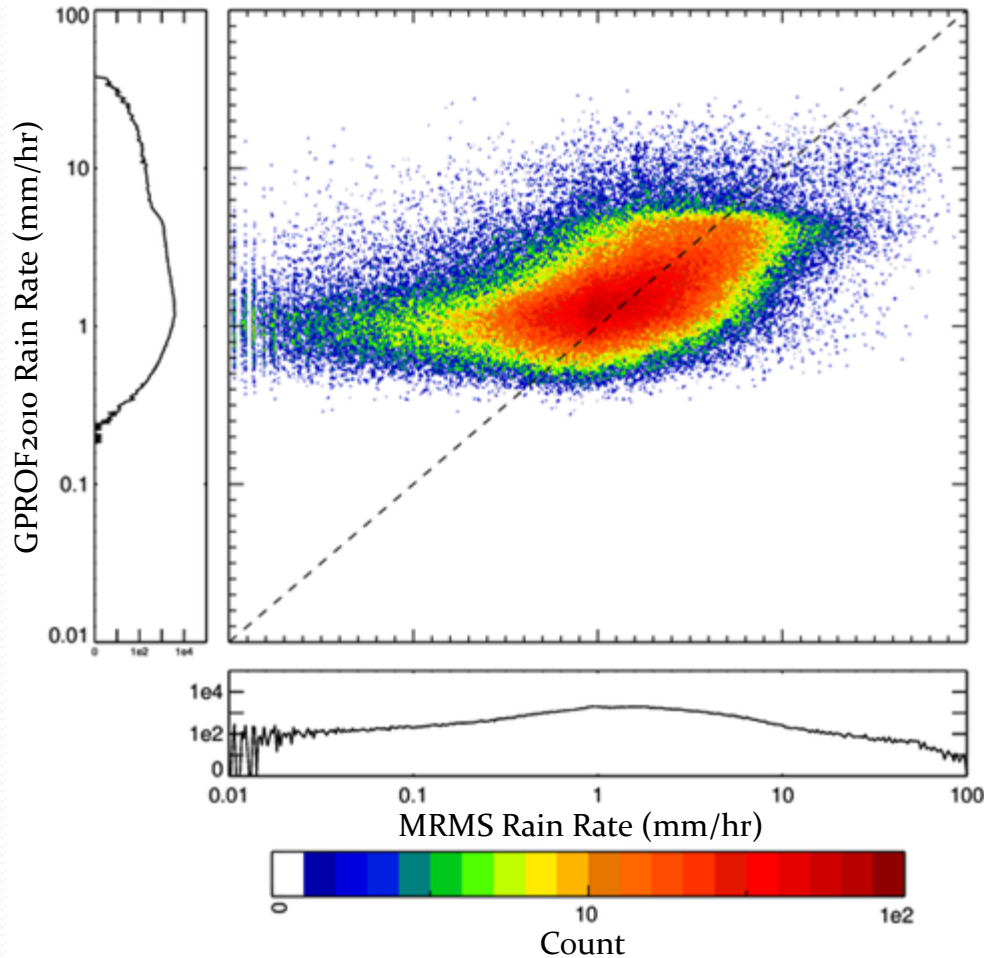
# Program Requirements

## JPSS Requirements - GCOM Precipitation Type/Rate

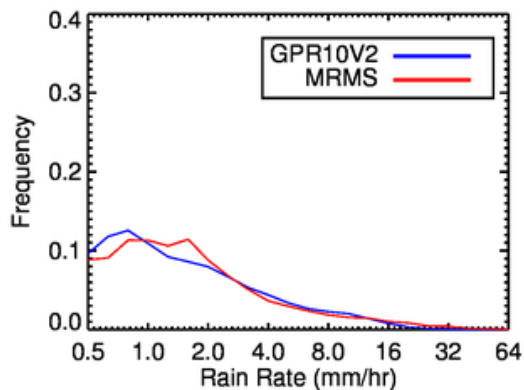
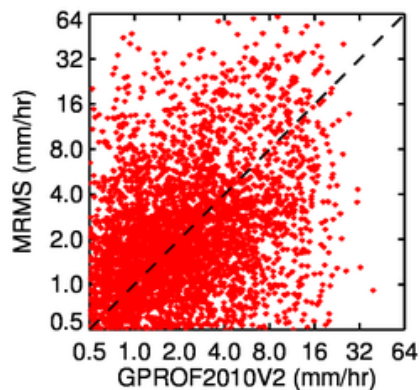
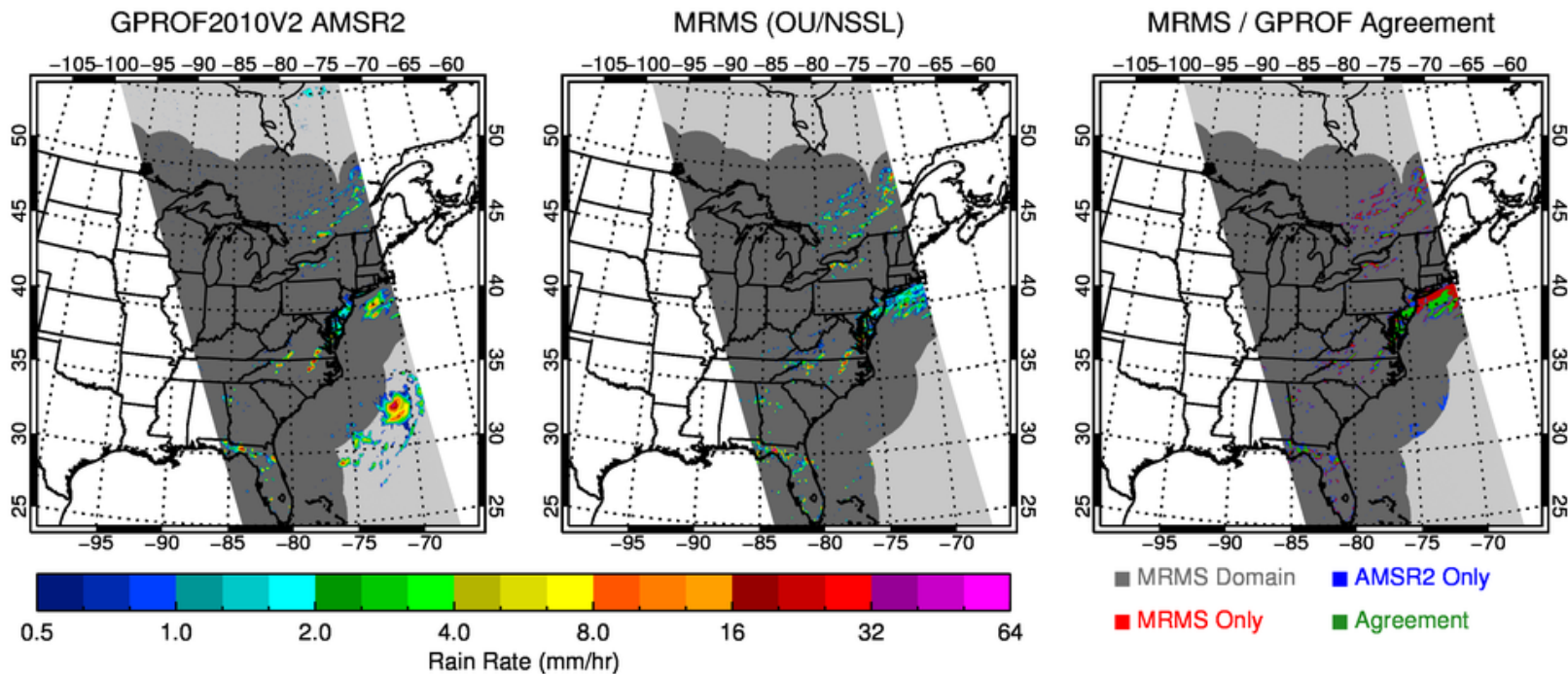
EDR Attribute	Threshold	AMSR <sub>2</sub> EDR
Applicable conditions		Delivered under "all weather" conditions
Horizontal cell size	5 km land (89 GHz FOV); 10 km ocean (37 GHz FOV size); 5-10 km sampling	5.0 km (land); 10 km (ocean)
Mapping uncertainty, 3 sigma	< 5 km	~2.5 km
Measurement range	0 – 50 mm/hr	0 – 75 mm/hr
Measurement precision	0.05 mm/hr	0.01 mm/hr
Measurement uncertainty	2 mm/hr over ocean; 5 mm/hr over land	1.3 mm/hr (ocean) 3.6 mm/hr (land)
Refresh	At least 90% coverage of the globe about every 20 hours (monthly average)	91% every 20 h
Precipitation type	Stratiform or convective	Convective rain rate
Latency	25 minutes	8 min

# Validation

GCOM-W/AMSR<sub>2</sub> vs. MRMS Rain Rates



# Routine Monitoring

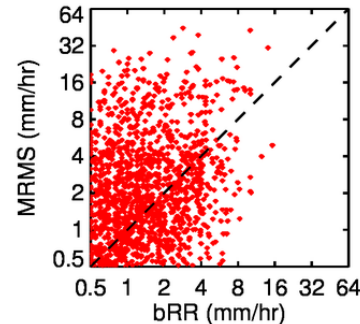
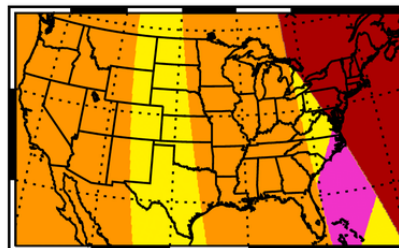
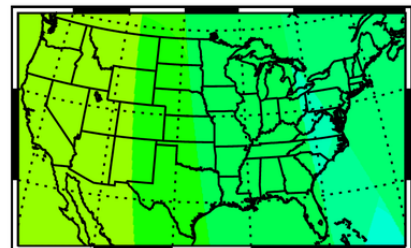
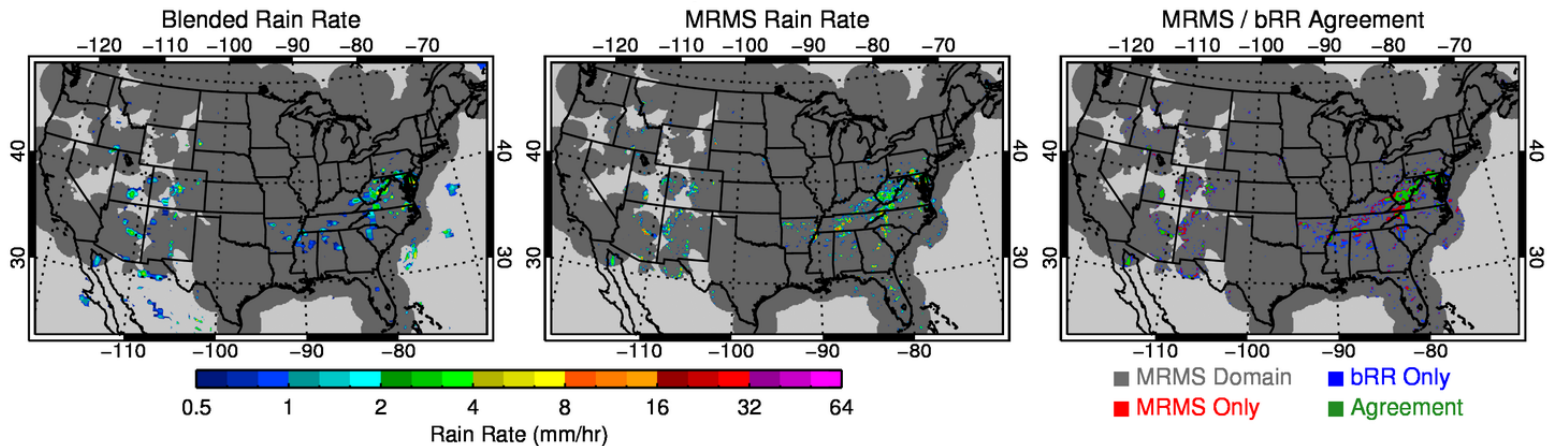


## Reference Statistics

RMSD : 6.04 mm/hr  
 r : 0.30  
 POD : 52.7%  
 FAR : 23.7%

# Applications

- bRR (Blended Rain Rate; below)
- eTRaP [Ensemble Tropical Rainfall Potential]
- Direct Broadcast



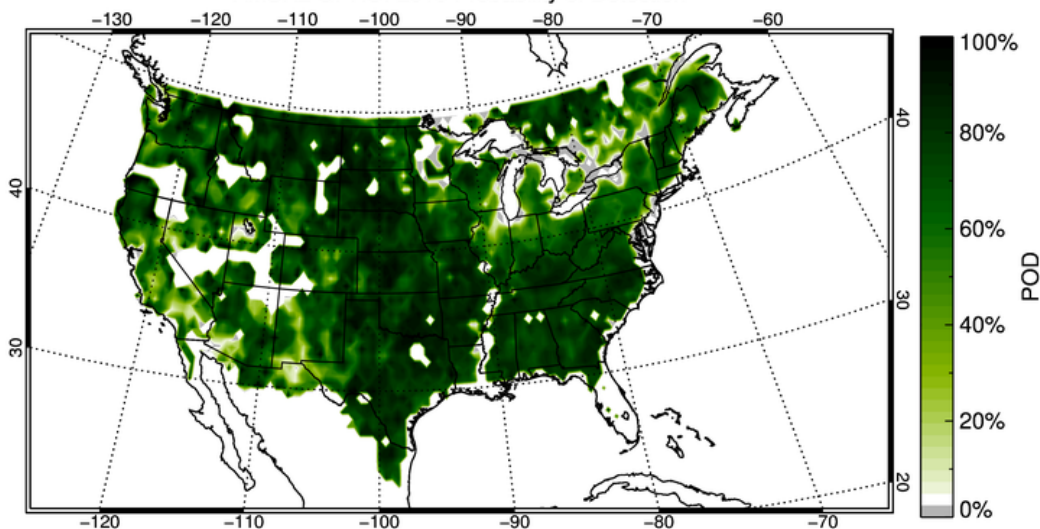
**Reference Statistics**

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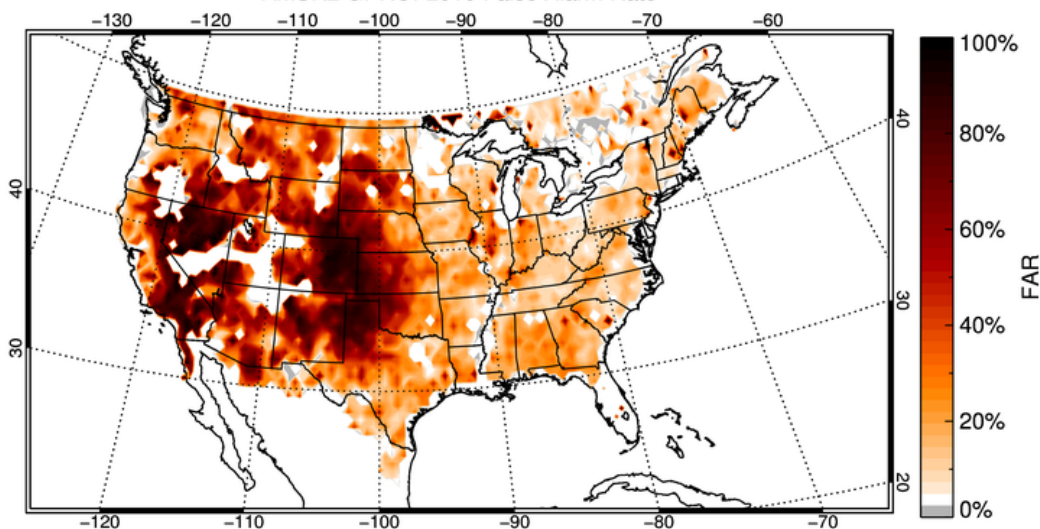
RMSD : 4.70 mm/hr  
 r : 0.21  
 POD : 60.0%  
 FAR : 33.9%

# Detection Limitations

AMSR2 GPROF2010 Probability of Detection

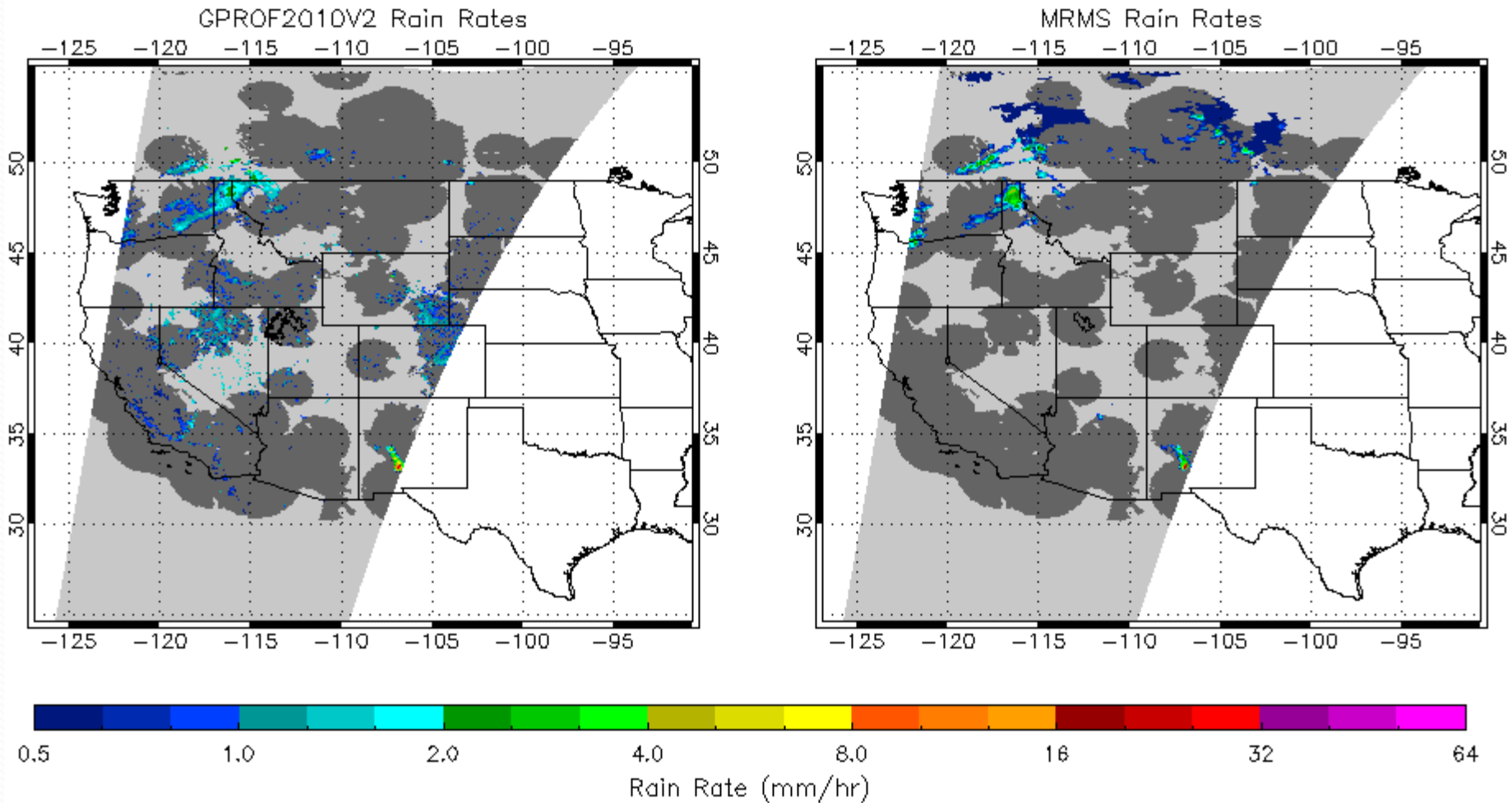


AMSR2 GPROF2010 False Alarm Rate



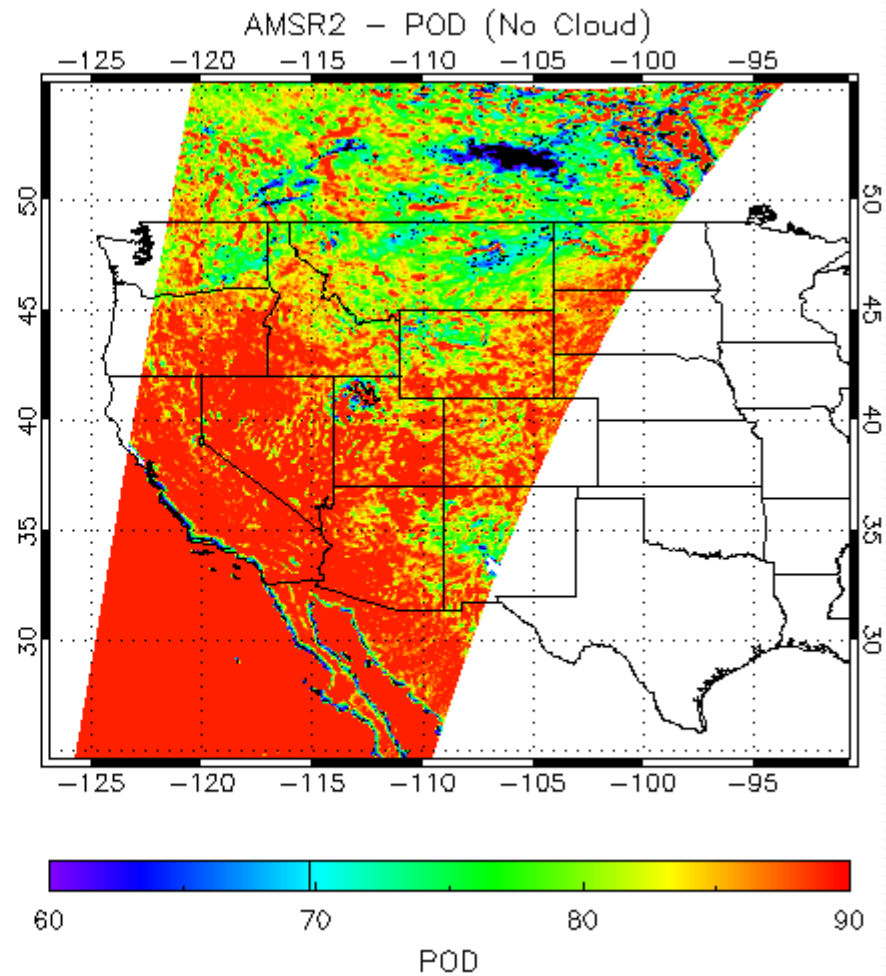
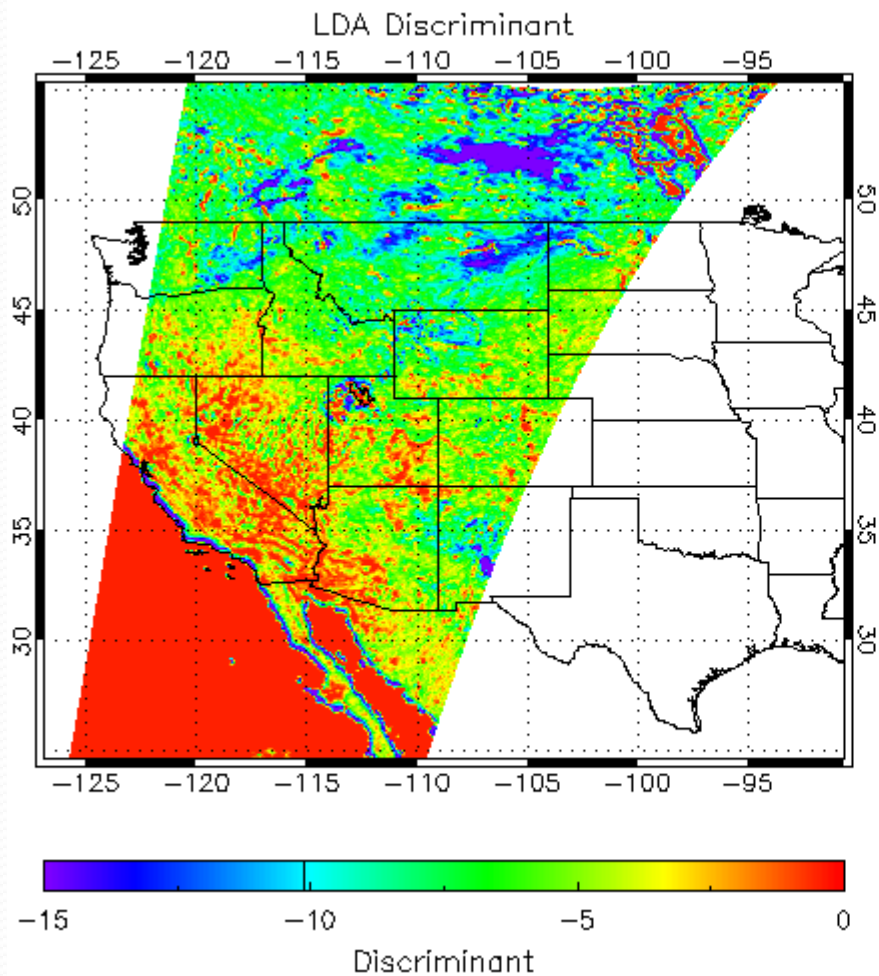
- False detection of precipitation based on Scattering Index and Tb thresholds
- Apply Turk (2016) cloud-free detection algorithm
- Use last IMS snow analysis for screening

# Nighttime False Alarms

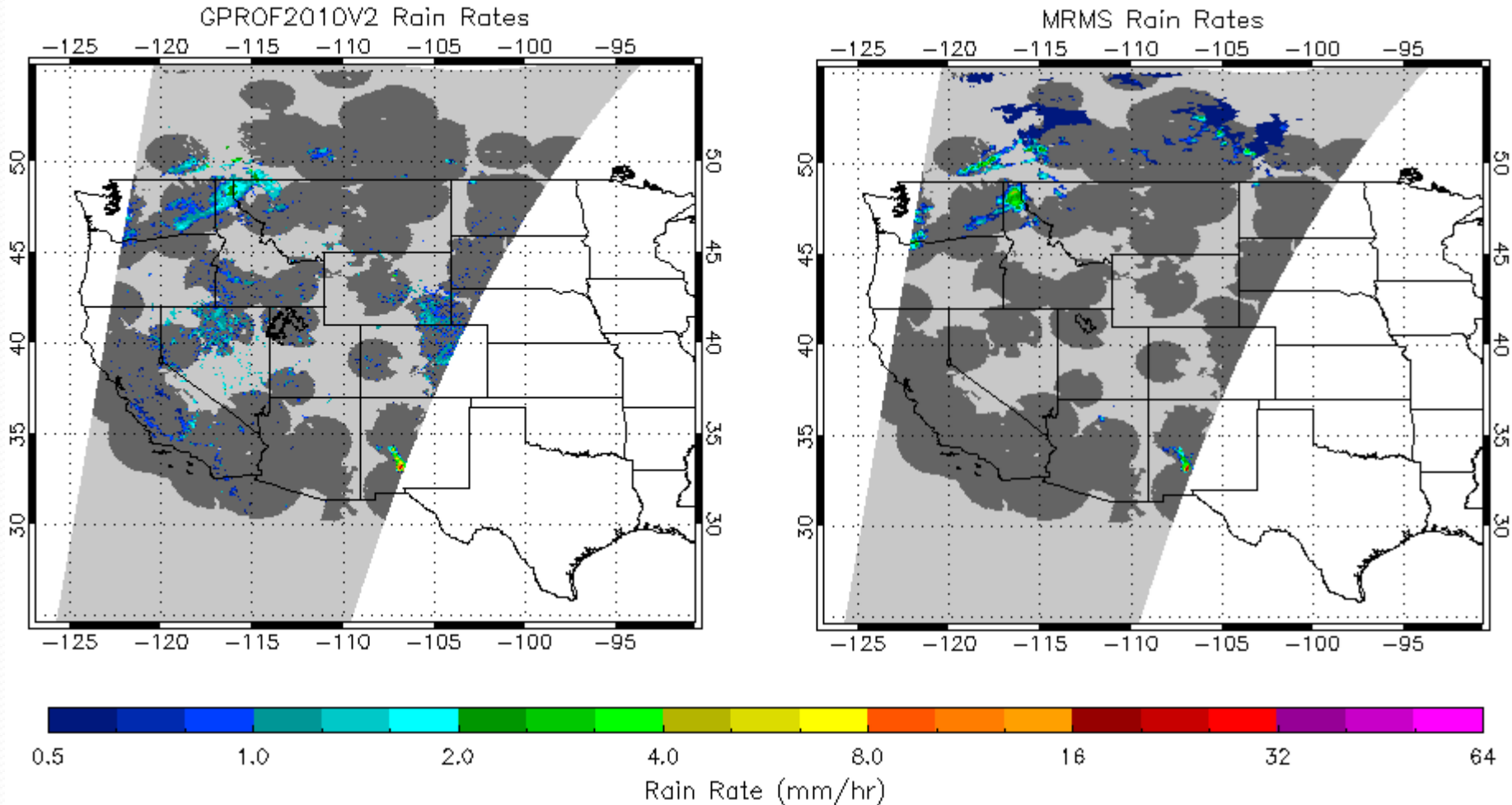




# Linear Discriminant Analysis for Cloud-Free Scenes



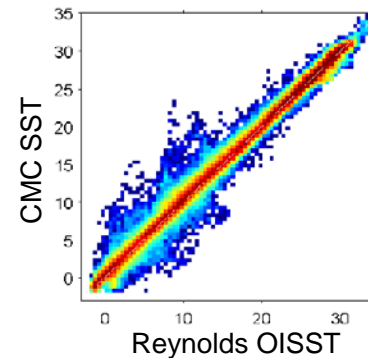
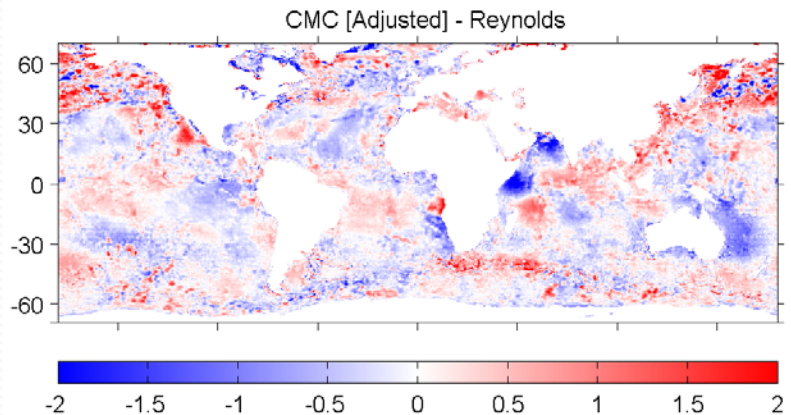
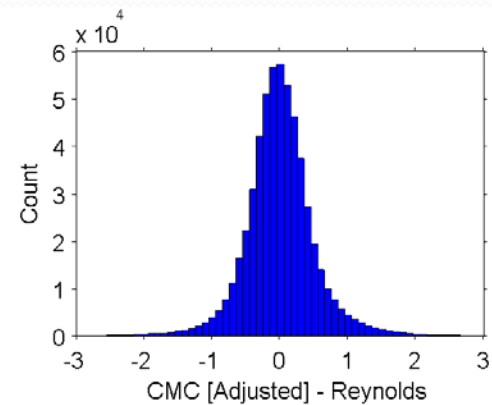
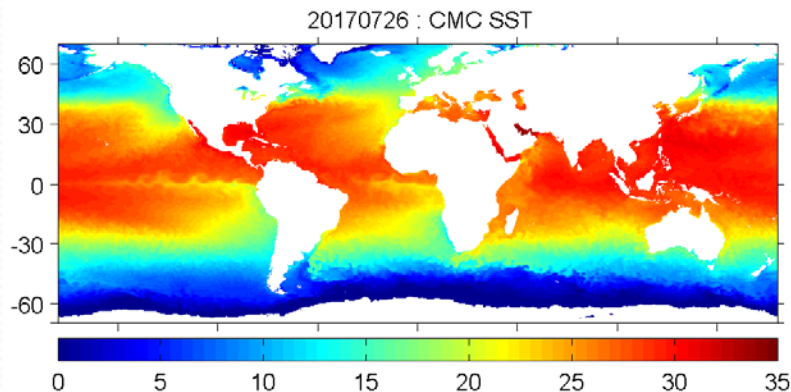
# FAR Reduction



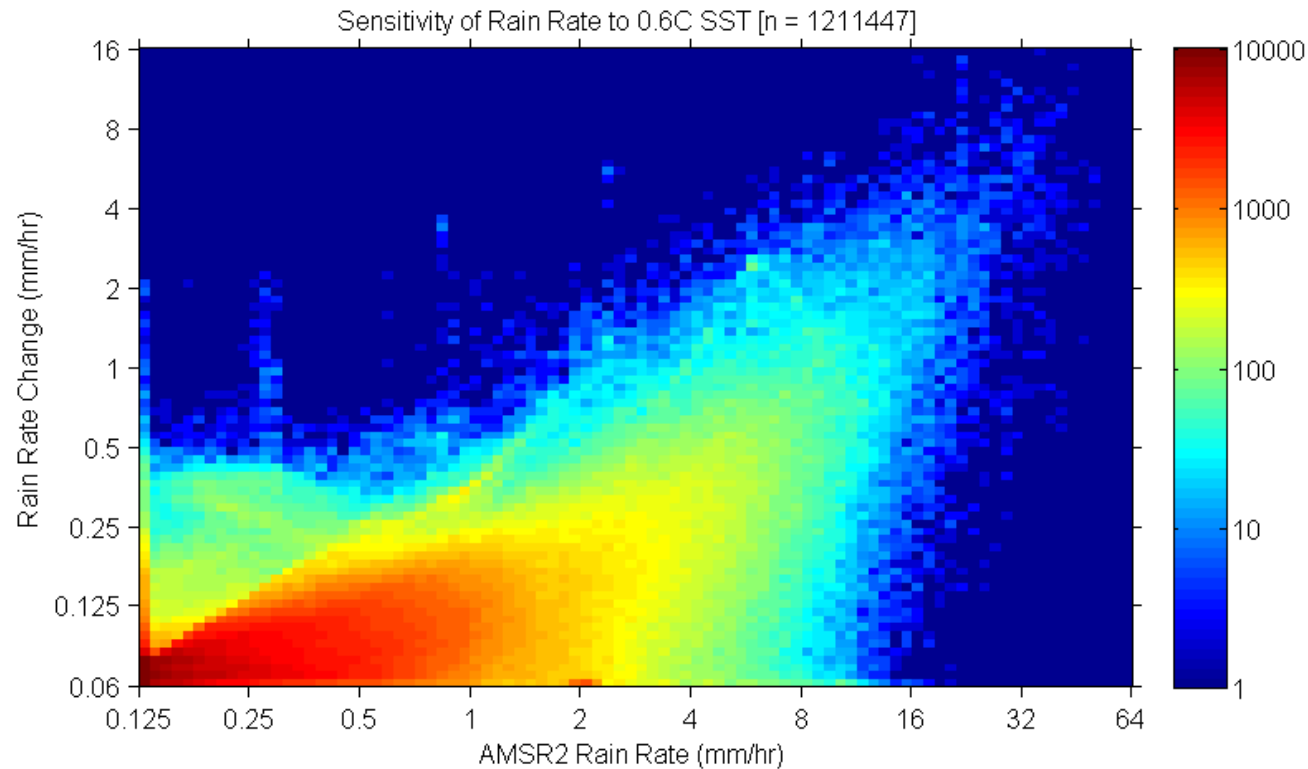
Fall-Spring:	POD	FAR	CSI	HSS
Original :	0.644735	0.535026	0.370140	0.515073
Filtered :	0.593108	0.318920	0.464190	0.618437

# SST Product Reliability

- Currently using non-operational Reynolds  $\frac{1}{4}^\circ$  OISST
  - JPSS-RR suggests evaluating CMC SST



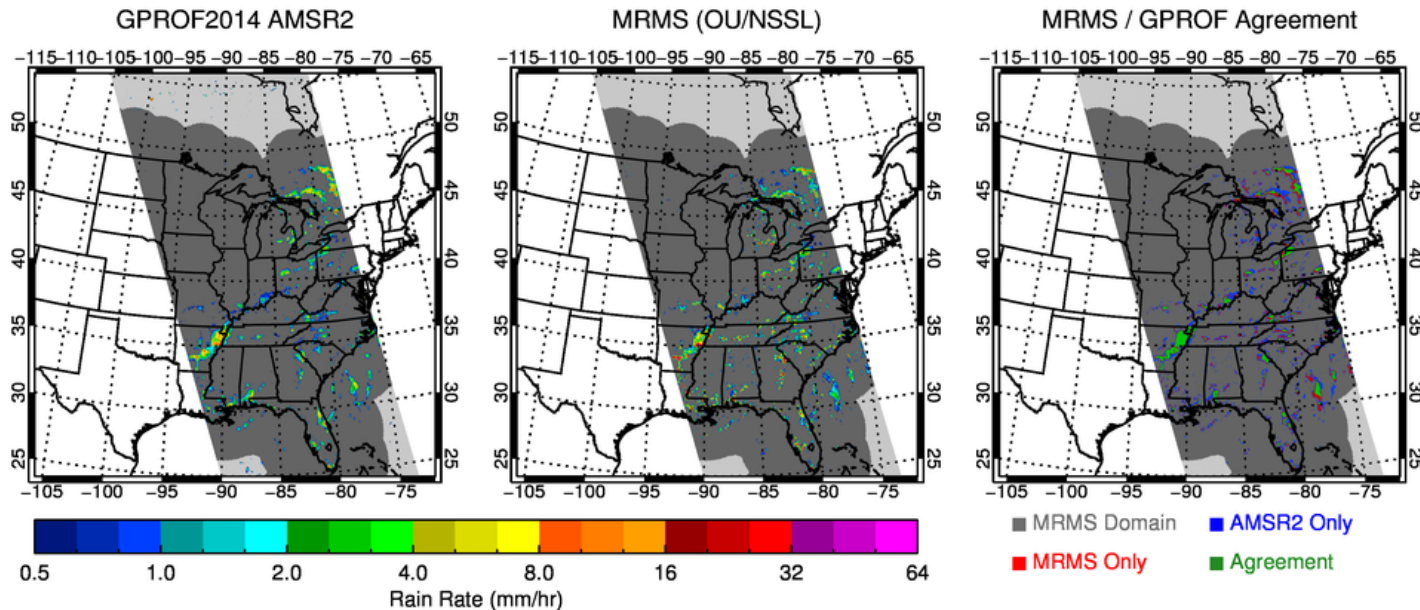
# SST Product Sensitivity



- Would require validation with respect to requirements
- May require recalculation of a priori database

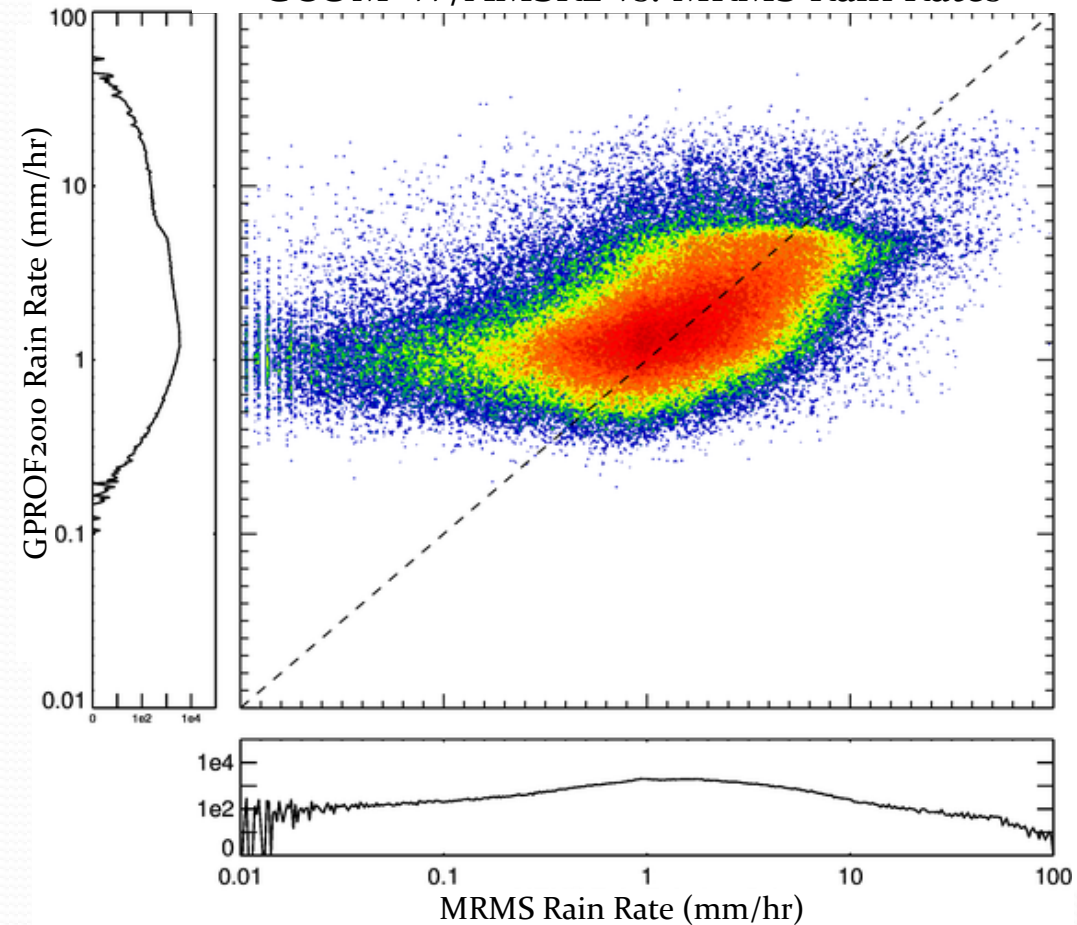
# Evaluation of GPROF2017

- Collaboration with NASA/GPM
- Fully Bayesian retrieval
  - Separated by surface type, TPW, and near surface temp
- Trained with Dual-frequency Precipitation Radar

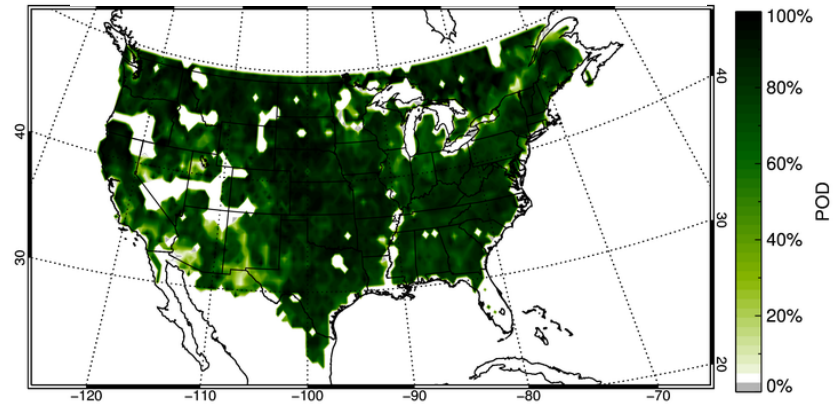


# GPROF2010v3

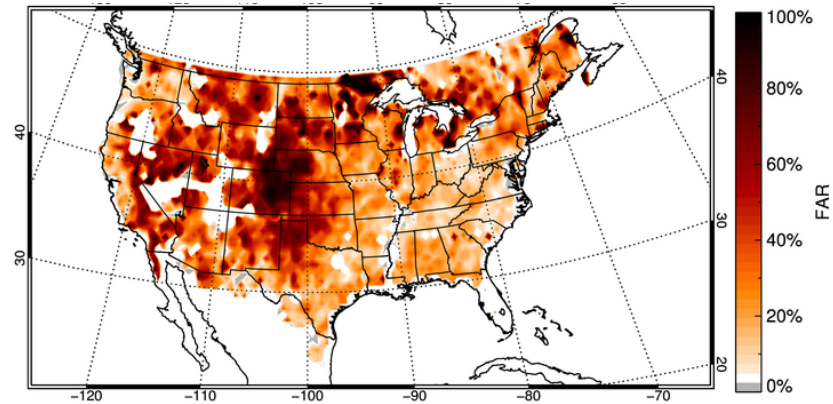
## GCOM-W/AMSR2 vs. MRMS Rain Rates



## POD

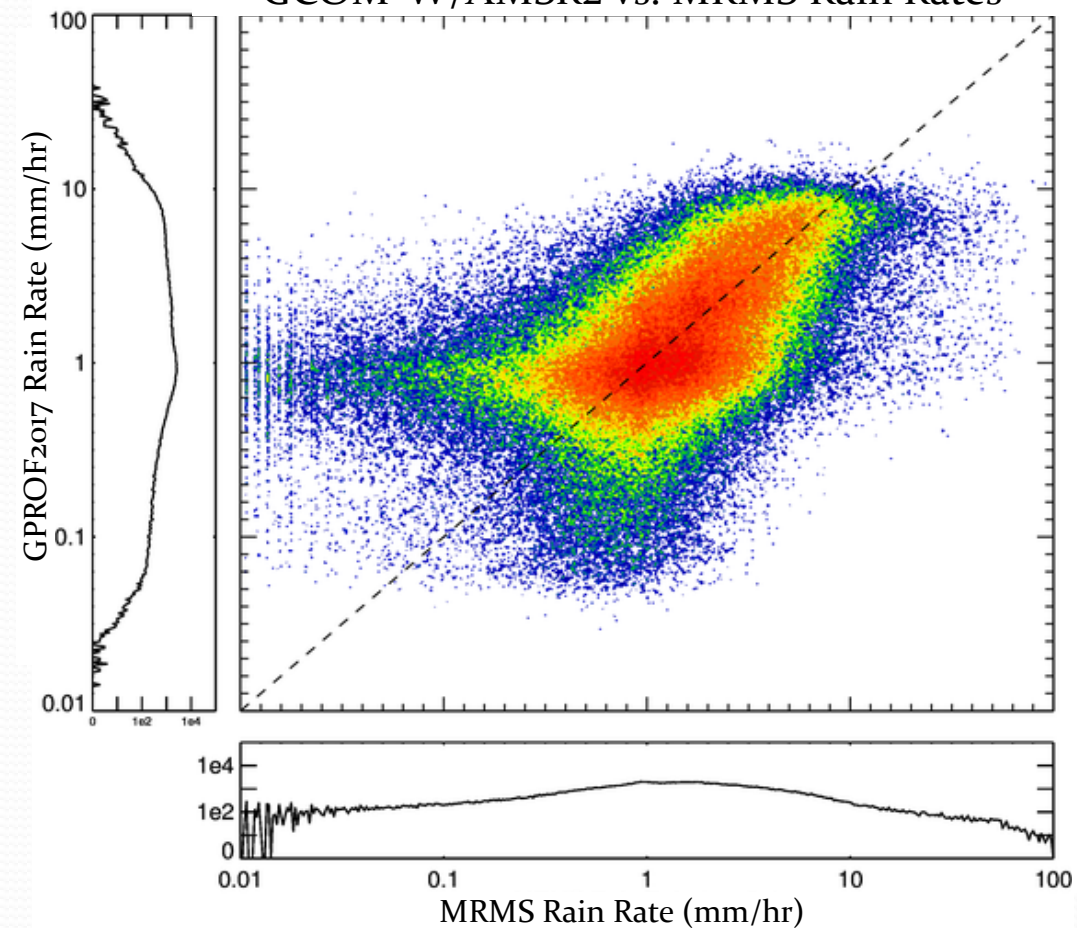


## FAR

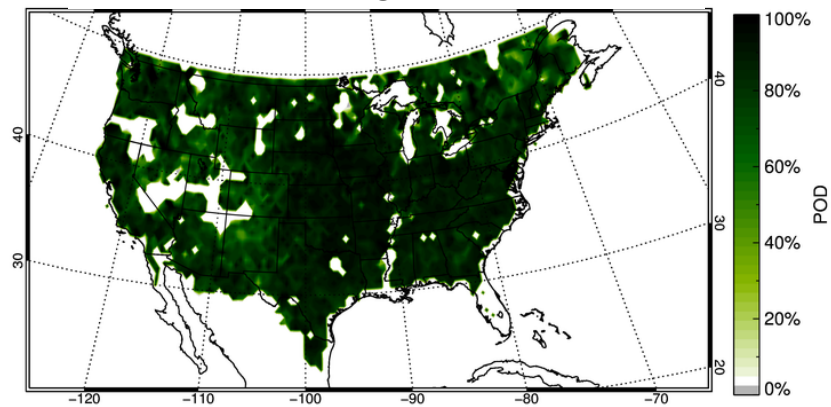


# GPROF2017

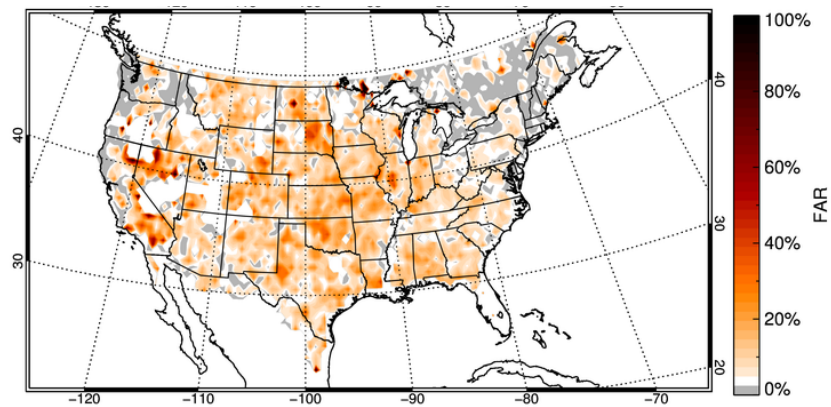
## GCOM-W/AMSR2 vs. MRMS Rain Rates



## POD



## FAR



# Notes on GPROF2017

- Ongoing work to improve Conv/Strat using environmental conditions [Veljko Petkovic]
- Need to evaluate ancillary products for potential transition into STAR operational framework

Algorithm	POD	FAR	CSI
GPROF <sub>2010V3</sub>	0.83	0.37	0.55
GPROF <sub>2017</sub>	0.86	0.10	0.78



# Summary & Paths Forward

- Modifications of AMSR2 precipitation algorithm reduce false alarms and improve performance metrics
- Implementation and reprocessing of updated GPROF2010 algorithm
- Suitability testing of GPROF2017 for NOAA operations
- Leveraging more ancillary data
  - GOES-16 ABI & GLM
  - Environmental information