GeoSwath Plus side scan data normalisation and classification using the GeoTexture software

A case-of-study using the Shallow Survey 2012 common dataset

GEOHAB

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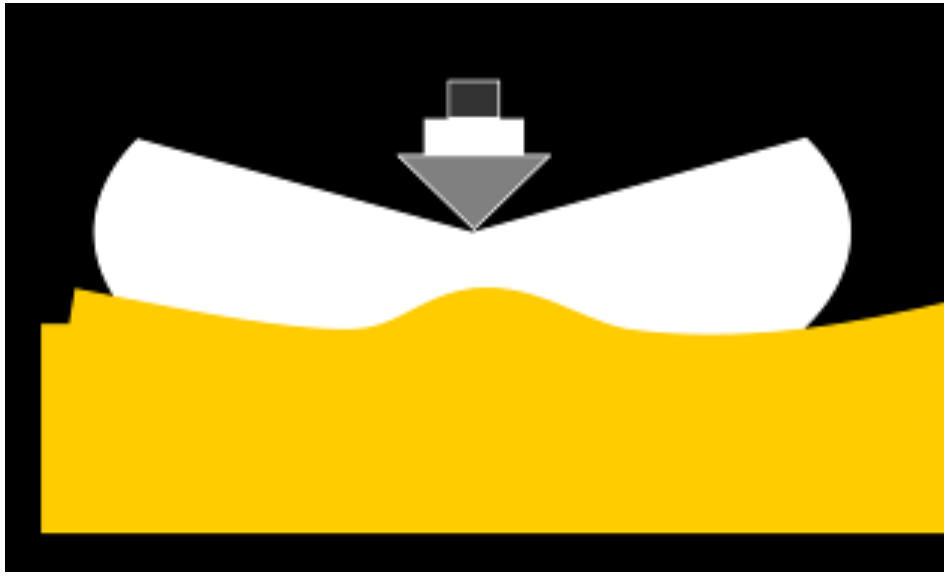
Marine Geological and Biological Habitat Mapping

Outline

- GeoSwath Plus backscatter characteristics
- GeoSwath Plus side scan processing using GeoTexture
- Case-of-study: Barrets Reef, Shallow Survey 2012, Wellington, NZ
- More examples

GeoSwath Plus backscatter

- GeoSwath is a Phase Measuring Bathymetric Sonar (PMBS)



Also called:

Interferometric Multibeam
Bathymetric Side-Scan
Vernier Interferometer
Wide Swath Sonar
Multi-stave side scan

Phase Measuring

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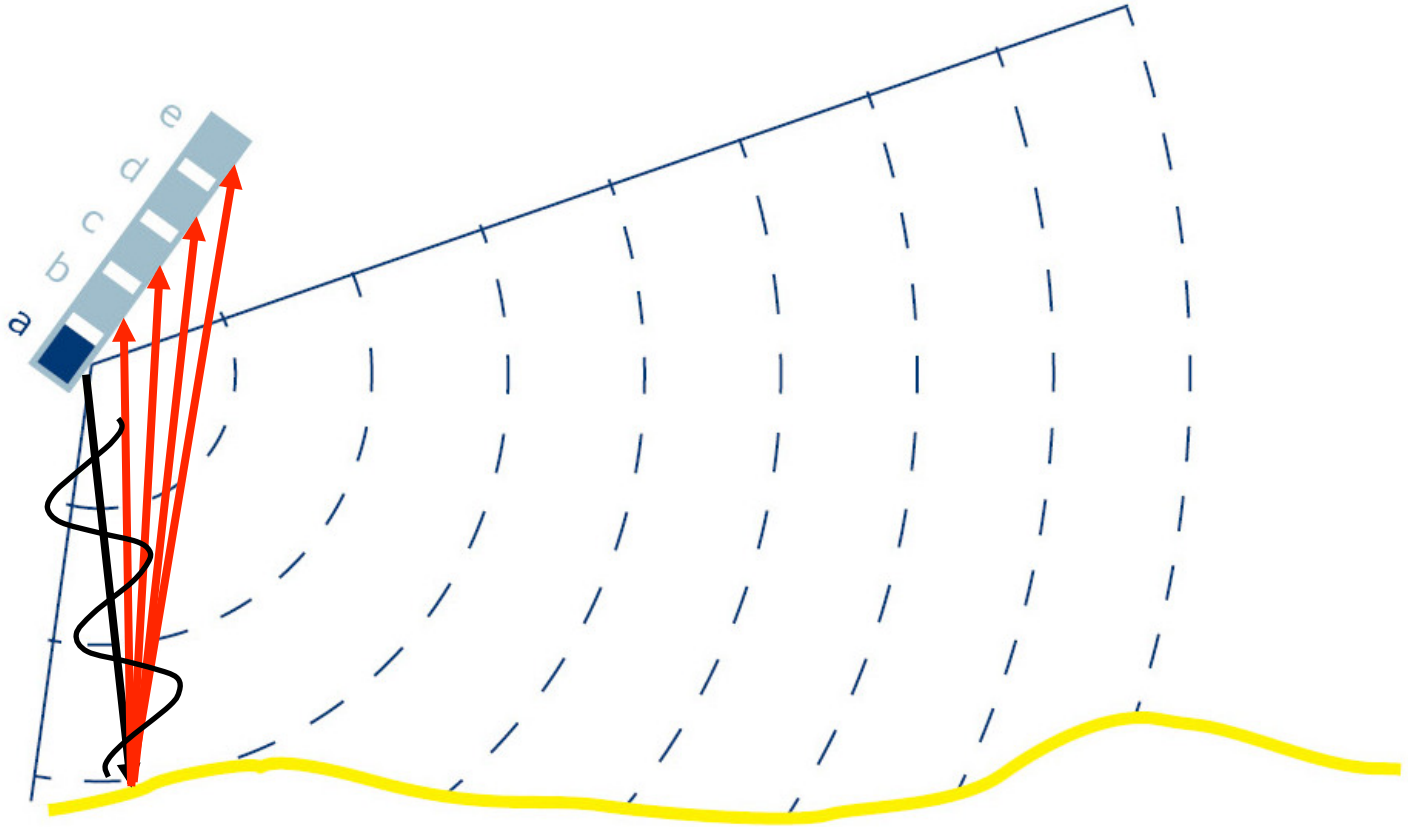

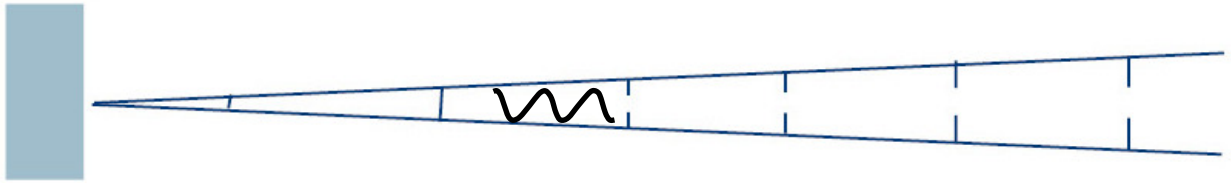

Phase Measuring

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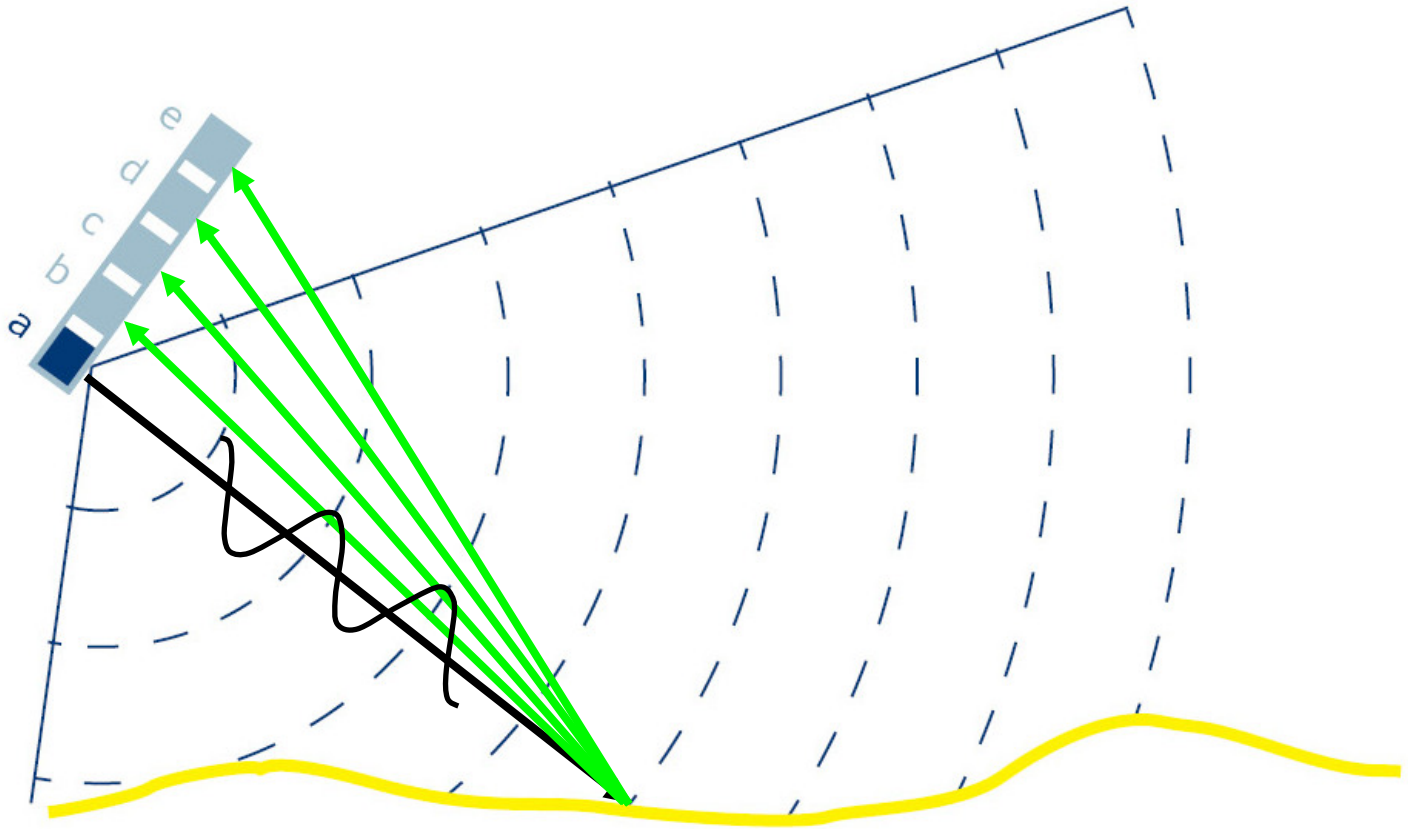
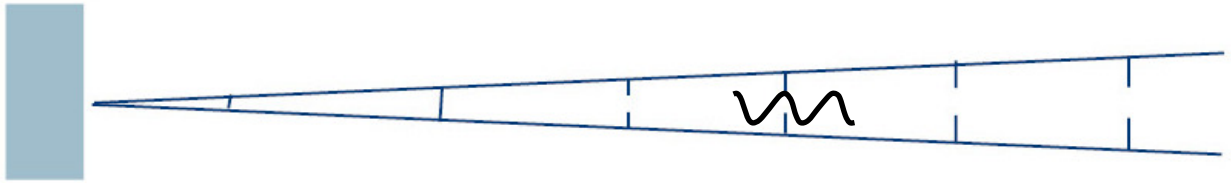
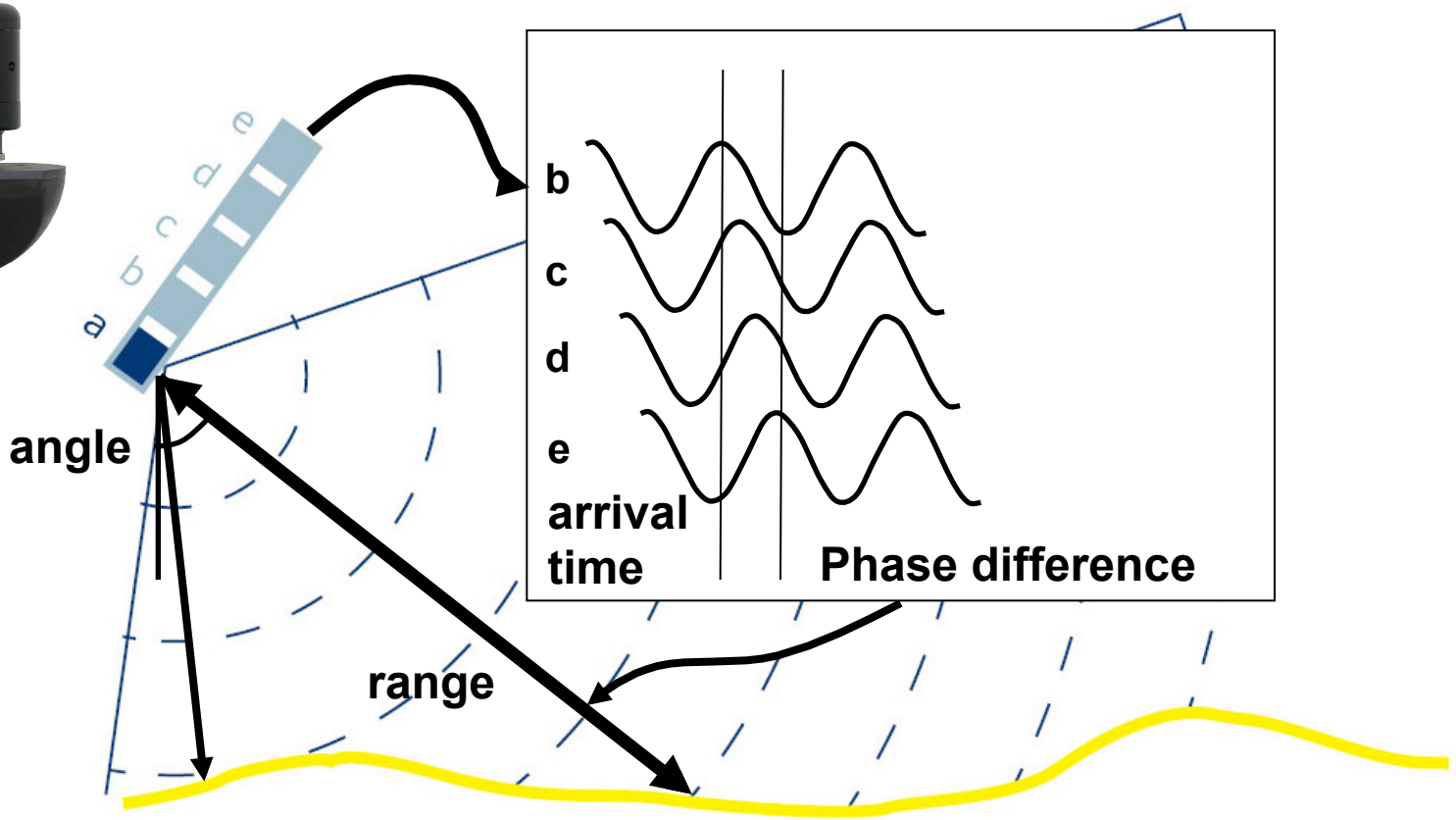
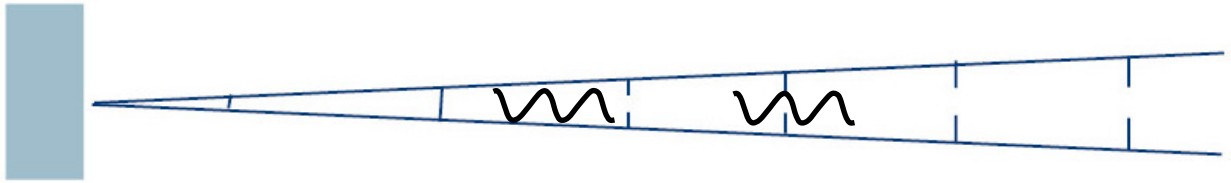




Phase Measuring





Data: Bathymetry and Side Scan

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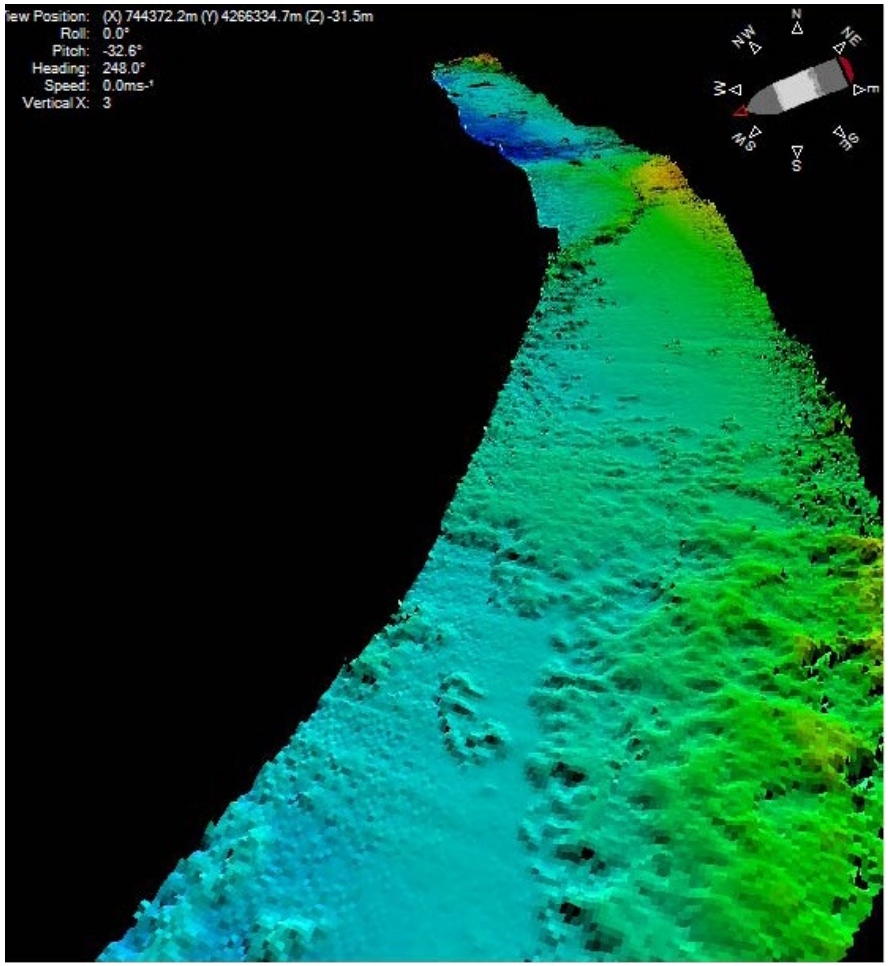
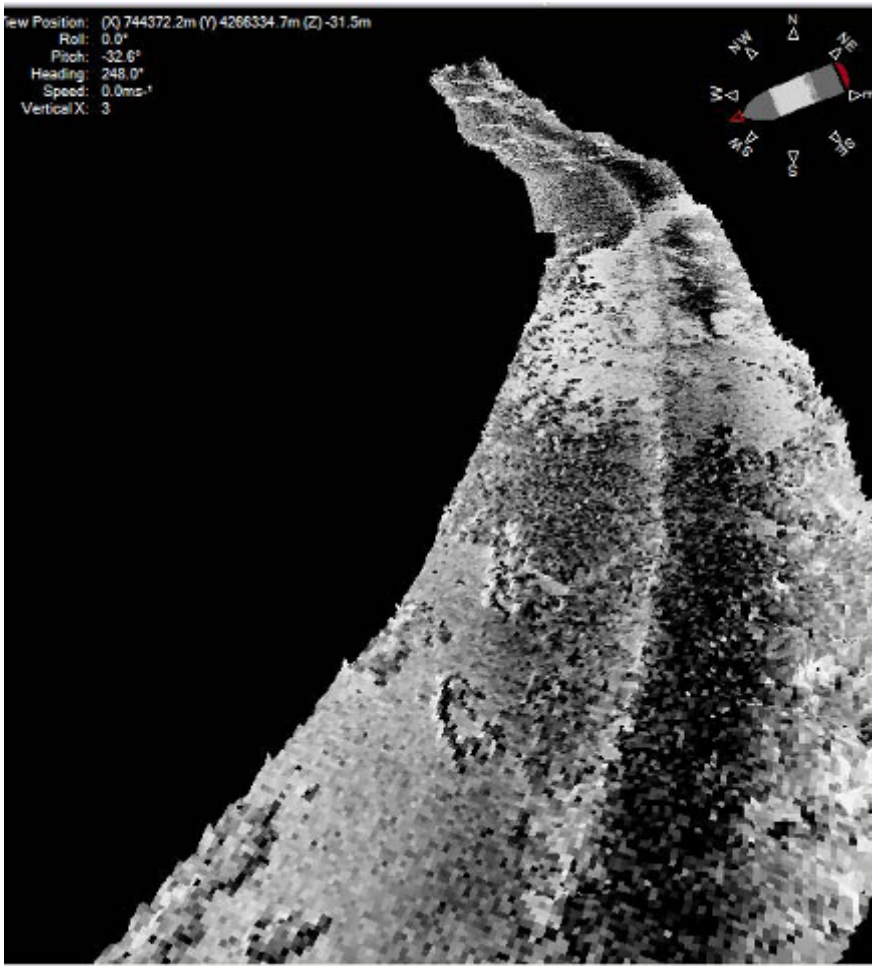




Set-up – peripheral sensors

GeoSwath Plus backscatter

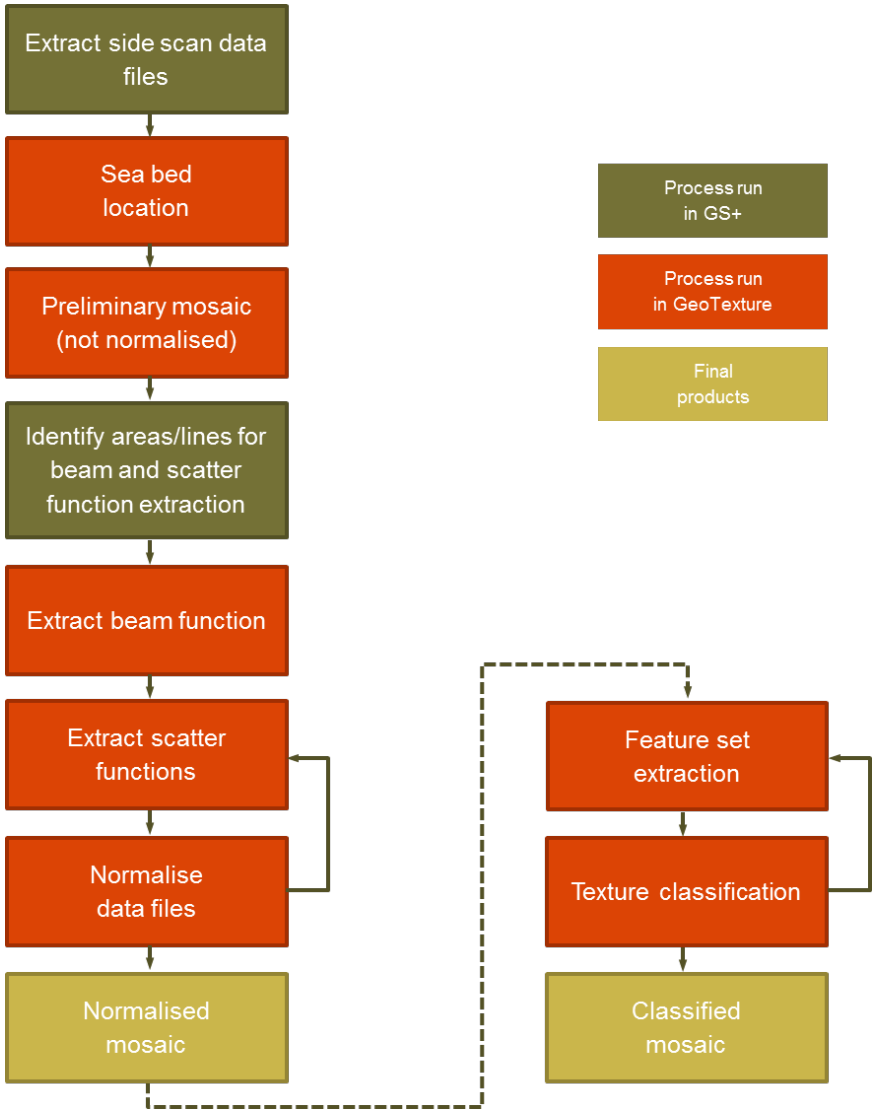
- GeoSwath is a PMBS, i.e.:
  - Measures true backscatter (side scan–like)
  - Backscatter data is perfectly correlated with
    - Bathymetry (slopes)
    - Sonar attitude (roll)
    - Sonar altitude (true range)
- To make full use of available information the recommended tool to process GeoSwath Plus backscatter data is GeoTexture

How does GeoTexture process GeoSwath backscatter?

- GeoTexture strategy:
  - decouple beam pattern and geometrical effects from seabed response (reflectivity vs. incident angle)
  - account and correct for bathymetry, attitude and water column effects

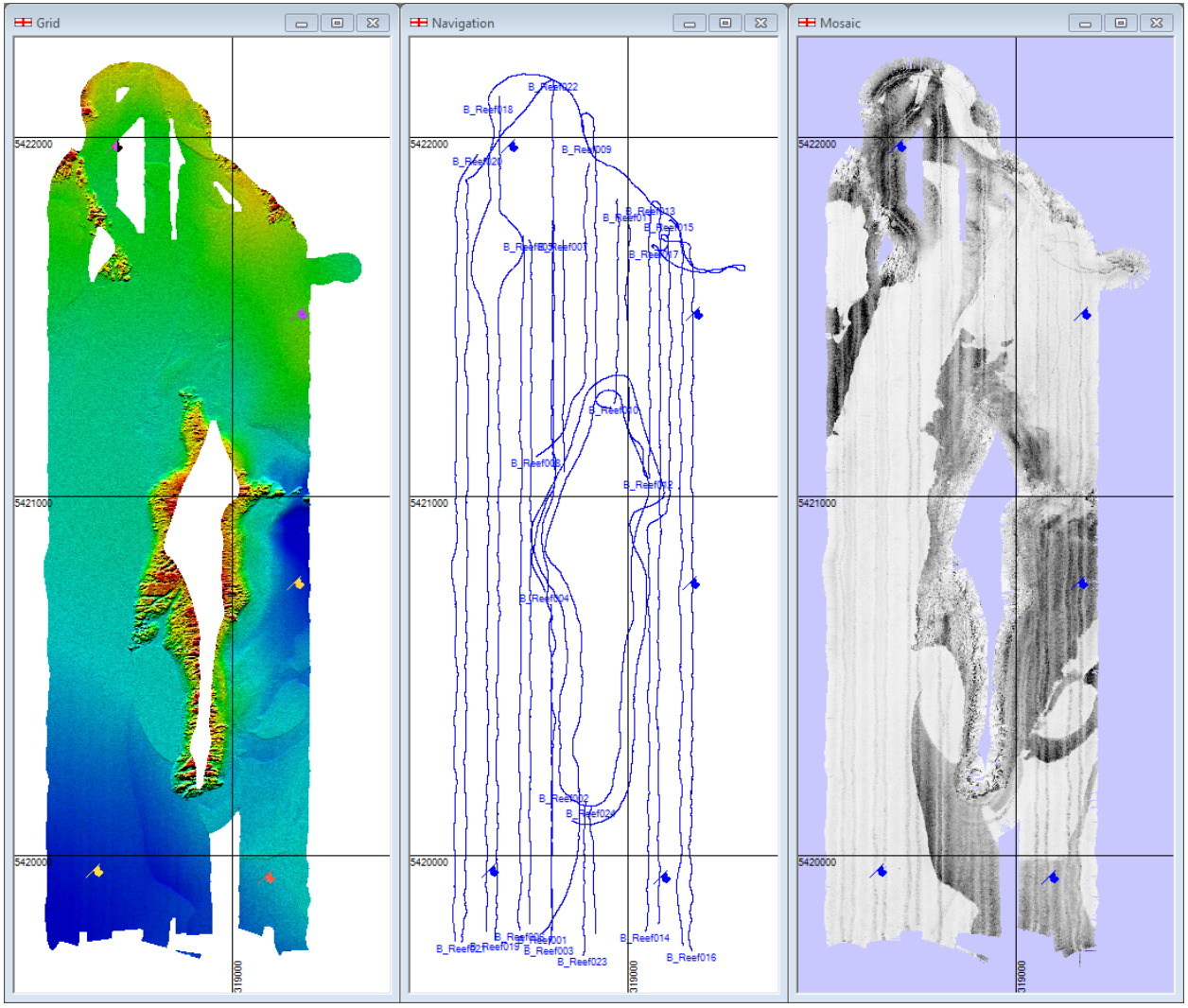
- How?
  - Using the system beam function – measured and refined (new algorithm)
  - Extracting scatter functions (decoupled seabed response) from flat and homogeneous areas
  - Accounting and correcting from local slopes, roll and water column attenuation and absorption

GeoTexture workflow for GeoSwath backscatter



Case-of-study: Barrets Reef

Shallow Survey 2012, Wellington, New Zealand



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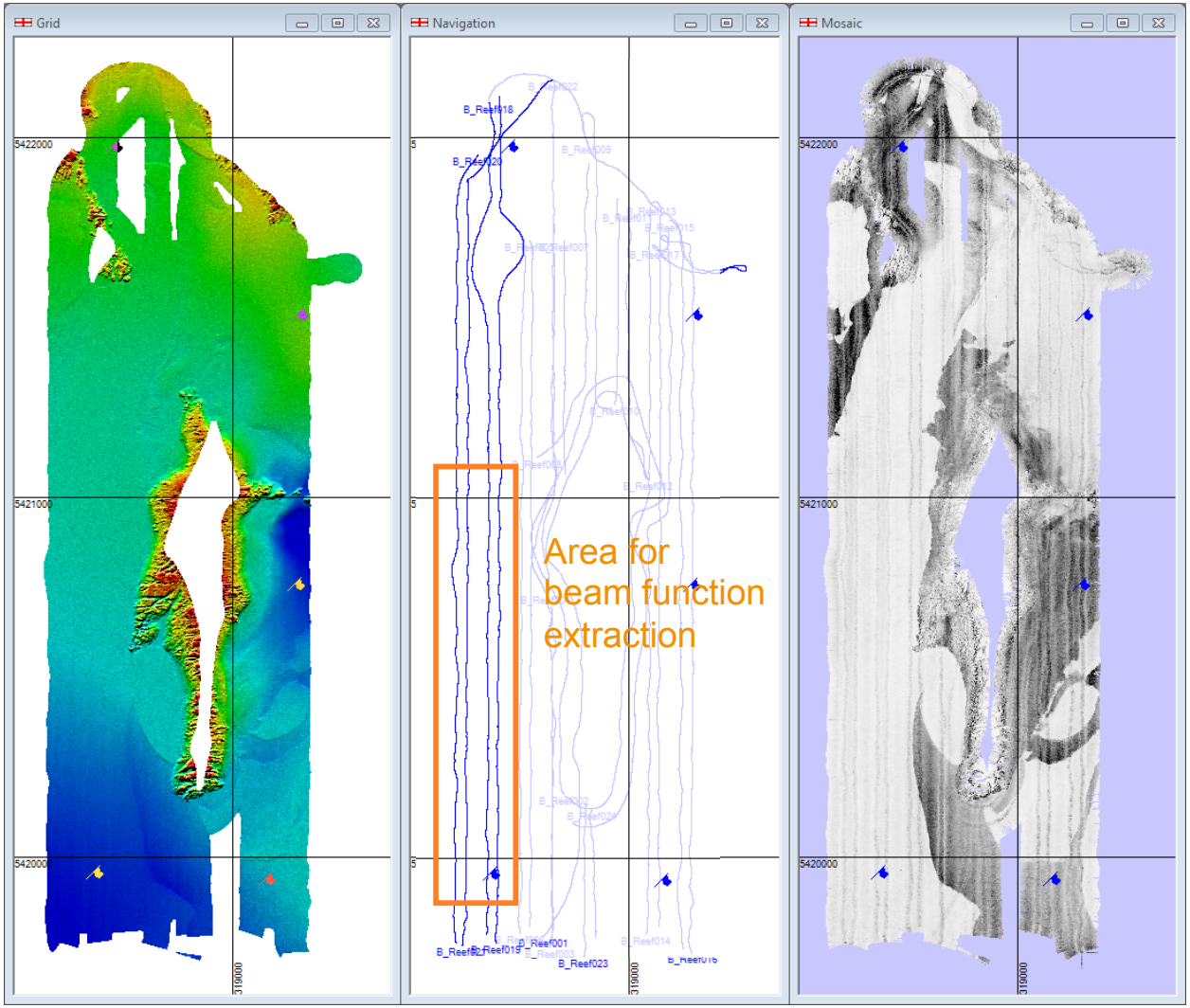

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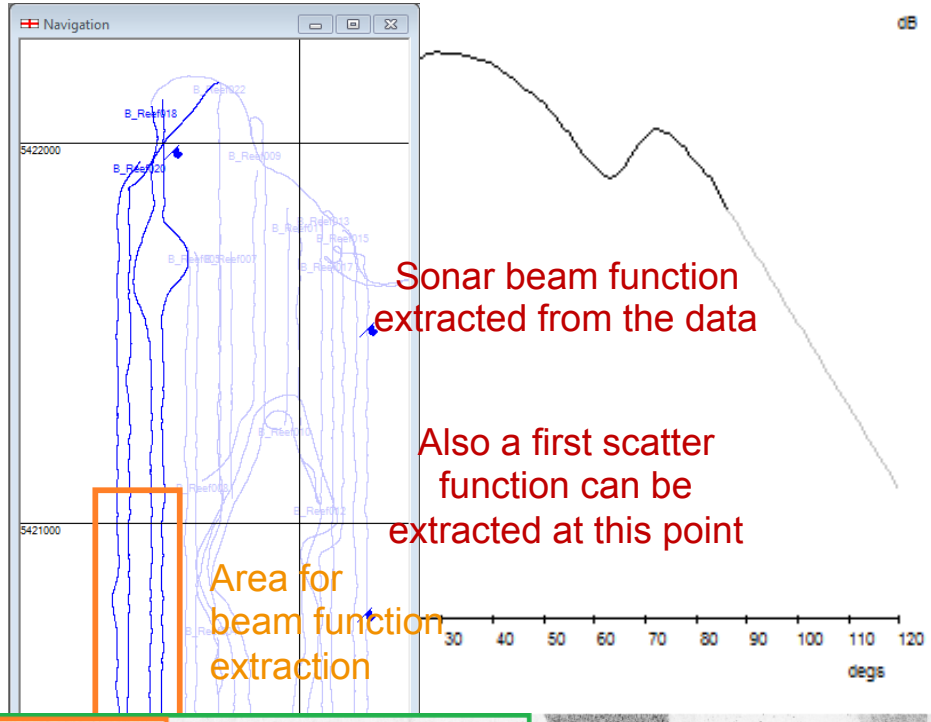

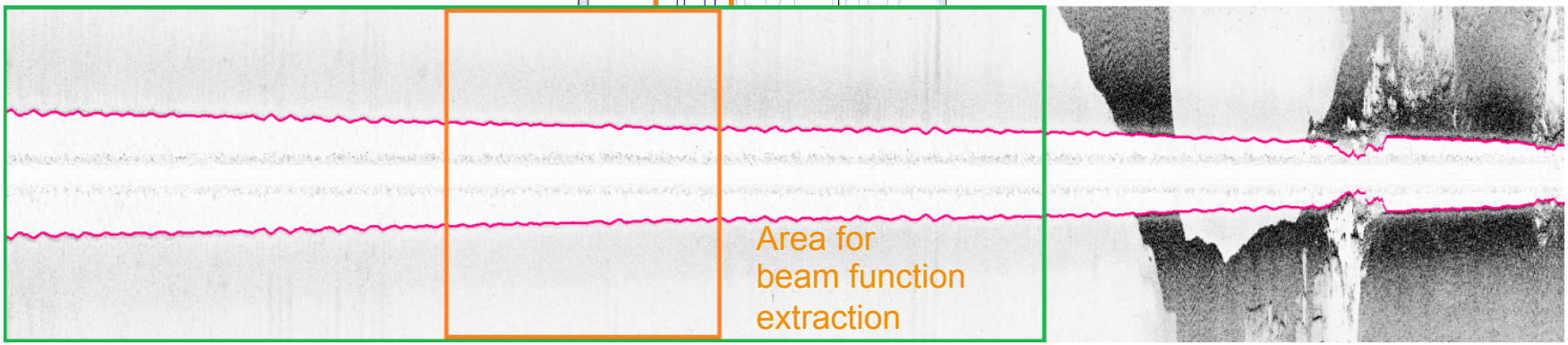

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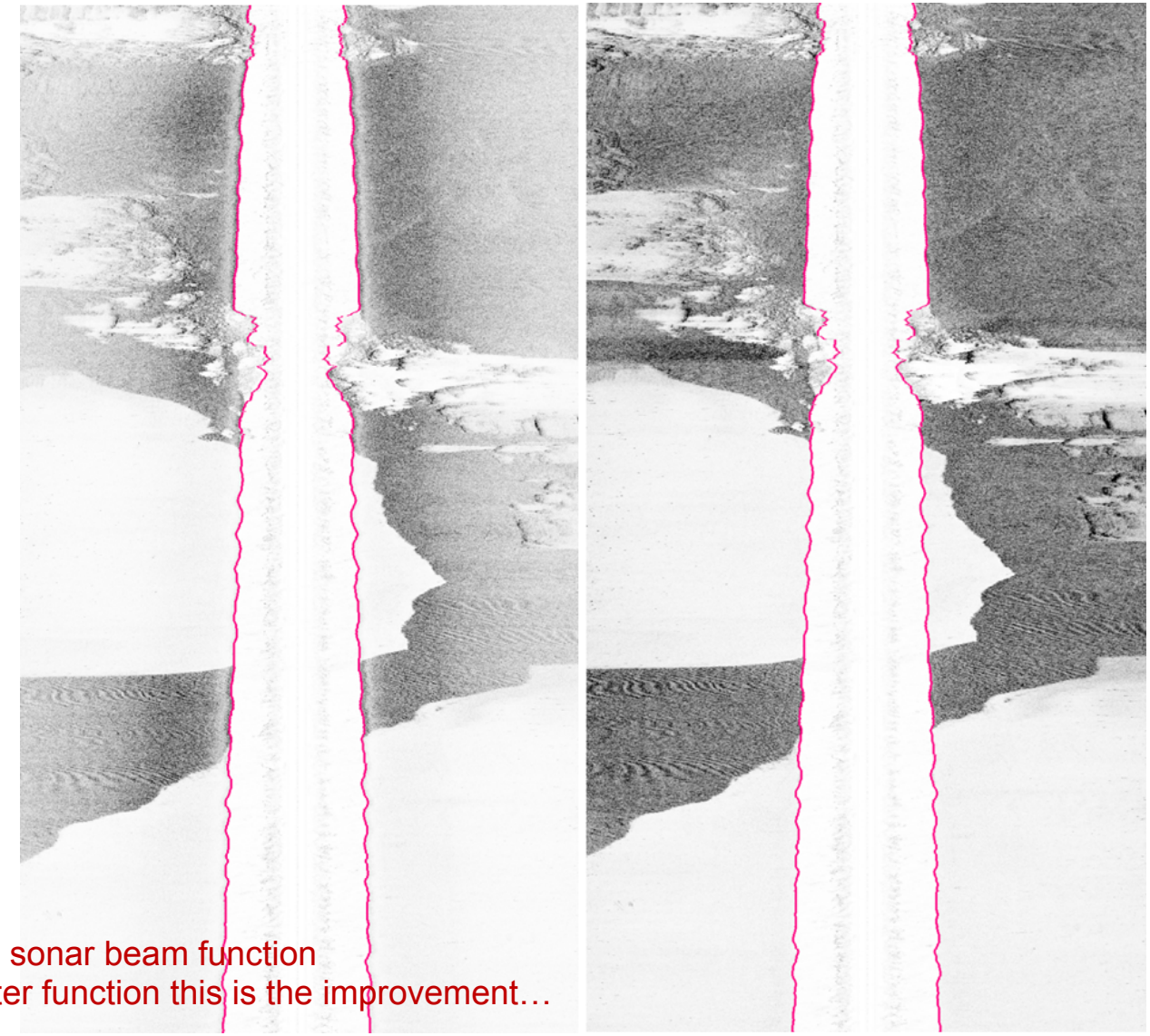
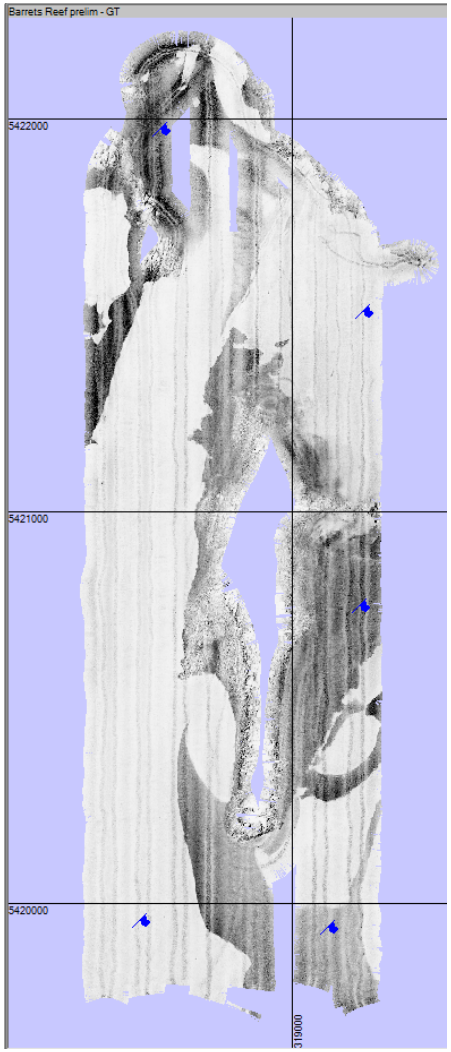


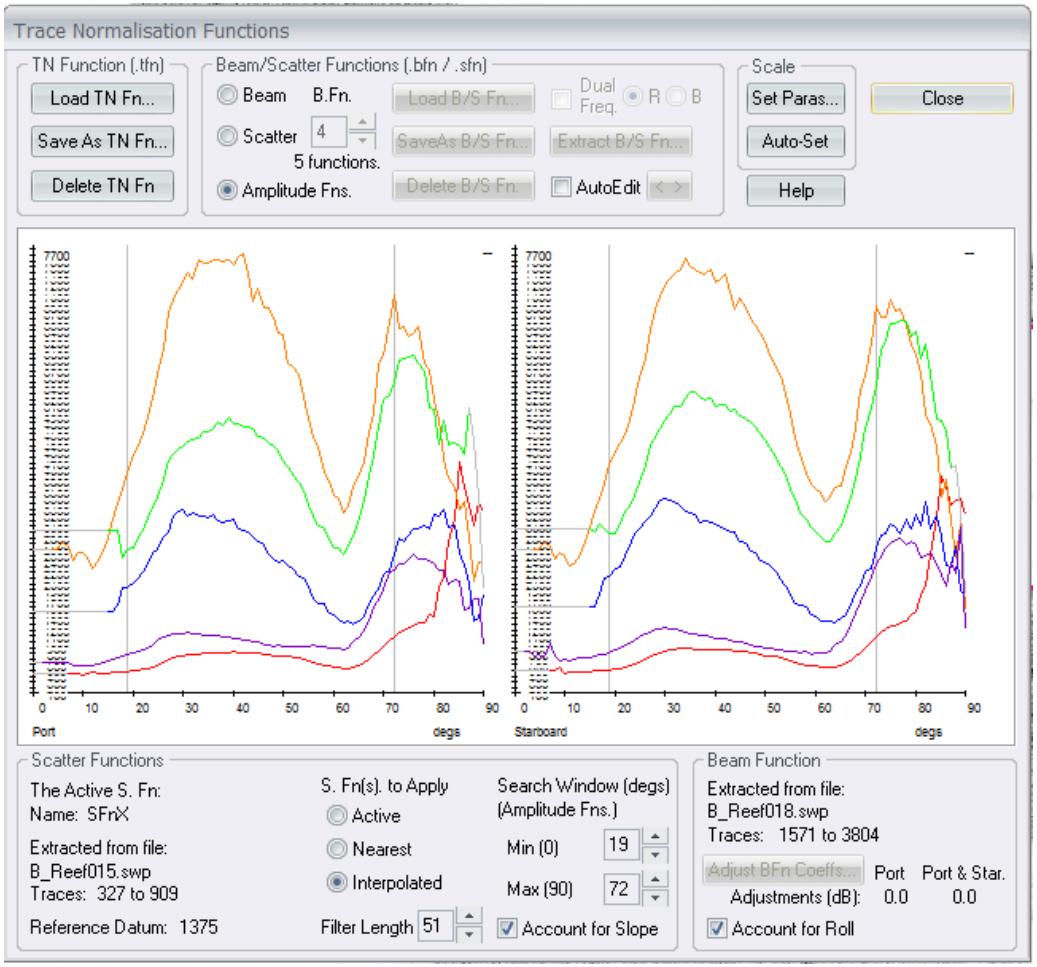
After extracting sonar beam function
and a first scatter function this is the improvement…

Case-of-study: Barrets Reef

Shallow Survey 2012, Wellington, New Zealand



Areas with different seabed reflactivities need different scatter functions…



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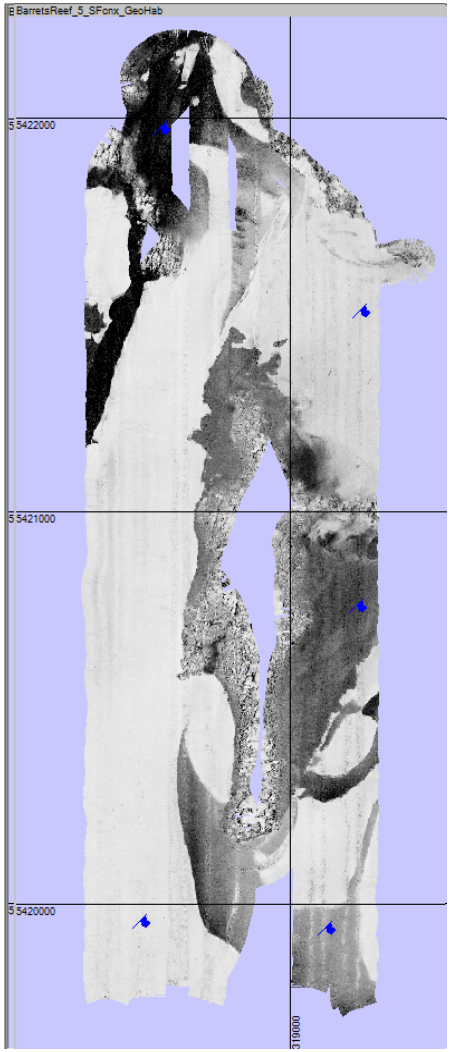
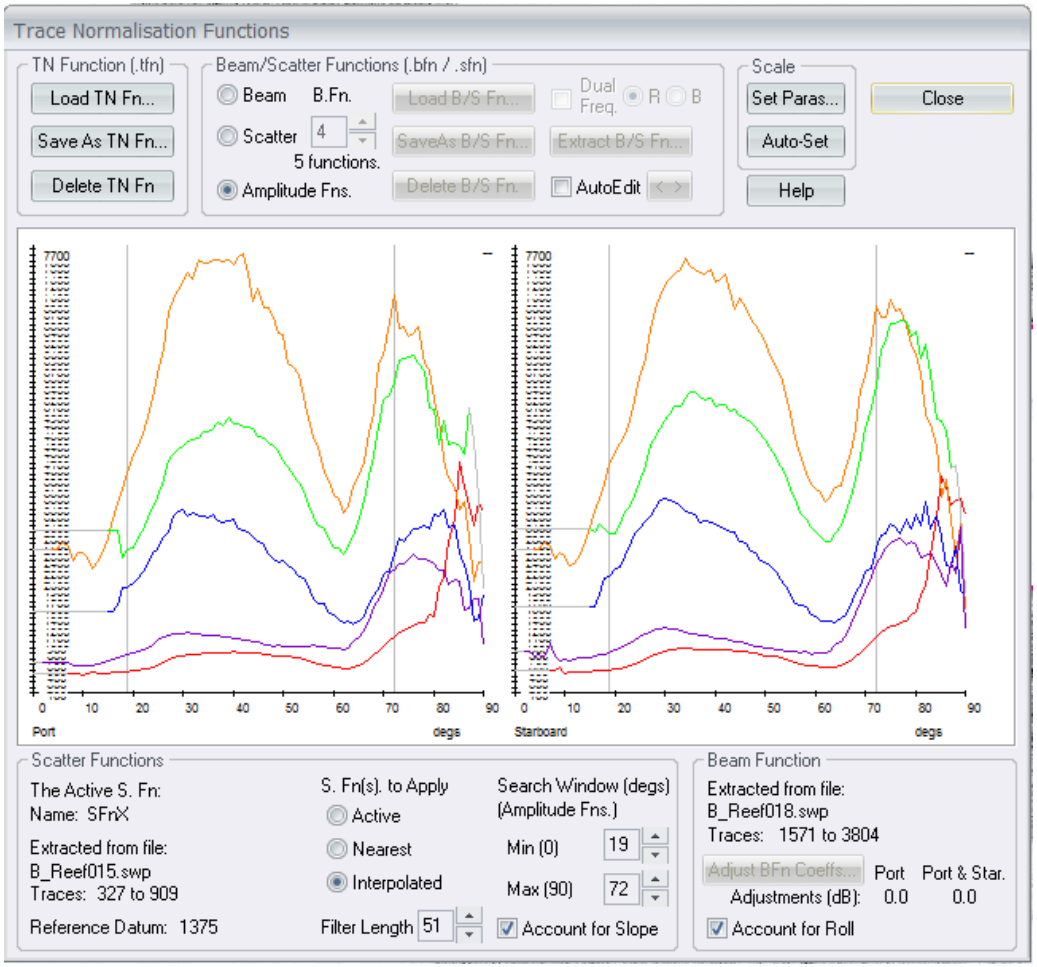
Shallow Survey 2012, Wellington, New Zealand



… and this is the result:
a fully normalised mosaic based on true seafloor response



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Shallow Survey 2012, Wellington, New Zealand

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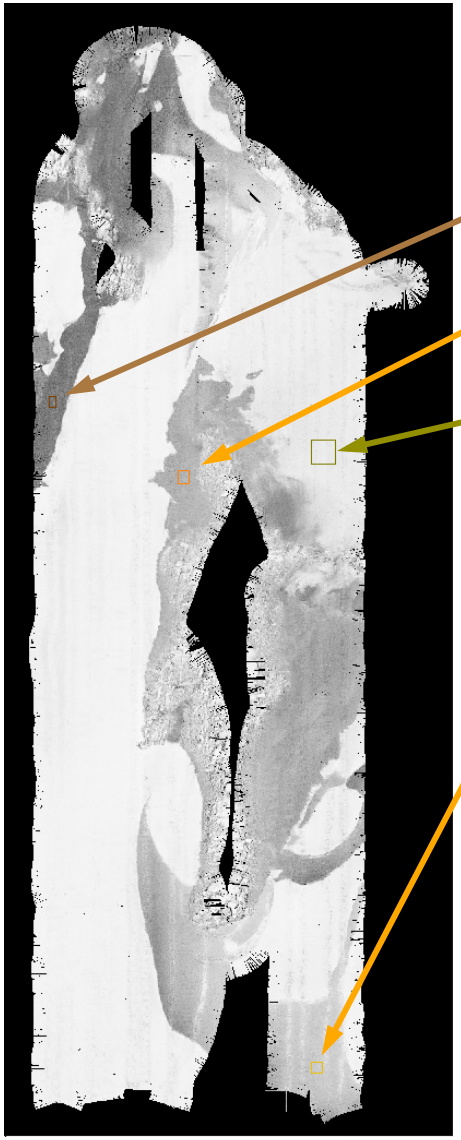


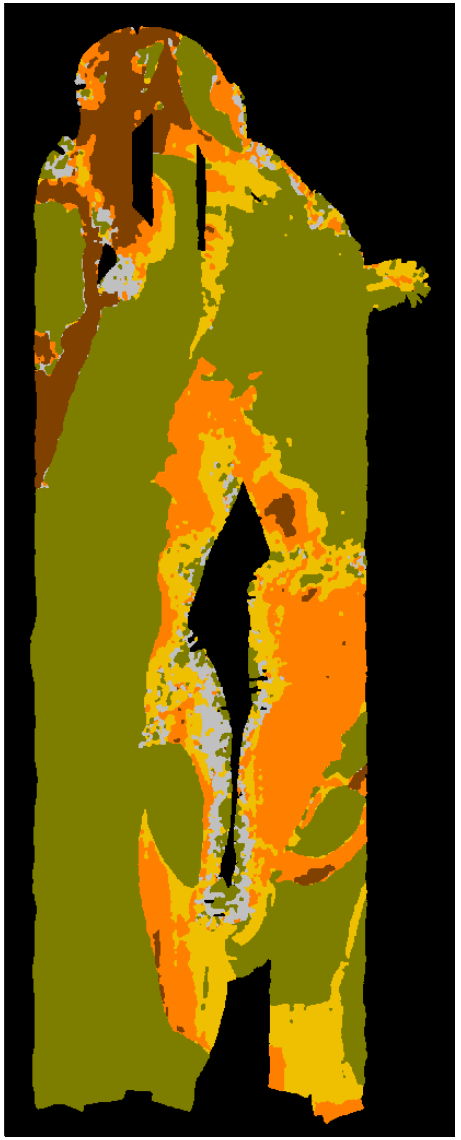
Hard bottom

Medium 1

Soft bottom

Medium 2

Time for supervised seabed classification..



Final step: 2D filtering

Case-of-study: Barrets Reef

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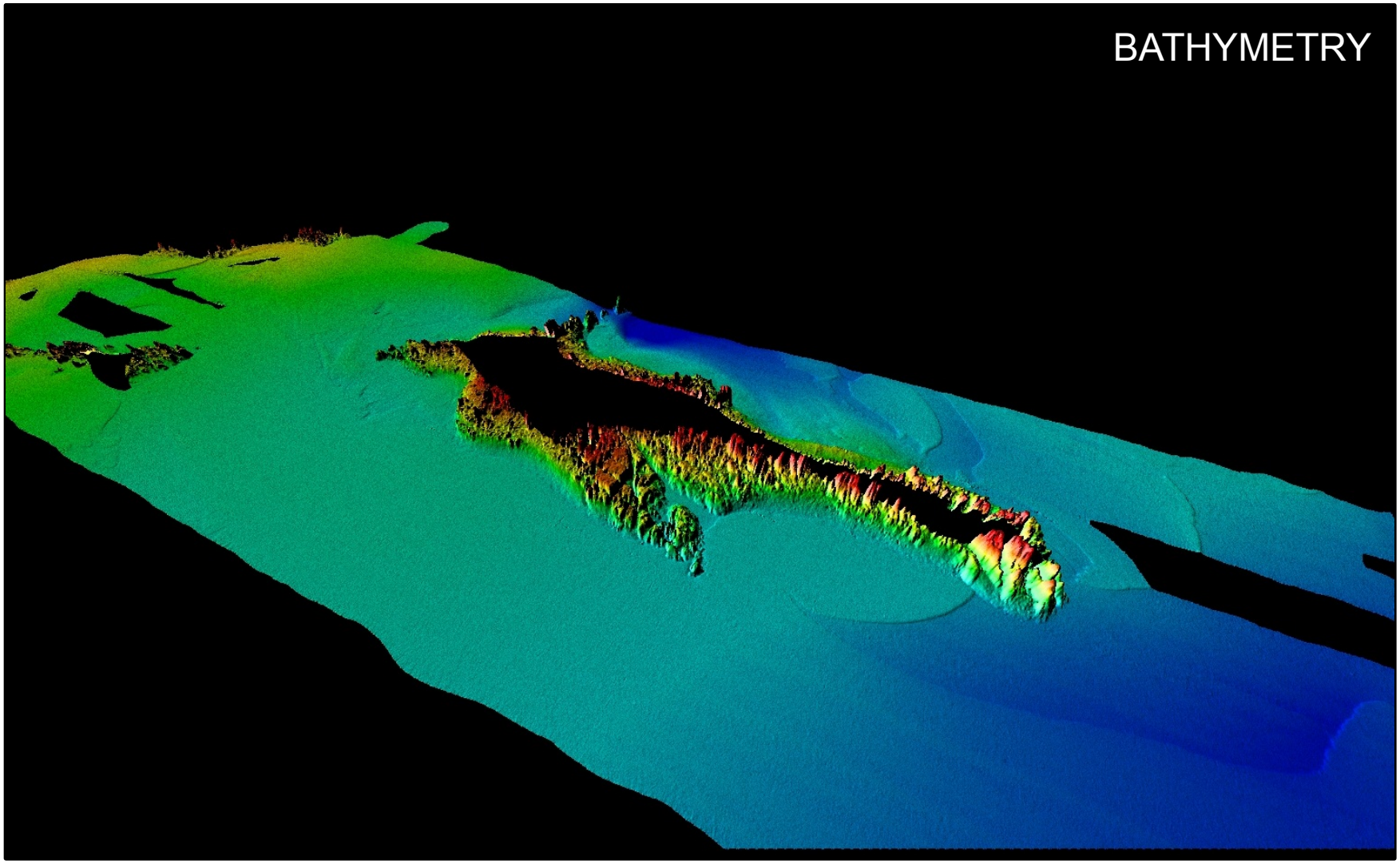

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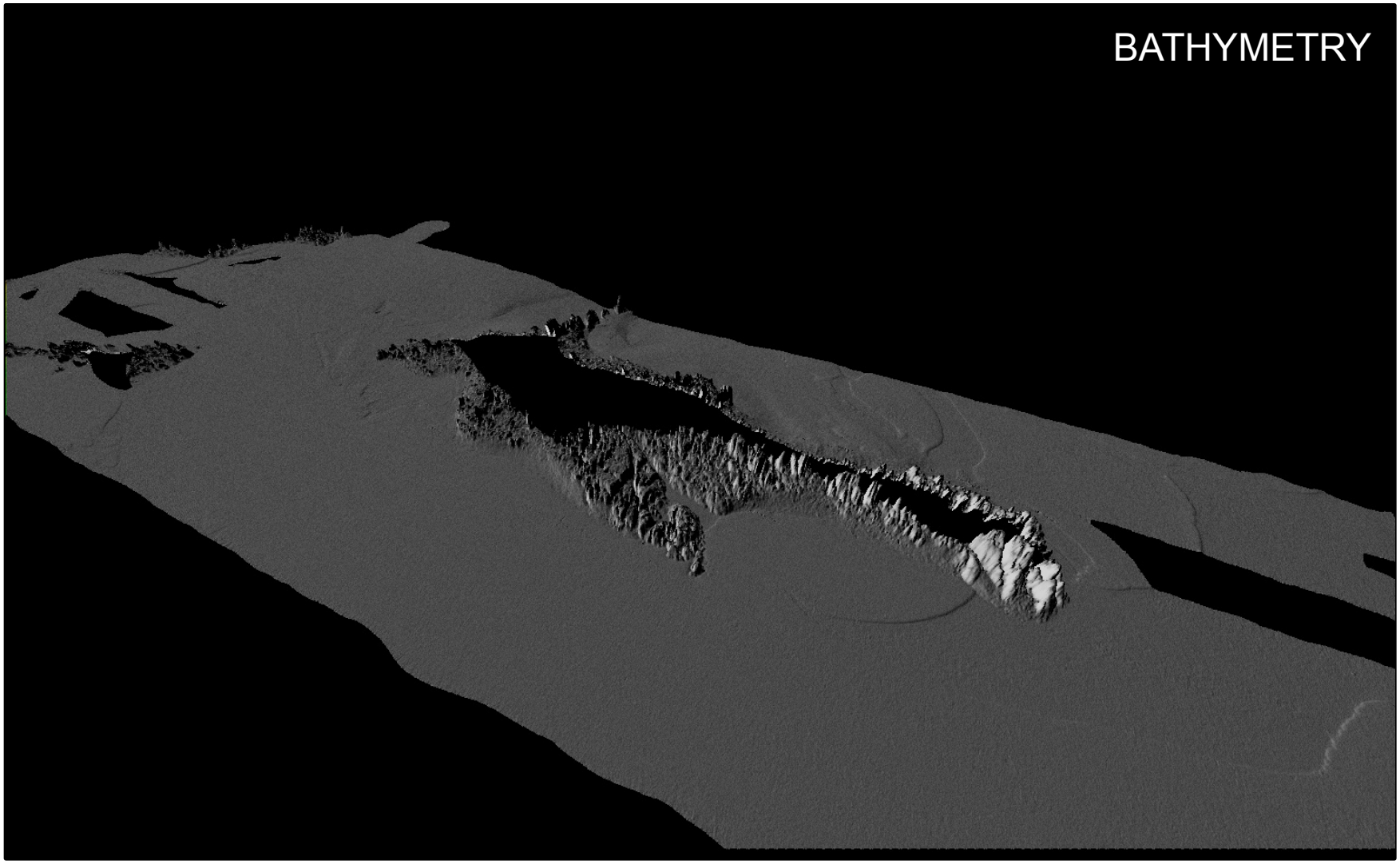

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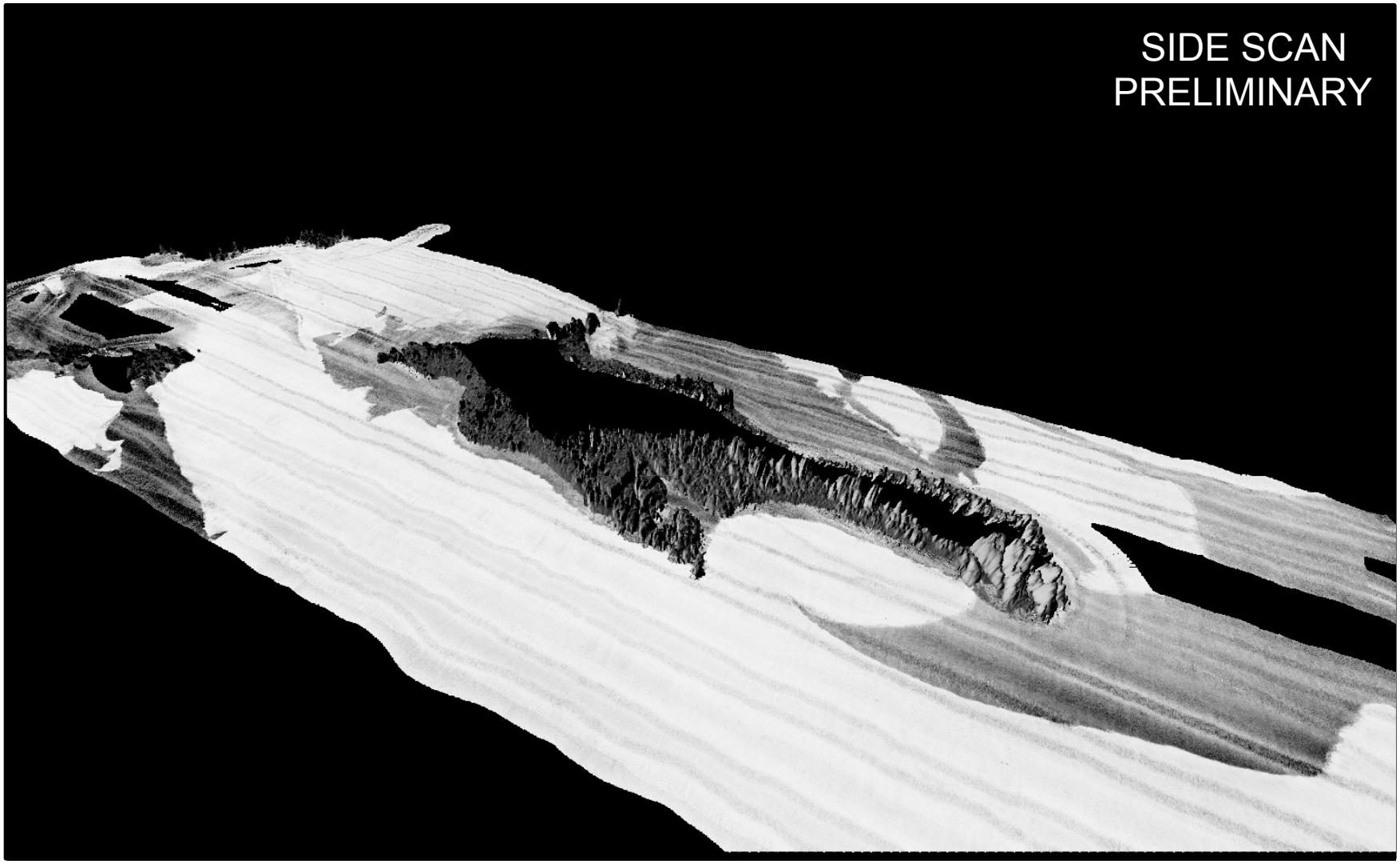

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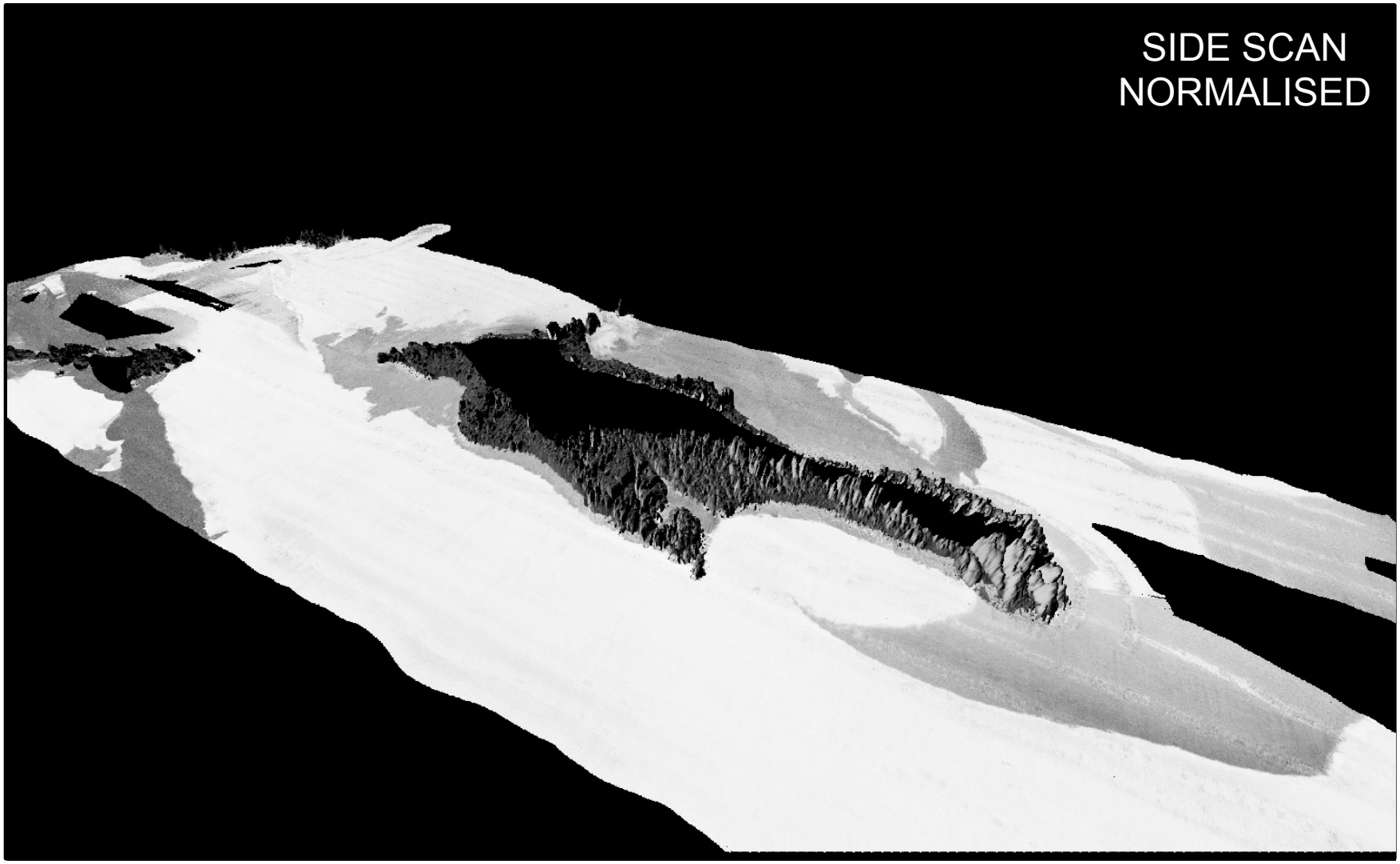

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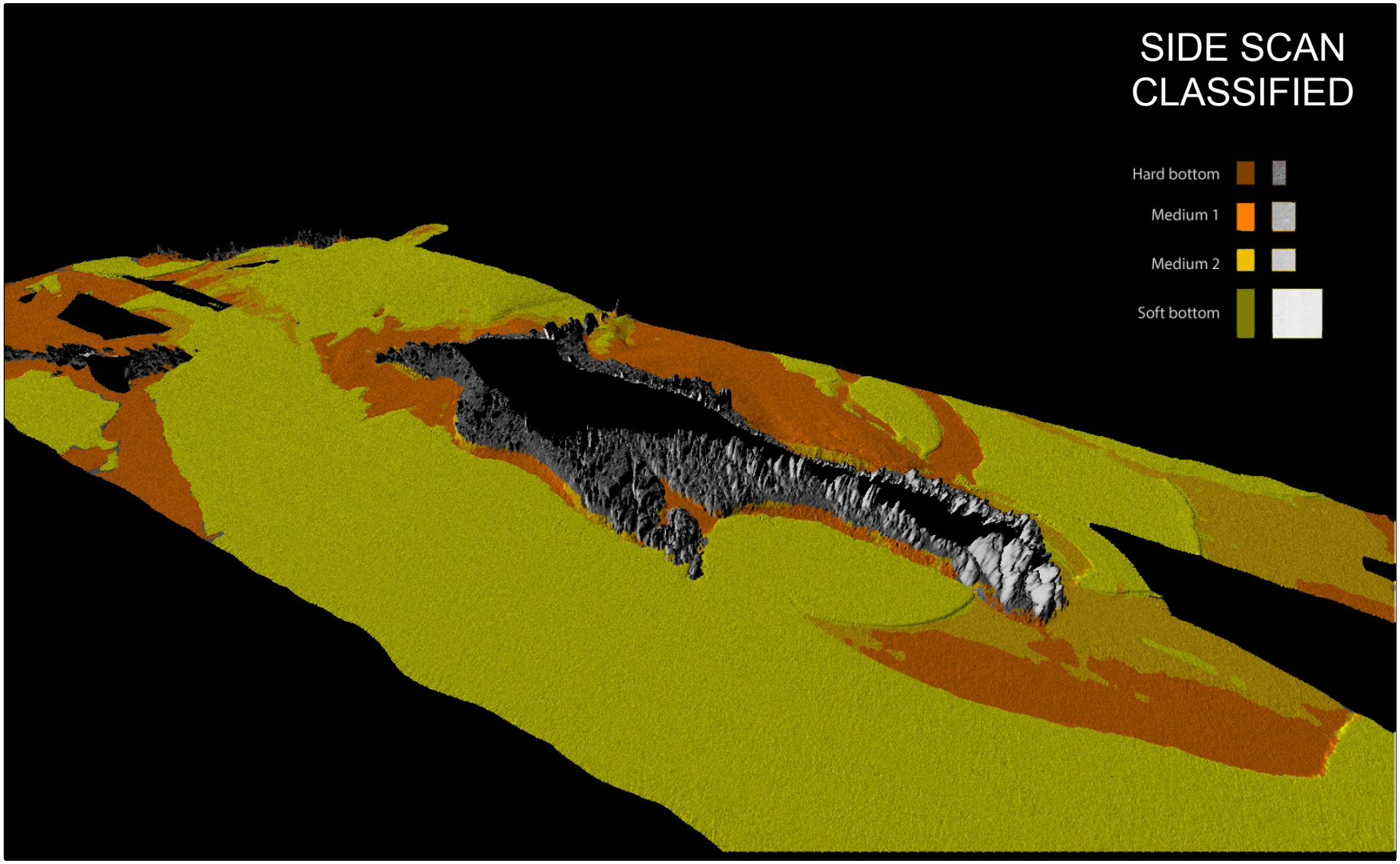
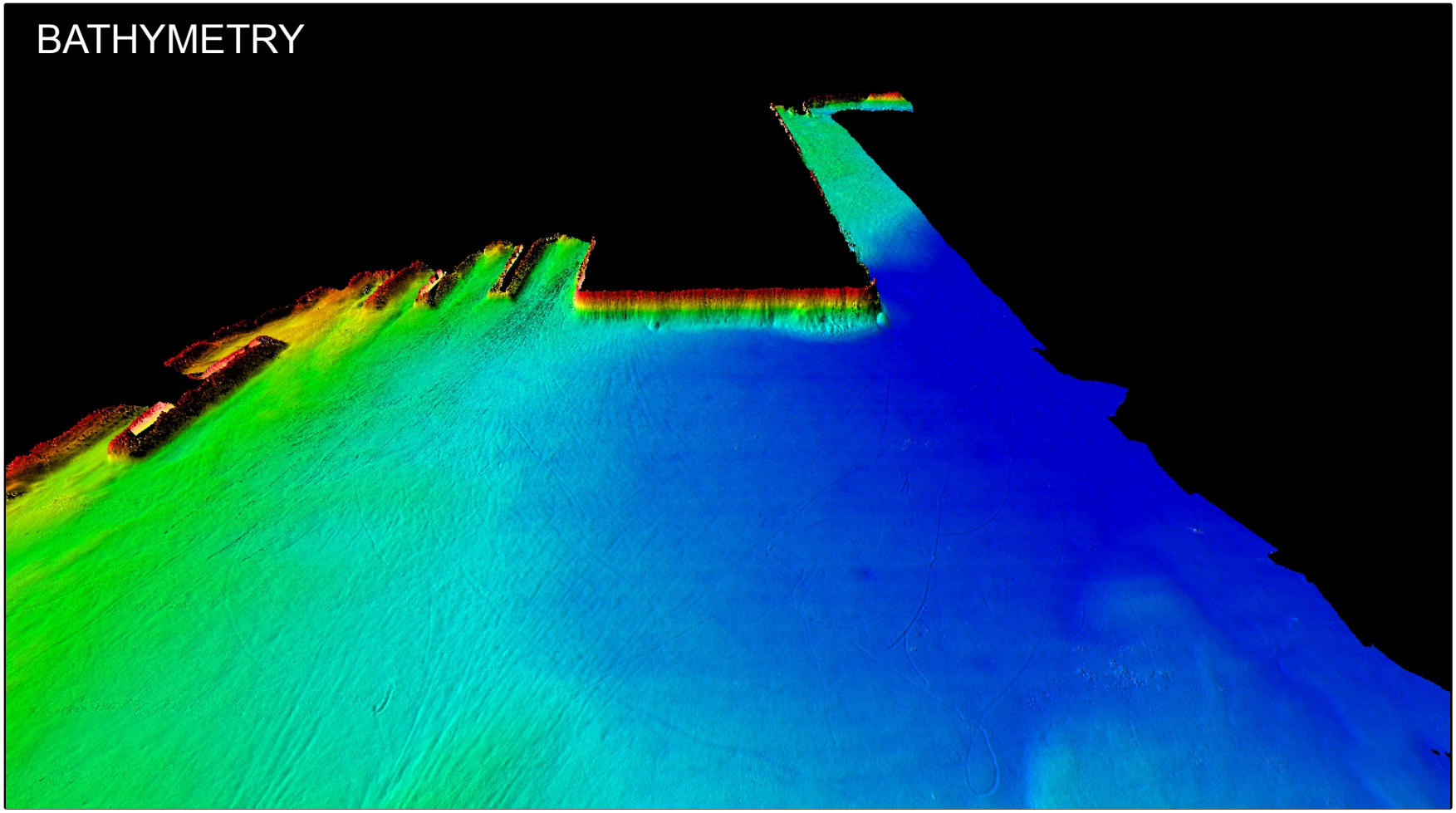


Other examples – Wellington docks

Shallow Survey 2012, Wellington, New Zealand



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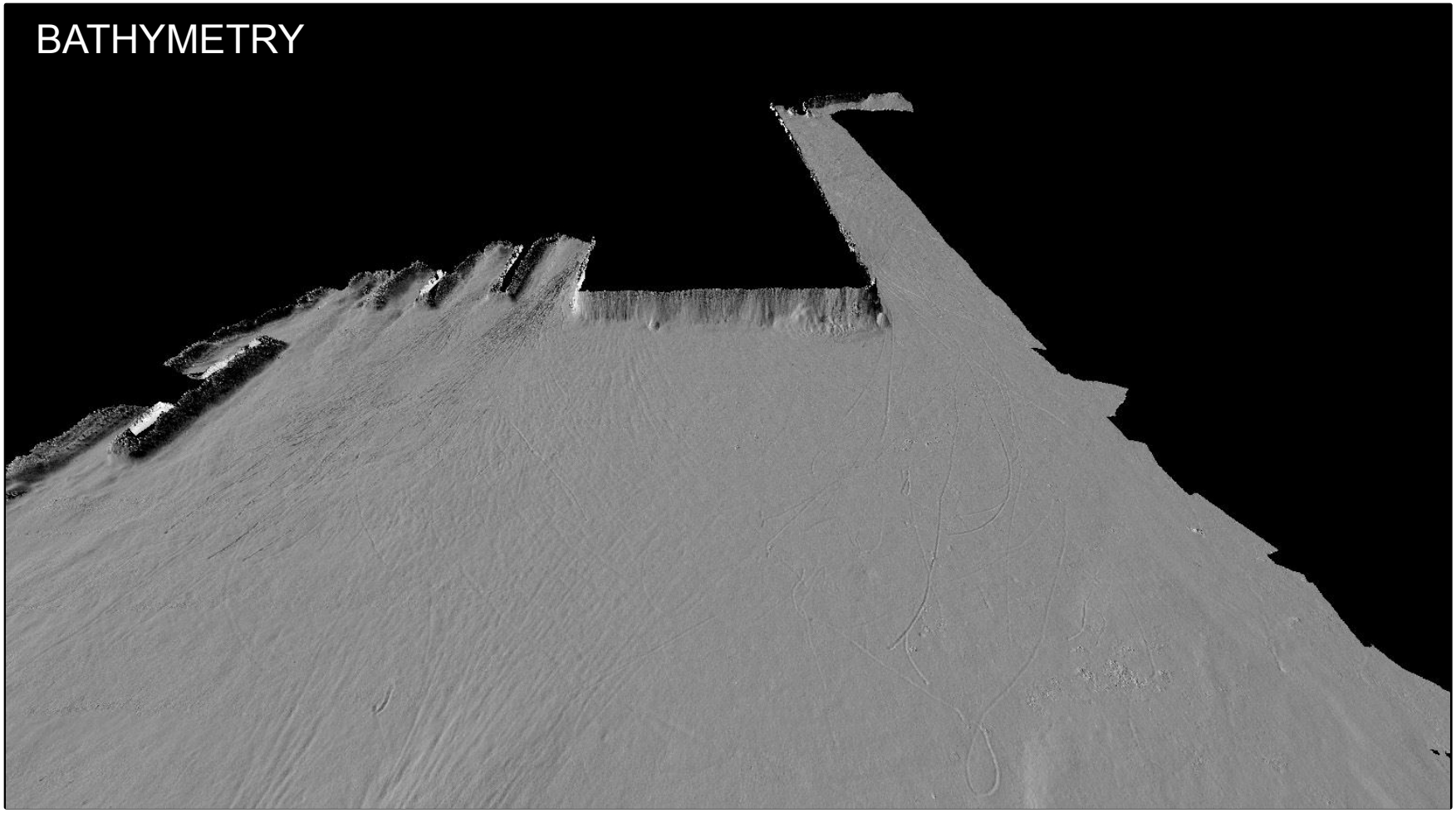

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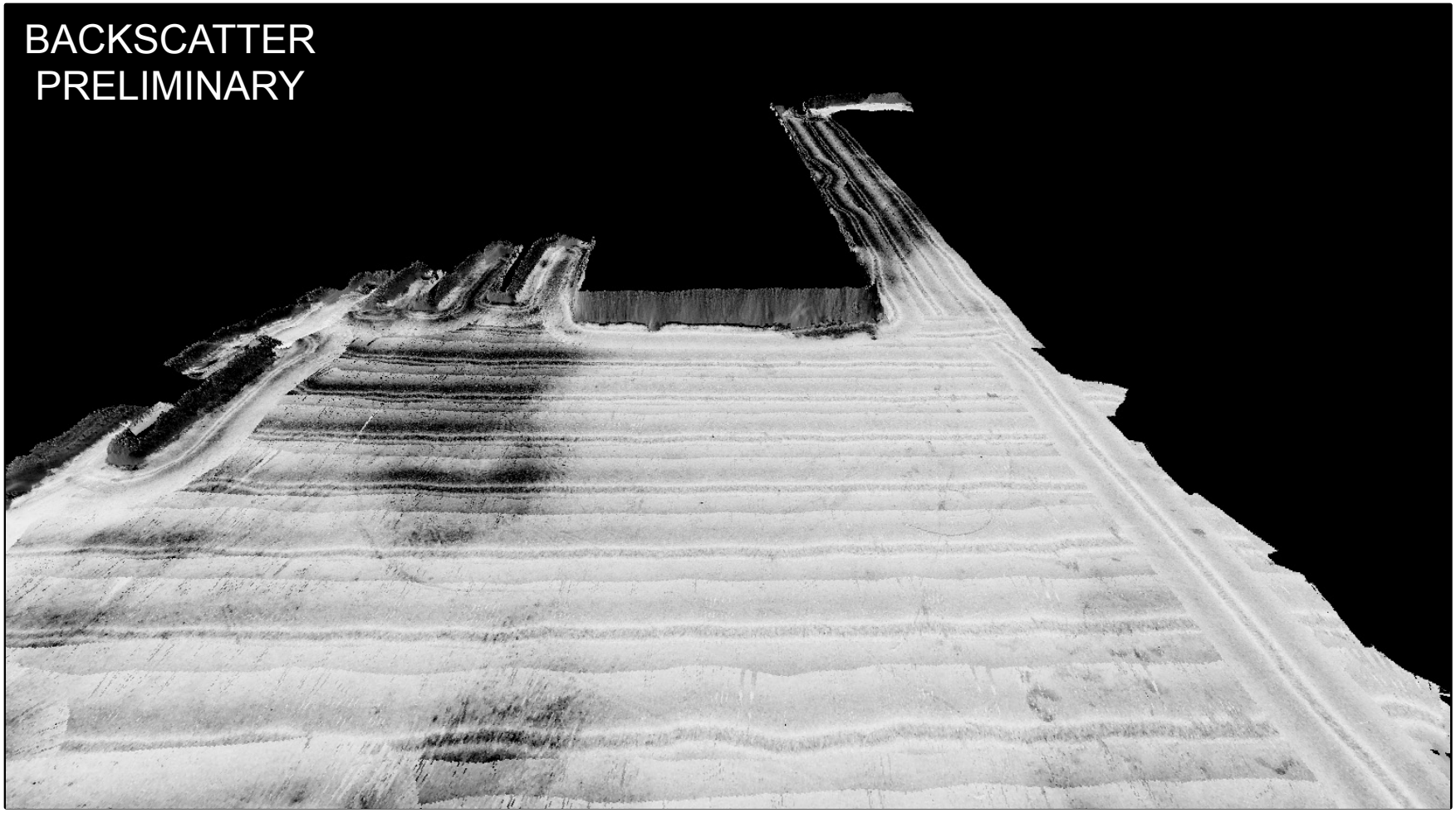

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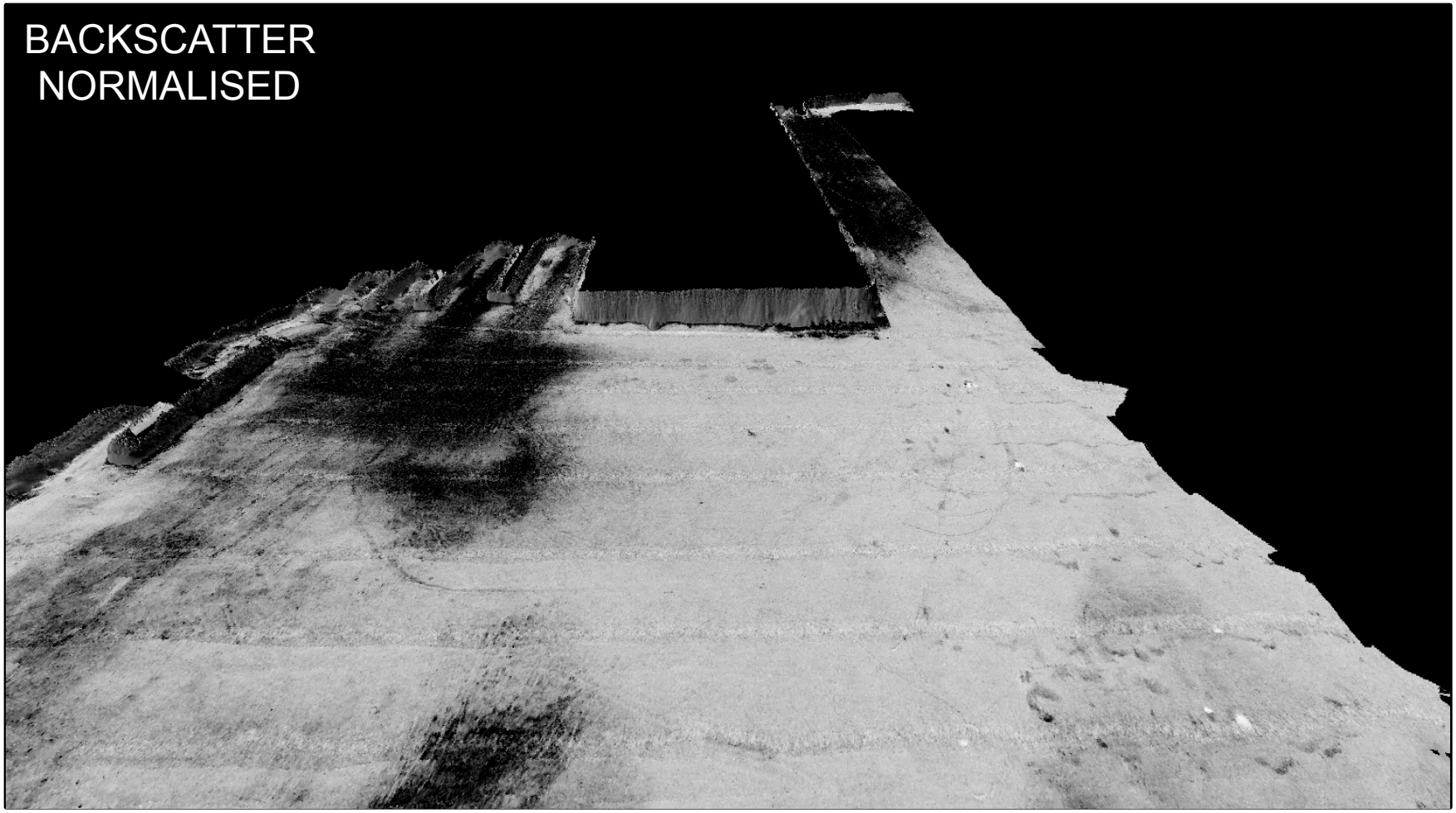

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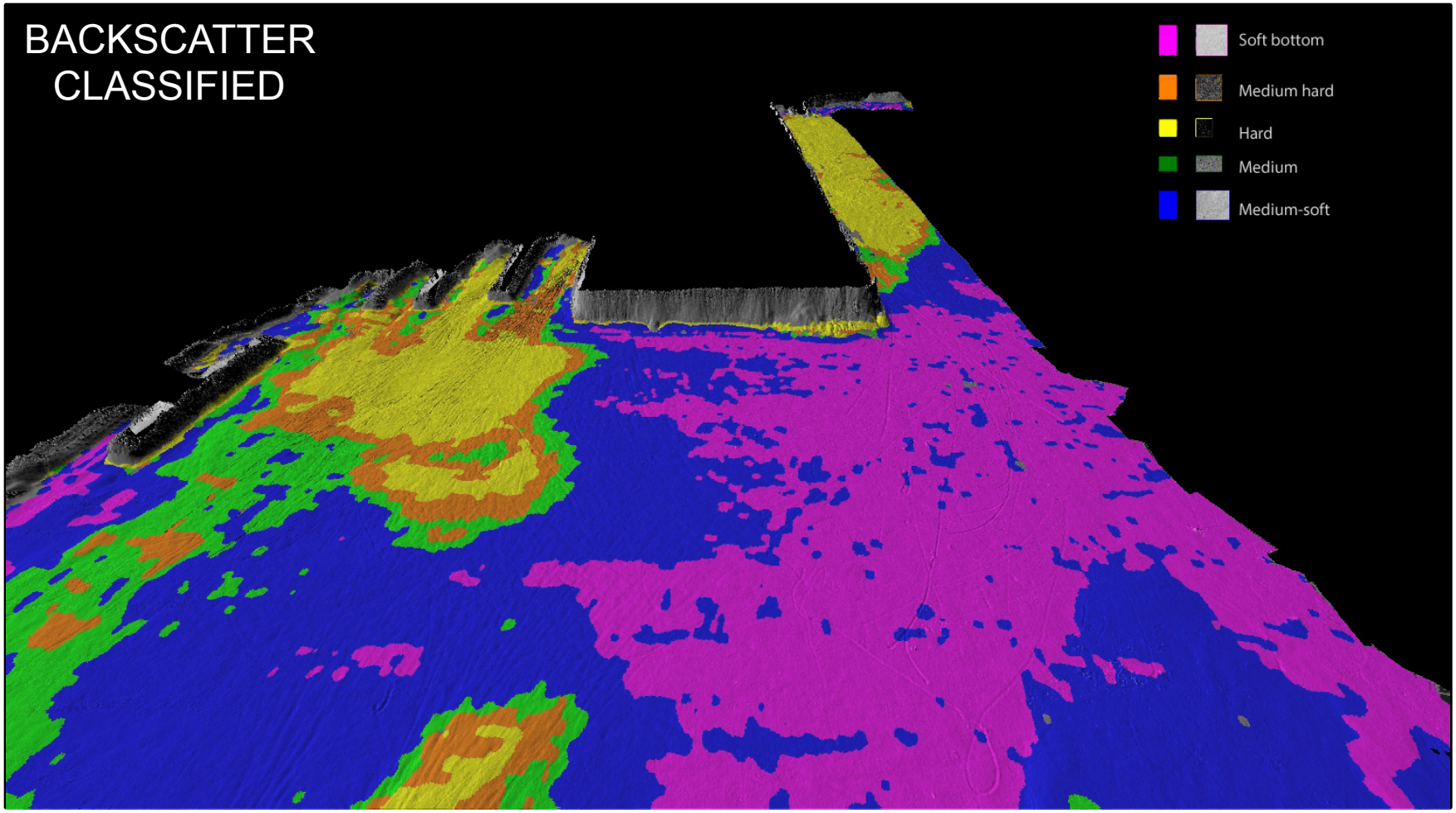
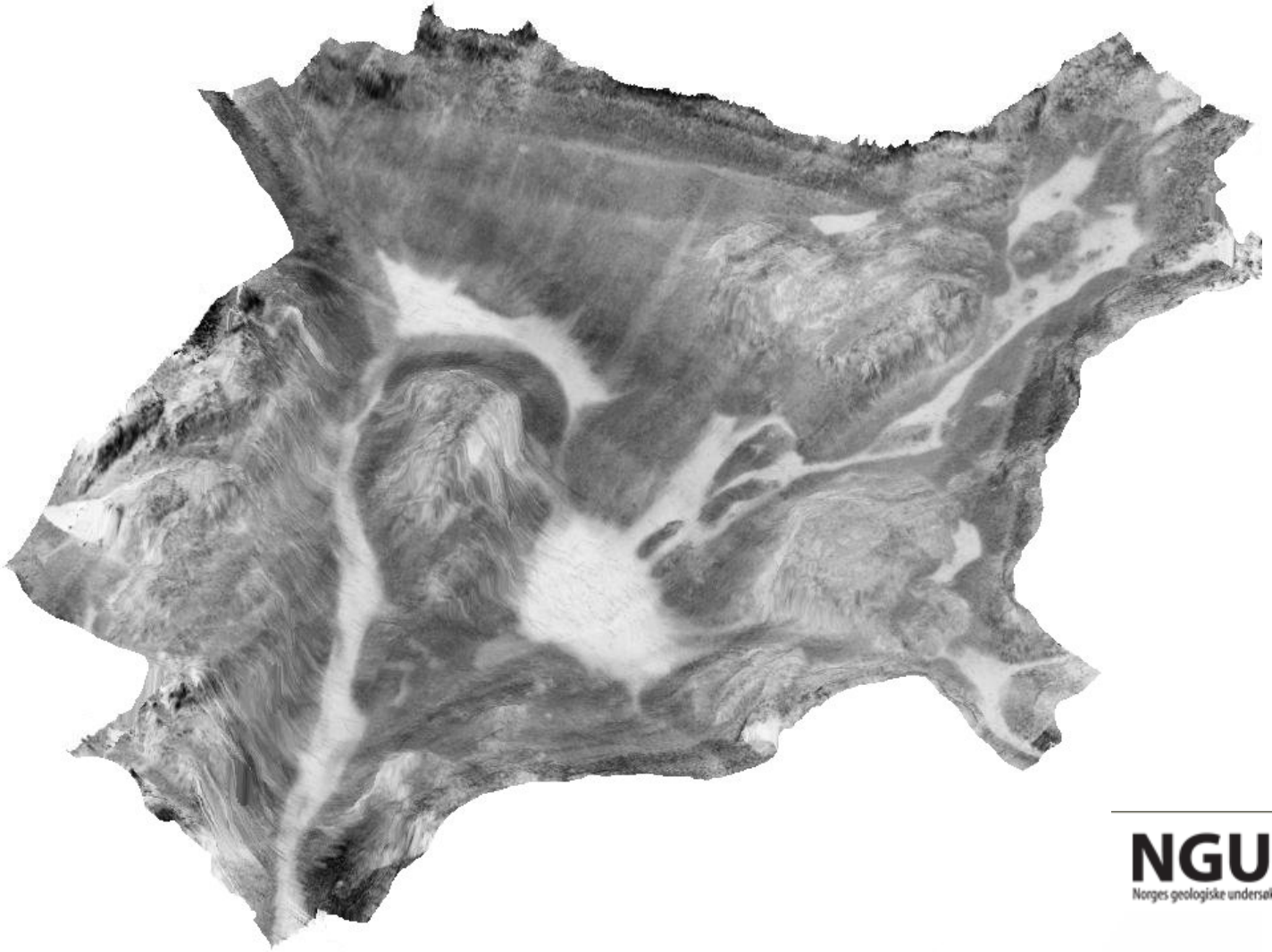
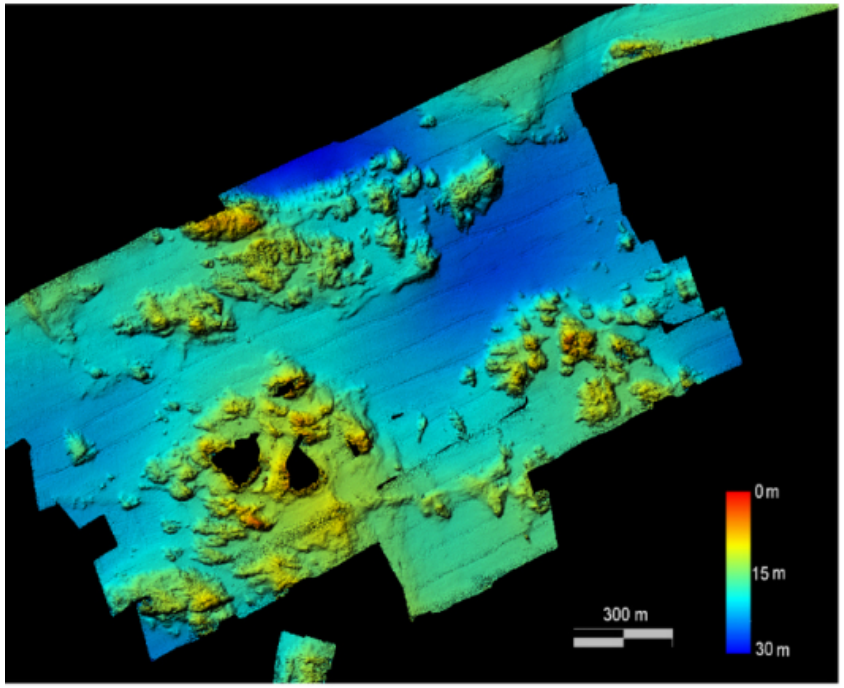
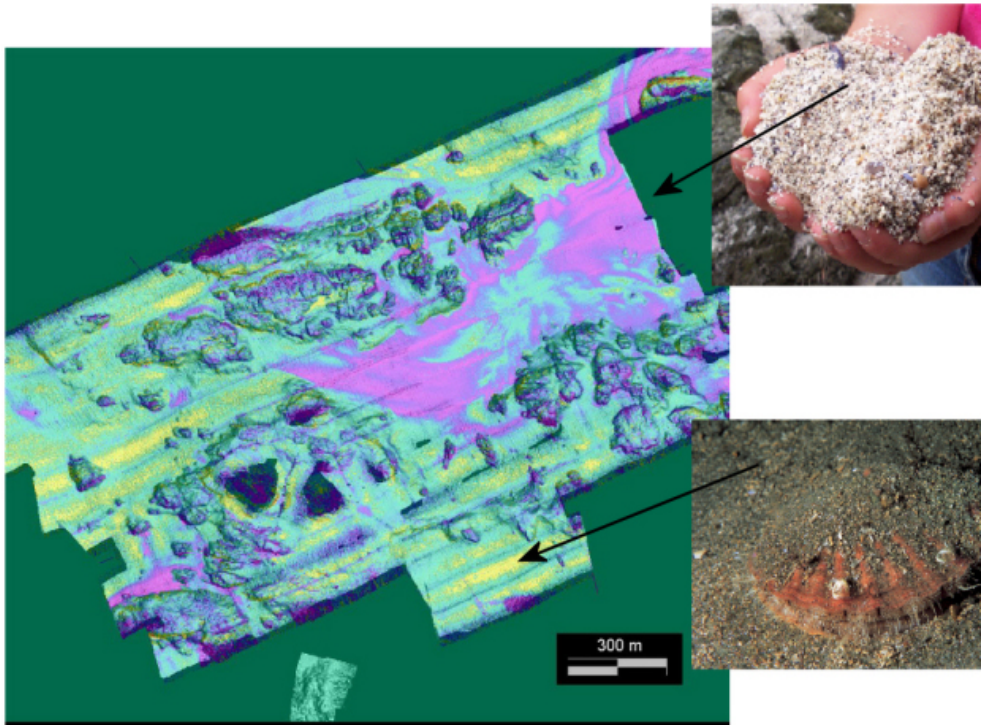


Other examples

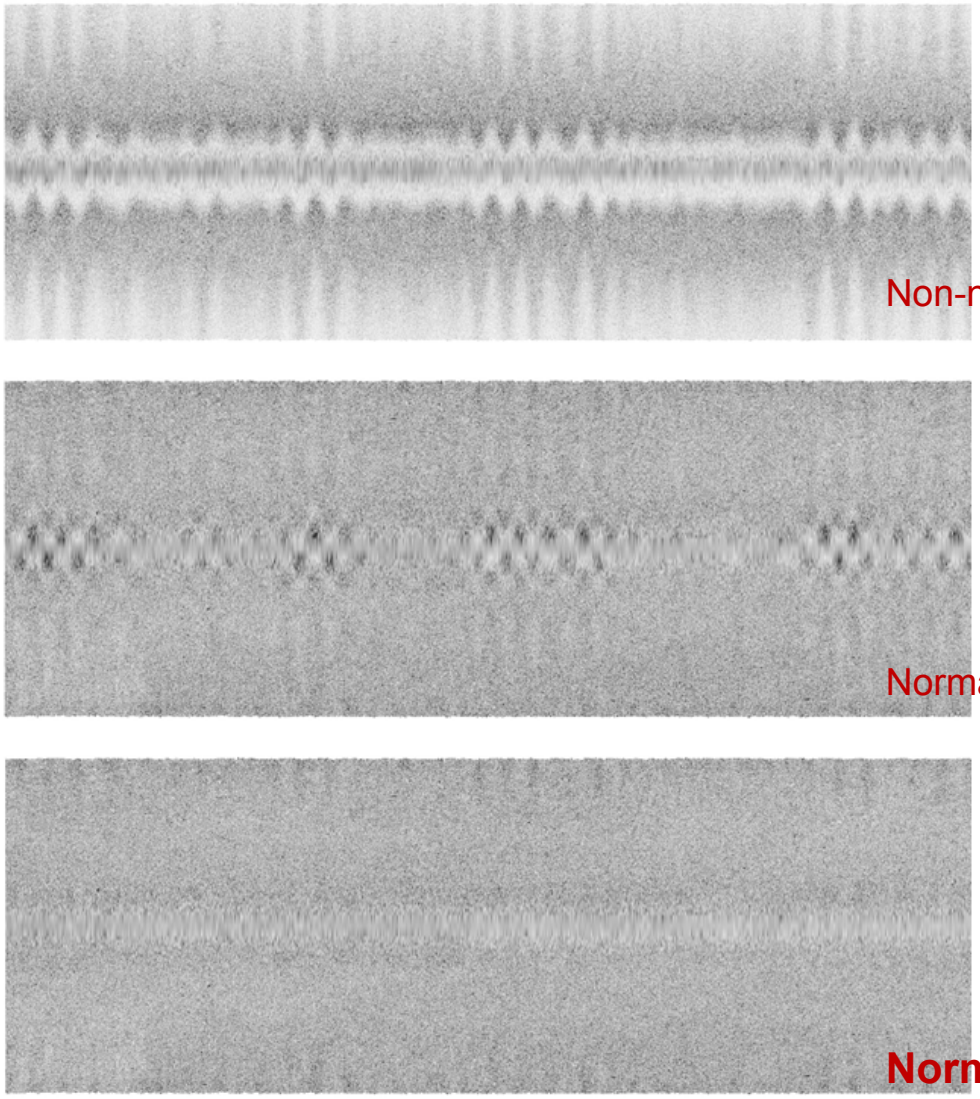


Other examples





What's new in GT 6.8?



Non-normalised

Normalised (standard)

Normalised (new algo)

Conclusions

- PMBS provide true side scan backscatter data with added attributes: bathymetry, attitude, range
- GeoTexture decouples beam and seafloor contributions to backscatter to normalise the data
- AND corrects for bathymetry, attitude and range absorption effects
- GeoTexture performs supervised texture mapping for side scan sonar images

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Thank you very much for you attention

Any questions?...

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