

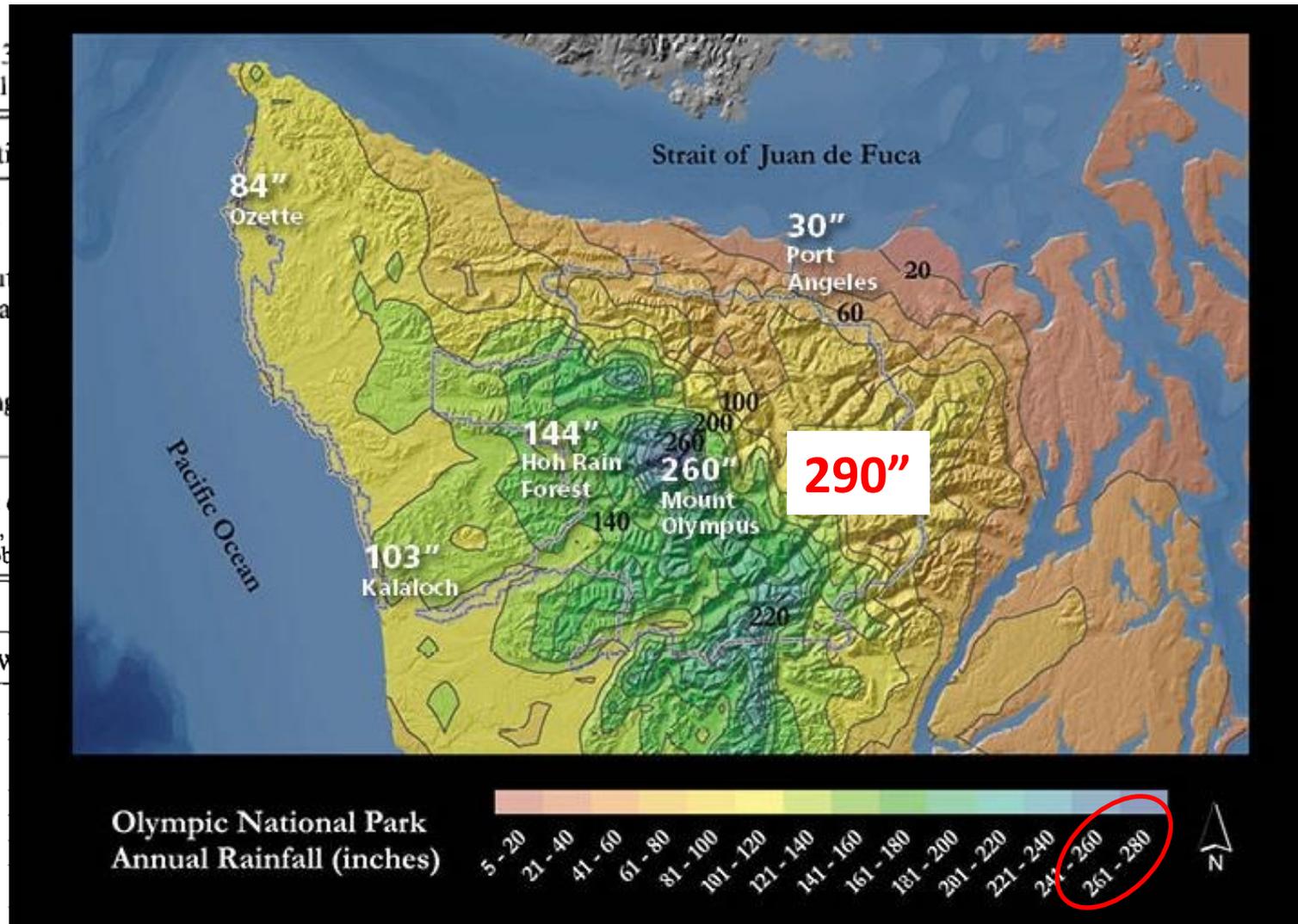
A Framework for Systematic Assimilation of GPM DPR Observations to Improve Orographic QPE

TABLE 3
years 1

Station
Clallam
Elwha
Lake Su
Neah Ba
Sappho
Sequim
Port An
Forks

TABLE 4
Quinault,
served)/ob

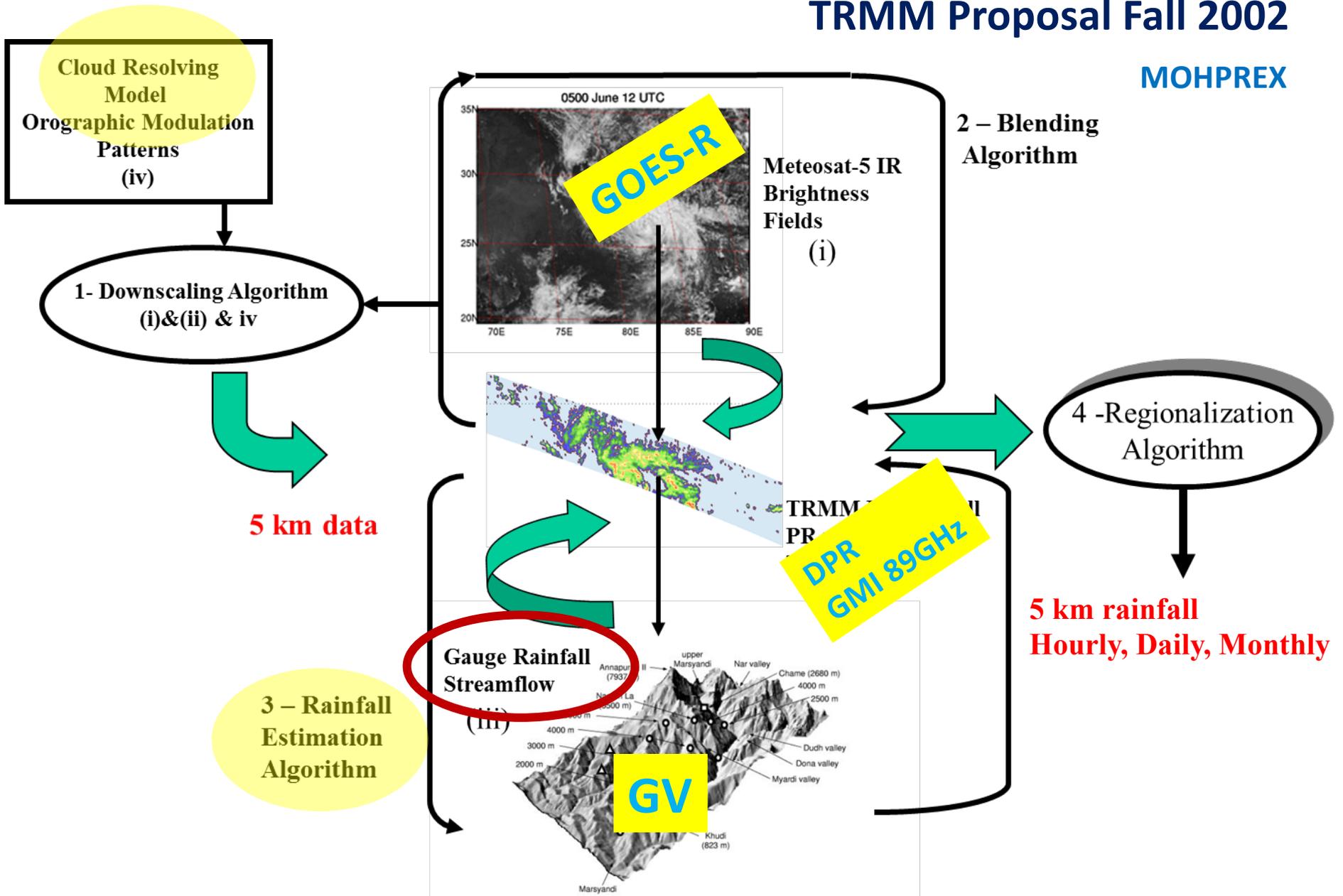
1967
1968
1969
1970
1971
1972
1973
Mean



Barros & Lettenmaier, IAHS, 127, 1993

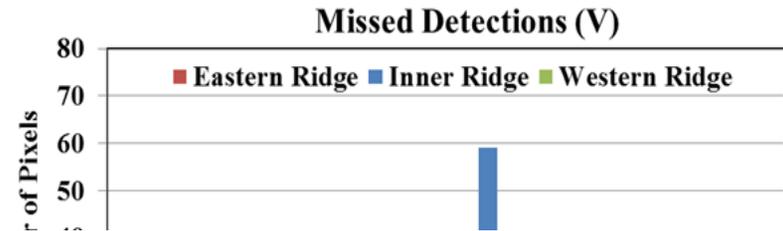
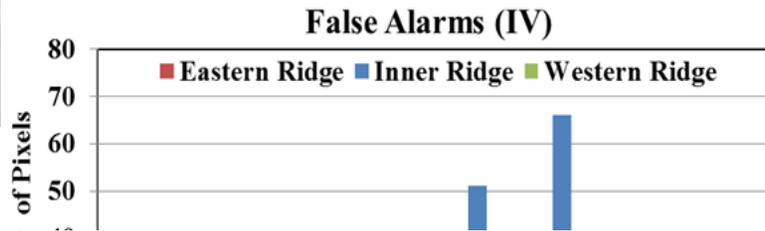
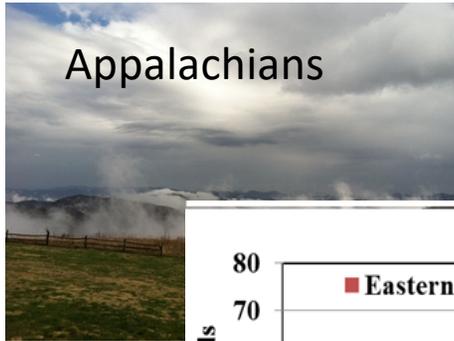
TRMM Proposal Fall 2002

MOHPREX

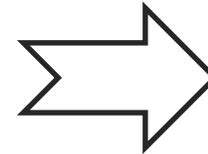


Appalachians

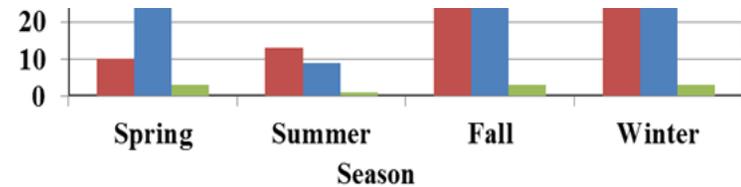
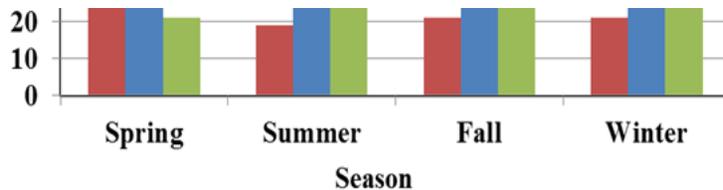
TRMM Error Climatology



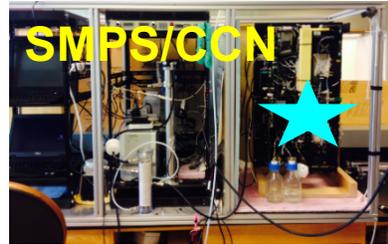
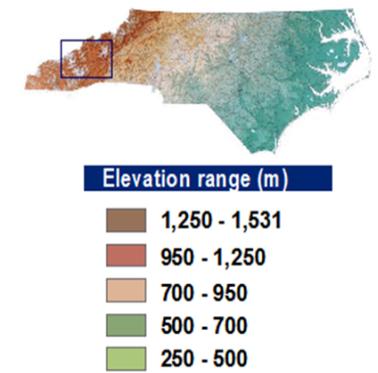
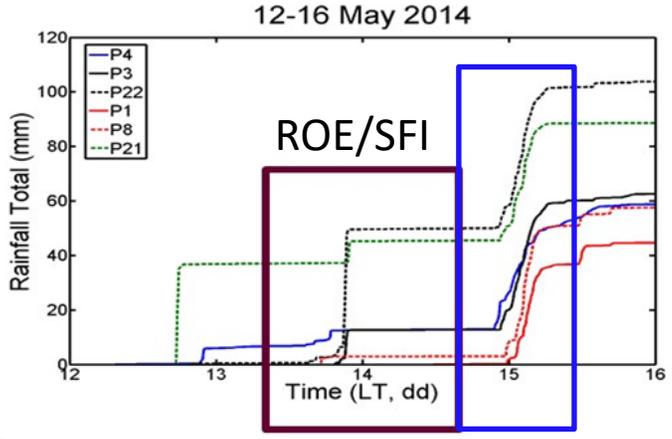
Seasonality
Diurnal Cycle
Spatial Organization



Processes



IPHEX Campaign 2014



Markus Petters (NCSU)



- Aerosol-cloud-precipitation interactions
- Operational hydrology

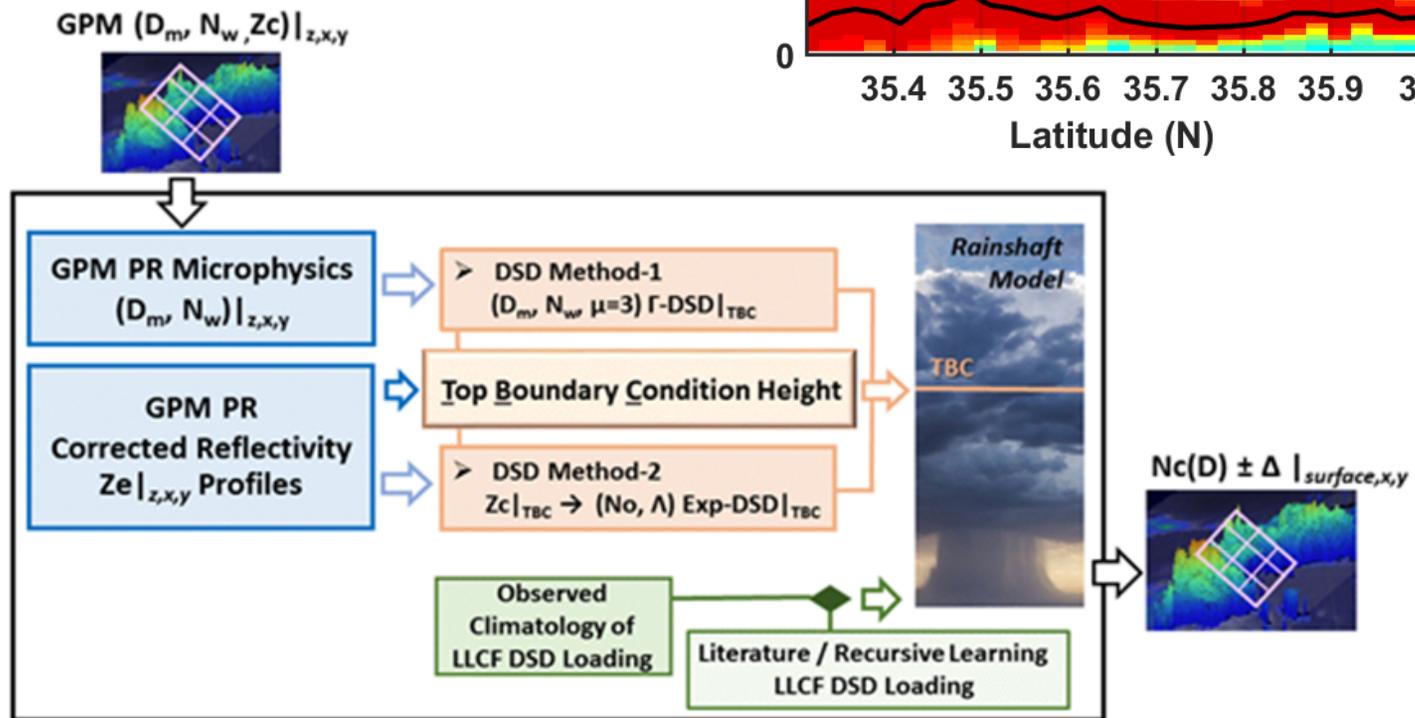
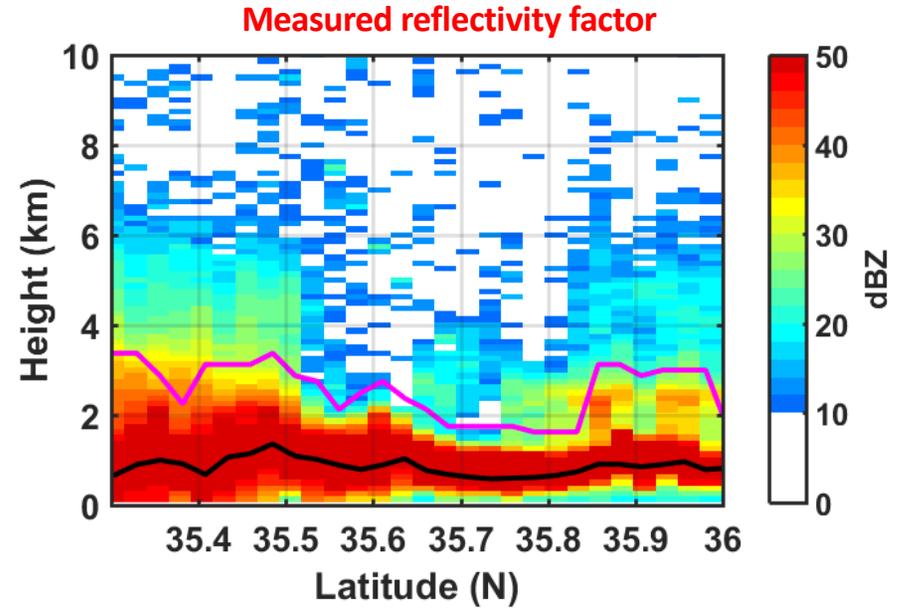
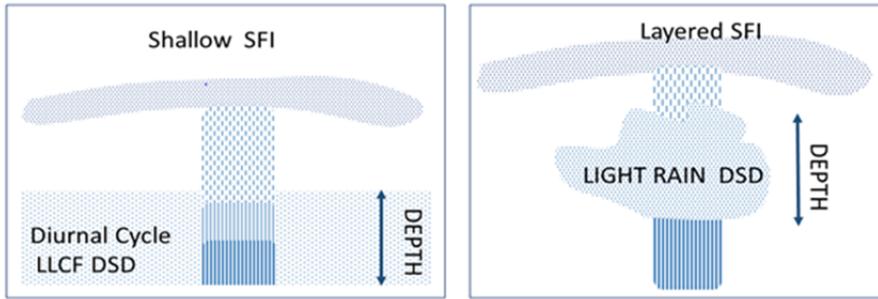


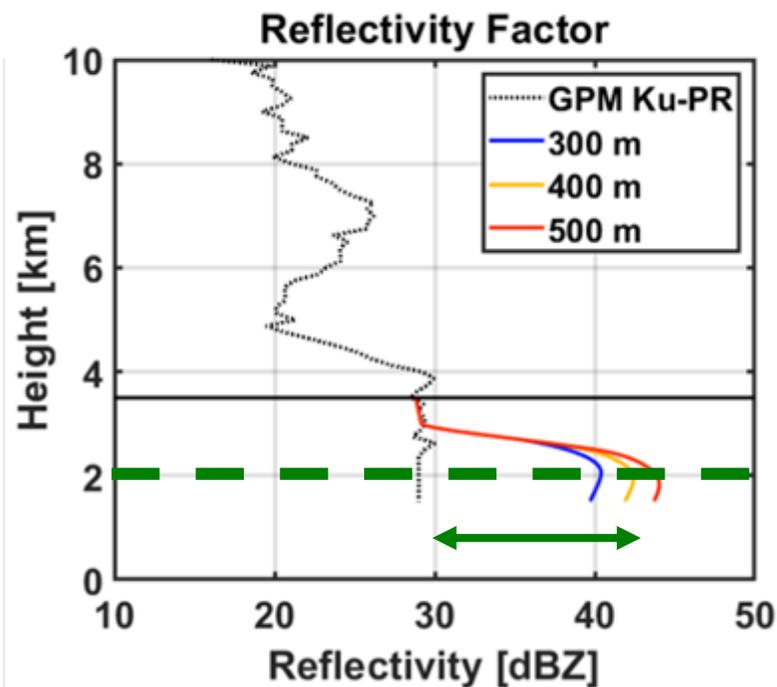
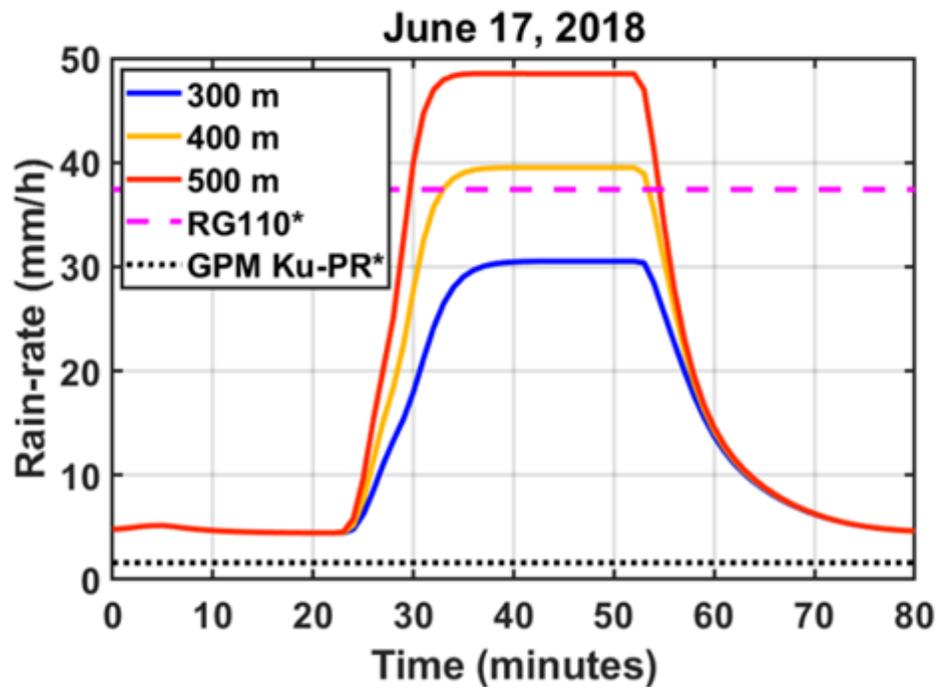
(ARM DOE)



Low Level Rainfall

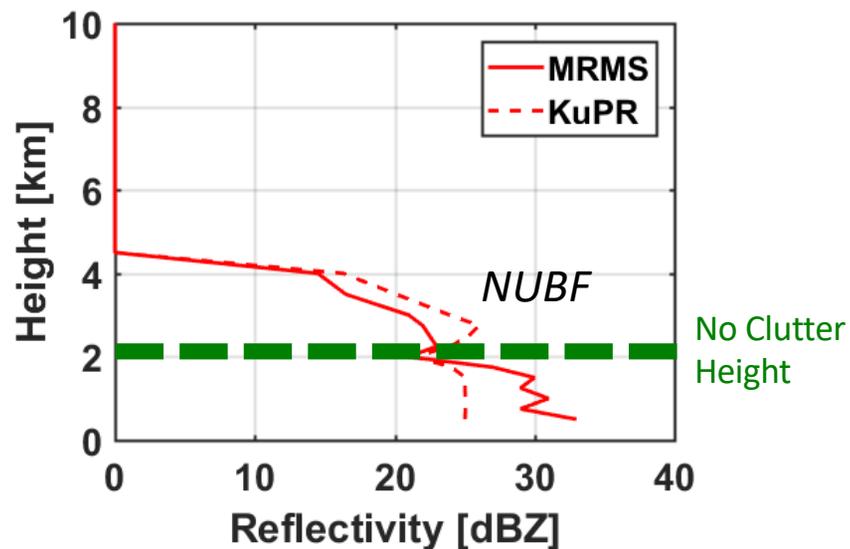
“Physically-Based Retrieval



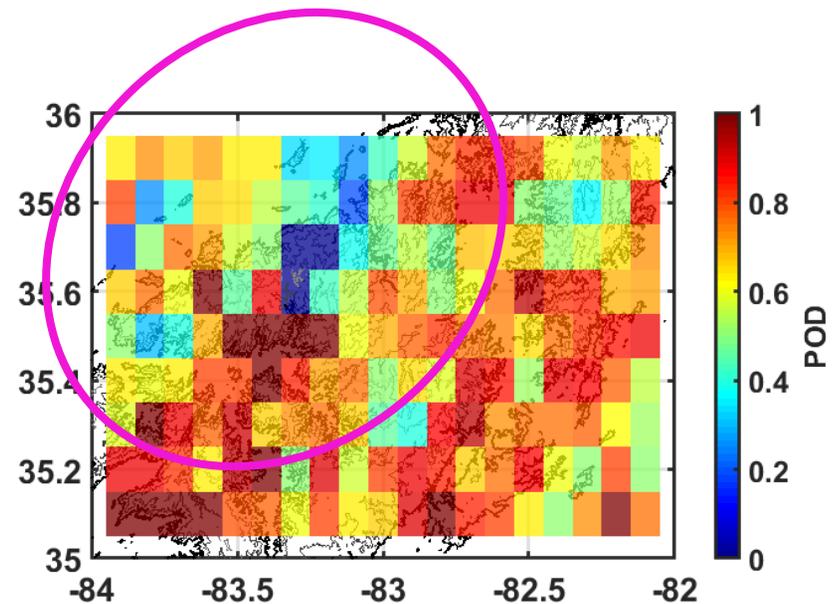


Next

- Map Ku-PR to MRMS toward inferring objective constrains for model configuration

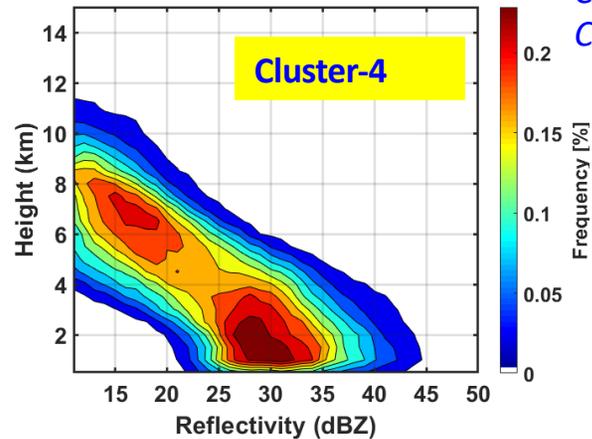
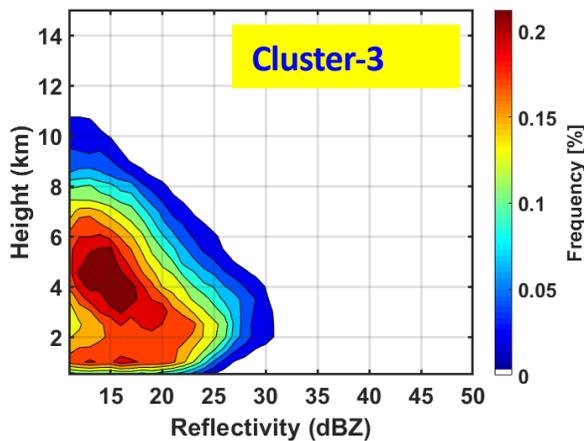
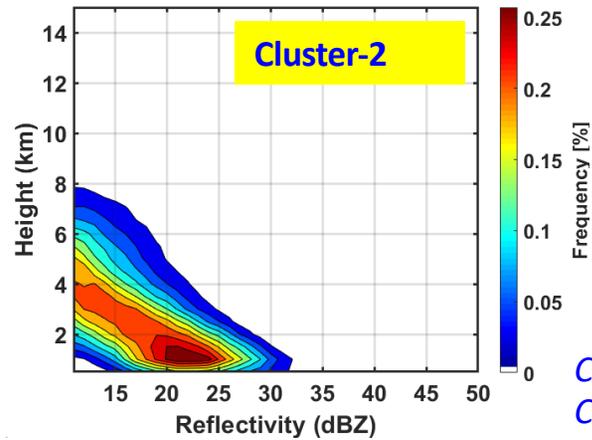
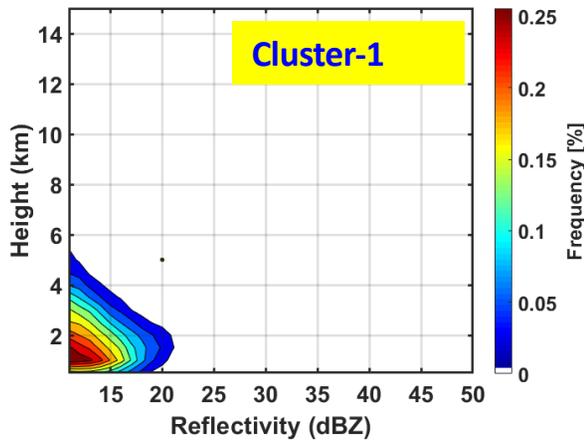


	MRMS \neq 0	MRMS = 0
Ku-PR \neq 0	YY 1972 (7.0%)	FA 779 (2.8%)
Ku-PR = 0	MD 917 (3.3%)	NN 24,438 (86.9%)



Radar Observing Geometry Convolved with Regional Weather

Clustering of MRMS “Rainy” Reflectivity Profiles

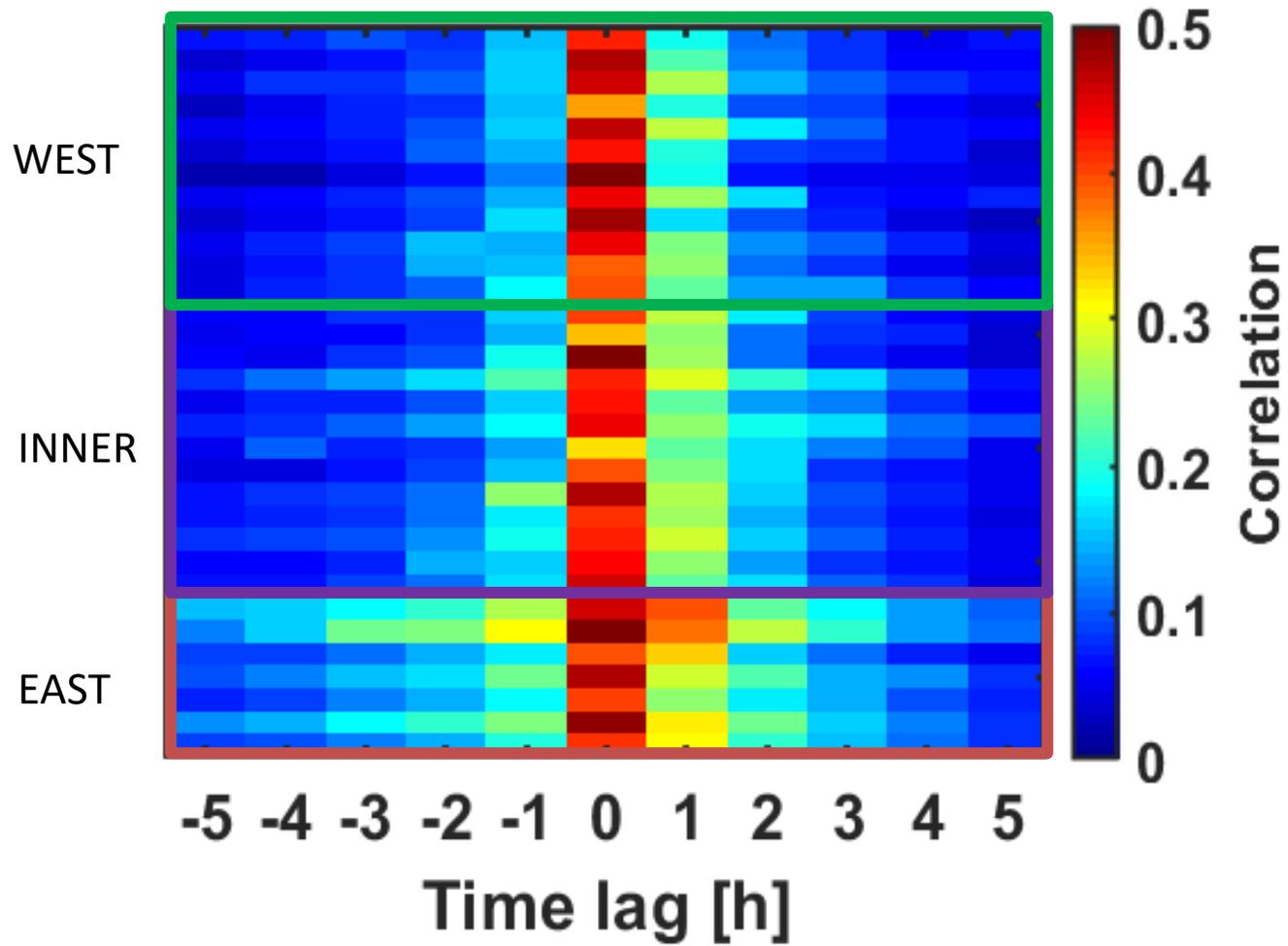


- Cluster 1 – Low level light precipitation (78% MD)*
- Cluster 2 – Low-level enhanced system (26% MD)*
- Cluster 3 – Bright-band profiles (16% MD)*
- Cluster 4 – Deep and Heavy (1% MD)*

For global applications, do models capture this behavior?

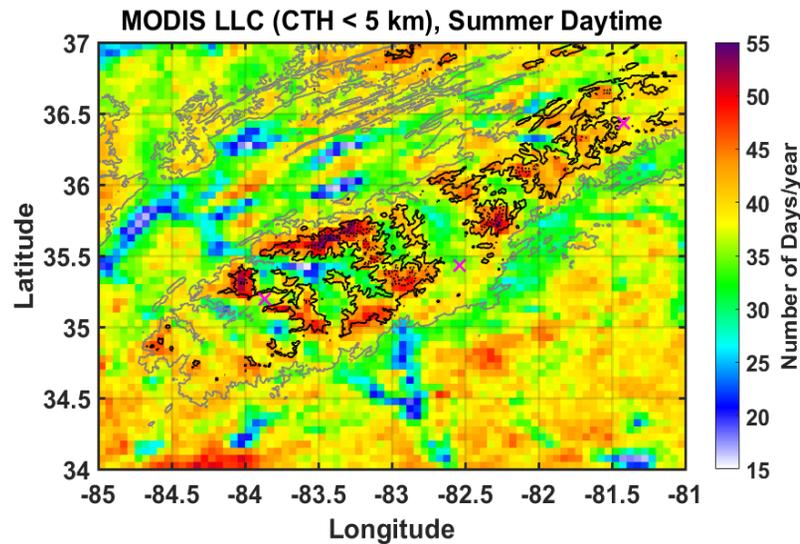
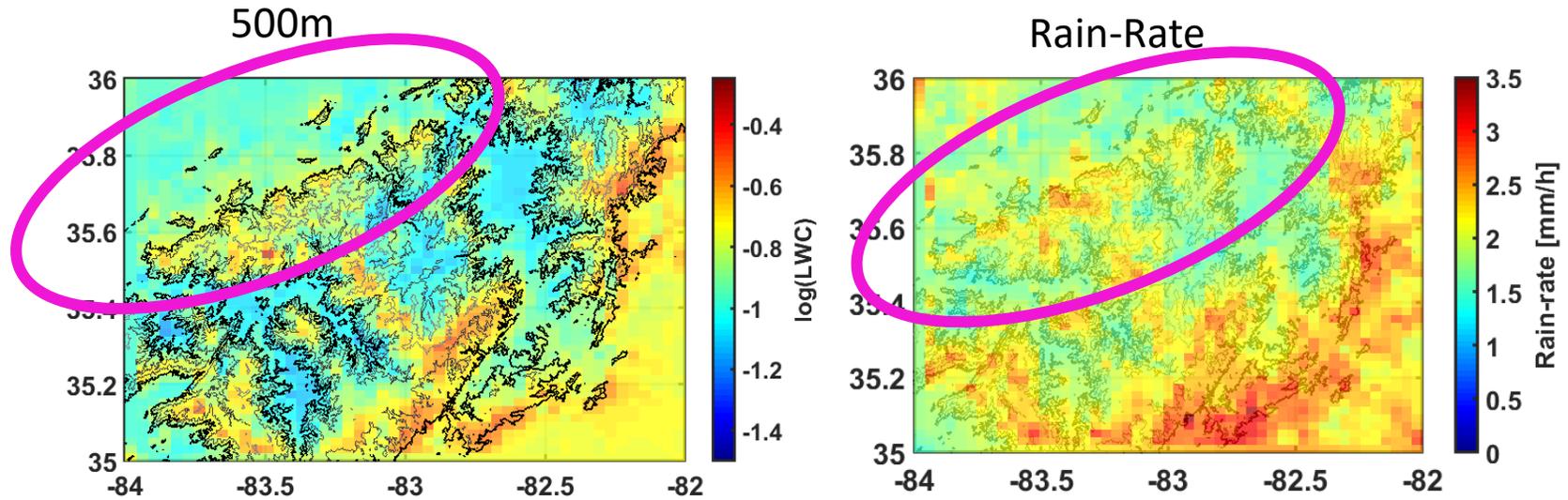
HRRR Model Browser - Storm Prediction Center

Correlation coefficient vs Lag in RG rain-rate



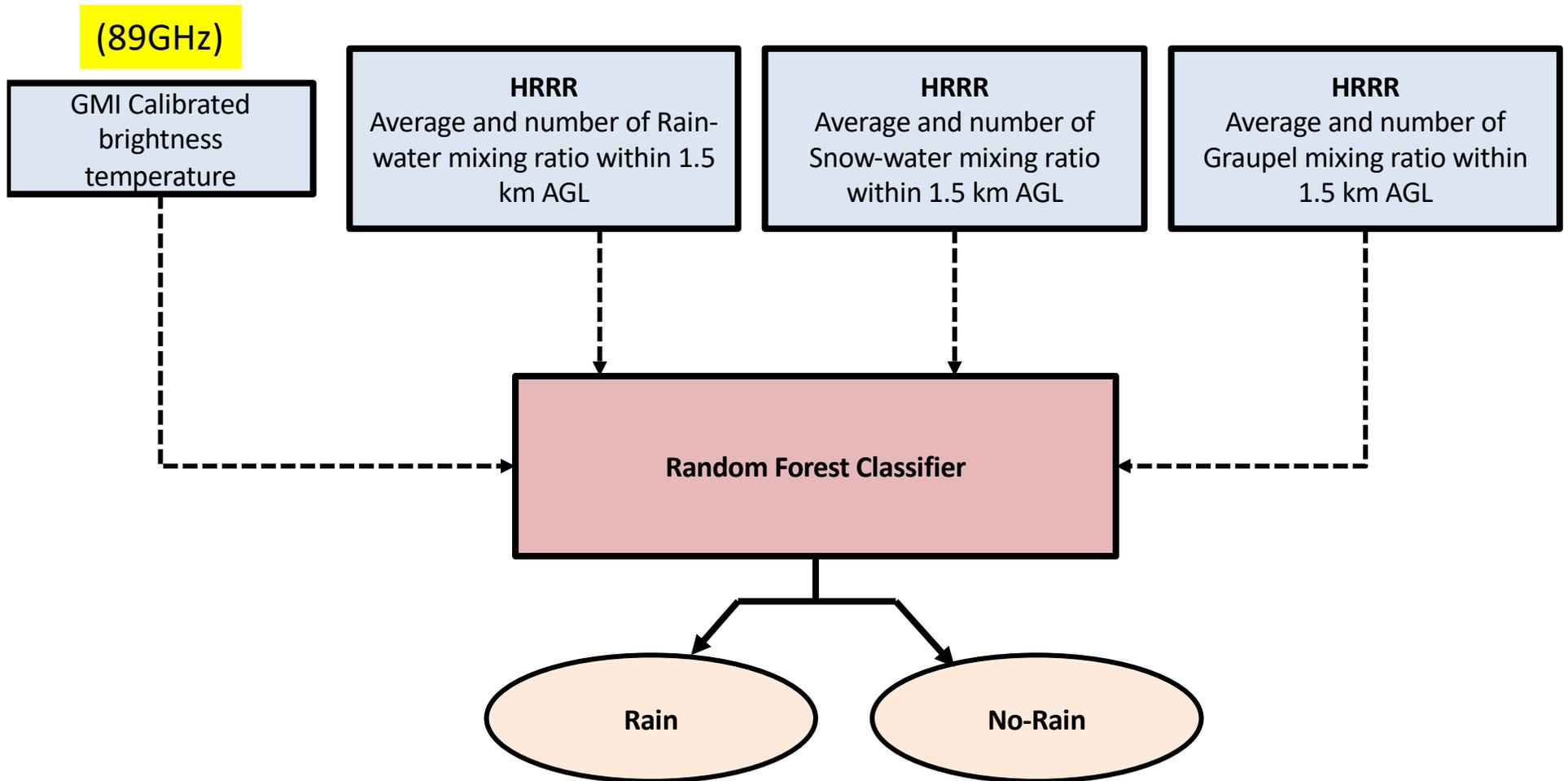
3 km, hourly

HRRR 4-year Climatology



Duan and Barros, 2017

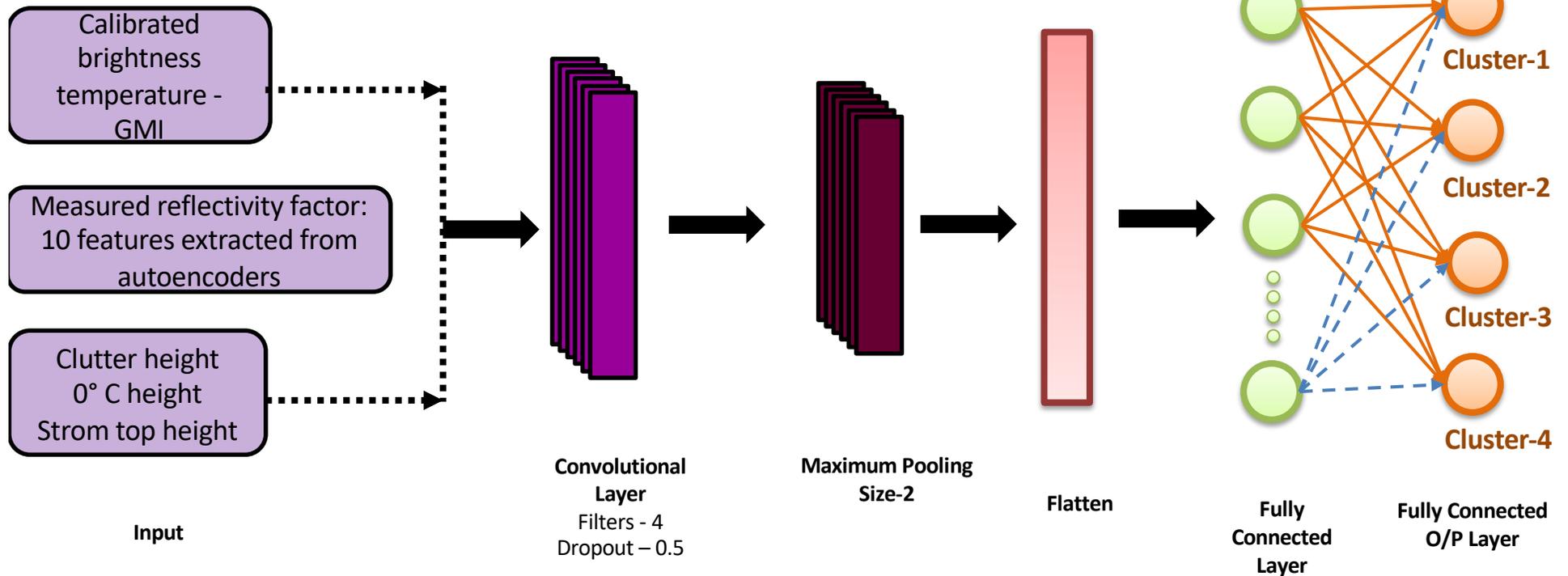
Trust (Yes/No) model for precipitation detection (reduce no rain bias) – Integrating GPM and HRRR



Rain Profiles

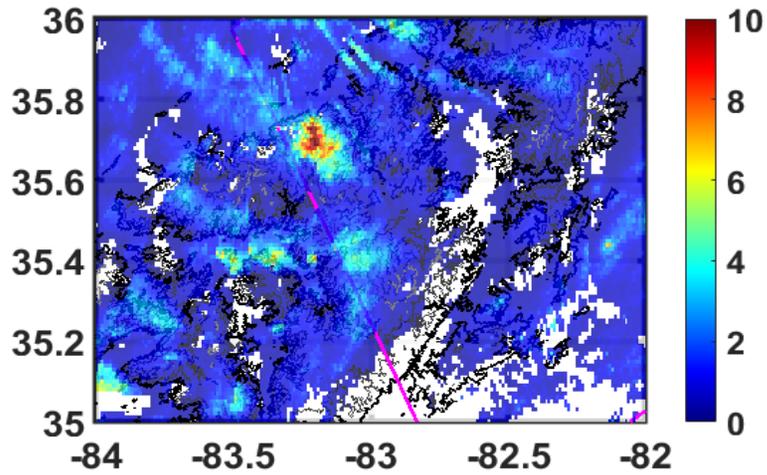
Convolution Neural Network Model

Classification algorithm

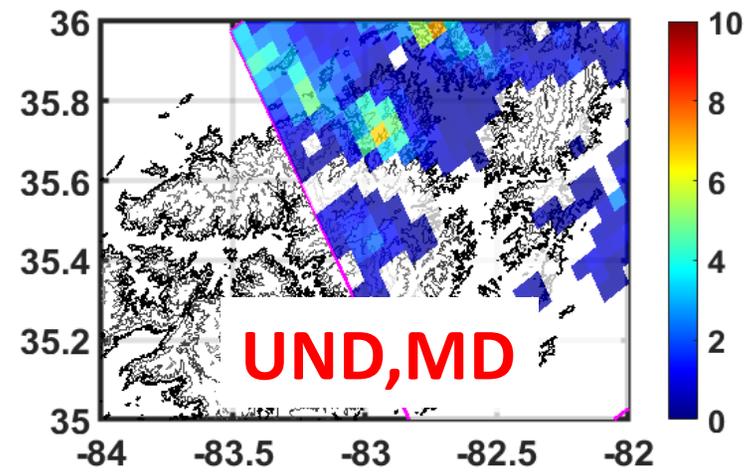


Example

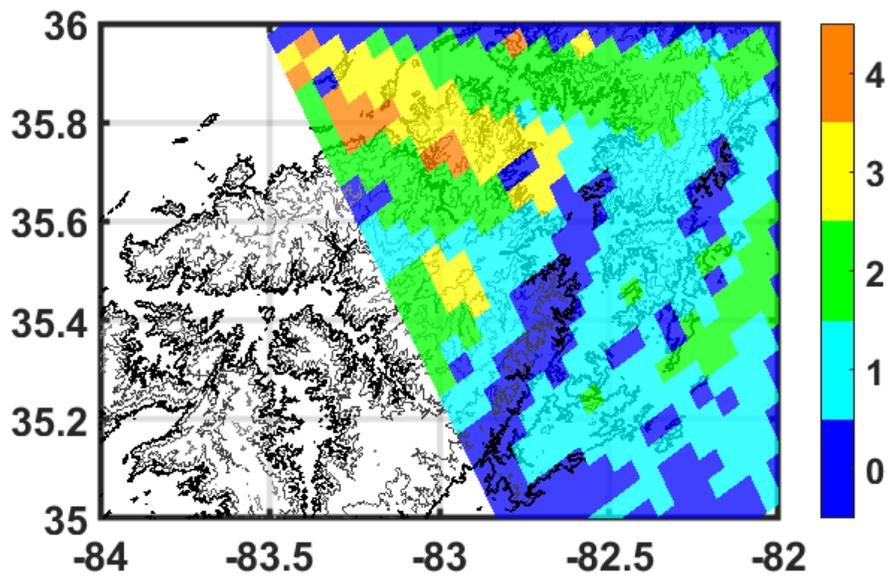
MRMS Precipitation Rate



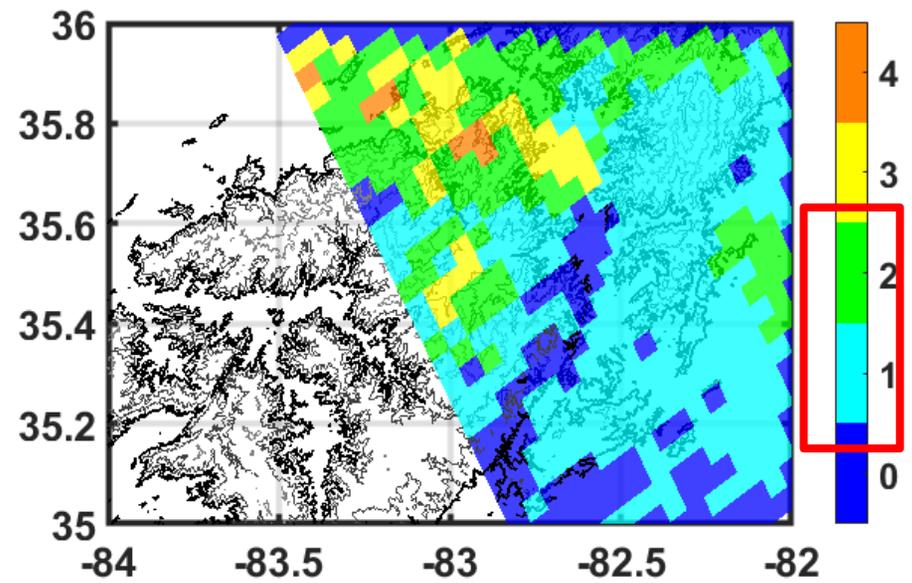
GPM Ku-PR Precipitation Rate



Classification label from MRMS



Model predicted Classification label



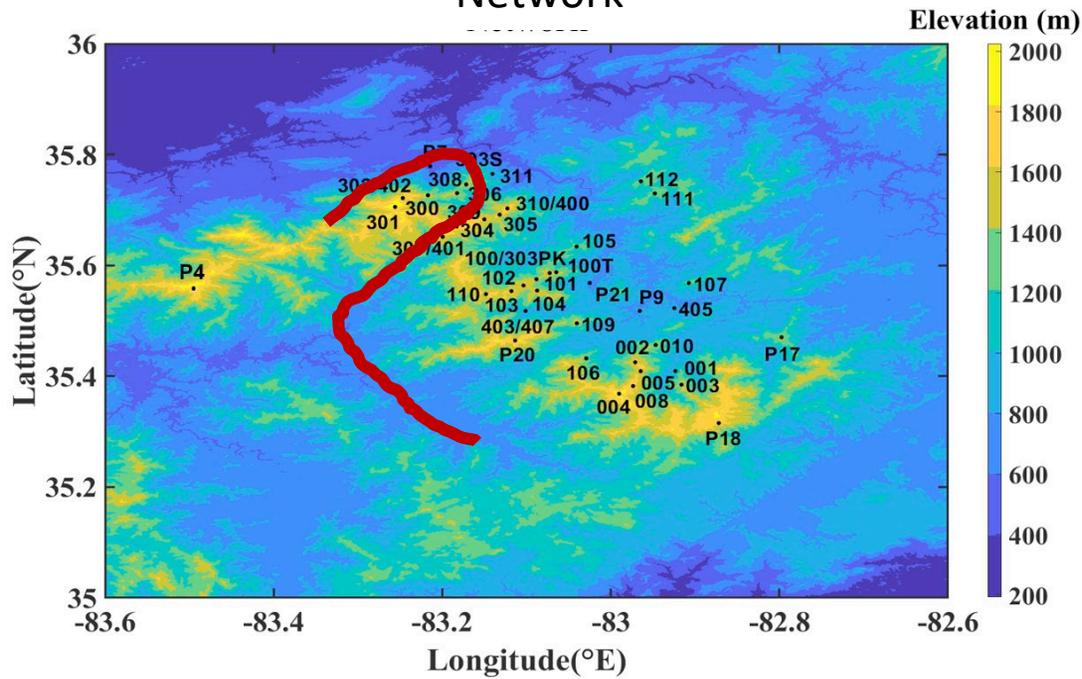
Results

Actual	Model Prediction			
	C1	C2	C3	C4
C1	572	82	66	2
C2	169	346	140	25
C3	35	82	406	107
C4	2	40	112	552

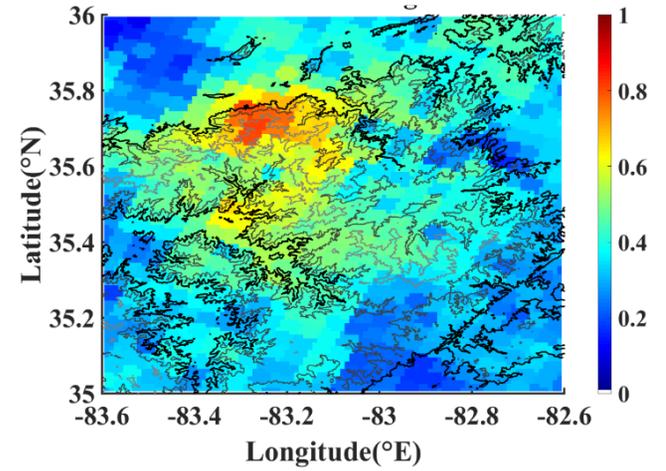
BONUS

- Reduction of 75% in False Alarms
- Reduction of 84% in Missed Detection

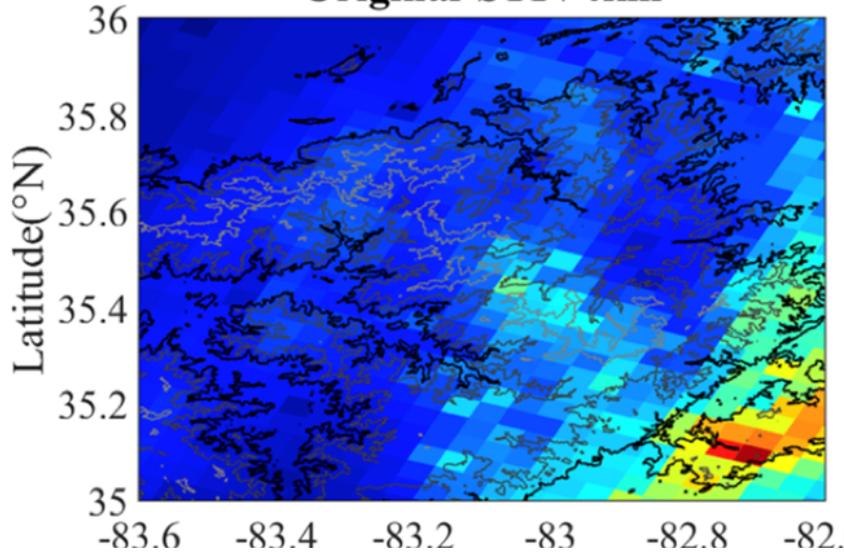
Network



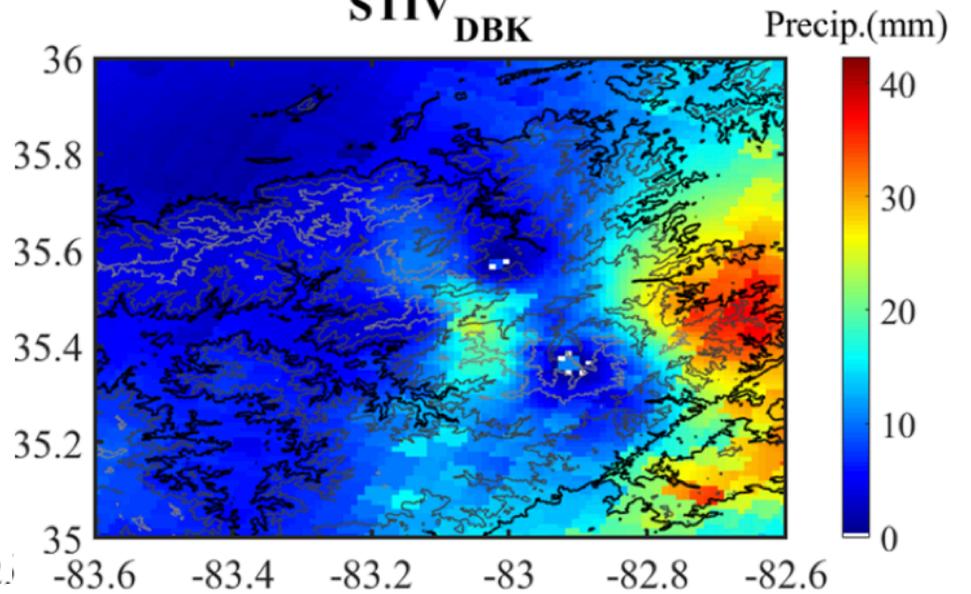
Spatial Correlation RG301

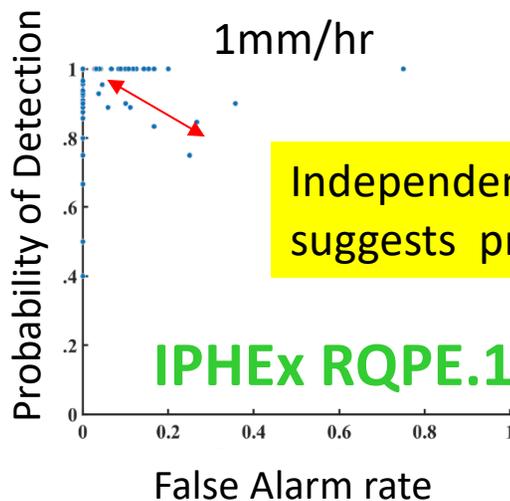
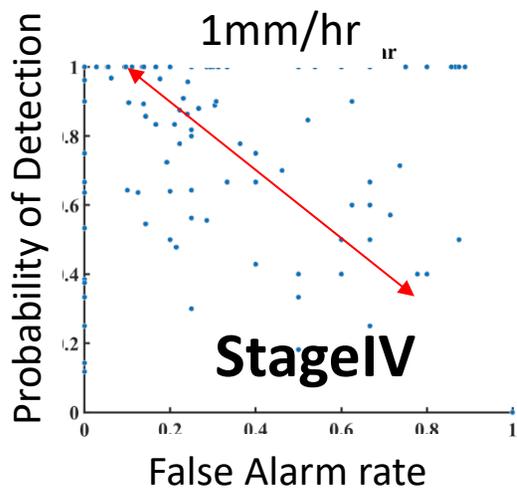


Original-STIV4km

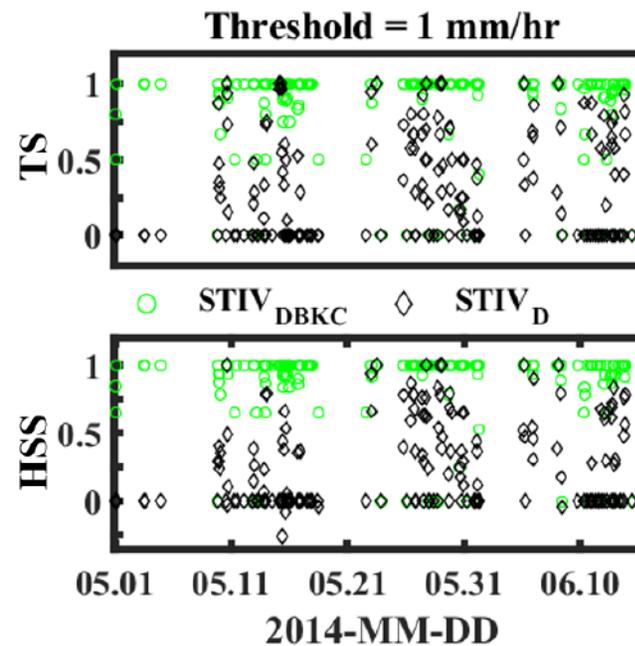
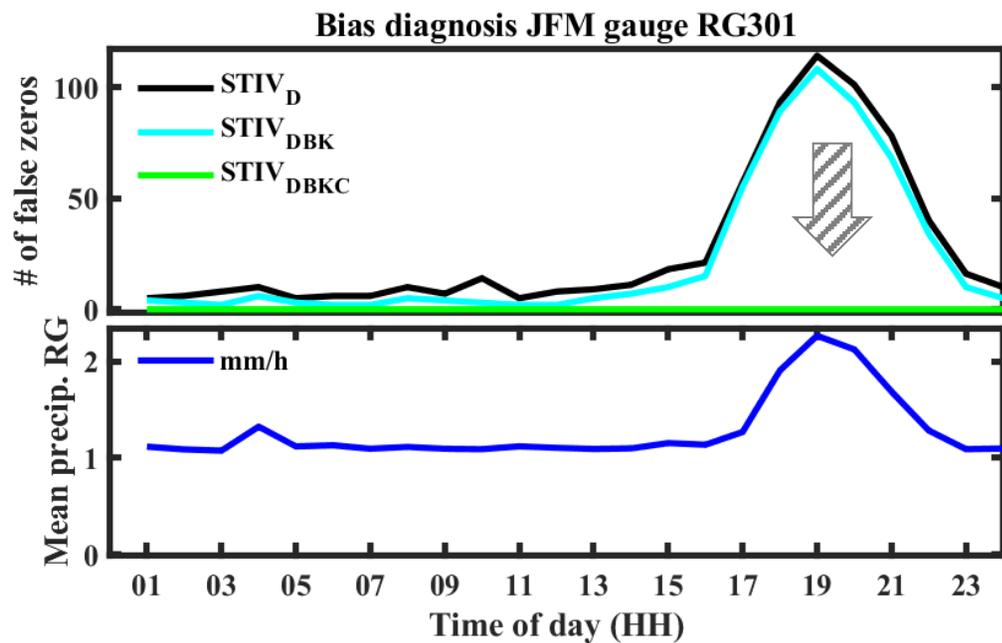


STIV_{DBK}

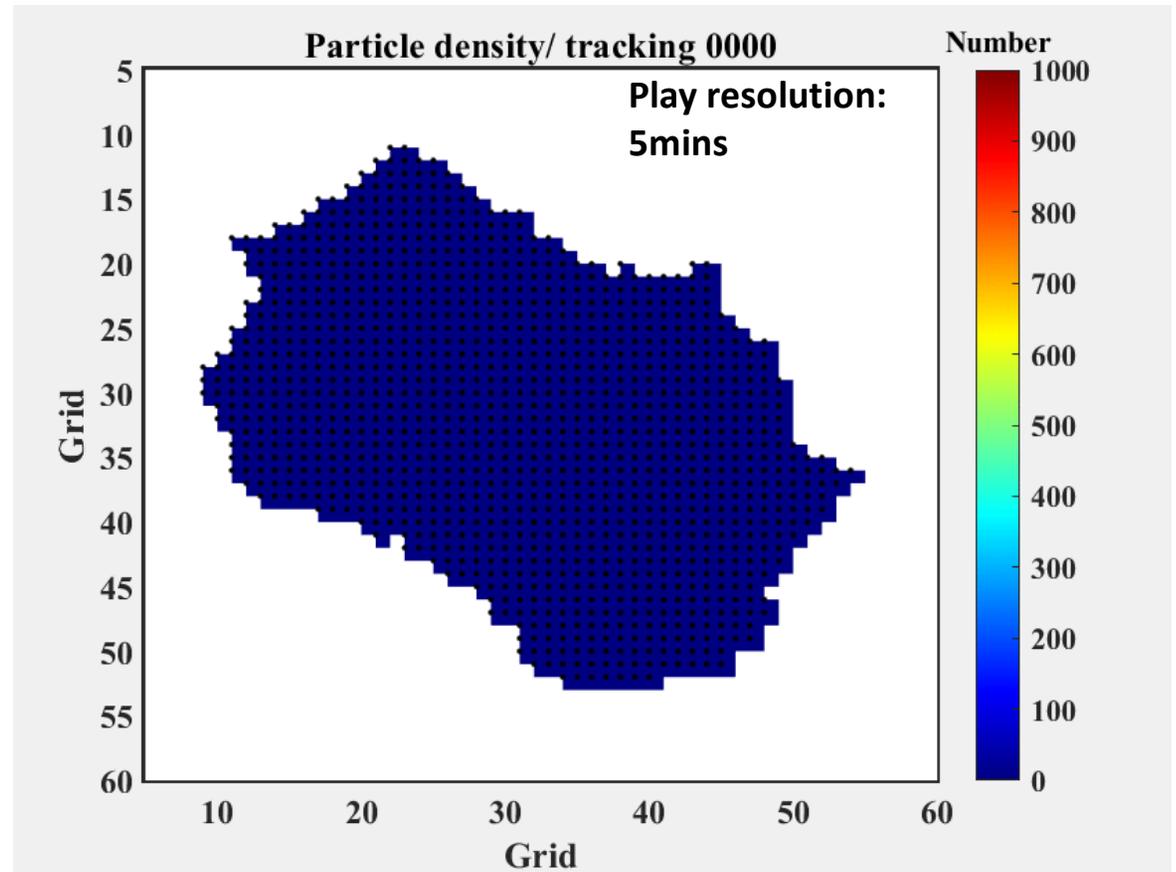
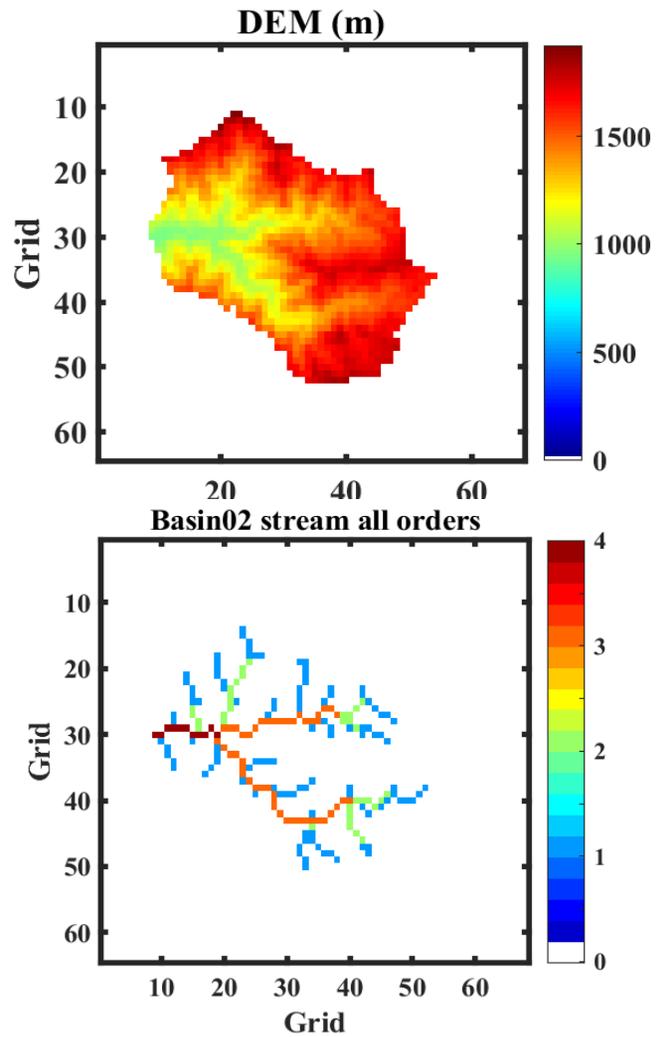




Independent validation against disdrometers suggests problems in the valleys

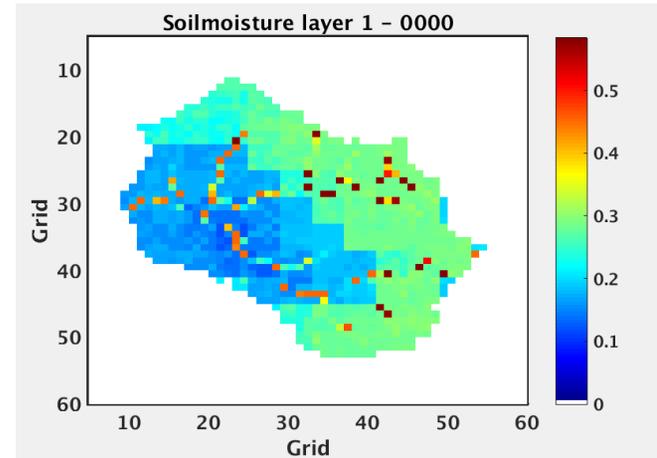
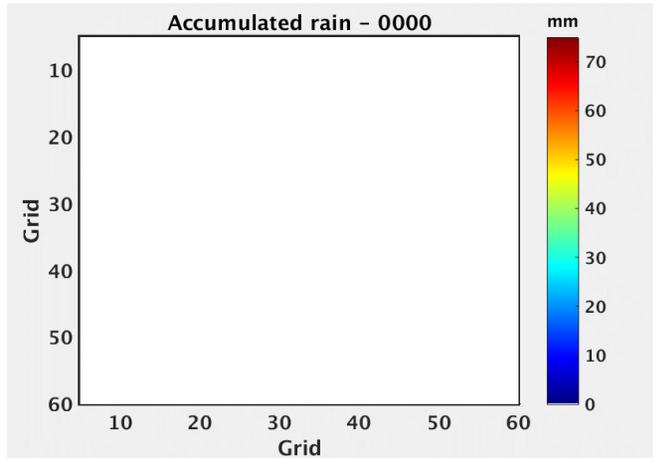


Physically-Based Dynamic Correction

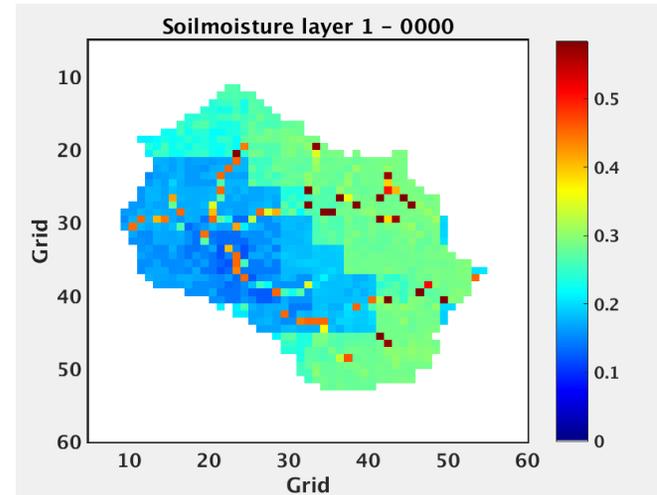
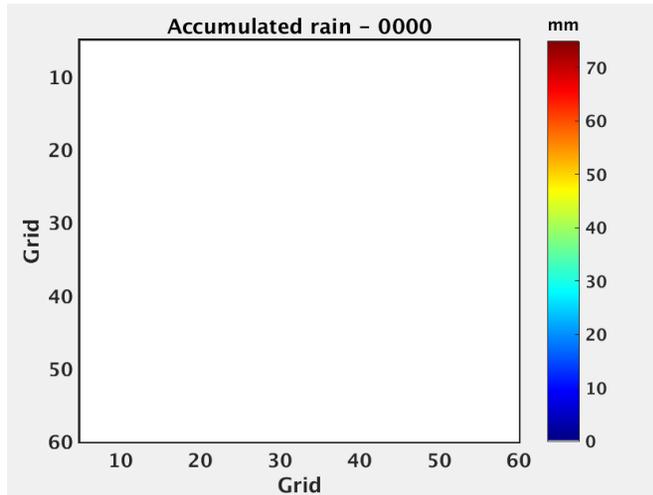


IPHEX Reference V1

250 m, 5 min

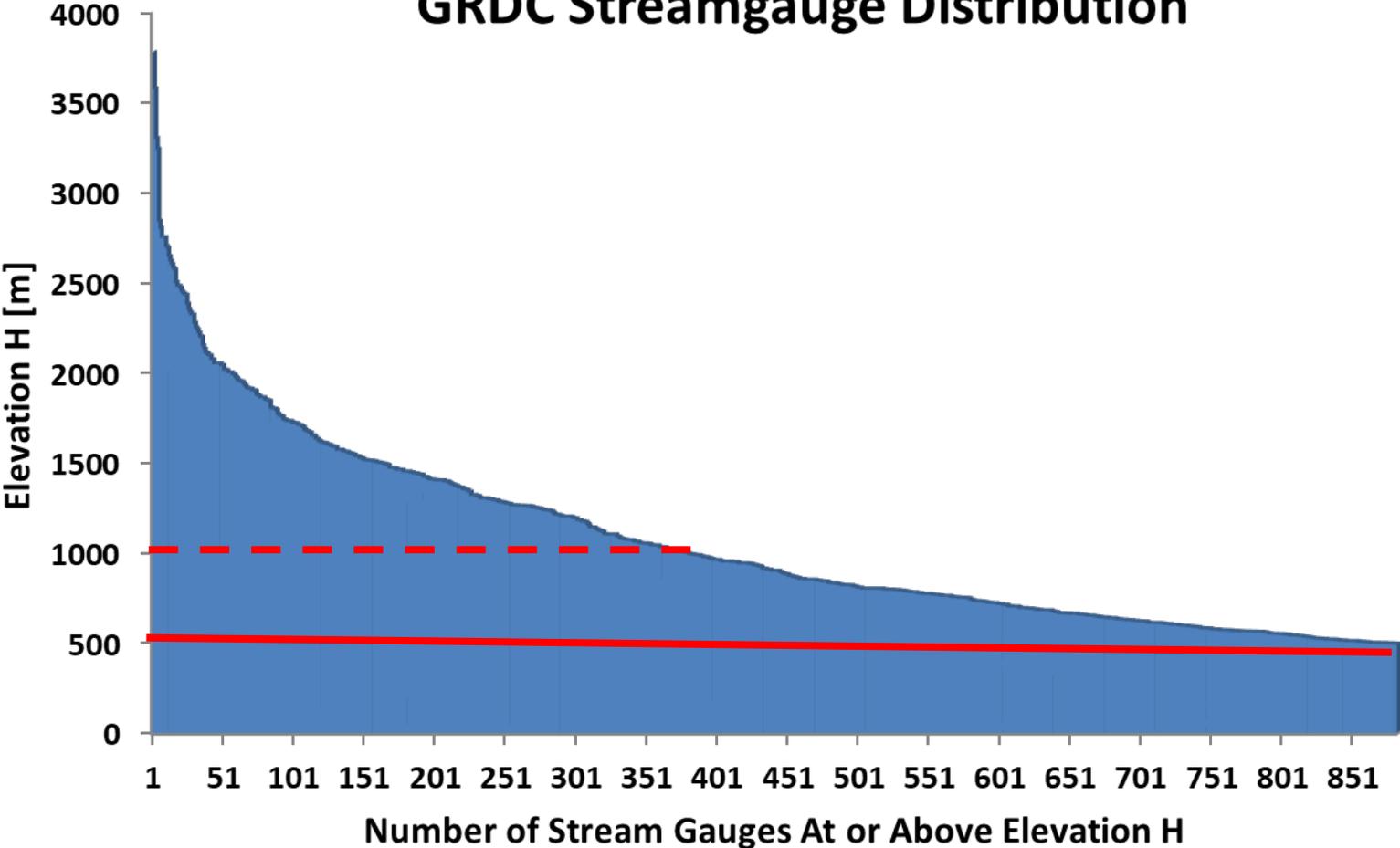


+ Dynamic Correction



Liao and Barros, in prep

GRDC Streamgaugage Distribution



September 16, 2018 – 18 UTC

