

Backscatter Adjustment for Multi-Sector Multi-Swath Multibeam Echosounders

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Survey Quality Control

**Hydrographer only monitoring
bathymetry!**



Survey Products

The image displays a collection of survey-related products and logos. At the top center is the title "Survey Products". Below it, on the left, is the cover of a report titled "Best Seller" with the subtitle "Recommendations by seafloor-mapping sonars" and "Guidelines and Recommendations". The report is a collective report by members of the GeoHab Backscatter Working Group, edited by Xavier Lurton and Geoffroy Lamarche, and dated May 2015. The cover features the logos of GEOHAB (Marine Geological and Biological Habitat Mapping), Ifremer, and NAWA (Tahiti Nui Sūkaraŋi). A small inset image on the cover shows a bathymetric map with various colored zones. To the right of the report cover is a large bathymetric map showing a detailed seafloor profile with a color scale from -40 to -5. At the bottom left, there is a color scale from -870 to -7. At the bottom right, there is a grayscale bathymetric scale from -40 to -5. The bottom of the collage features logos for NSCC, the University of Tasmania, and QPS.

Best Seller
Recommendations by seafloor-mapping sonars
Guidelines and Recommendations
A collective report by members of the
GeoHab Backscatter Working Group
Editors
Xavier Lurton and Geoffroy Lamarche
May 2015

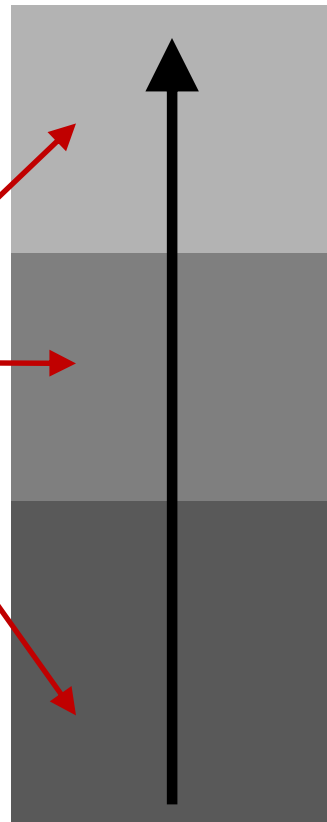
Logos: GEOHAB (Marine Geological and Biological Habitat Mapping), Ifremer, NAWA (Tahiti Nui Sūkaraŋi), NSCC, UNIVERSITY of TASMANIA AUSTRALIA, QPS.

Color Scales:
Left: -870, -840, -810, -7
Right: -40, -35, -30, -25, -20, -15, -10, -5

Categorizing Backscatter Artefacts

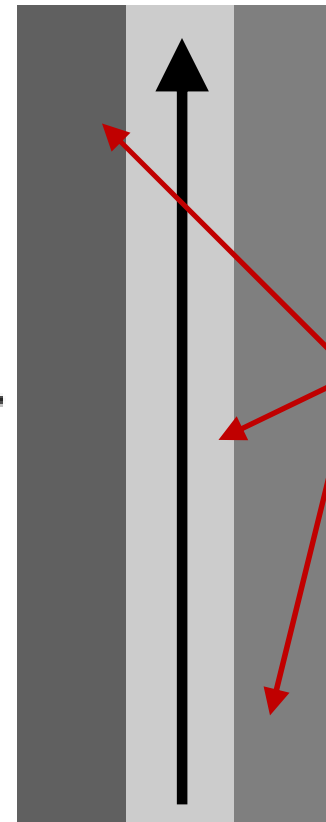
Artefacts at the survey-line level

Across-Track
Artefacts



Beams

Along-Track
Artefacts

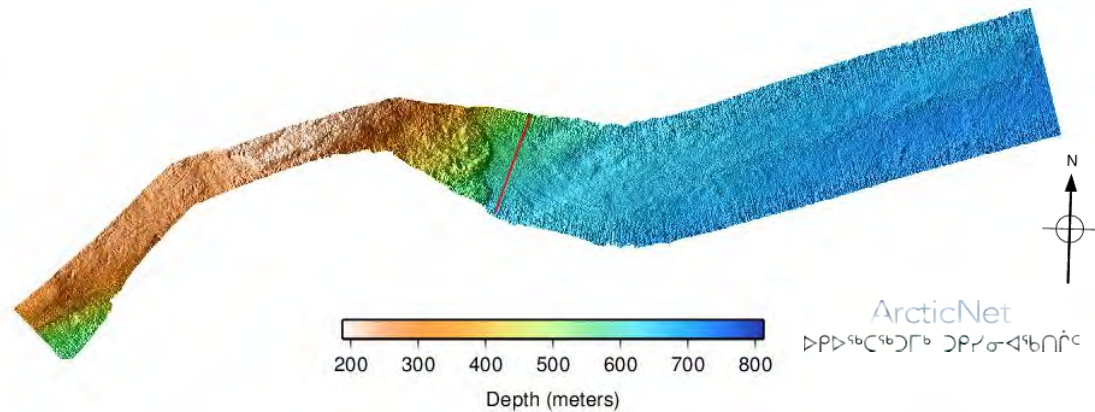
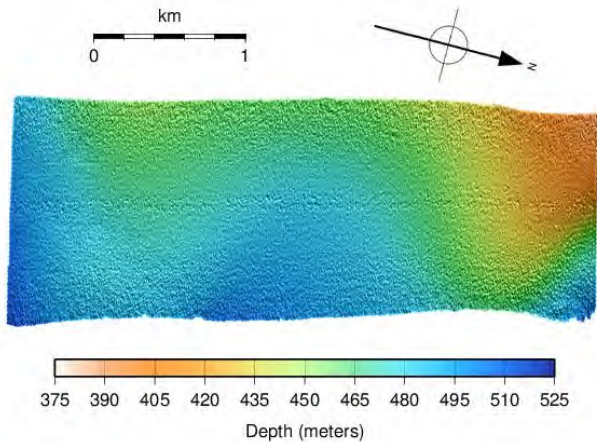
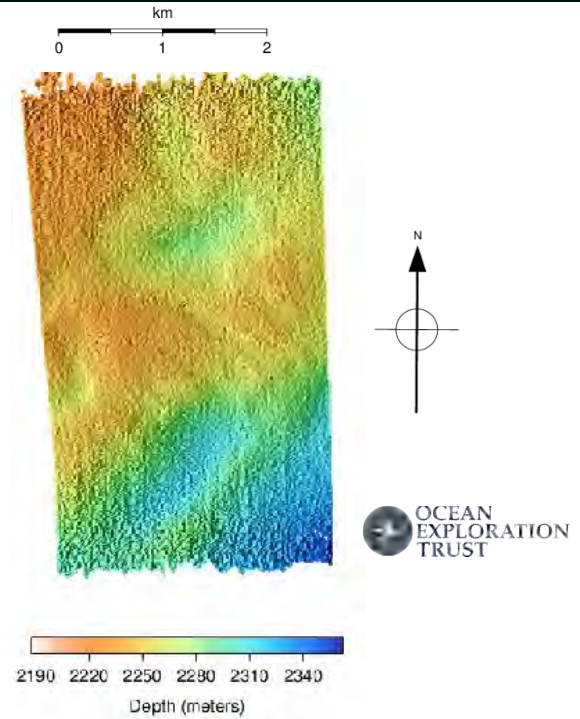
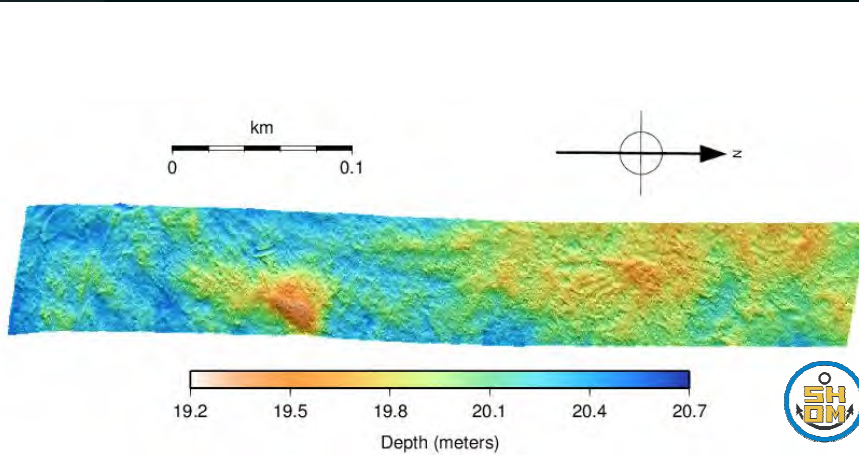


Beams

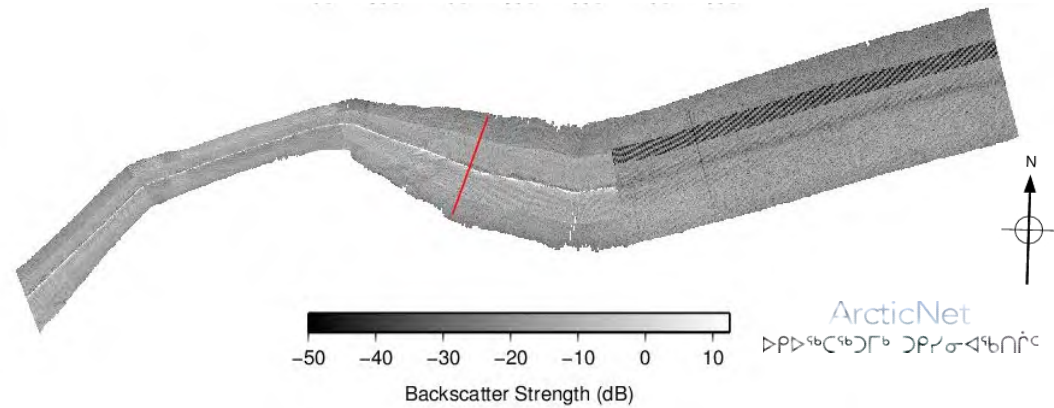
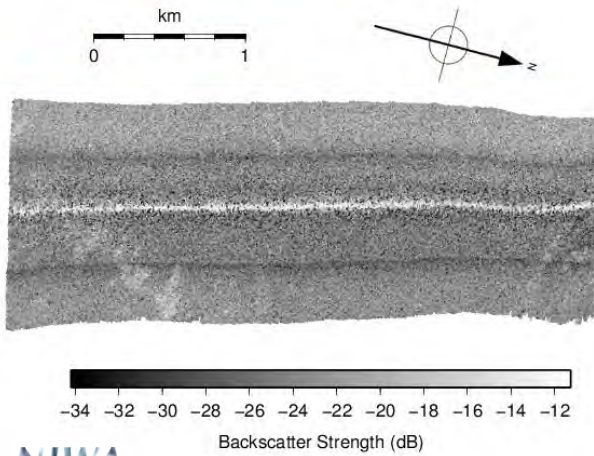
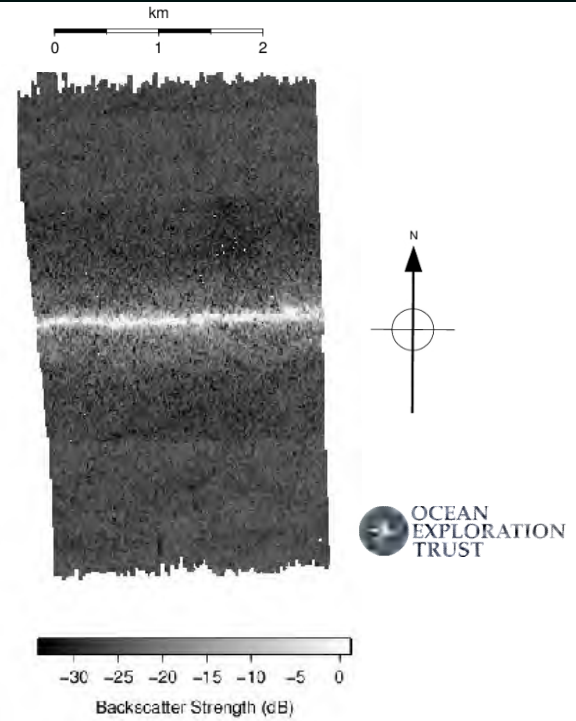
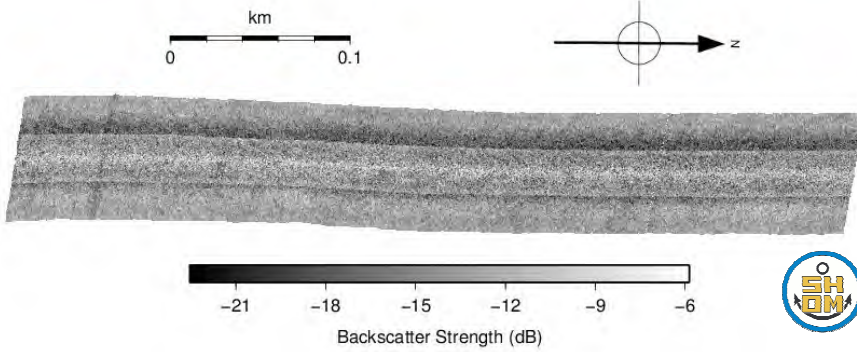
**Acquisition
parameter
changes**

**Poorly
compensated
transmit patterns**

DTMs from several organizations



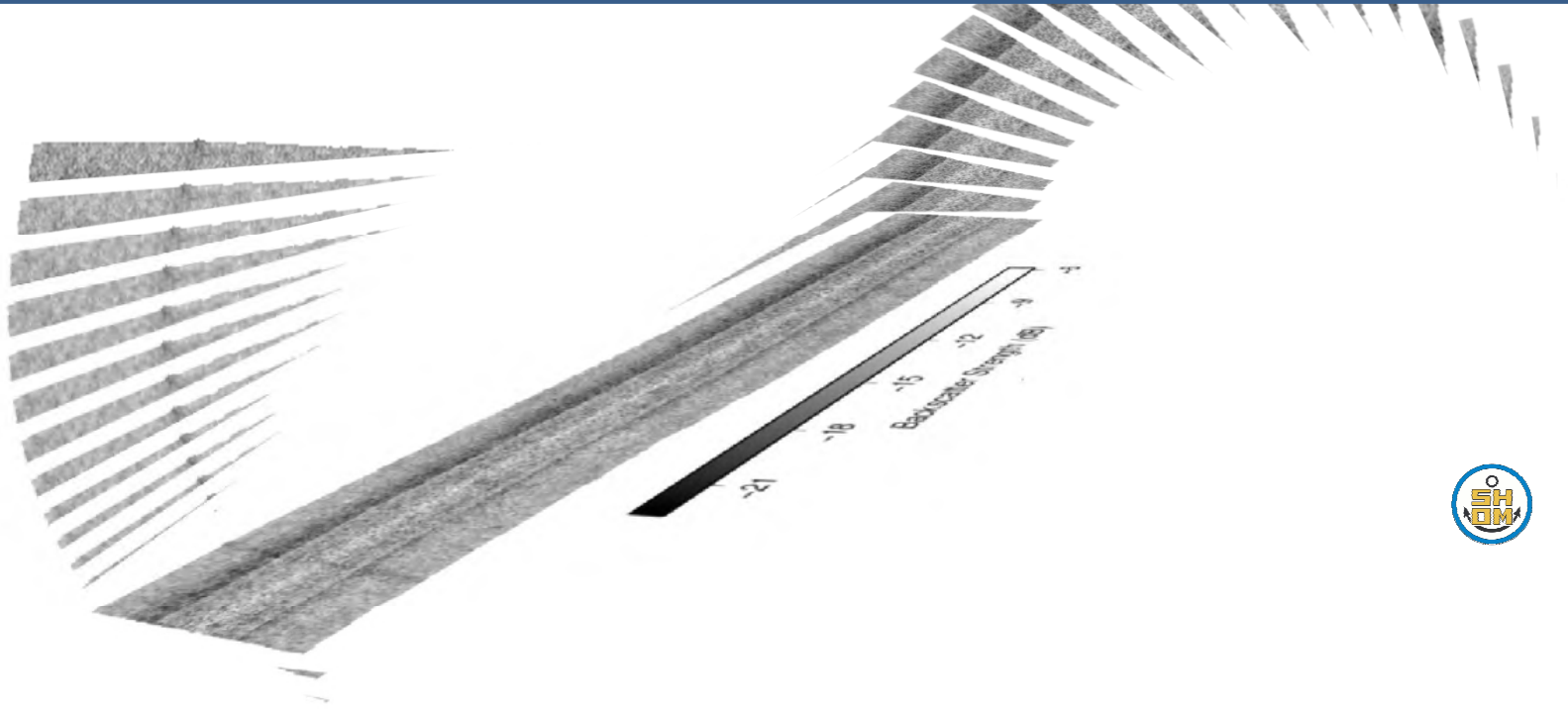
BS Mosaics from the same organizations



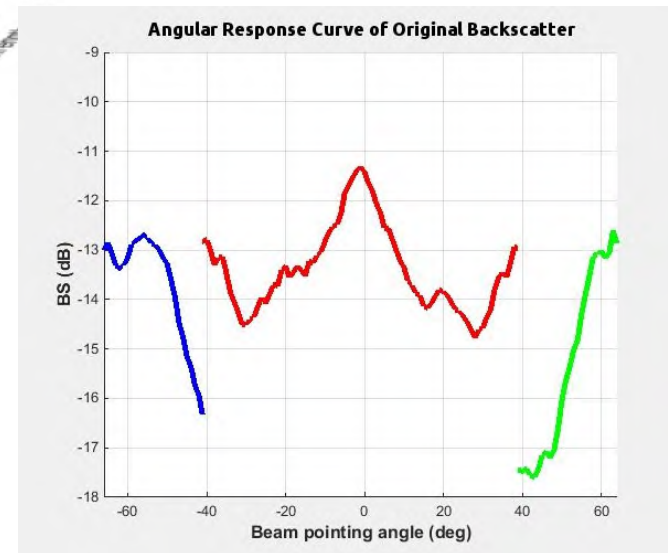
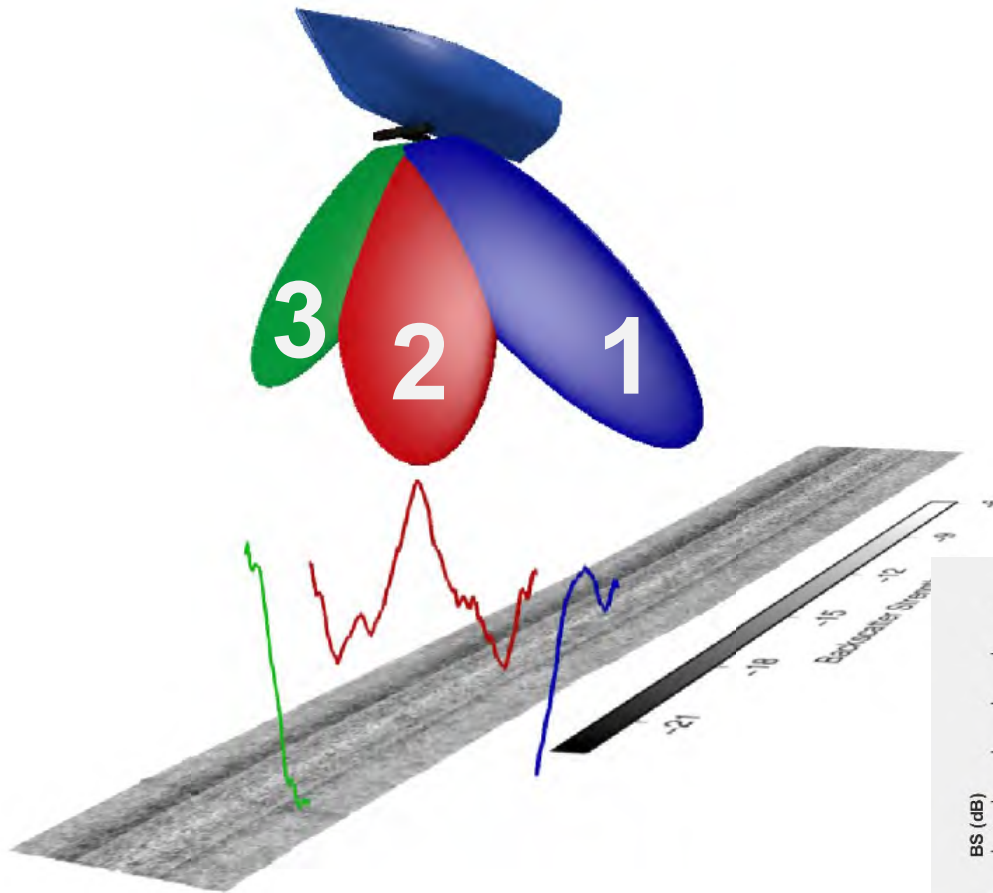
NIWA
Taihoro Nukurangi

Transmit Patterns

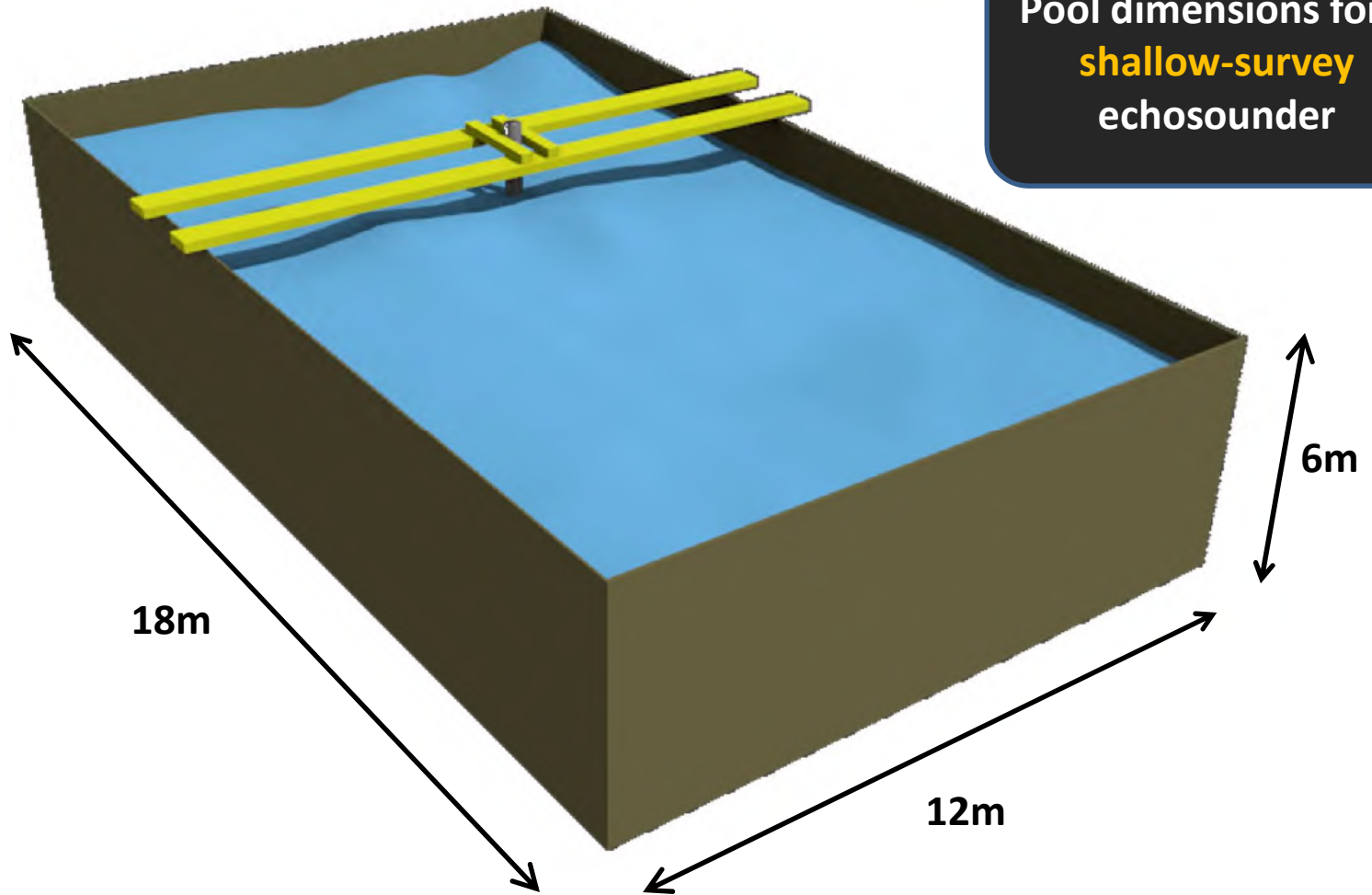
- Best estimate of the *Backscatter Strength*
- Flat and homogeneous seabed type



Transmit Patterns



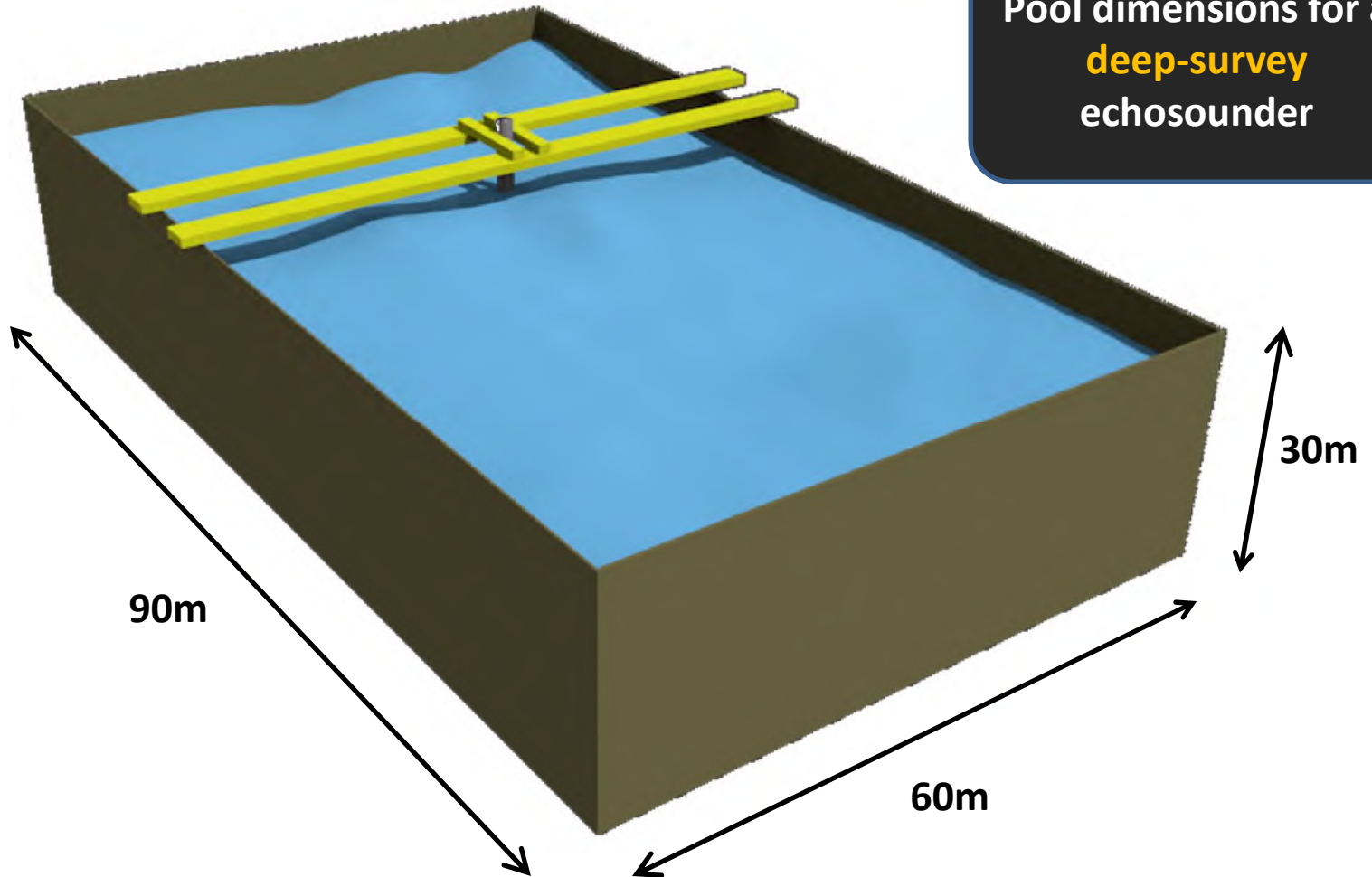
Calibration in water tank



Calibration in water tank

125 times volume increase!

Pool dimensions for a
deep-survey
echosounder



Factors affecting Transmit Patterns



SOUNDER SPECIFIC

- Transmit frequency
- Transmit antenna sector steering
- Physical state of the antenna at production

SHIP AND SOUNDER SPECIFIC

- Mounting of the transmit antenna on the ship
- Aging of the transmit antenna

Objective

Execute a field calibration once , which will find the parameters needed to properly compensate the Transmission Patterns of the transmit antenna sectors (for all subsequent surveys).

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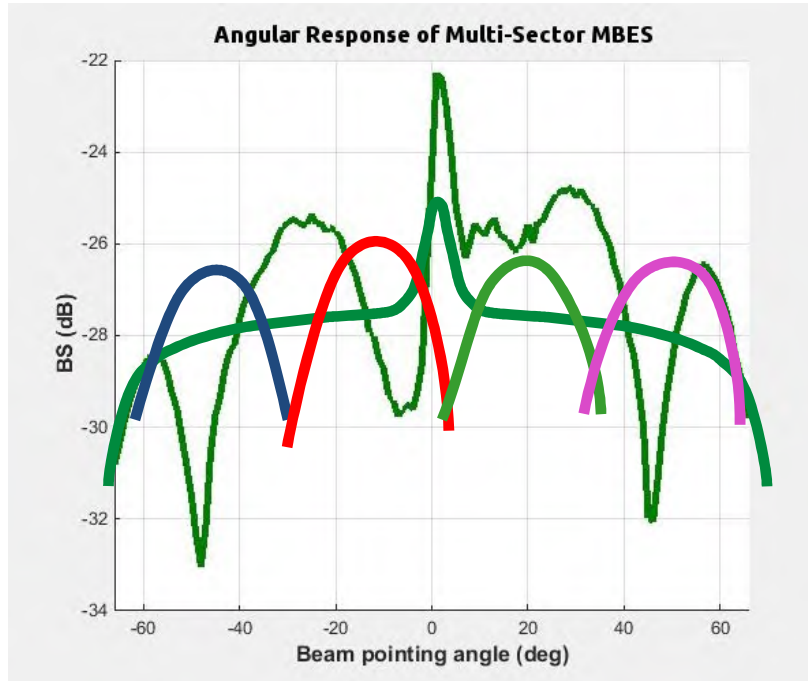
KONGSBERG

EM302, EM710



bscorr.txt

Challenge



BS angular response

Transmit Patterns

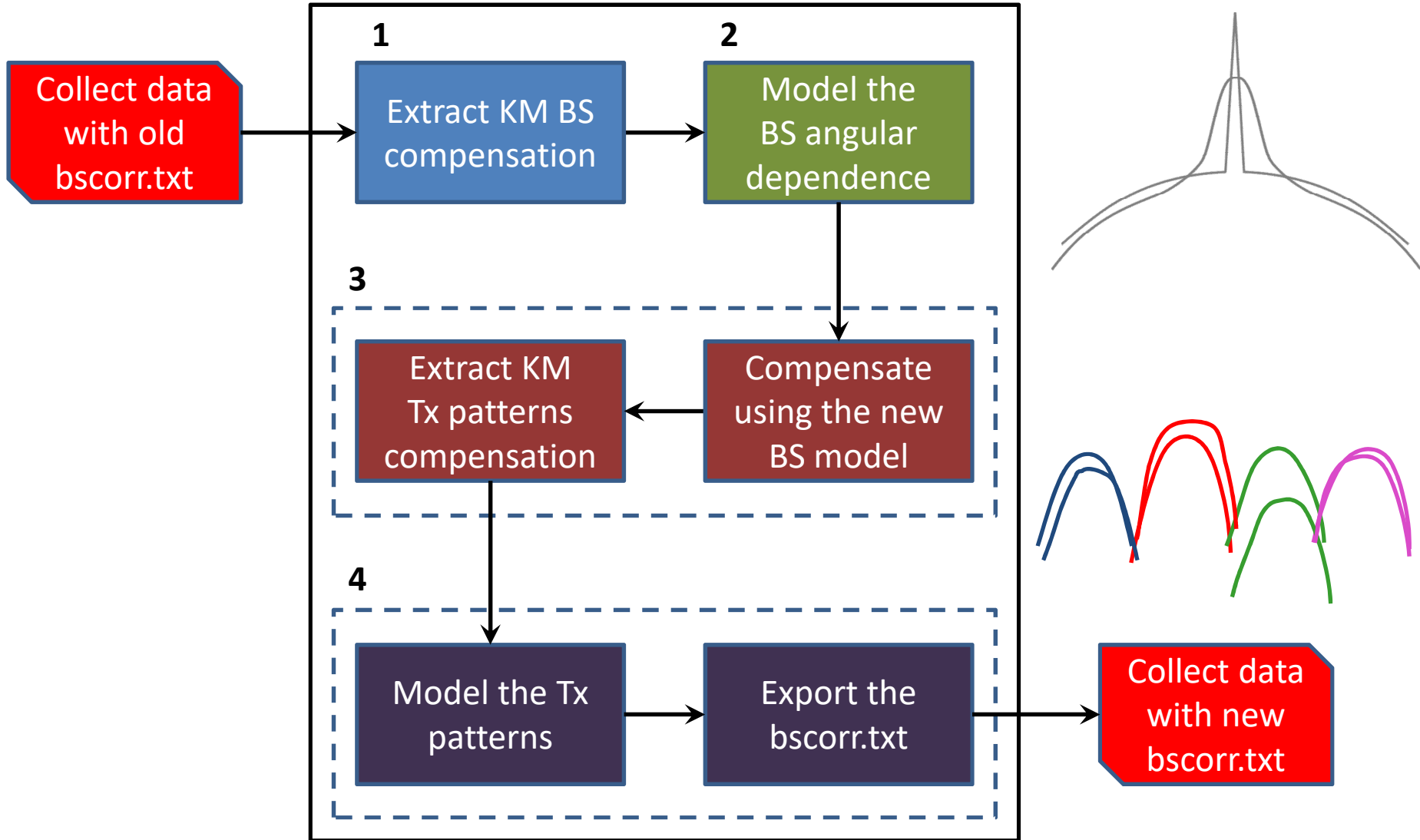
Predictable

+

Parameterized

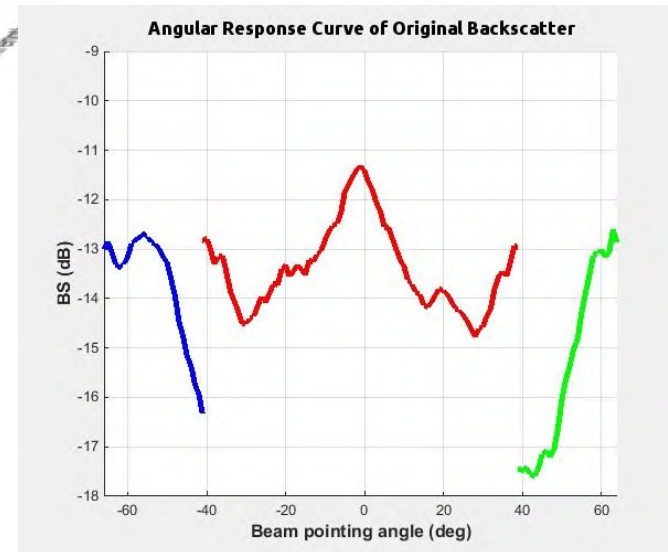
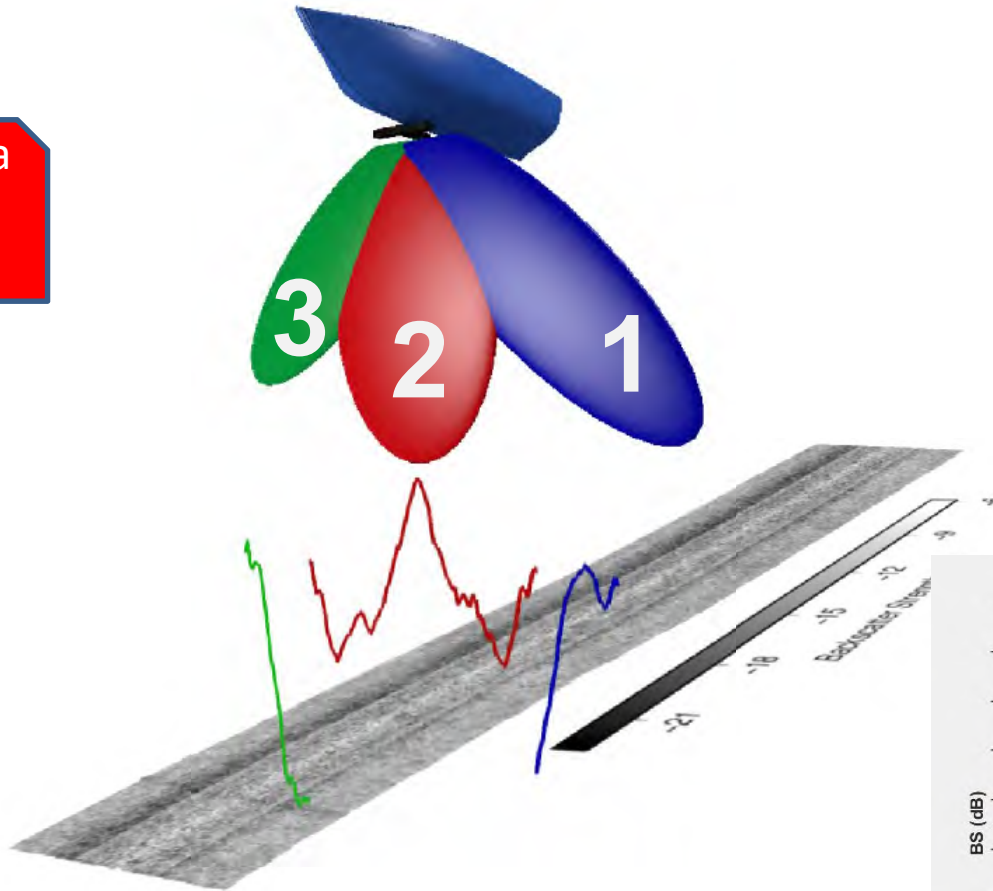
Flow Chart of Calibration

CALIBRATION PROCEDURE



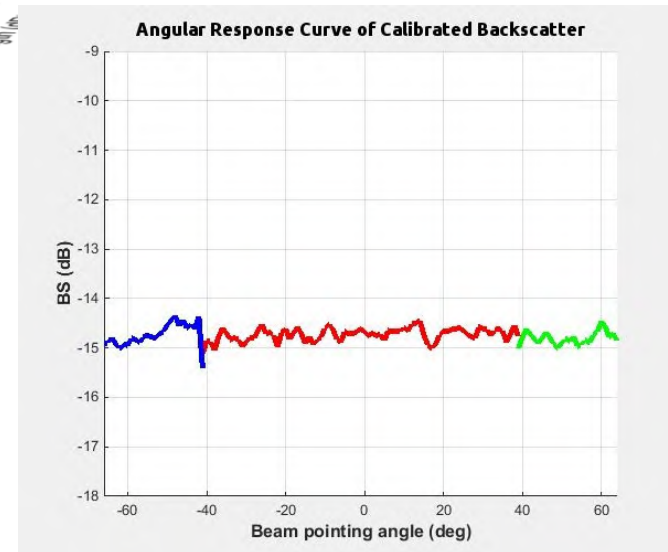
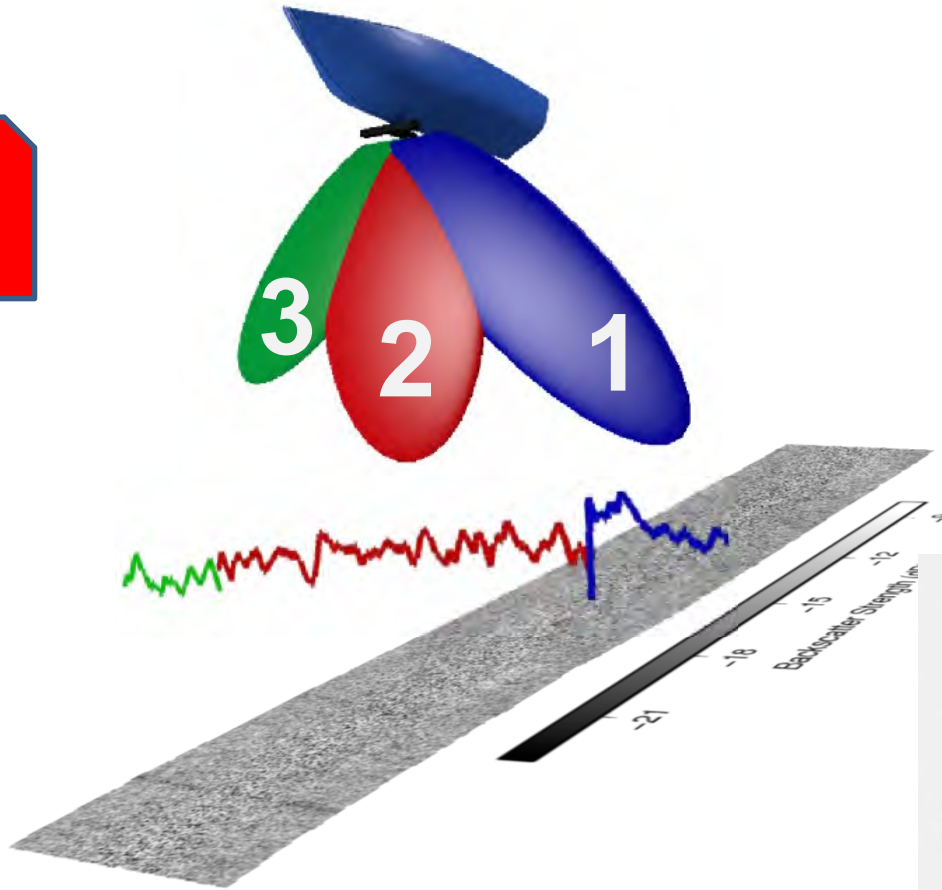
Original EM710 Survey

Collect data
with old
bscorr.txt



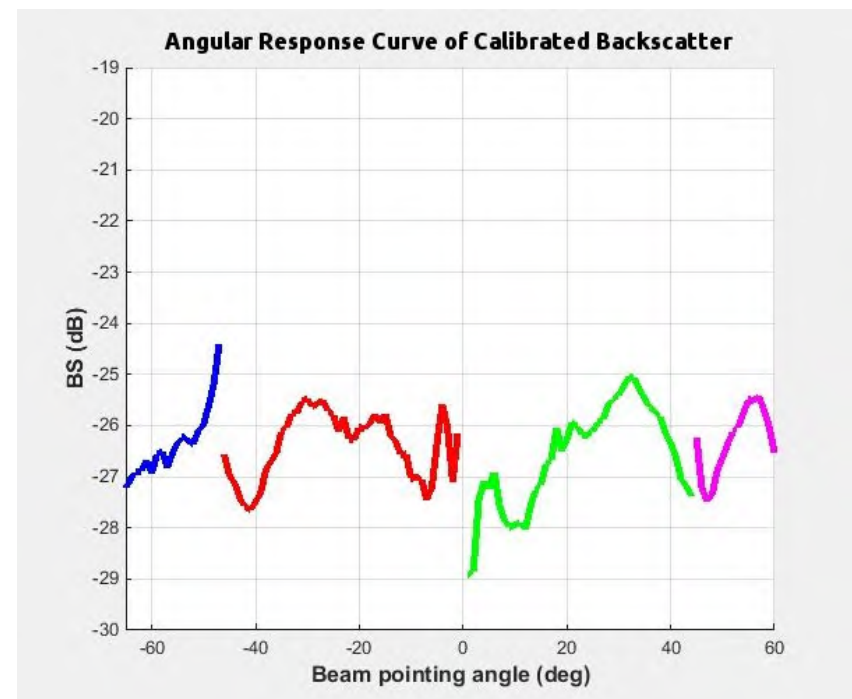
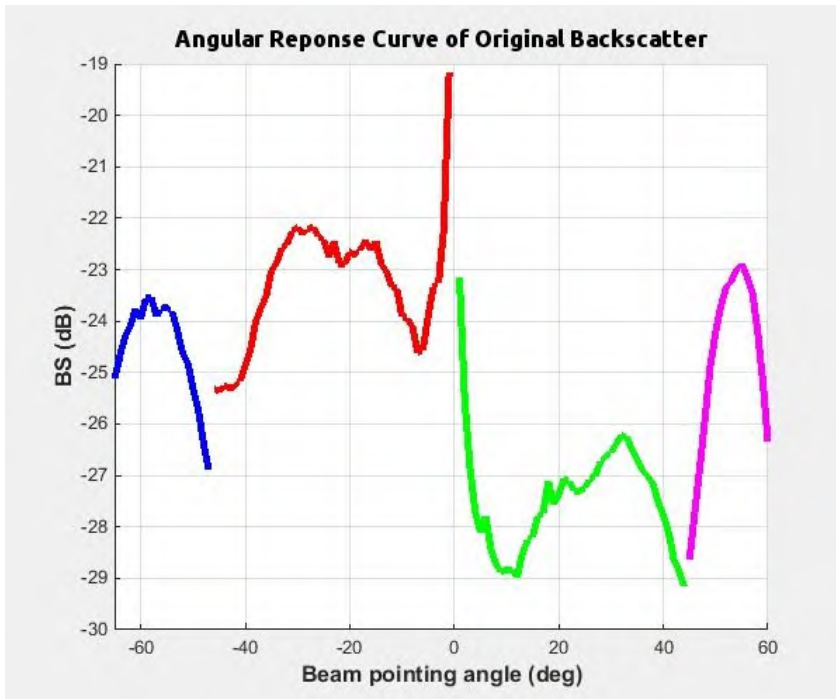
New EM710 Survey

Collect data
with new
bscorr.txt



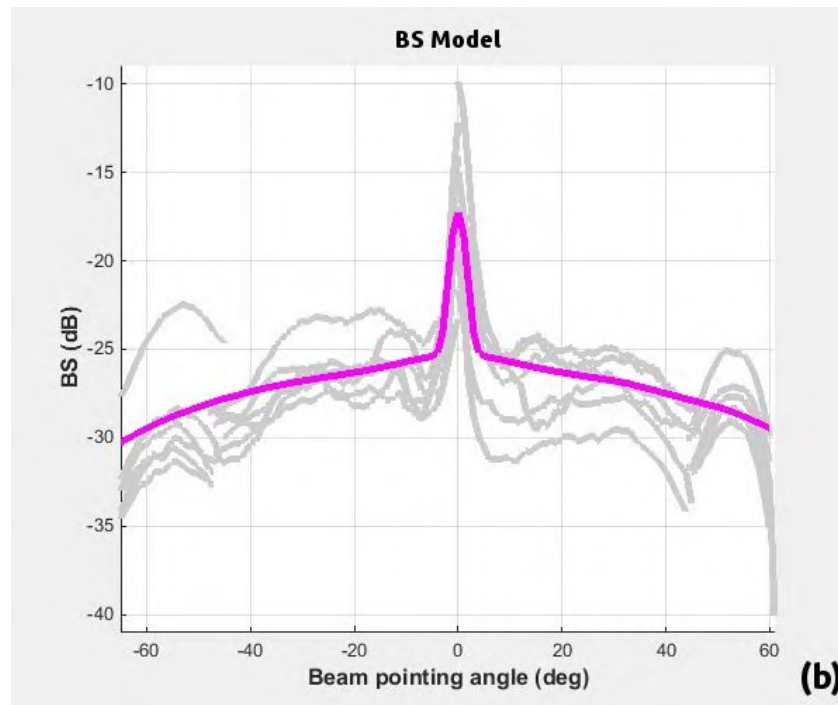
Caveats

1) EM302 results are not as good due to a **different modeling technique** of the Transmit Patterns.



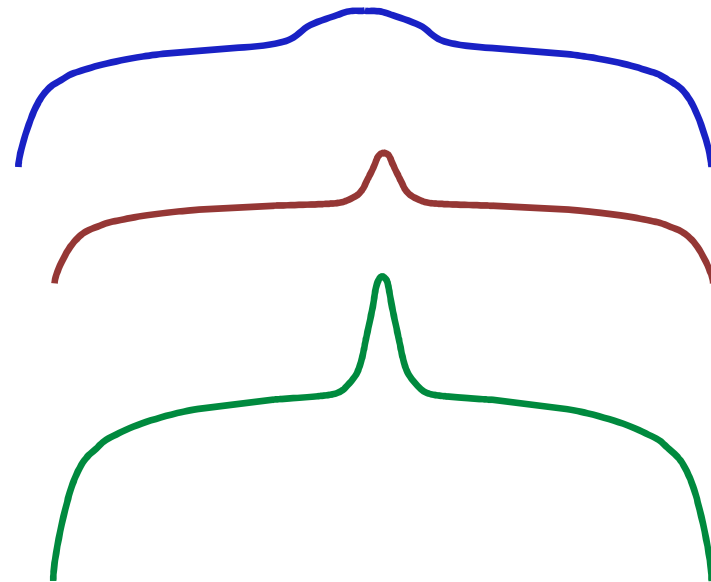
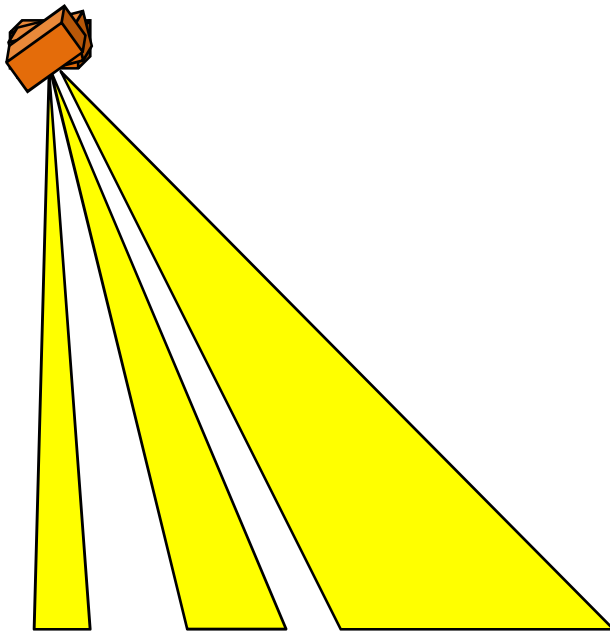
Caveats

2) Accurately modeling the **BS angular response** is difficult.



Future Improvement: *inter-calibration*

Get the **BS angular response** by
an external **calibrated echosounder**.



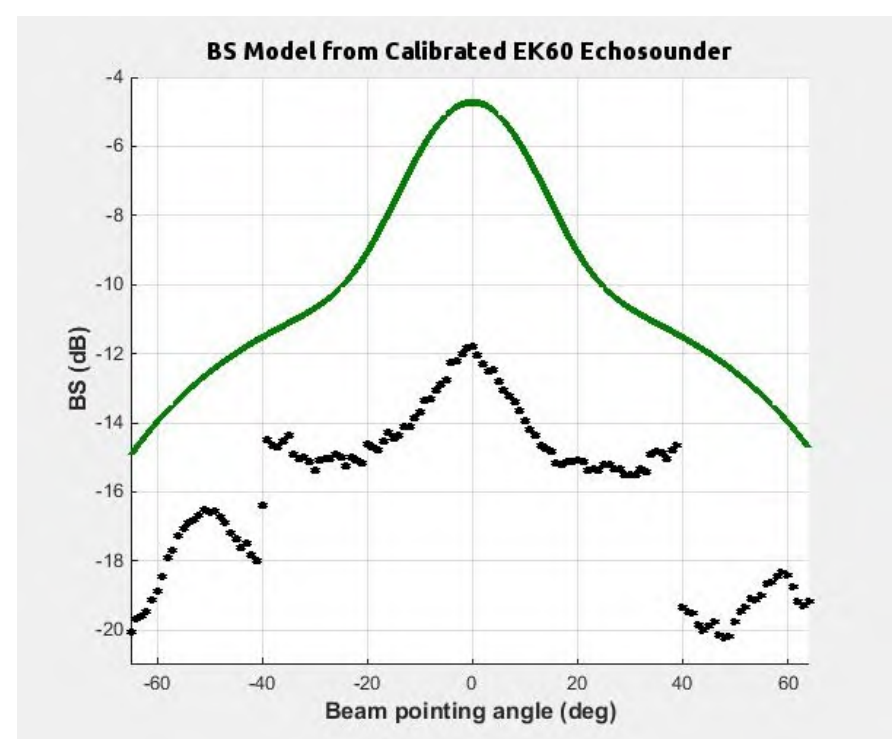
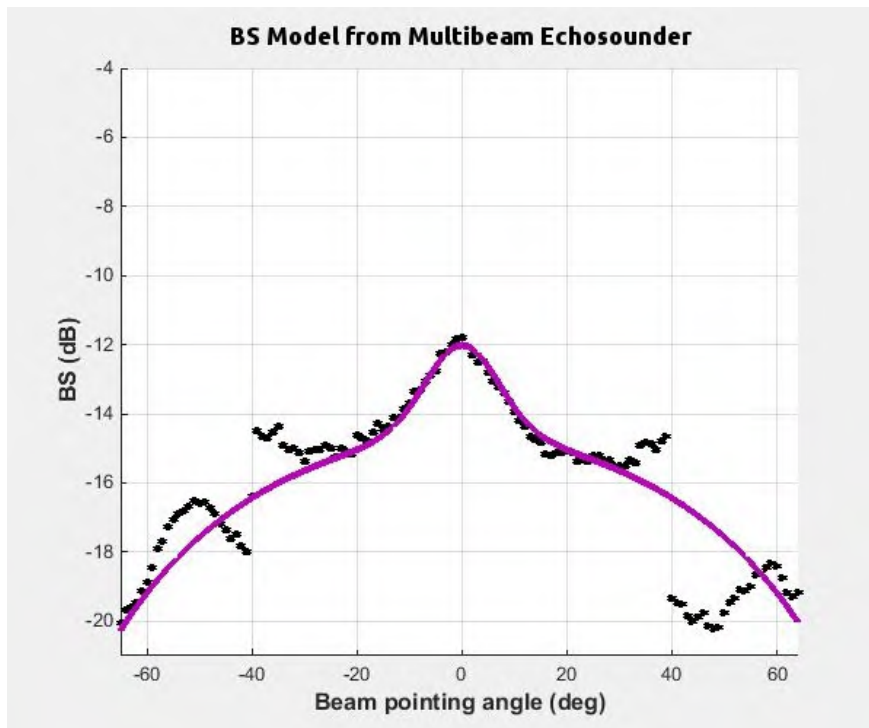
HF



LF

EM710

Comparison of BS angular responses derived from the EM710 dataset and obtained from a calibrated EK60 echosounder



Conclusion

Along-track backscatter artefacts due to poorly compensated transmit patterns in multi-sector multibeams can be strongly minimized by a field calibration procedure.



With inter-calibration, we are moving towards absolute calibrated backscatter.

Special Acknowledgments

To data providers:



To individuals:



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Xavier Lurton



Patrick Lajeunesse
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