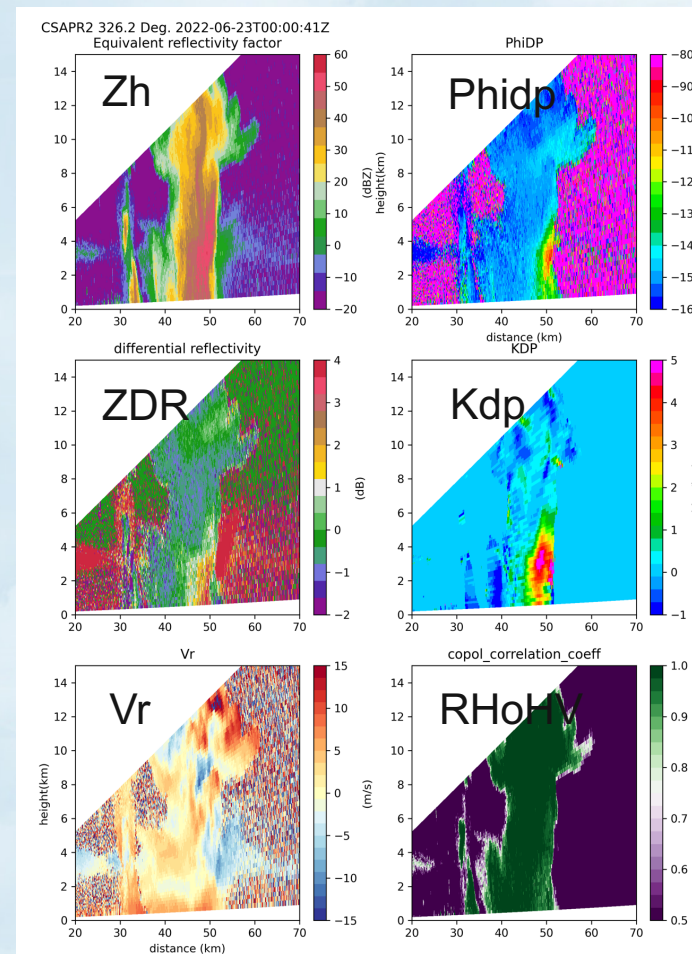


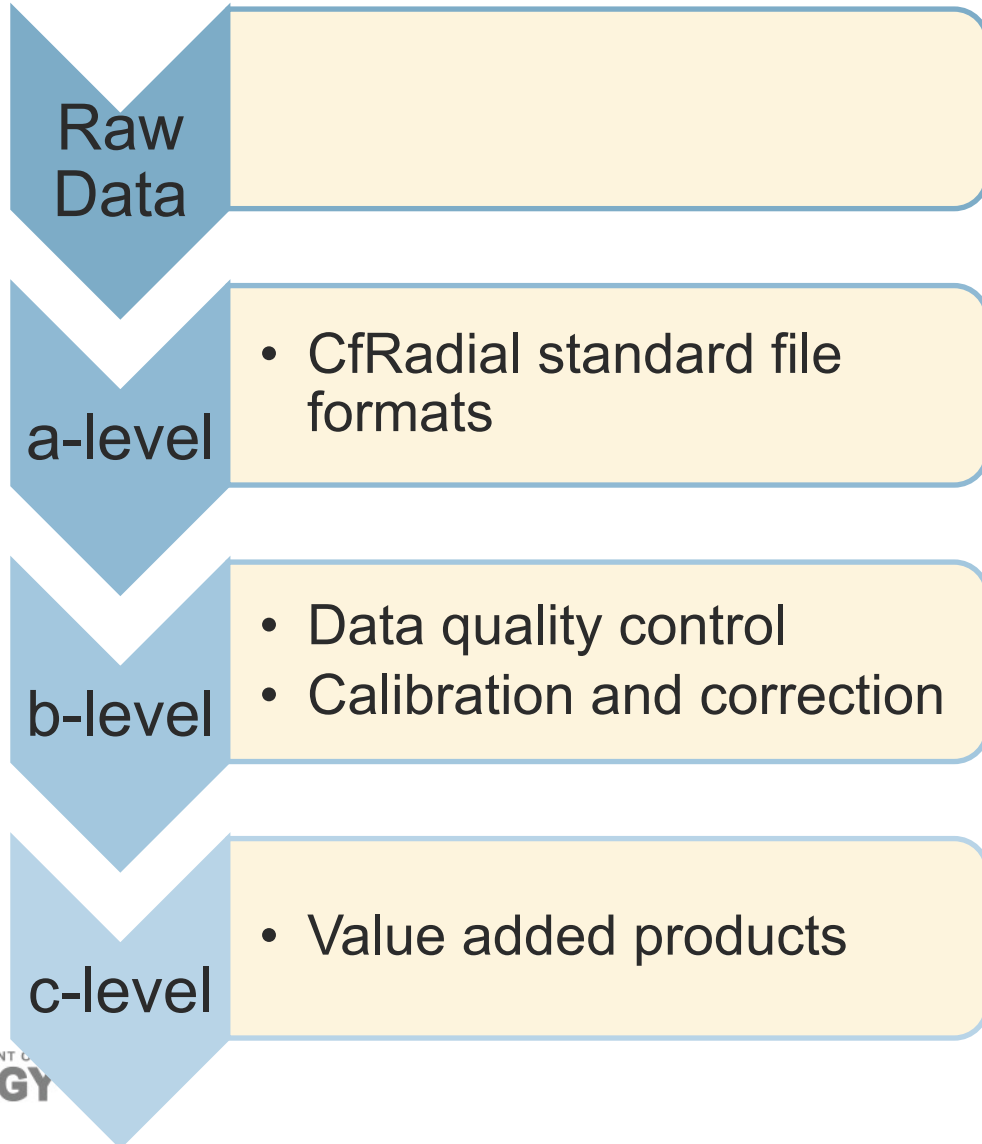
Radar data updates

YA-CHIEN FENG¹, ALYSSA MATTHEWS¹, KAREN JOHNSON², MIN DENG²

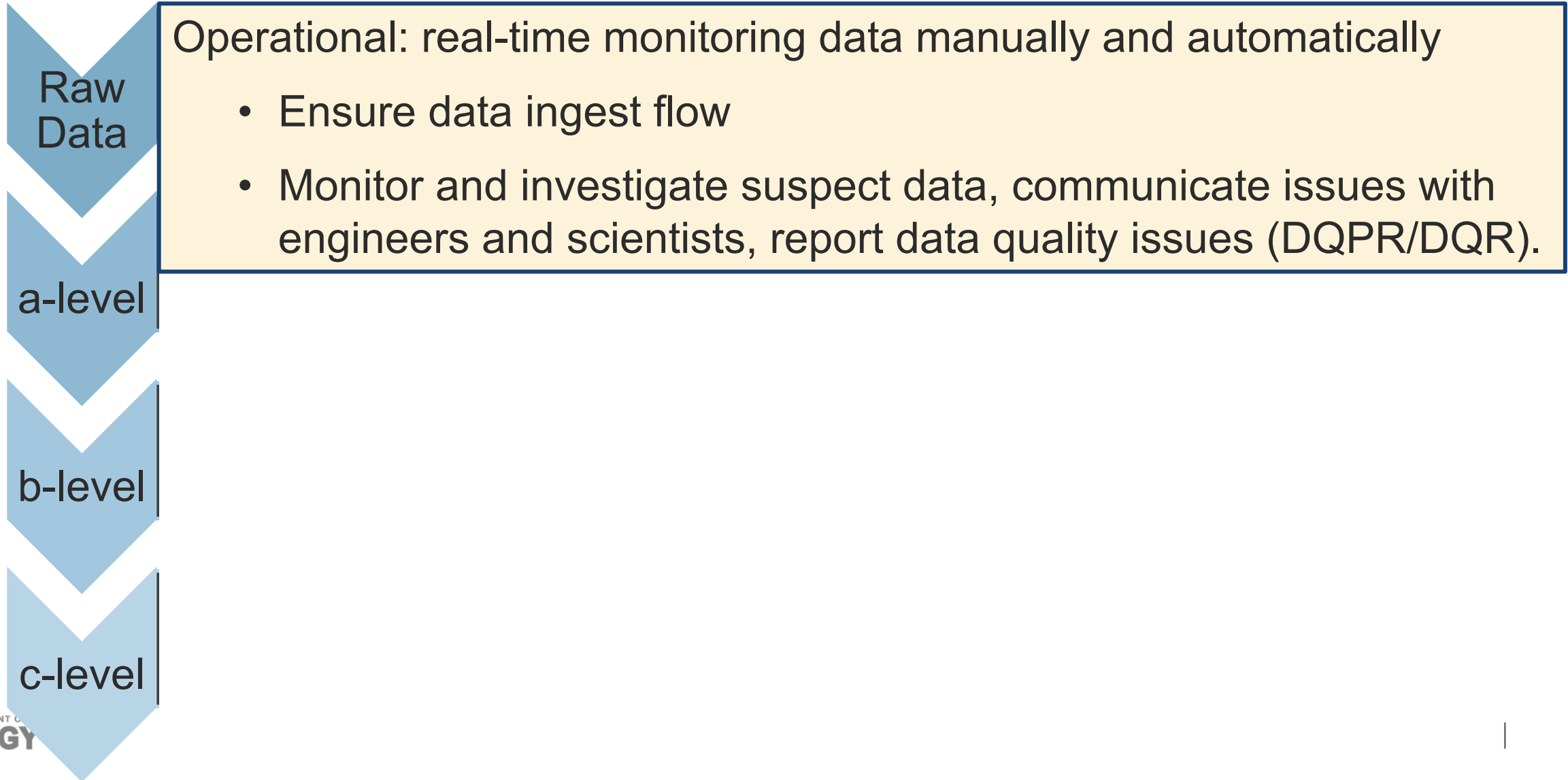
¹Pacific Northwest National Laboratory ²Brookhaven National Laboratory



Radar data



Radar data



Current radar operational status (data monitoring)

	ENA	NSA	SGP	AMF 1 EPCAPE 2023 02	AMF 1 TRACER 2021-2022	AMF 2 SAIL 2021-2022	AMF 3 BNF 2023 09
Cloud radars	KAZR2	KAZR	KAZR	KAZR	KAZR*	KAZR*	KAZR
	KaSACR2*	KaSACR2*	KaSACR	KaSACR	KaSACR*		KaSACR
	WSACR2*	WSACR2*	WSACR	WSACR	XSACR*		XSACR
Precipitation radars	XSAPR2	XSAPR*	XSAPR-SW		CSAPR2*		CSAPR2
			XSAPR-SE				
			XSAPR-NW				
			CSAPR				
						Operational	
						Data evaluation	
						Future works	
						Upcoming campaign	

Radar data

Raw
Data

Operational: real-time monitoring data manually and automatically

- Ensure data ingest flow
- Monitor and investigate suspect data, communicate issues with engineers and scientists, report data quality issues (DQPR/DQR).

a-level

a1 to b1 calibrated data and report for scientific research

- Environment issue: terrain blockage, biological signals, interferences,
- Estimate and correct systematic bias of reflectivity and differential reflectivity. Intercomparison with surrounding instruments.
- DQ Methodology development, long-term dataset analysis

b-level

c-level

General a1 to b1 data process

Non-meteorological
signal identification
(data quality
masking)

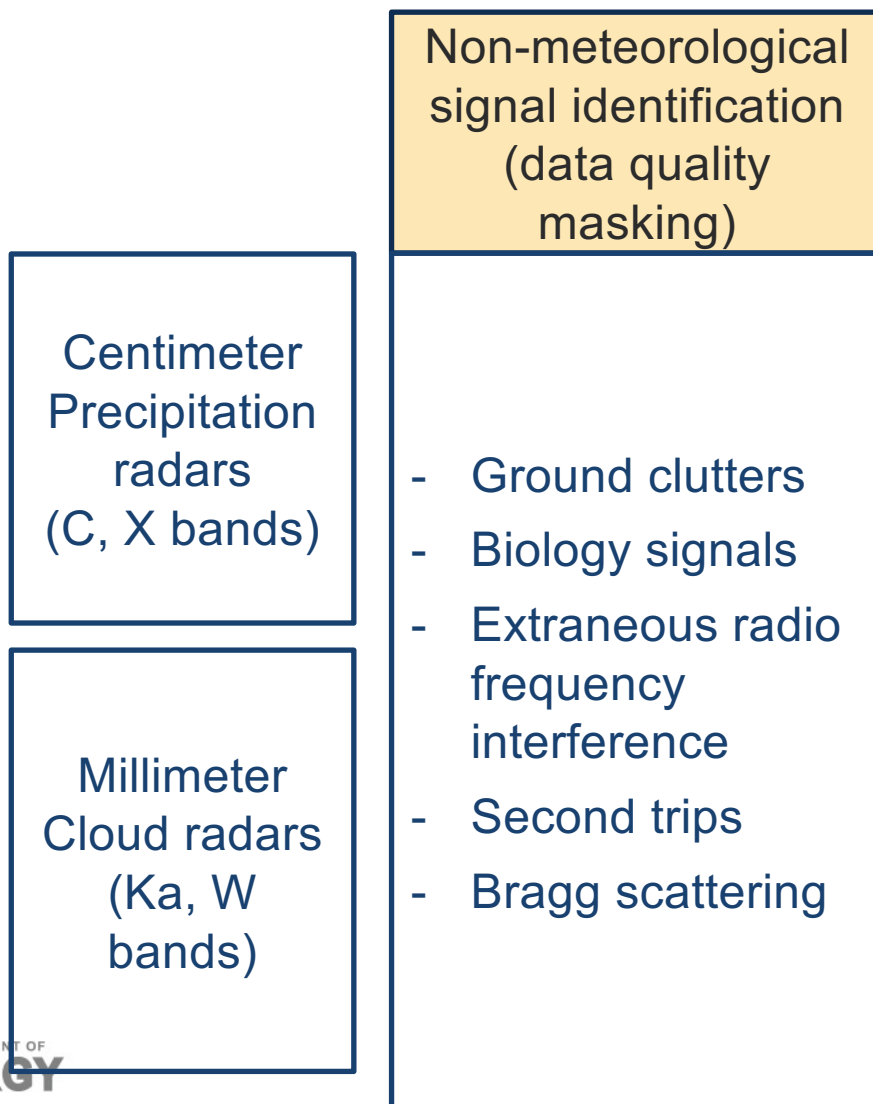
Data calibration
Data intercomparison between instruments

$$Z_{\text{correction}} = Z_{\text{obs}} + Z_{\text{bias}} + Z_{\text{attenuation}}$$

Centimeter
Precipitation
radars
(C, X bands)

Millimeter
Cloud radars
(Ka, W
bands)

General a1 to b1 data process



General a1 to b1 data process

Centimeter
Precipitation
radars
(C, X bands)

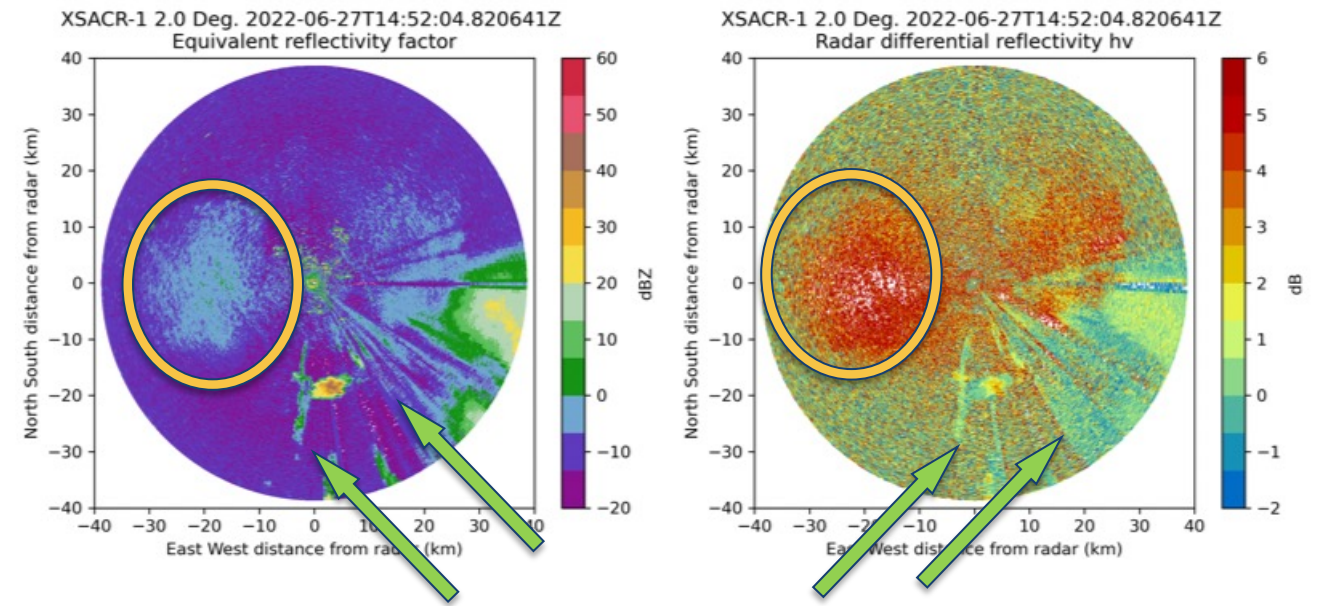
Millimeter
Cloud radars
(Ka, W
bands)

Non-meteorological
signal identification
(data quality
masking)

- Ground clutters
- Biology signals
- Extraneous radio frequency interference
- Second trips
- Bragg scattering



TRACER Biology signals



Second trips

(ARM DQ plotbrowser)

General a1 to b1 data process

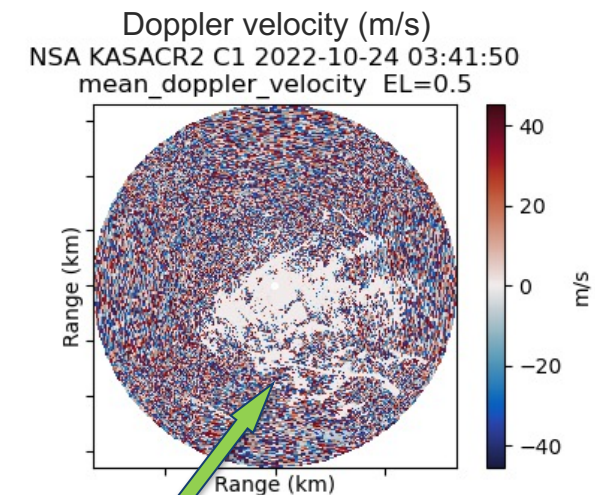
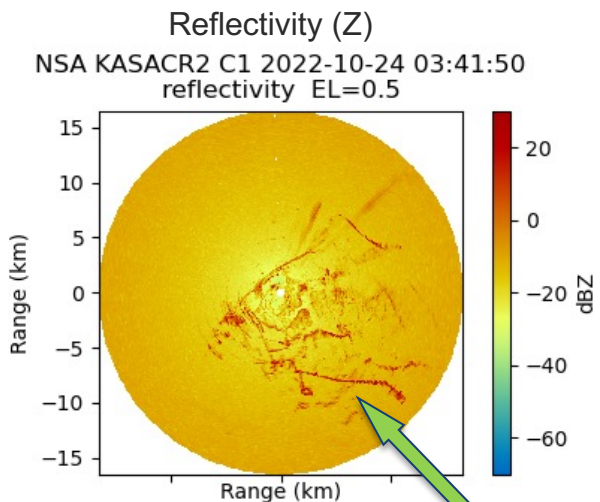
Non-meteorological
signal identification
(data quality
masking)

Centimeter
Precipitation
radars
(C, X bands)

Millimeter
Cloud radars
(Ka, W
bands)

- Ground clutters
- Biology signals
- Extraneous radio frequency interference
- Second trips
- Bragg scattering

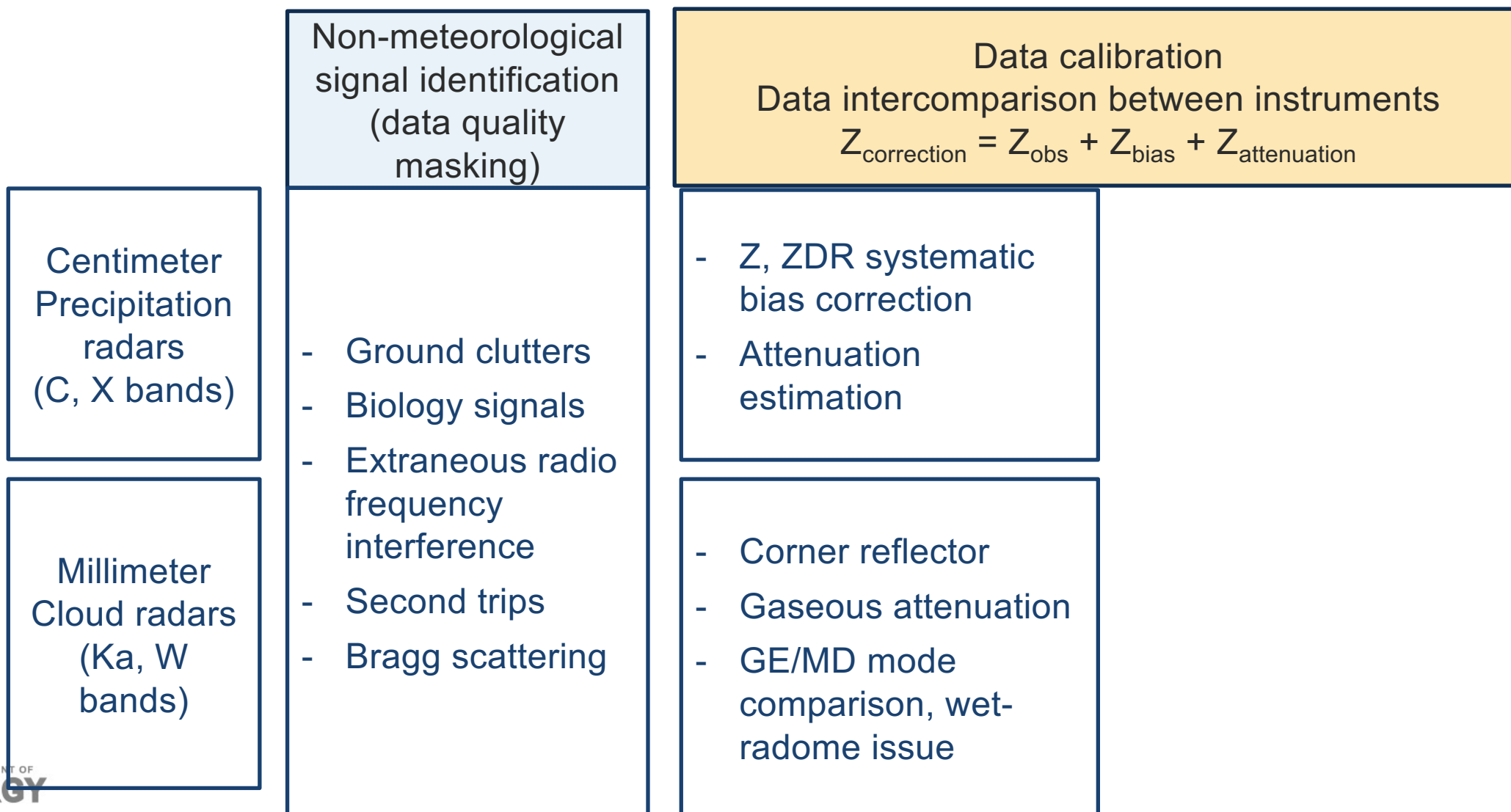
NSA KaSACR2



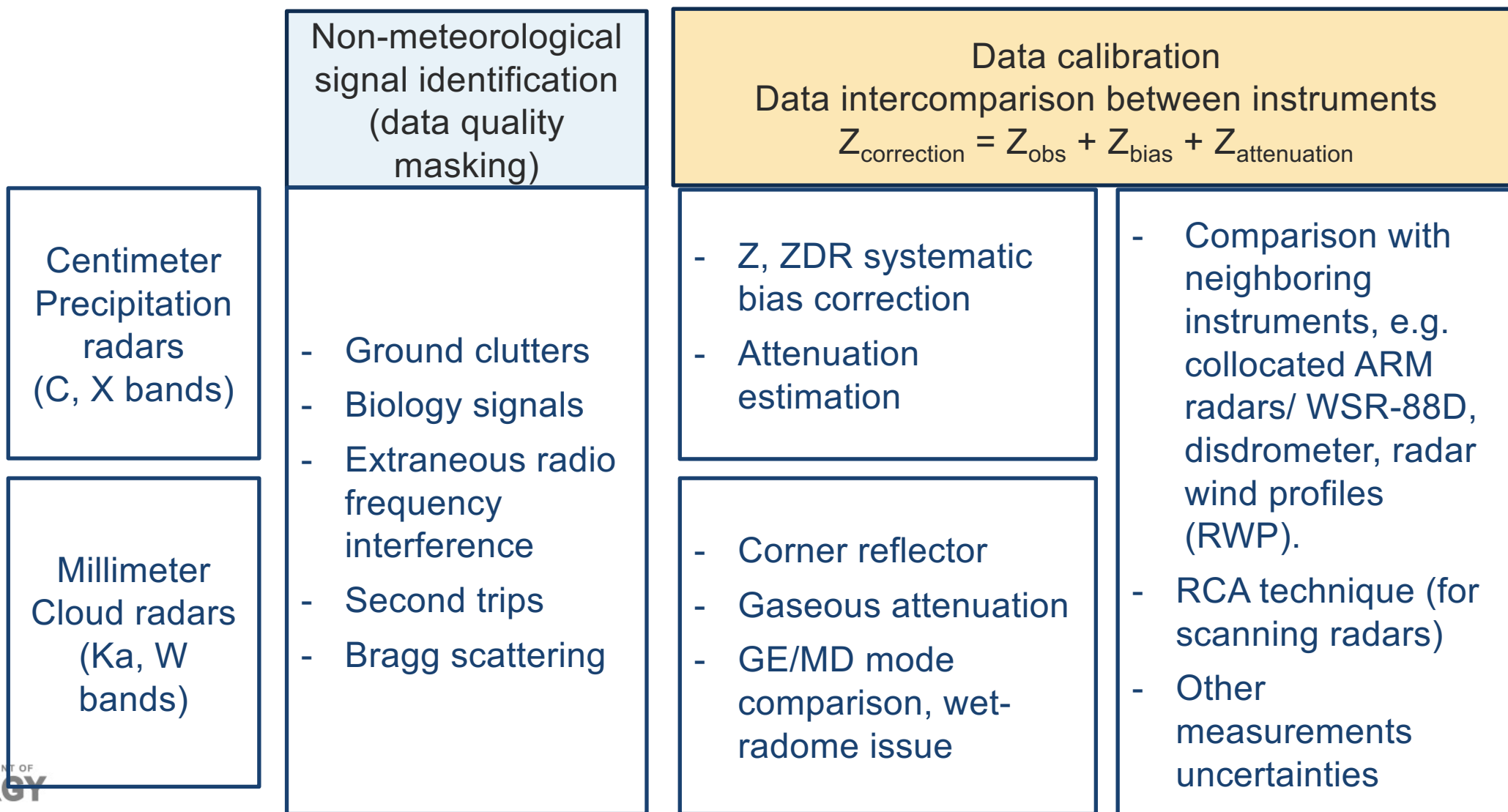
Ground clutters

(ARM DQ plotbrowser)

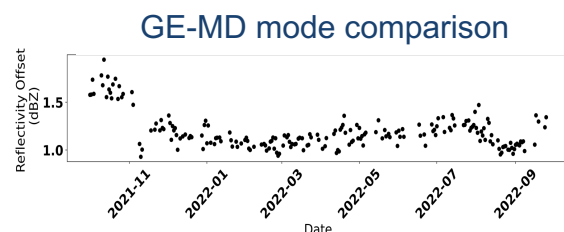
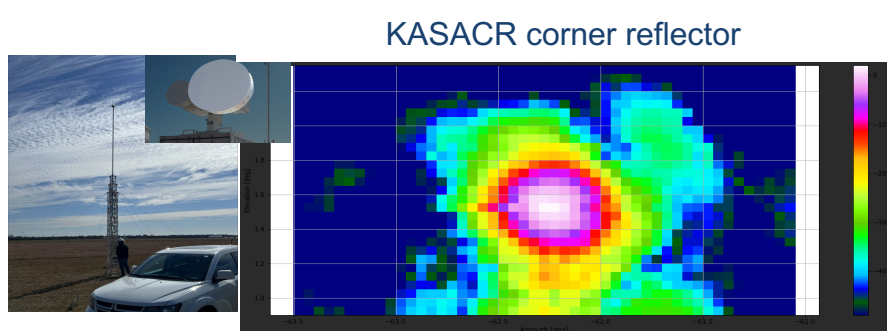
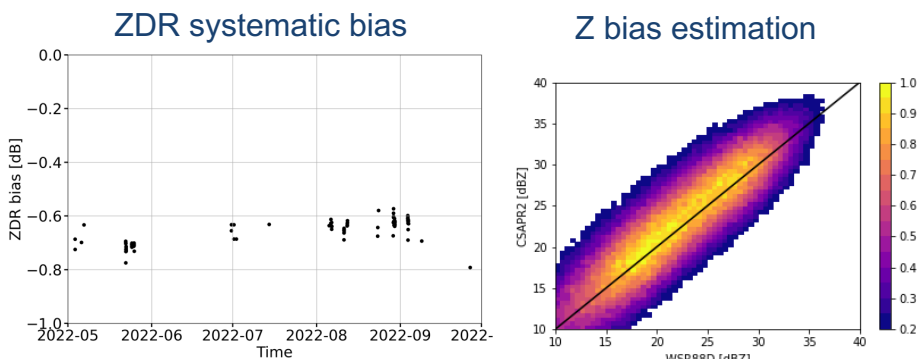
General a1 to b1 data process



General a1 to b1 data process



General a1 to b1 data process



Data calibration
Data intercomparison between instruments

$$Z_{\text{correction}} = Z_{\text{obs}} + Z_{\text{bias}} + Z_{\text{attenuation}}$$

- Z, ZDR systematic bias correction
- Attenuation correction

- Corner reflector
- Gaseous attenuation
- GE/MD mode comparison, wet-radome issue

- Comparison with neighboring instruments, e.g. collocated ARM radars/ WSR-88D, disdrometer, radar wind profiles (RWP).
- RCA technique (for scanning radars)
- Other measurements uncertainties

Current b1 data processing progress

	Field campaigns	Preliminary analysis	b1 data release	b1 report	Expect dates
Poster 2, #90	COMBLE	Completed	Completed	In progress	2022 Oct
	MOSAIC	Completed			2022 Dec
Poster 2, #65	TRACER	In progress			2023 March
	SAIL	In progress			2023 spring
	ENA (3 months)	In progress			2023 summer
	NSA (6 months)	In progress			2023 fall
	SGP (3 months)	In progress			2023 fall

Contact us: radar@arm.gov

For engineering and data team

Backup slides

SAIL and TRACER data

SAIL and TRACER KAZRs

- ▶ Stable during the field experiments

TRACER CSAPR2

- ▶ Nov 23, 2021 — April 20, 2022: a1 data with DQR data, no b1-level files
- ▶ April 21, 2022 — Sep 30, 2022: b1-level data during the IOP
- ▶ Issues of jumping background Z noise and abnormal ZDR were fixed in March after change LNAs and SATLO. During the intensive IOP, CSAPR2 was sometimes affected by lightnings leading to maintenances and restarts, e.g. the control board was replaced after a storm in mid July.

TRACER SACR

- ▶ May 1 — Sep 30
- ▶ KaSACR Nyquist was modified on July 12 as PI preference
- ▶ Radar hardware was affected by the high humidity and high temperature weathers, leading to chiller issues (for example in June 28).

Permanent site update

Eastern North Atlantic (ENA), Graciosa Island (2022 May)

- Ka/WSACR2 is operational after a trip by the radar mentors and an initial scan strategy is being implemented and will be discussed with the science community.
- The SAPR transmitter was problematic and unable to be brought online. Discussions on the path forward are ongoing.
- Operational issues: Radar would be fixed vertically while in high wind condition.

Northern Slope of Alaska (NSA), Barrows Alaska (2022 Aug)

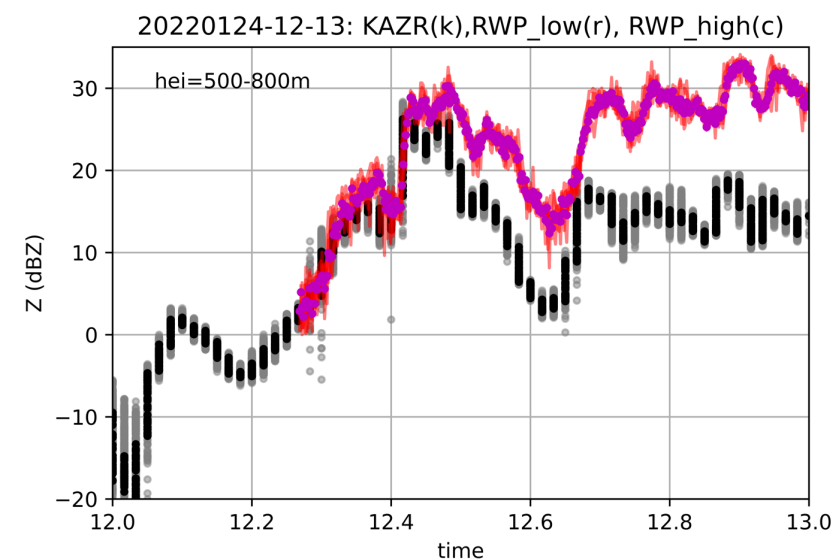
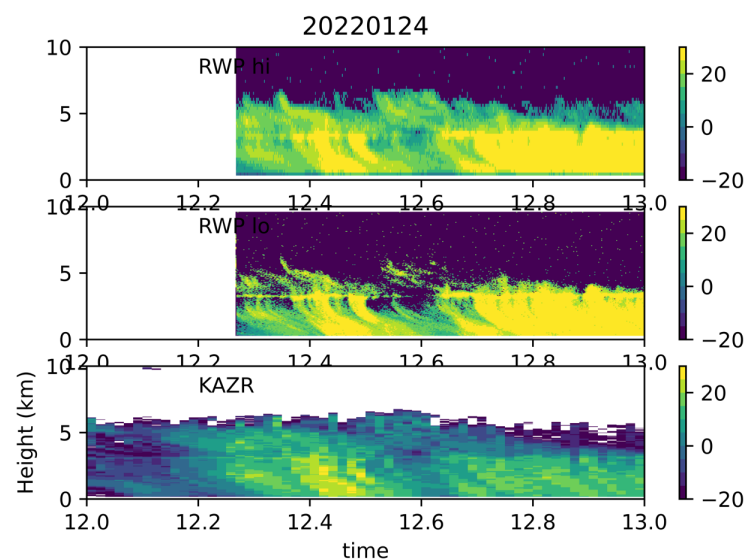
- Ka/WSACR2 was operational after a trip by the engineering team in Aug. The vertical channel receivers of SACR and LNA were replaced in Oct.
- XSAPR was operational after Tod replaced a transmitter in Oct.

Note – KAZR new radome

New hydrophobic radome for KAZR

- The KAZRs need more hydrophobic antenna radomes. We have an ongoing problem of water pooling on the antennas in rain. This causes an unknown amount of signal attenuation, which lasts until the water is blown off or evaporates. The engineers can provide the best solution, whether replacing the radomes is necessary or if recoating the existing ones would suffice.

Wet radome issues



Scanning strategy



Radars	VPT	HSRHI	PPI	Special scans
TRACER				
CSARP2	VPT	54, 84, 114, 144, 174, 204 deg in azimuth 63*	0.5, 1.5, 3 deg in elevations	Cell tracking
X-Ka SACR	VPT	0, 30, 60, 90, 120, 150 deg in azimuth	1, 2 deg in elevations	
ENA				
KA-W SACR	VPT	270, 300, 330, 0, 30, 60, 90 deg in azimuth	1, 2, 3, 5 in elevation	
NSA				
KA-W SACR	VPT	51, 97, 141, 187 deg in azimuth	0.5, 1.5, 3 deg in elevations	
XSAPR	VPT	52, 97, 141, 187 deg in azimuth	Ingest problem	