Snowfall Retrieval Products AKA: We Are In This Together!

Some Faces of ARM Precipitation Radar Data

Bhupendra Raut

Ya-Chien Feng

Alyssa Matthews

Max Grover

Zach Sherman

Andre (Iosif) Lindenmaier

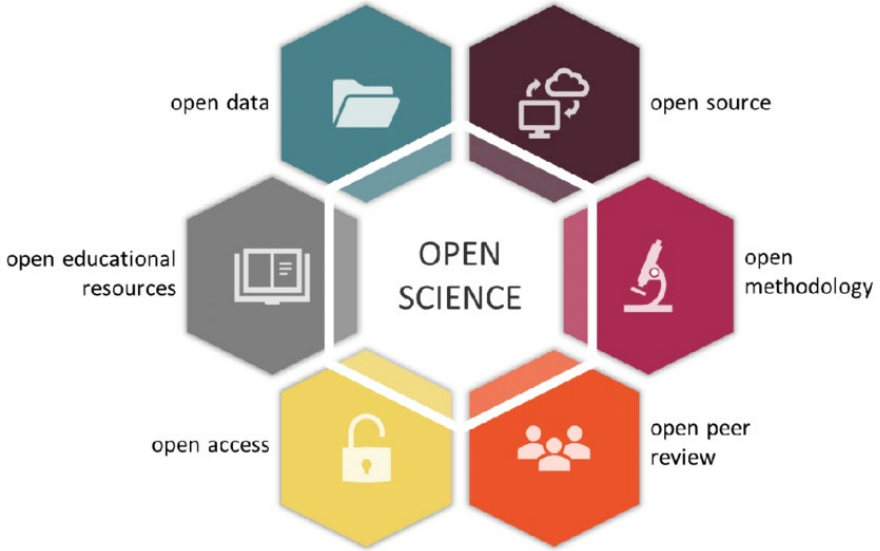
Bobby Jackson

Joe O'Brien

This does not include the many engineers who make radar data possible….

Overarching philosophy

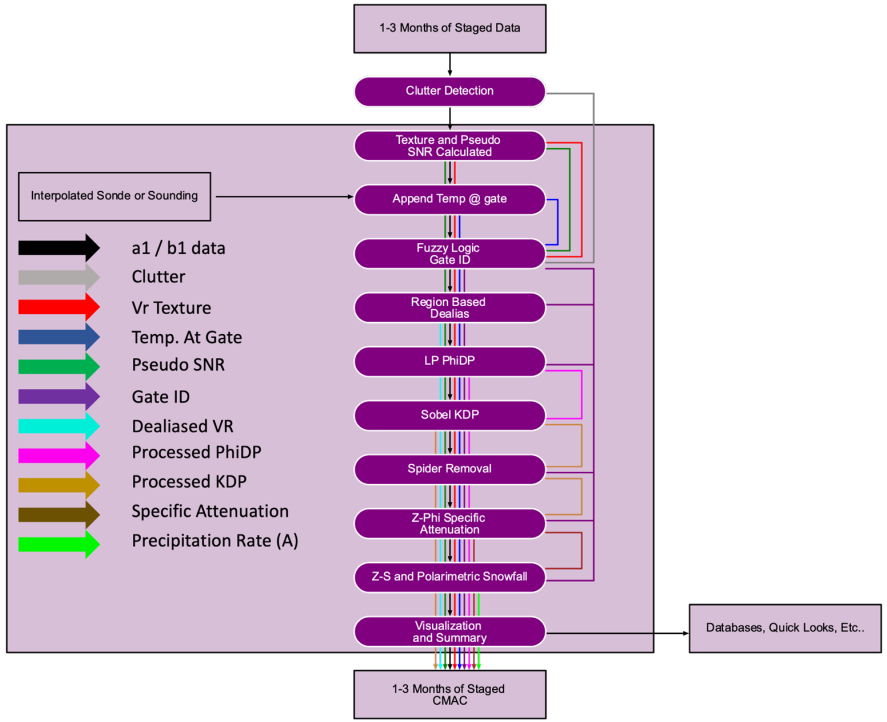
- Open Science.
- As we work make cookbooks.
- Where impactful support radar engineering. We can’t build products or facilitate science without data.
- Highest priority is quality gate based data. Start here and build into bespoke solutions.
- There will be corner cases. We will release and re-run.



Gallagher, Rachael & Falster, Daniel & Maitner, Brian & Salguero-Gómez, Roberto & Vandvik, Vigdis & Pearse, William & Schneider, Florian & Kattge, Jens & Alroy, John & Ankenbrand, Markus & Andrew, Samuel & Balk, Meghan & Bland, Lucie & Boyle, Brad & Bravo Avila, Catherine & Brennan, Ian & Carthey, Alexandra & Catullo, Renee & Cavazos, Brittany & Enquist, Brian. (2019). The Open Traits Network: Using Open Science principles to accelerate trait-based science across the Tree of Life. 10.32942/osf.io/kac45.

Corrected Moments in Antenna Coordinates (CMAC)

- CMAC (note we are dropping the “2.0”) is a workflow for ARM precipitation radars.
- At its core is the gate_ID. This early step creates tags that are uses in downstream processing.
- Modules can be removed (eg if b/a level fields are of high quality) and different algorithms uses.
- All leverages ADC HPC using Dask.



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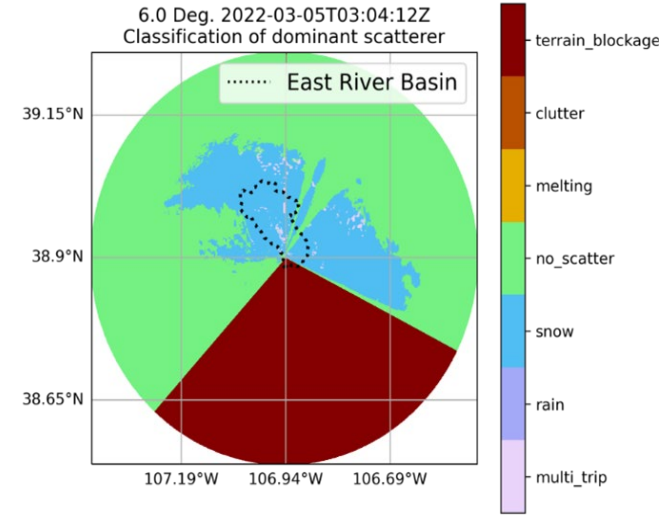
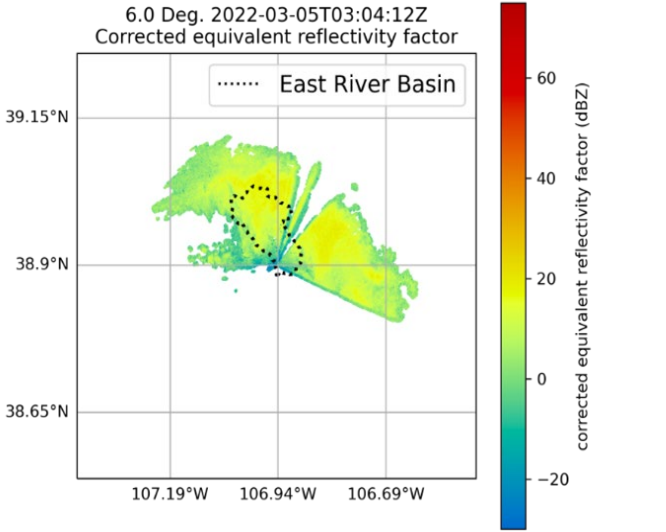
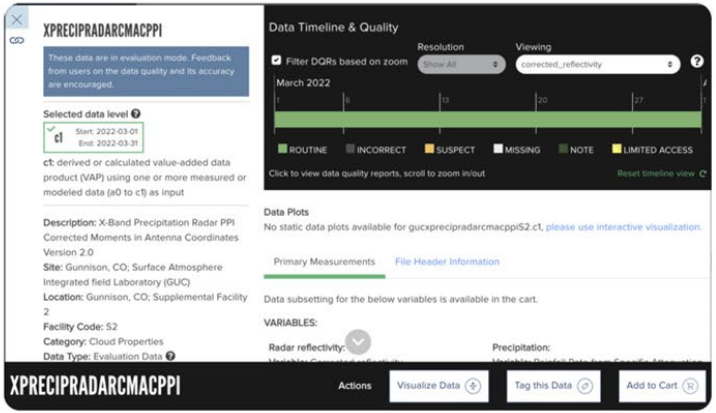




Joe O'Brien 12:02 AM

@Scott Collis @Max Grover @Bobby Jackson @Zachary Sherman @drfeldman @AdamTheisen 👀👀👀👀👀

Screen Shot 2022-10-25 at 11.00.44 PM.png



if someone could mention the data are now discoverable at my poster tomorrow, that would be great!

I'll send out a email to the SAIL/SPLASH group in the morning once I download it

Bobby Jackson 4:54 AM

Just in time for the SAIL breakout today!

Scott Collis 7:18 AM

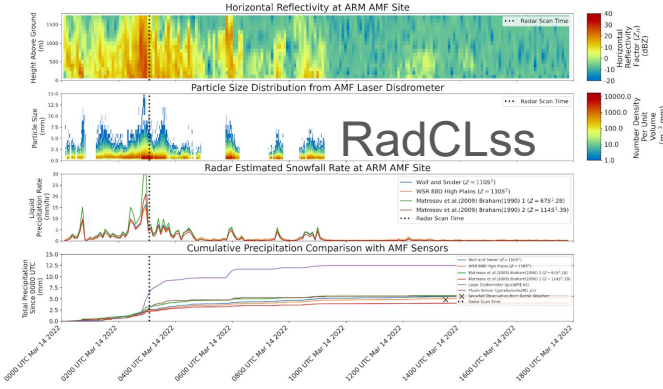
Unreal

Max Grover 7:46 AM

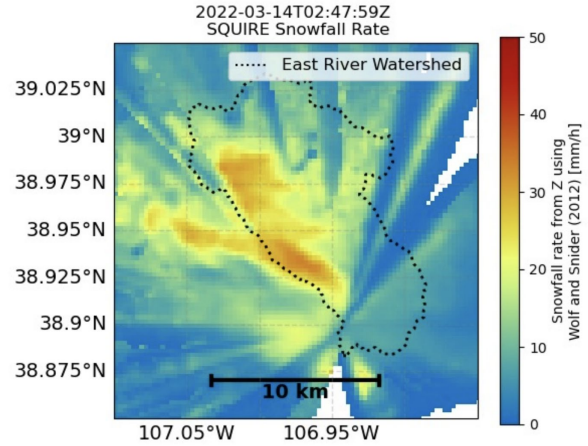
WOOOOOOOO

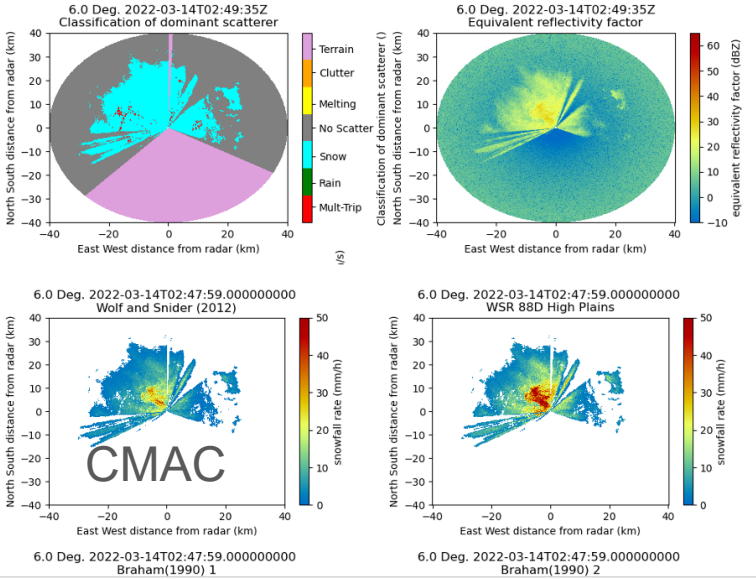
Products!

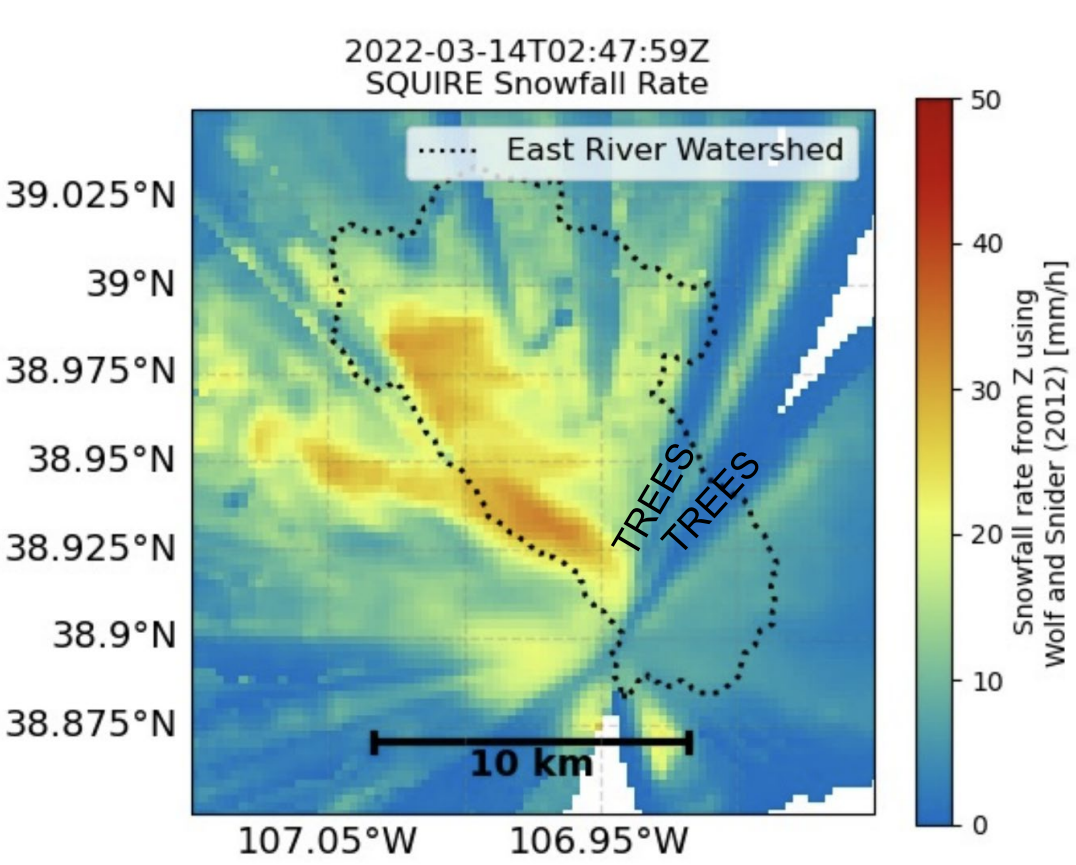
- For radar enthusiasts: CMAC.
- For radar retrievals, a new product, RadCLss. Columns over sensors.
- For hydrologists, modelers etc, a new product, SQUIRE, QPE at surface.
- All with for reflectivity based snow estimates.

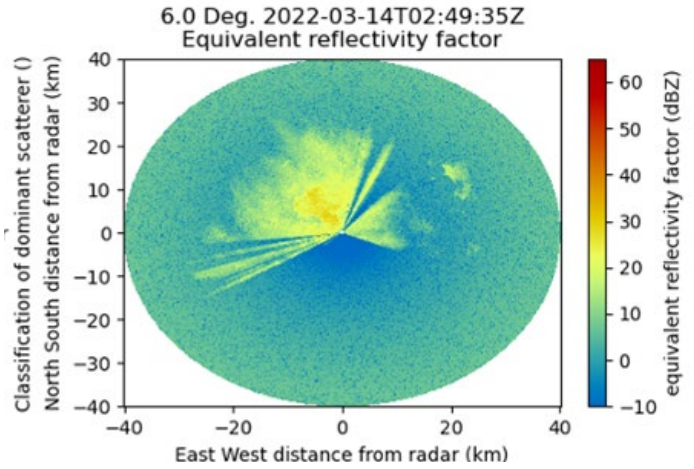


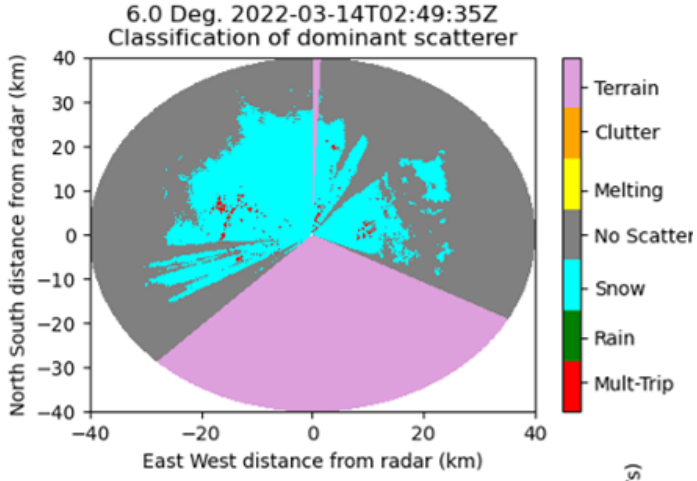
Sergey Matrosov: Use KaZR for VPR.. (Good idea)

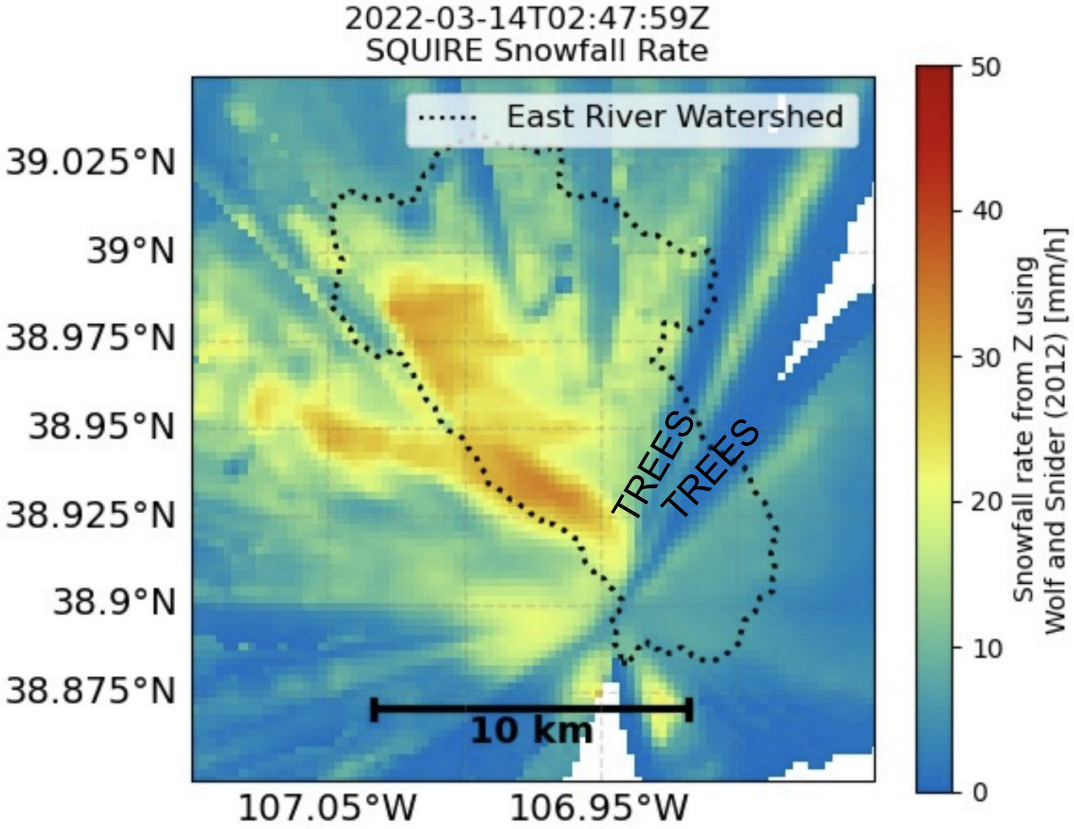





2022-03-14T02:47:59Z
SQUIRE Snowfall Rate
East River Watershed
39.025°N
39°N
38.975°N
38.95°N
38.925°N
38.9°N
38.875°N
TREES
TREES
10 km
107.05°W
106.95°W
50
40
30
20
10
0
Snowfall rate from Z using
Wolf and Snider (2012) [mm/h]


6.0 Deg. 2022-03-14T02:49:35Z
Equivalent reflectivity factor
Classification of dominant scatterer ()
North South distance from radar (km)
East West distance from radar (km)
equivalent reflectivity factor (dBZ)


6.0 Deg. 2022-03-14T02:49:35Z
Classification of dominant scatterer
North South distance from radar (km)
East West distance from radar (km)
Terrain
Clutter
Melting
No Scatter
Snow
Rain
Mult-Trip


2022-03-14T02:47:59Z
SQUIRE Snowfall Rate
East River Watershed
39.025°N
39°N
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38.95°N
38.925°N
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TREES
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10 km
107.05°W
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50
40
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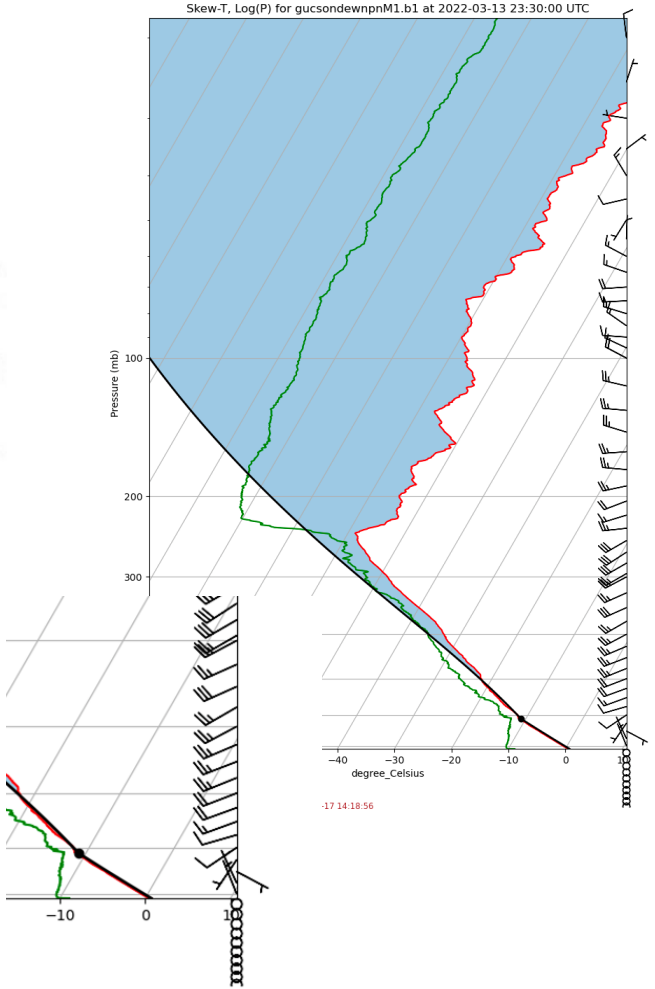
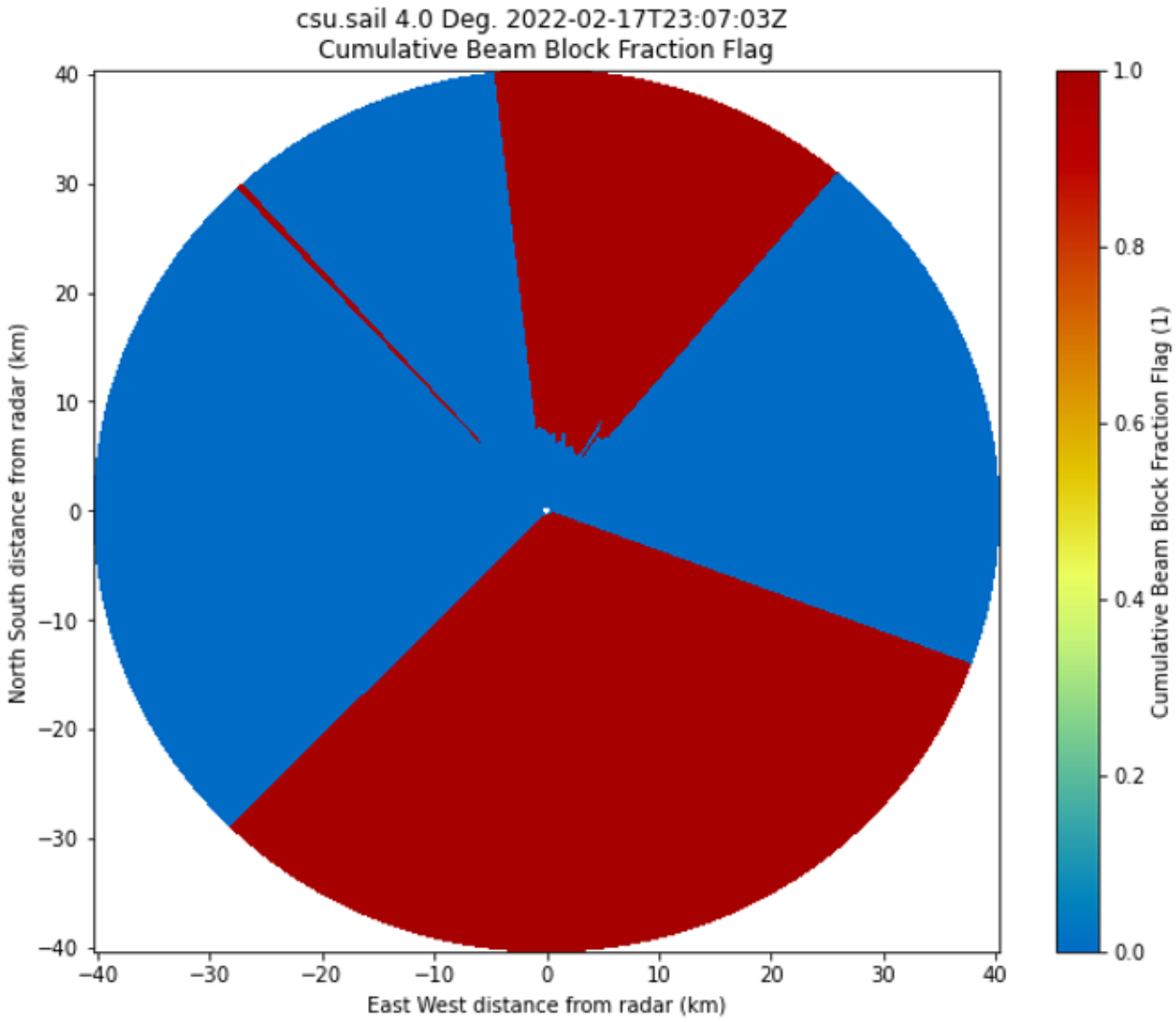
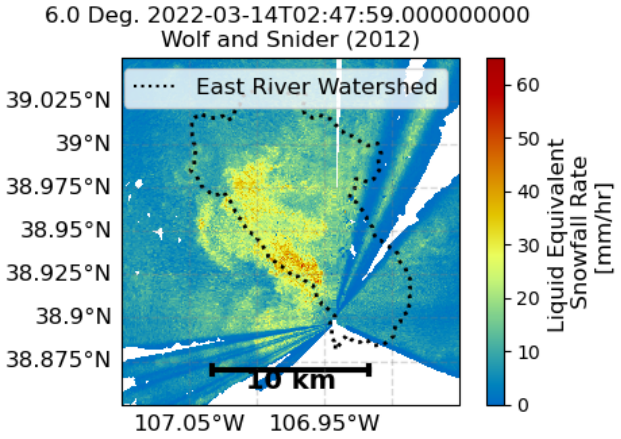
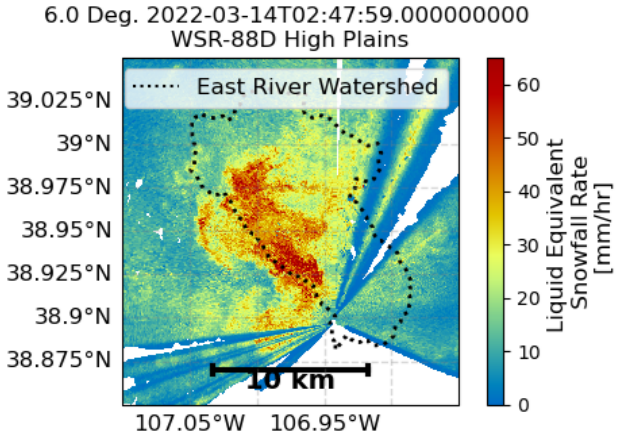
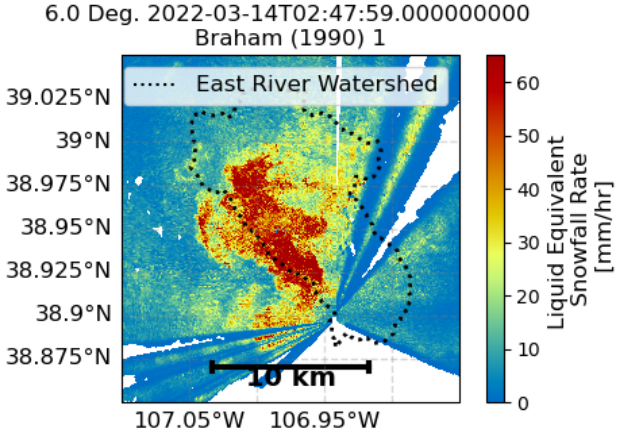
20
10
0
Snowfall rate from Z using
Wolf and Snider (2012) [mm/h]

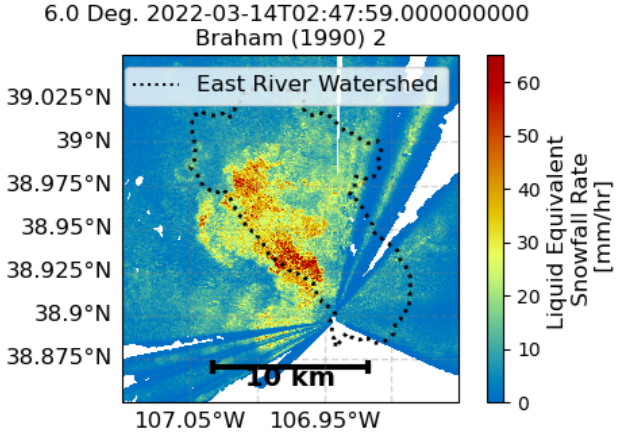

Skew-T, Log(P) for gucsondewnpnM1.b1 at 2022-03-13 23:30:00 UTC
Pressure (mb)
100
200
300
−40
−30
−20
−10
0
degree_Celsius
-17 14:18:56
−10
0


csu.sail 4.0 Deg. 2022-02-17T23:07:03Z
Cumulative Beam Block Fraction Flag
North South distance from radar (km)
East West distance from radar (km)
Cumulative Beam Block Fraction Flag (1)
40
30
20
10
0
−10
−20
−30
−40
1.0
0.8
0.6
0.4
0.2
0.0

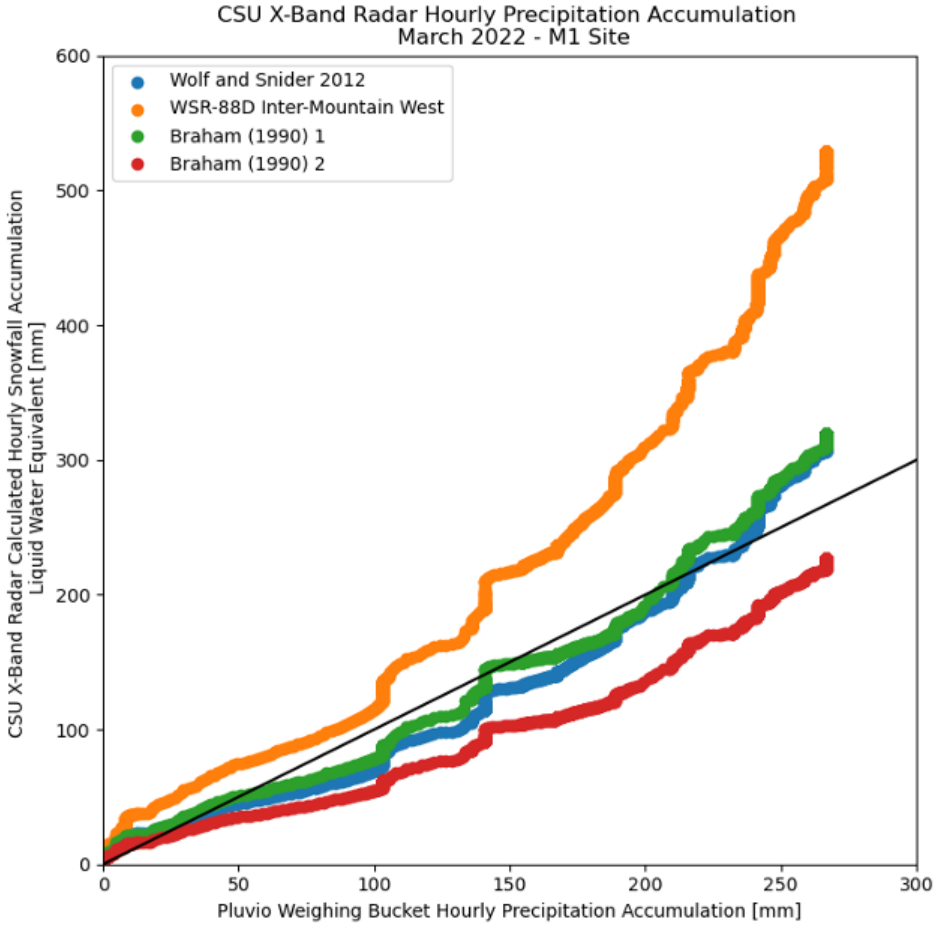

6.0 Deg. 2022-03-14T02:47:59.000000000
Wolf and Snider (2012)
East River Watershed
39.025°N
39°N
38.975°N
38.95°N
38.925°N
38.9°N
38.875°N
10 km
107.05°W
106.95°W
Liquid Equivalent Snowfall Rate [mm/hr]
0
10
20
30
40
50
60

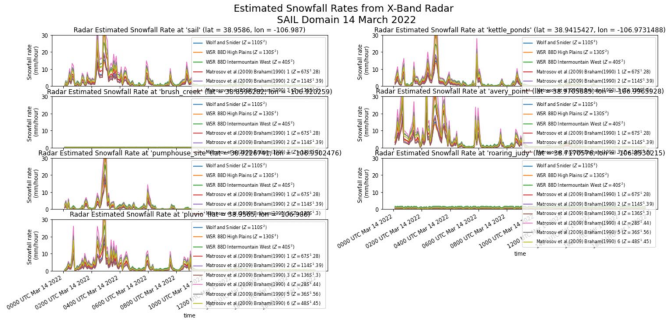

6.0 Deg. 2022-03-14T02:47:59.000000000
WSR-88D High Plains
East River Watershed
39.025°N
39°N
38.975°N
38.95°N
38.925°N
38.9°N
38.875°N
10 km
107.05°W
106.95°W
Liquid Equivalent Snowfall Rate [mm/hr]
0
10
20
30
40
50
60


6.0 Deg. 2022-03-14T02:47:59.000000000
Braham (1990) 1
East River Watershed
39.025°N
39°N
38.975°N
38.95°N
38.925°N
38.9°N
38.875°N
10 km
107.05°W
106.95°W
Liquid Equivalent Snowfall Rate [mm/hr]
0
10
20
30
40
50
60


6.0 Deg. 2022-03-14T02:47:59.000000000
Braham (1990) 2
East River Watershed
39.025°N
39°N
38.975°N
38.95°N
38.925°N
38.9°N
38.875°N
10 km
107.05°W
106.95°W
Liquid Equivalent Snowfall Rate [mm/hr]
0
10
20
30
40
50
60

Cook Book Goodness





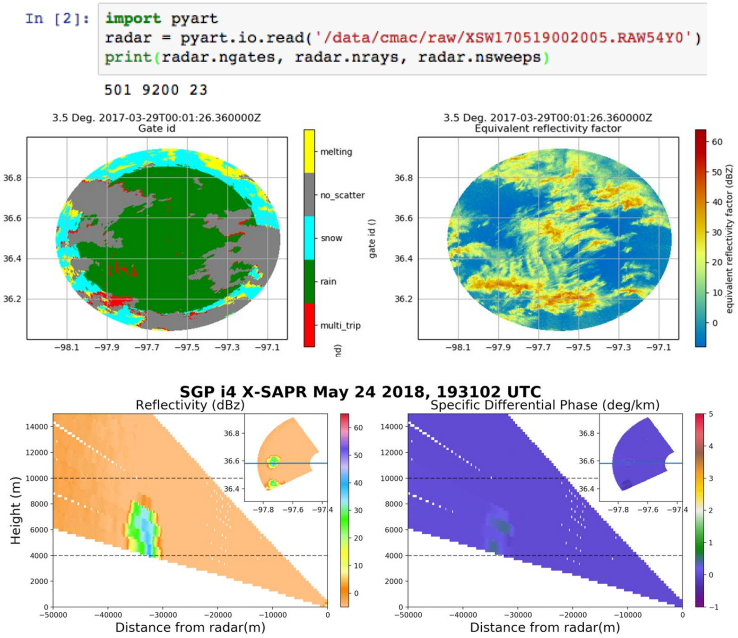
arm-development.github.io/sail-xprecip-radar

THE PYTHON ARM RADAR TOOLKIT

Philosophy: It's all about the data model.

https://github.com/ARM-DOE/pyart

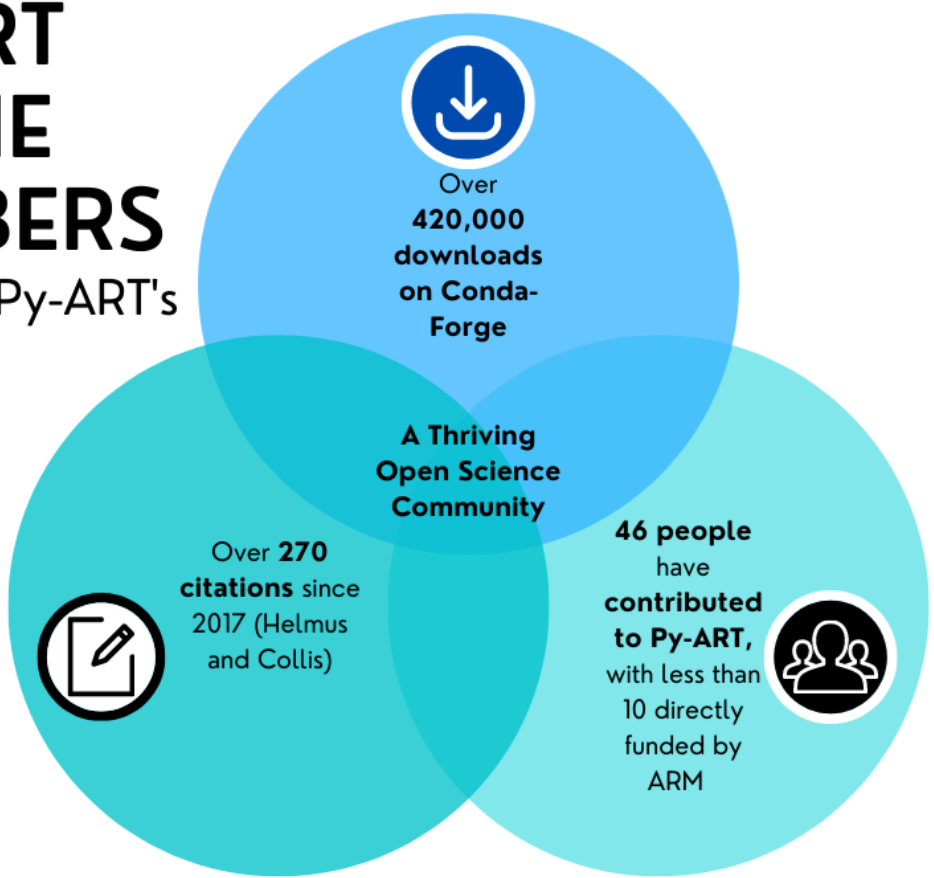
- Py-ART's central core is a data model for gated data with pointing information.
- Py-ART created a way of representing radar data in the Python programming language that mirrors the CF-Radial standard.
- Py-ART has a cloud functions to correct, retrieve and grid radar data.
- By keeping a limited scope Py-ART aims to "do less better".
- There is now a **rich ecosystem** of packages that interact: Py-DDA, CSU tools… etc..



Animation courtesy of users Marcus van Lier-Walqui and Sara E. Lytle
Data: Andrei Lindenmaeir – ARM Mentor

PY-ART BY THE NUMBERS

Measuring Py-ART's Impact and Success



https://github.com/openradar/erad2022

We know there are challenges.
We will need your help.