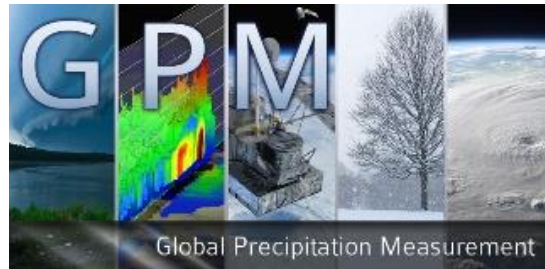
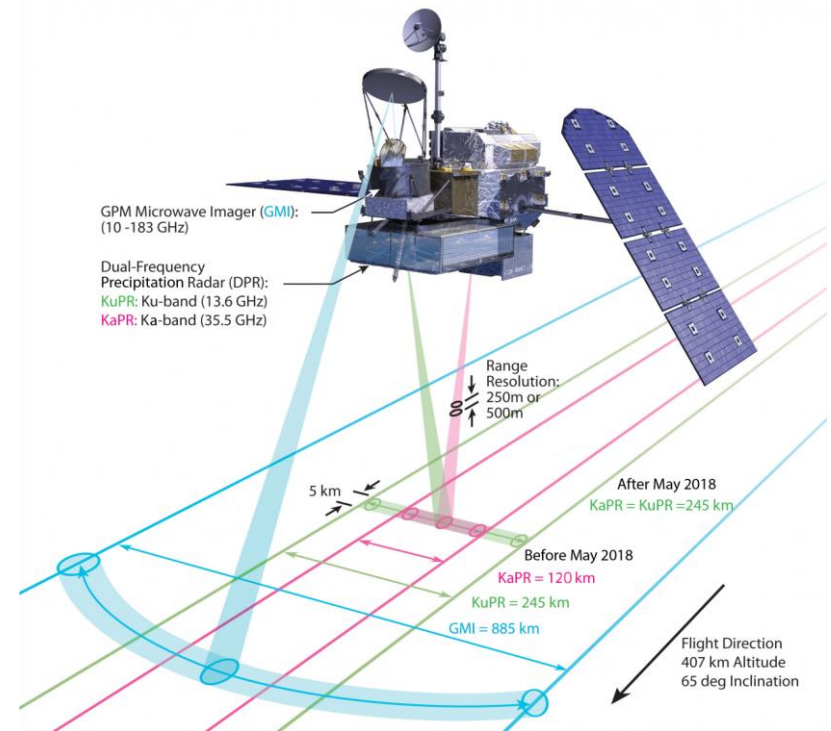


Winter Precipitation Measurements in New England: Results from the Global Precipitation Measurement Ground Validation Campaign in Connecticut



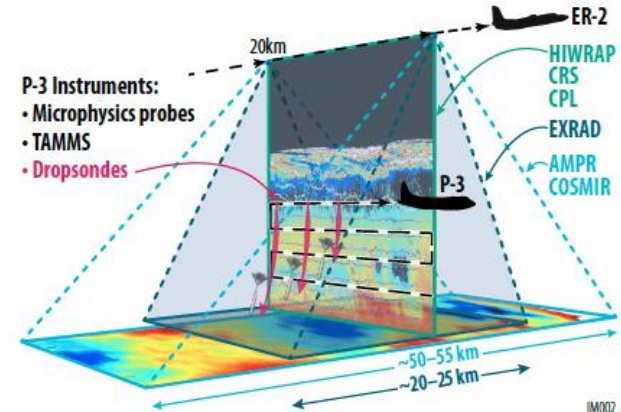
GPM Mission

- International collective effort to use satellites to observe rain and snow across the globe
- GPM deployed in 2014 building off TRMM success
- Expanded observations to $\pm 68^\circ$
- Core observatory equipped with Dual-Frequency (Ka and Ku) Precipitation Radar and GPM Microwave Imager



Why Ground Validation?

- Necessary for refinement and development of satellite algorithms
- Focus on specific troublesome areas and environments for satellite retrievals
- How?
 - Ground observations
 - Airborne observations



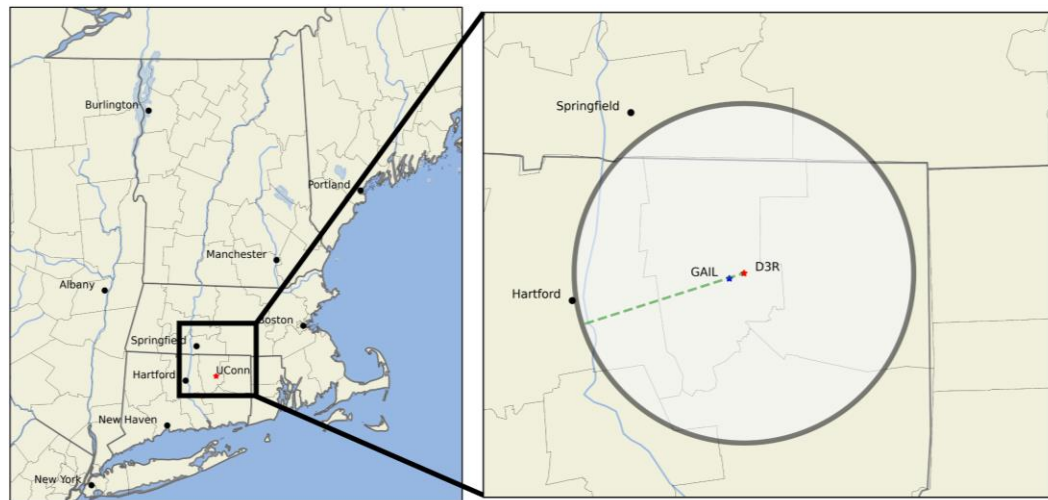
UConn Ground Validation

- First GPM validation campaign in Northeast United States
- Focused on variety of winter weather conditions
- Overlapped with IMPACTS in 2021-2022 and 2022-2023
 - Consistent ground observations (in situ and remote sensing instruments)
- Continued ongoing deployment in 2023-2024

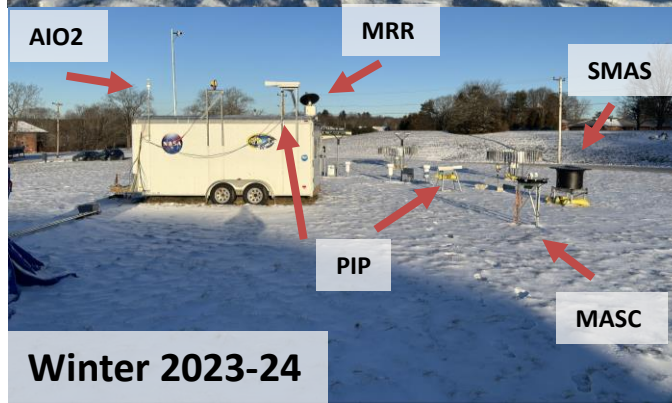
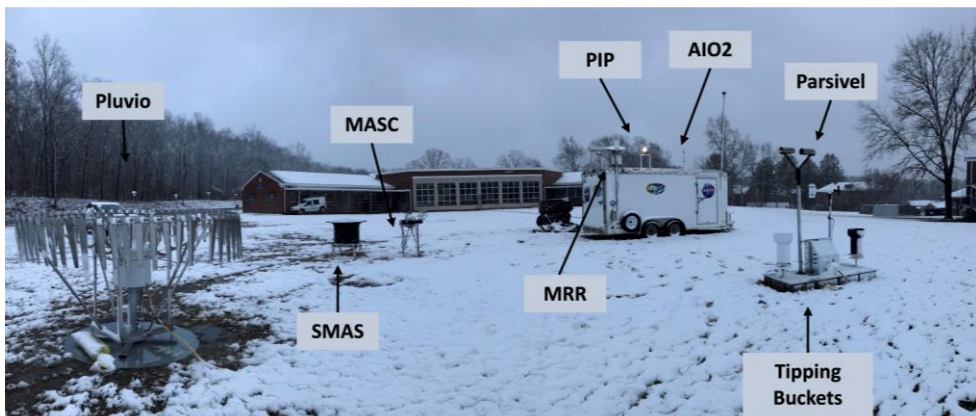
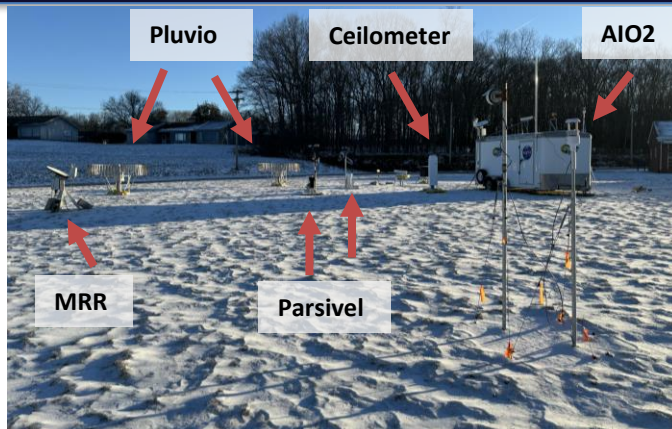
Instrumentation

- 2021-2022
 - One site (GAIL)
- 2022-2023
 - Two sites (GAIL and D3R)
 - 70m of elevation changes
 - 3.2km apart
- 2023-2024 (Ongoing)
 - One site (GAIL)

Instrument (owner)	2021-22	2022-23	2023-24
MRR-2 (NASA)	✓	X	X
MRR-Pro (NASA)	X	✓	✓ (x2)
Pluvio (NASA)	✓	✓	✓ (x2)
All-in-one-2 (NASA)	✓	✓	✓ (x2)
Parsivel (NASA)	✓	✓	✓ (x2)
PIP (NASA)	✓	✓	✓ (x2)
PIERS (NASA)	X	✓	✓
RMYoung (NASA)	X	✓	✓
D3R (NASA)	X	✓	X
ACHIEVE (NASA)	X	✓	X
SMAS (CSU)	X	✓	✓
MASC (CSU)	X	✓	✓
Ceilometer (NASA)	X	X	✓
WxUAS (OSU)	X	X	✓



Instrumentation

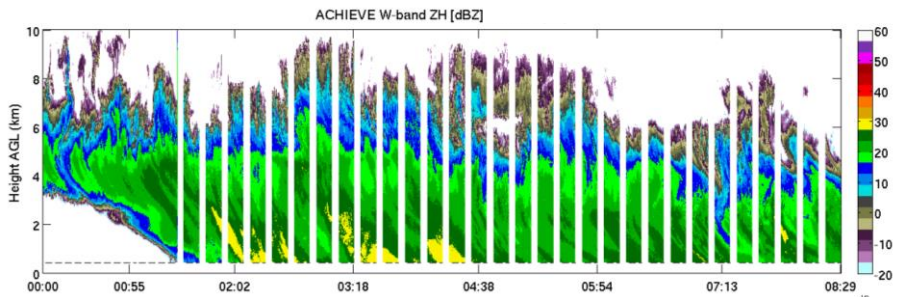
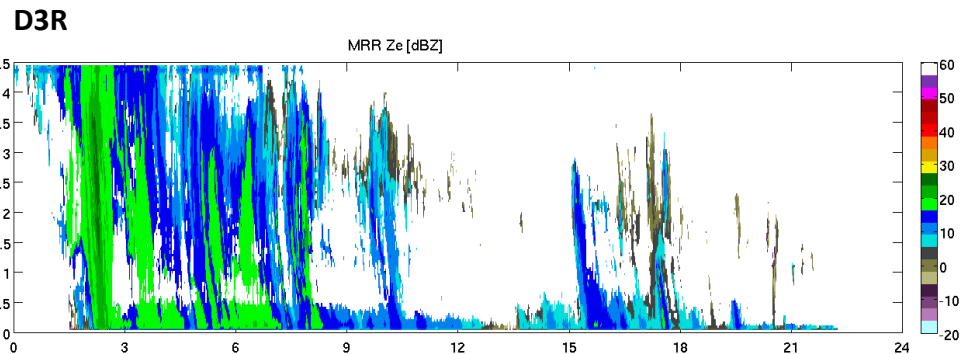
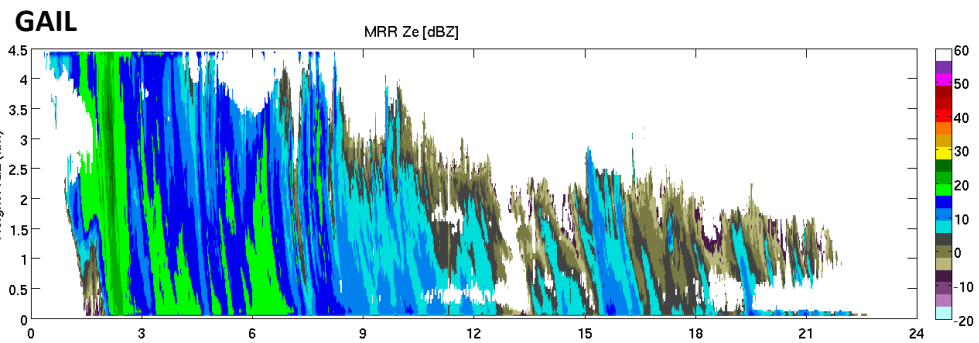


Dataset Collected

- Over 90+ precipitation events to date
- Variety of storm types and impacts
 - Heavy rain & wind events
 - Freezing rain and sleet
 - Nor'easters/ heavy snow
 - Multi-phase transitions

Case Study- February 28, 2023

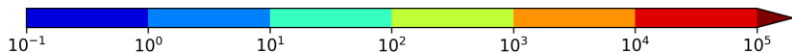
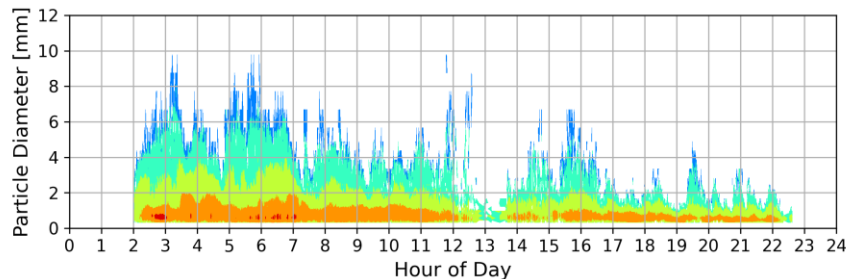
- Heavy snow event in Connecticut (6-8 inches)
- IMPACTS overlap and GPM Overpasses



Case Study- February 28, 2023

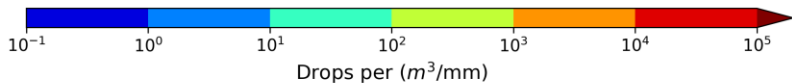
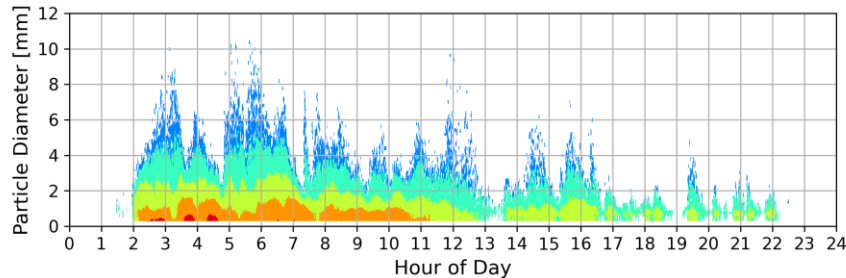
GAIL

Parsivel PSD



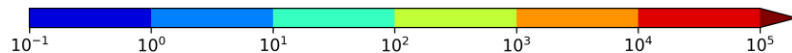
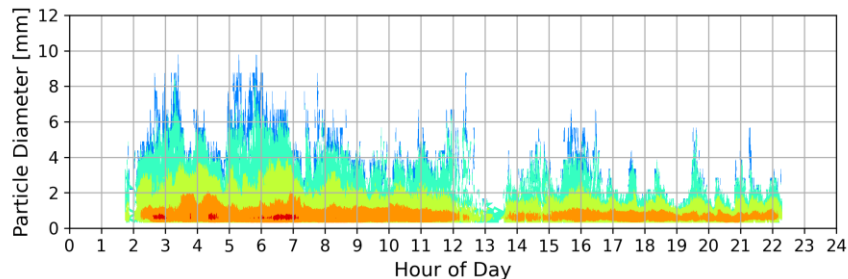
GAIL

PIP PSD



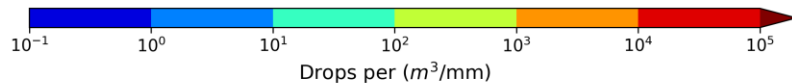
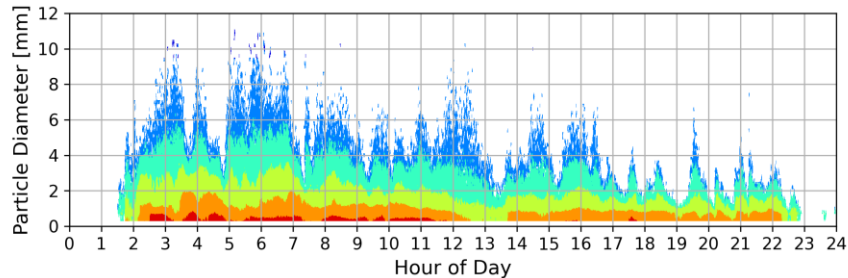
D3R

Parsivel PSD



D3R

PIP PSD



Summary

- Ground validation is necessary for improving satellite observations
- Wide array of precipitation, radar and microphysical observations were collected in Connecticut for the winters of 2021-2024
- Multi-purpose dataset helpful across a variety of atmospheric applications

Ongoing Research

- BAMS Overview Article: Filipiak and Coauthors, *in review*
- Focusing on precipitation type identification
- Satellite snowfall validation
- Applying microphysical observation to NWP
- More at AMS (Thursday 3-4:30PM):
 - D3R Snow Observations during IMPACTS (ePoster)
 - Radar Snowfall Estimation (Poster)

Acknowledgements

- Collaborators:
 - Aaron Spaulding and Diego Cerrai (Univ. of Connecticut)
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