MARCUS Ship Navigation and Tilt Corrections: A look at ARSCL-related data from the campaign so far

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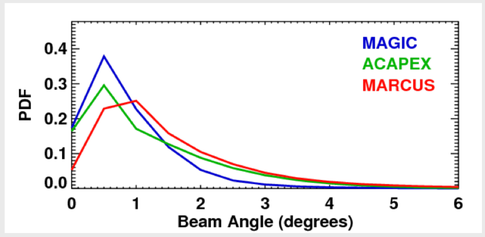
Abstract: The second ARM Mobile Facility (AMF2) is designed to support ocean-based deployments. Two deployments have completed: Marine ARM GPCI Investigation of Clouds (MAGIC) (2012 – 2013) and the ARM Cloud Aerosol Precipitation Experiment (ACAPEX) (2015). Currently under way is the Measurements of Aerosols, Radiation, and CloUds over the Southern Ocean (MARCUS). The Australian Antarctic supply vessel, Aurora Australis, carries the AMF2 between Hobart, Australia, and the Antarctic from 30 October 2017 - 1 April 2018.

This poster presents the status of the MARCUS navigation and ship correction data and first looks at corrected W-band (95 GHz) ARM Cloud Radar Active Remote Sensing of CLouds (WACR-ARSCL) VAP.

The histograms at right show beam angle (angle off zenith) for the MAGIC, ACAPEX, and MARCUS campaigns.



Key Point #1: ARM Translators are producing the following navigation and inertial measurement-related or -impacted data for MARCUS:

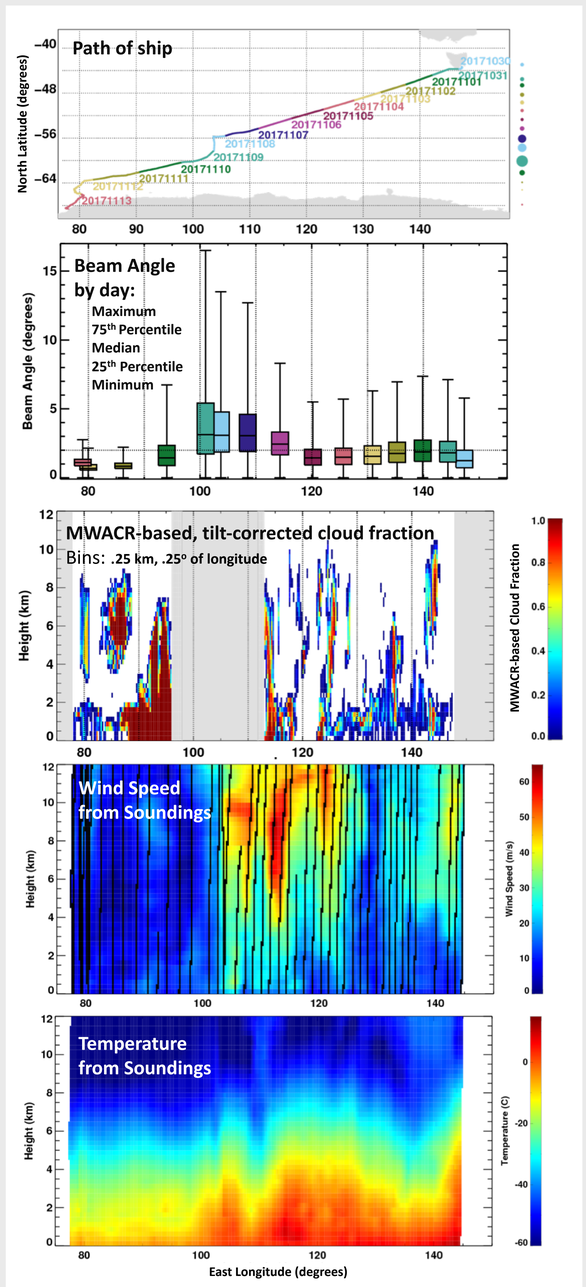
- **NAVBE:** navigation and inertial data with added value of en route flag, beam angle, and beam angle orientation
- **NAVBE1M:** 1-min averaged NAVBE quantities with addition of course over ground and speed over ground
- **CEILSHIPCOR:** tilt and heave corrected ceilometer cloud bases
- **MPLSHIPCOR:** tilt and heave corrected Micropulse Lidar (MPL) data
- **MWACRSHIPCOR:** tilt and heave corrected moments, heave velocity corrected mean Doppler velocity
- **MWACRARSCL:** ARSCL from corrected ceilometer, MPL, and MWACR data

Data is expected to be available from the ARM Archive by August 2018.

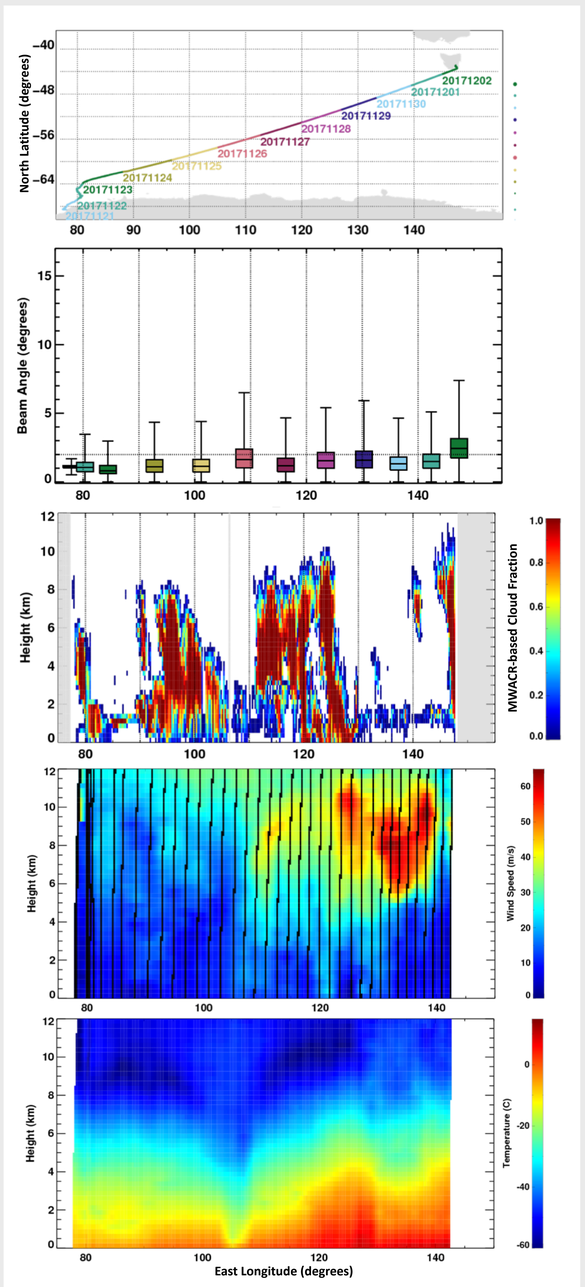
Key Point #2: The MWACR is installed on a stabilized table to keep it zenith-pointing; however the table was not always zenith-pointing. We derive corrections that currently are sufficient for reflectivity, but extra corrections may be necessary for mean Doppler velocities to account for the contribution from horizontal winds.

A look at each MARCUS leg so far ….

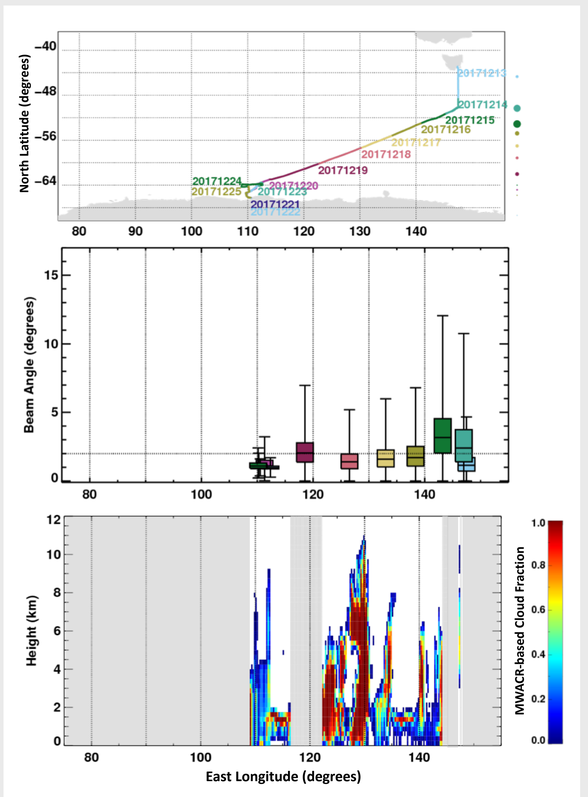
Voyage #1: 1st leg
Bruny Island, Australia to Davis, Antarctica



Voyage #1: 2nd leg
Davis, Antarctica to Hobart, Australia



Voyage #2: 1st leg
Hobart, Australia to Casey, Antarctica



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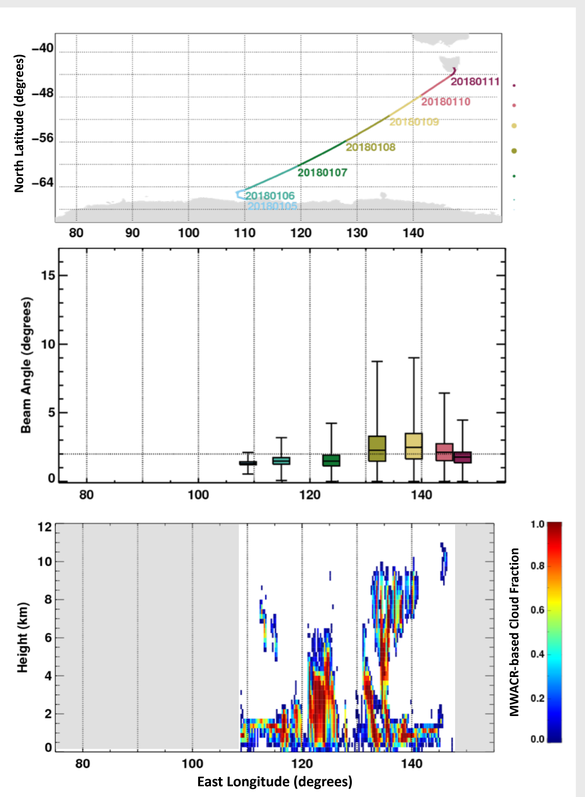
Voyage #2: 2nd leg
Casey, Antarctica to Hobart, Australia



Sounding data unavailable at time of printing

MWACR Mean Doppler Velocity Correction: Shown for each leg is the relationship between 5-min average beam angle from the MWACR and the SEANAV (left 2 columns) and original and corrected Mean Doppler velocity CFADs (right columns).

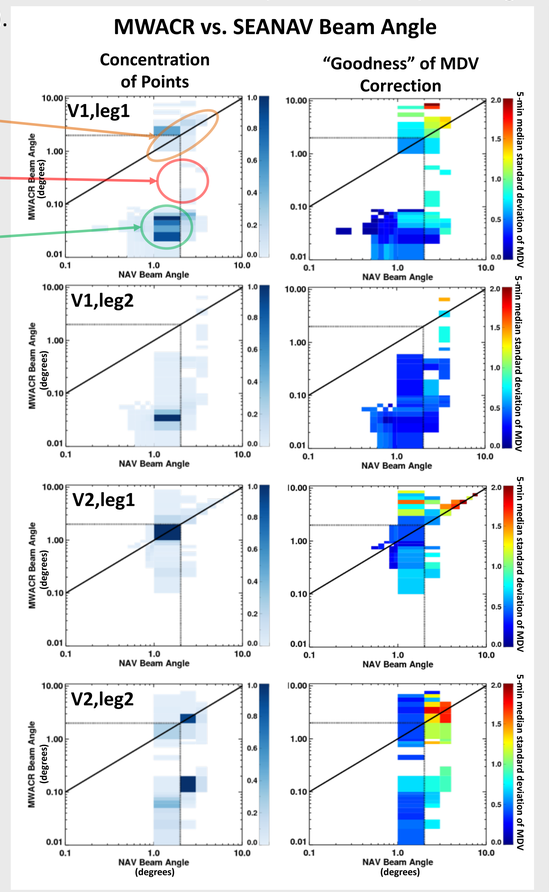
MWACR and SEANAV consistent, indicating the stable table is locked and the MWACR is in a position perpendicular to the deck of the ship

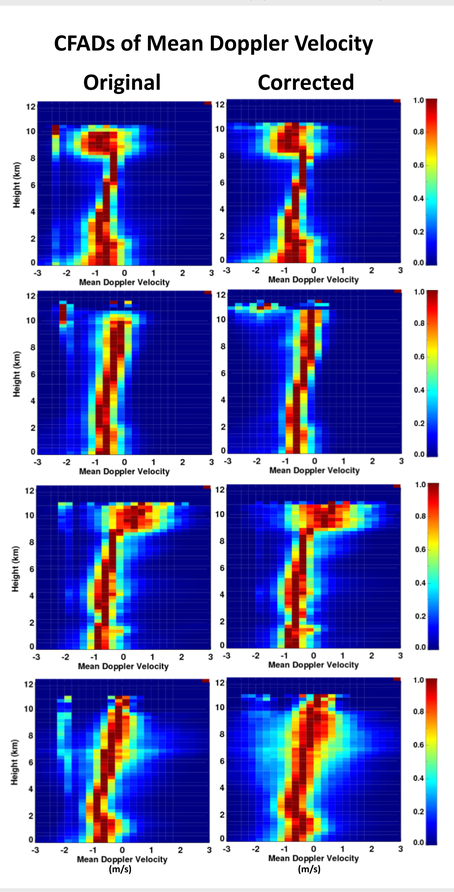
Stable table is not keeping up with the pitch and roll of the ship

BEST: Stable table is working well

The 1st column to the right compares for cloud points the 5-min average beam angle from the MWACR and the SEANAV. The color bar is normalized to the logarithmic bin with the greatest number of points.

The 2nd column shows how "good" the MDV correction is, based on the texture of the MDV field.





Ceilometer Correction for First Cloud-Base Height: The plots show distributions of the corrections for pitch, roll, and heave on the first cloud base height (CBH) determined from the ceilometer. For each original height bin, the color range is normalized to the pixel with the most points.