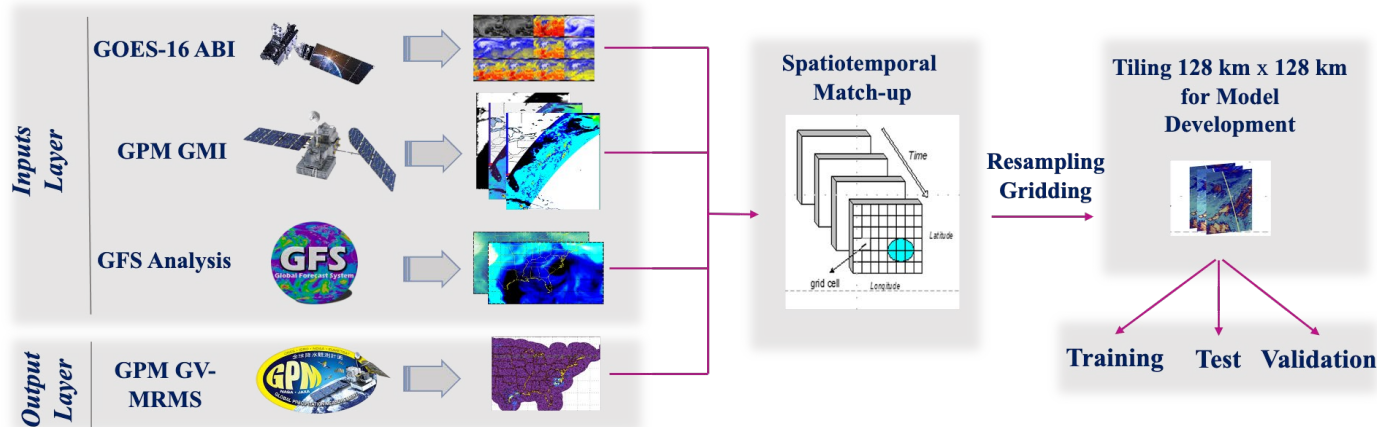


Satellite Quantitative Precipitation Estimation Using Neural Network Algorithms

Vesta Afzali Goroooh, Veljko Petković, Phu Nguyen, Kuolin Hsu, Soroosh Sorooshian, Malarvizhi Arulraj, and Ralph R. Ferraro

Develop a U-Net algorithm to fuse passive sensed information from Geostationary (GEO) and low-Earth-orbit (LEO) satellites with respect to spatiotemporal properties of precipitation systems.



Study Area:

-105°W: -60°W – 20°N: 45°N

Reference Dataset:

GV-MRMS Precipitation Rate (RQI > 0.8)

Gridded Dataset : ~2km x 2km

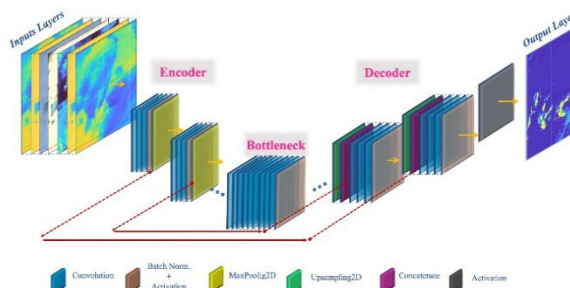
May–September 2017-2020

Testing: *Summertime 2020*

Training: *85% of the rest of data*

Validation: *15% of the rest data*

Generated patches (128 km x 128 km) ~ 120,000



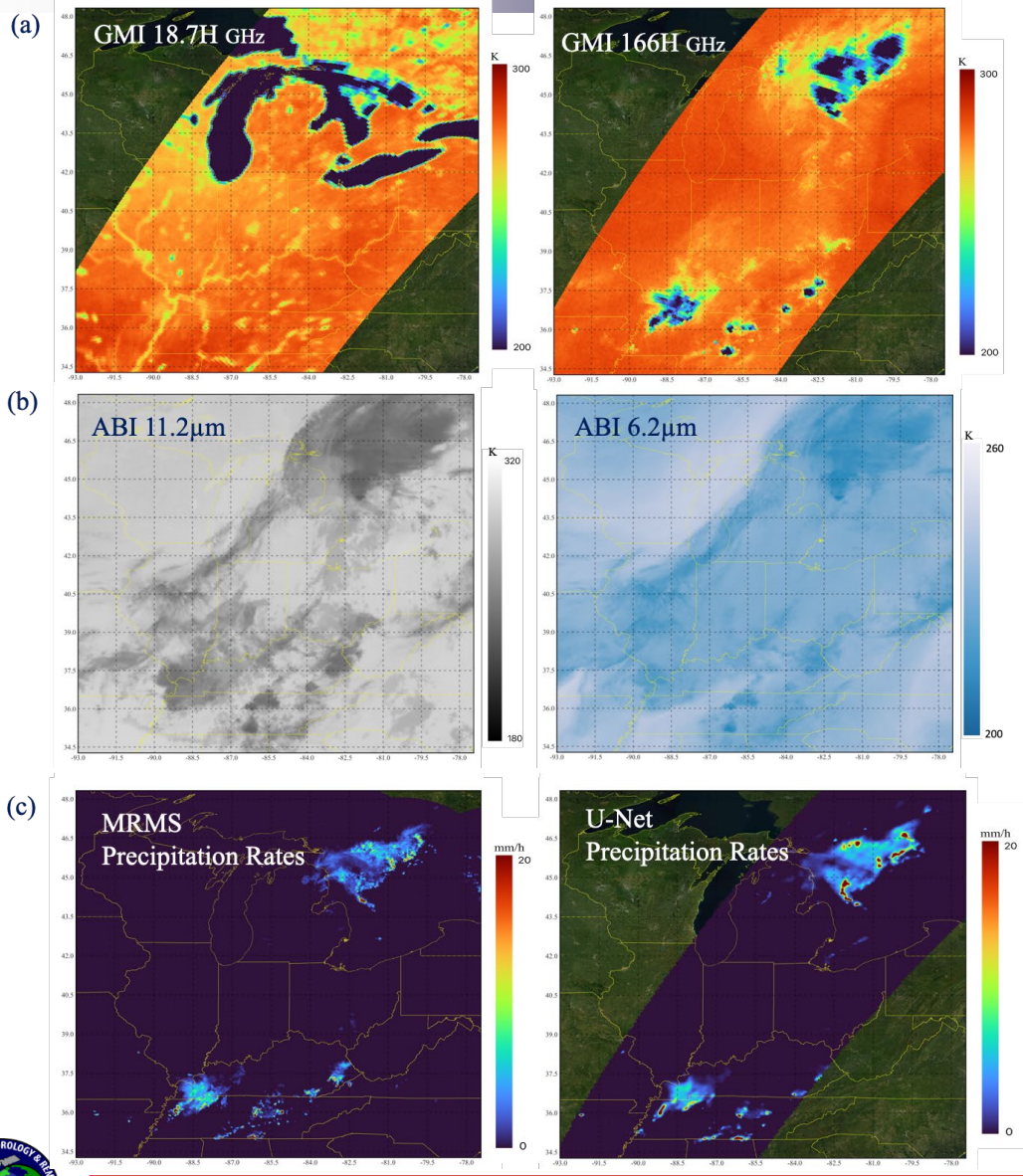
Inputs Layer

	Input	Description
1	GMI#1	10.65 V GHz
2	GMI#4	18.70 H GHz
3	GMI#5	23.80 V GHz
4	GMI#6	36.5 V GHz
5	GMI#7	36.5 H GHz
6	GMI#8	89 V GHz
7	GMI#9	89 H GHz
8	GMI#10	166 V GHz
9	GMI#11	166 H GHz
10	GMI#12	183.31±3 V GHz
11	G16-ABI#1	0.47 μm
12	G16-ABI#2	0.64 μm
13	G16-ABI#3	0.86 μm
14	G16-ABI#4	1.37 μm
15	G16-ABI#6	2.24 μm
16	G16-ABI#7	3.90 μm
17	G16-ABI#8	6.19 μm
18	G16-ABI#9	6.93 μm
19	G16-ABI#10	7.37 μm
20	G16-ABI#11	8.44 μm
21	G16-ABI#13	10.33 μm
22	G16-ABI#14	11.21 μm
23	GFS PWAT	kg/m ²
24	GFS T2m	Kelvin

Output Layer

	Output	Description
1	Precipitation Rates (mm/h)	GV-MRMS Precipitation Rates for Training Purpose





A case of GMI (a) 18.7H GHz and 166H GHz frequencies Tbs, and ABI (b) 6.2 μm and 11.2 μm Tbs, as well as (c) surface precipitation products from MRMS and U-Net on August 11, 2020, at 7:25 UTC.