



ARM Radar Network Update

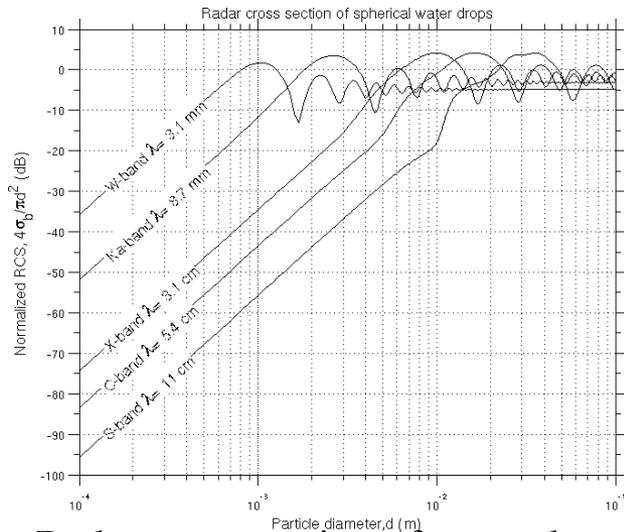
ARM/ASR Joint User Facility/ PI meeting
May 2-6, 2016



U.S. DEPARTMENT OF
ENERGY

Office of
Science

ARM radar network



Radar cross-section of water drops



KAZR

Ka-Band ARM Zenith Radar
@ (SGP, NSA, ENA, AMF2, and AMF3)



MWACR

Marine W-Band ARM Cloud Radar
@ (AMF2)



WACR

W-Band ARM Cloud Radar
@ (AMF1)



Ka/W-SACR

Ka/W-Band Scanning ARM Cloud Radar
@ (SGP, NSA, ENA, AMF1, and AMF3)



X/Ka-SACR

X/Ka-Band Scanning ARM Cloud Radar
@ (SGP and AMF2)



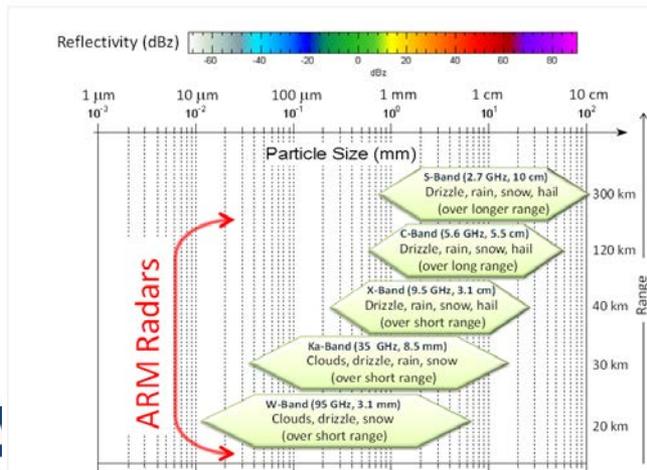
X-SAPR

X-Band Scanning ARM Precipitation Radar
@ (SGP, NSA, and ENA)



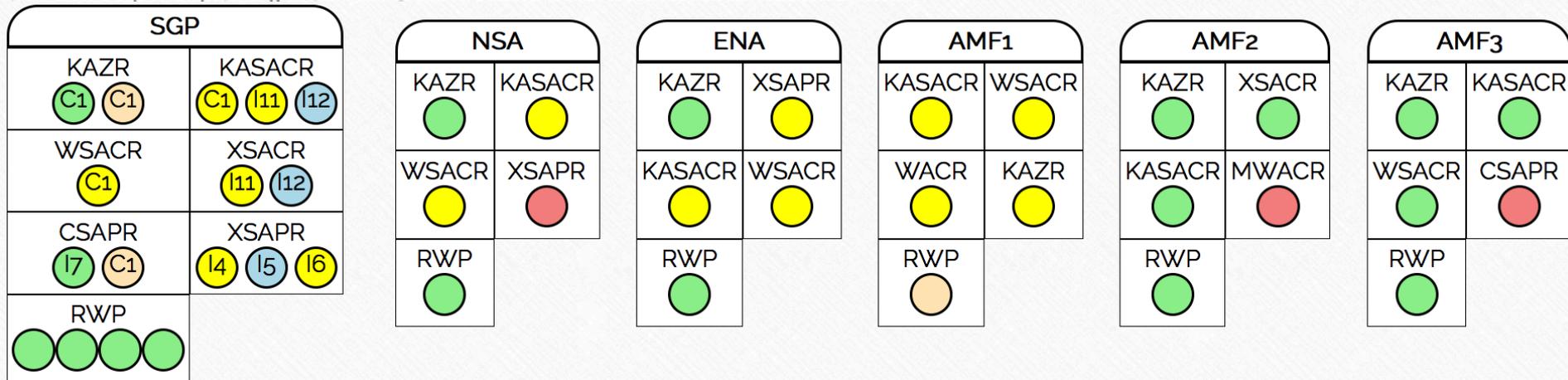
C-SAPR

C-Band Scanning ARM Precipitation Radar
@ (SGP and AMF3)



Radar status overview

Status Legend:



- updates on radar.arm.gov
 - Currently manually done on a weekly basis
 - Information is only about radar and not about data

Status:

Radar Engineering and Operations

- Integration of AMF2 SACR with Marine pedestal AL-4034 completed
 - ability to deploy SACR on a ship.
 - Ability to deploy in high wind conditions
- Installation and operations of SACR and KAZR in McMurdo station.
 - Radar installation at AWARE was a success.
 - Radars are operational and capturing data.
 - Data has passed ingest, and entered review.
- Calibration Grooming Alignment (CGA) at AMF3 (Oliktok)
 - October 11-24, 2015
 - 7.2 TB of data collected
 - Several opportunities for improvement were identified

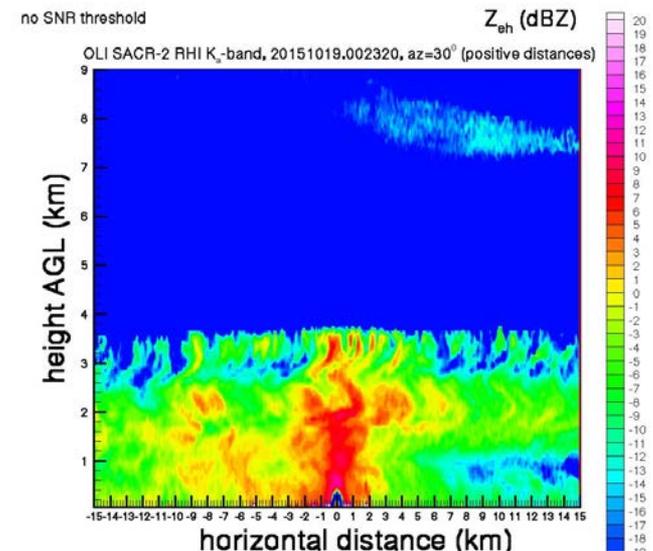
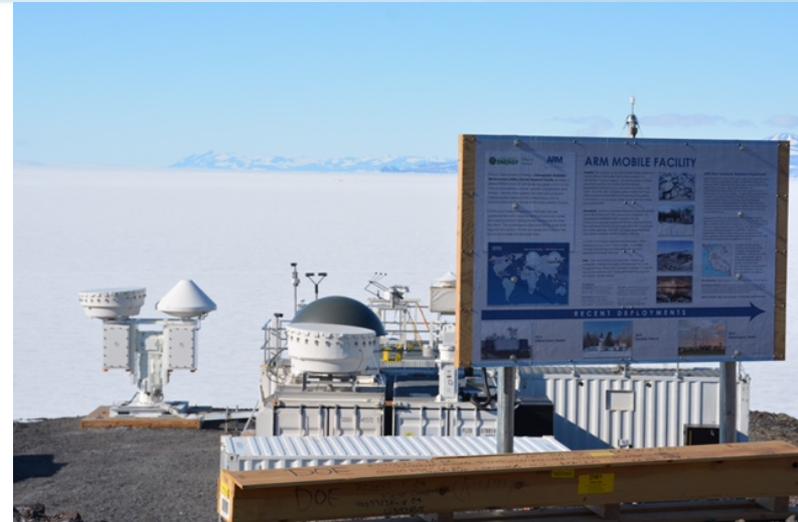
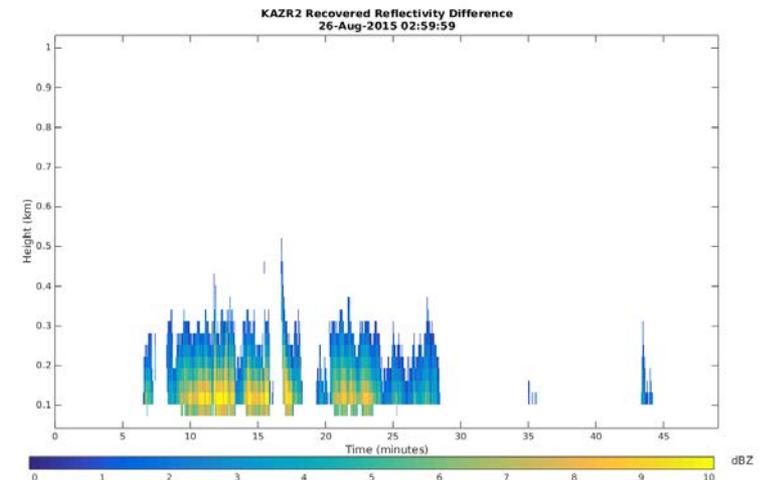
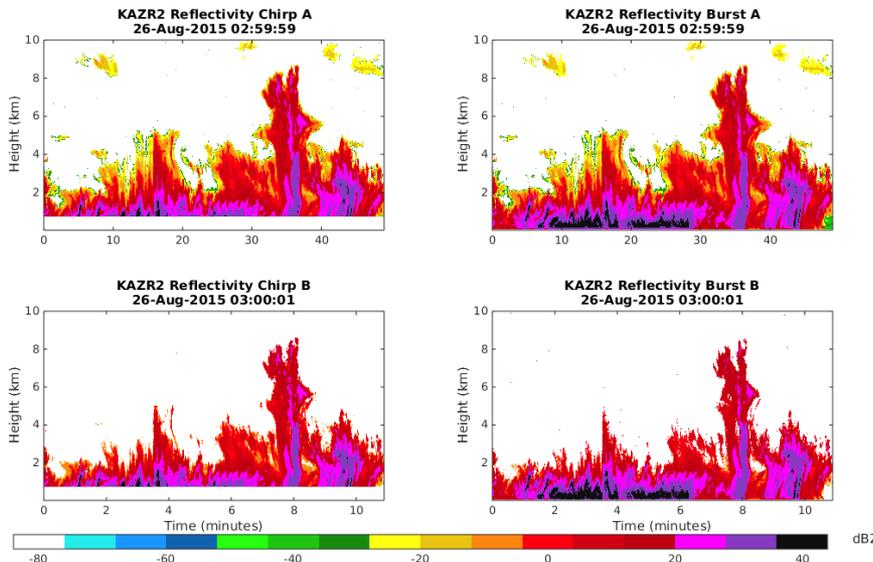
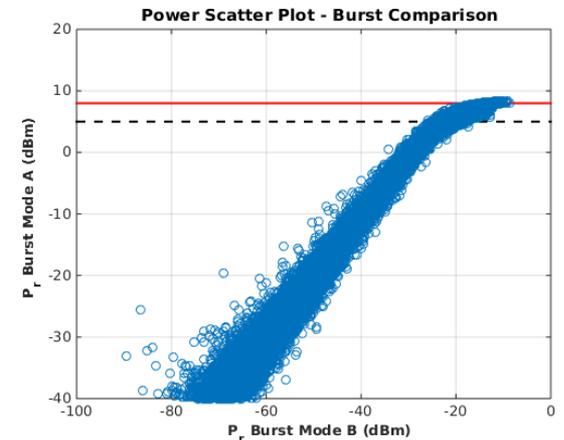


Image Courtesy: Sergey Matrosov

Status:

Radar Engineering and Operations

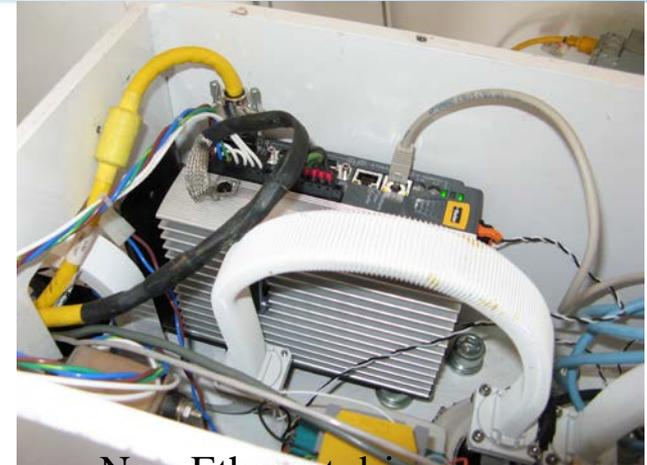
- KAZR2 Baseline mode defined (August 2015)
 - Two modes: High sensitivity (A) and low sensitivity (B)
 - Two pulses: Chirp ($\sim 4 \mu\text{s}$) and burst ($\sim 0.4 \mu\text{s}$)
 - Implemented both at ENA and AMF3
 - Reduces the impact of saturation at lower ranges



Status:

Radar Engineering and Operations

- XSAPR transmitters in stable operating mode
 - Engineering modifications were done to the transmitter to obtain reliable and stable operations.
 - The modifications were also tested with new magnetrons
- XSAPR control processor upgrade ongoing
 - Analog servo amplifiers upgraded with Ethernet controlled digital servo amplifiers
 - Antenna position recording upgraded to optical absolute encoders from Syncros
 - Control processor to be upgraded with Vaisala RCP8 in summer 2016.



New Ethernet driven servo amplifiers installed at SGP I5



Syncros upgraded with absolute optical encoders for position

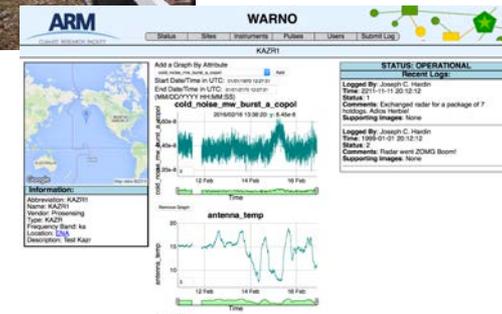
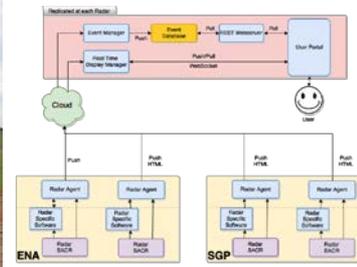
Status:

Radar Engineering and Operations

- SACR upgrades
 - W-SACR RF front end upgraded on all SACRs. This upgrade increases the sensitivity of WSACR compared to the original design and makes it comparable to KaSACR
 - SACR RF units upgraded to be modular making it easier for maintenance and repairs
- SACR and KAZR software upgraded with newer OS. This allow the use of solid-state hard drives on the radar to increase reliability on a moving platform
- AMF1 setup gets a KAZR. KAZR from TWP site has been integrated into AMF1
- AMF1 SACR repaired and upgraded. Preparations underway to ship the system to Ascension Island.

Status: Radar Engineering and Operations

- Radar Training: on-site training was conducted at SGP for the site operators
- Watchdog for ARM Radar Network Operations (WARNO) design completed with alpha implementation.
- Communication with PIs and end-users improved with Trello. Trello is facilitating discussions on data quality, data usage and scan strategy.
- CSAPR2 installed at SGP with few remaining acceptance tests
- XSAPR2 installed at SGP with few remaining acceptance tests



Radar Workshop

- Radar workshop to discuss the keys areas for radars
- Key
 - Reliable operations of the radars
 - Well characterized data: Calibration and uncertainty of observations
 - In-situ measurements for validation and verification

On the table

Installation of XSAPR2

Site operations

Installation of CSAPR2

Manus SACR upgrade

SGP Megasite SACR

KAZR2 ingest

WACR EIKA replacement

SACR2 ingest

KAZR b1 (re)processing

XSAPR characterization

Deployment of WARNO

SAPR VAPS

SGP HI-SCALE

XSAPR processor upgrade

SACR OS & software update

KAZR OS & software update

SACR characterization

WACR/MWACR antenna

AMF2 AWARE

AMF3 CGA

KAZR ARSCL

SGP XSAPR RCP8 Upgrade

NSA XSAPR RCP8 Upgrade

SACR b1 (re)processing

Test equipment

RF measurement setup

AMF1 SACR upgrade/repair

CSAPR2 ingest

Training

Data flow

AMF1 KAZR integration

Radar Trello

DQ

ENA CGA

AMF1 LASIC

Property Management

Calibration of BITE

XSAPR2 ingest

SACRCOR

SAPR b1 (re)processing

SACR Server replacement

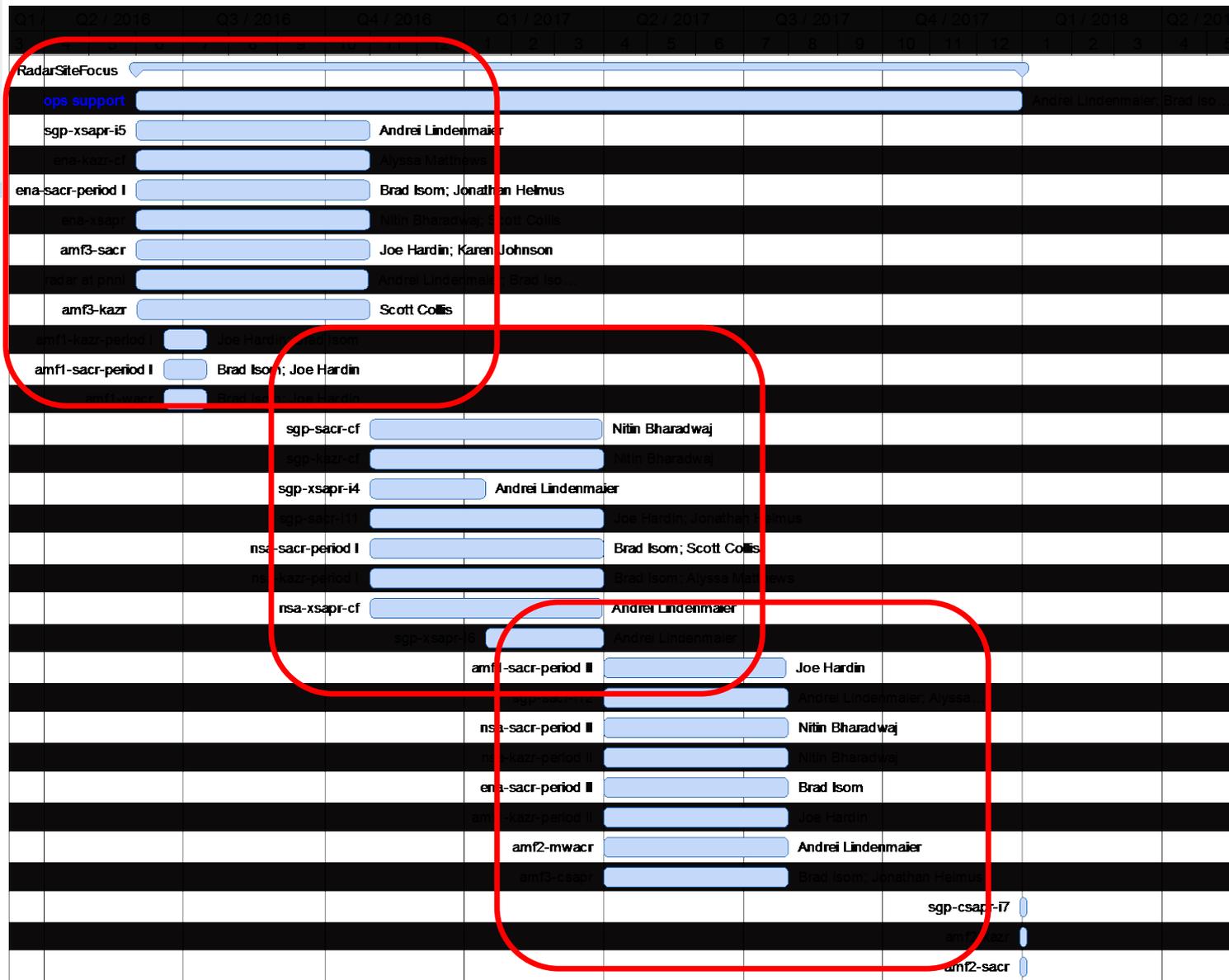
Wind turbine clutter

Sea clutter

Radar Workshop

- Develop a pragmatic plan to achieve the goal
 - Need to reallocate resources: time and personnel to specific radars.
 - Address radars in phases
 - There will radars which are not assigned key resources during a given phase
 - There is a dynamic component to the plan. The plan will be modified depending on the nature of the failure.
 - Things to consider
 - ARM strategic plan
 - Climatology and seasons
 - Future field campaigns

Draft plan:



- Breakout session on 1:45 PM to 4:00 PM on Thursday (Fairfax)

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Thank you

	Q1 2016				Q2 2016				Q3 2016				Q4 2016				Q1 2017				Q2 2017				Q3 2017				Q4 2017				Q1 2018				Q2 2018											
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