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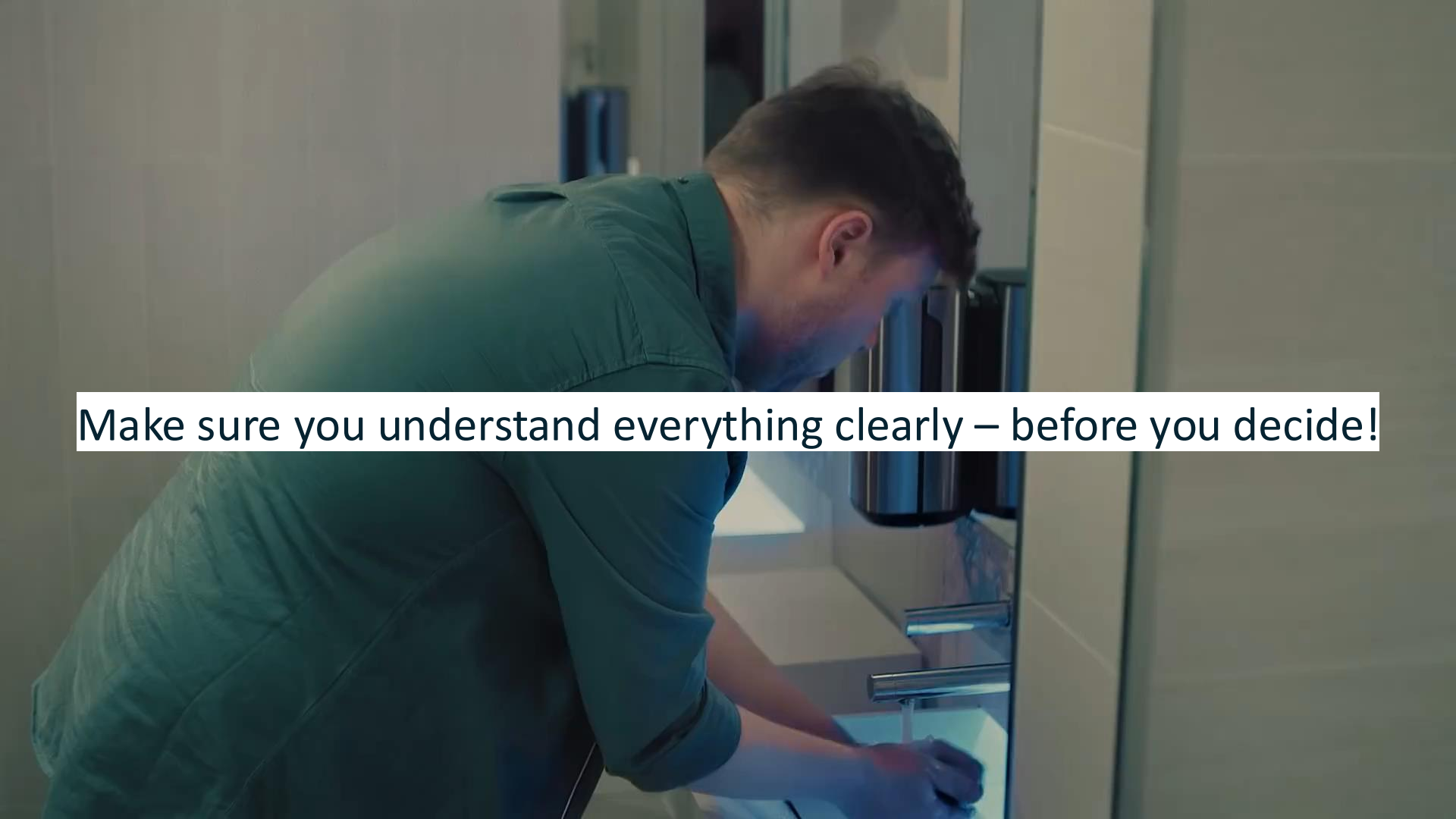
Decision making

Layered Media Detection

Uni Bull

DHyG 37. HydrographenTag 2025

2025-06-18


Make sure you understand everything clearly – before you decide!

Seafloor
Fluid mud / fluff
Acoustic challenges
Navigable depth

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- explore more -

Seafloor
Fluid mud / fluff
Acoustic challenges
Navigable depth
LMD – decision making tool

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Seafloor

Fluid mud / fluff

Acoustic challenges

Navigable depth

LMD

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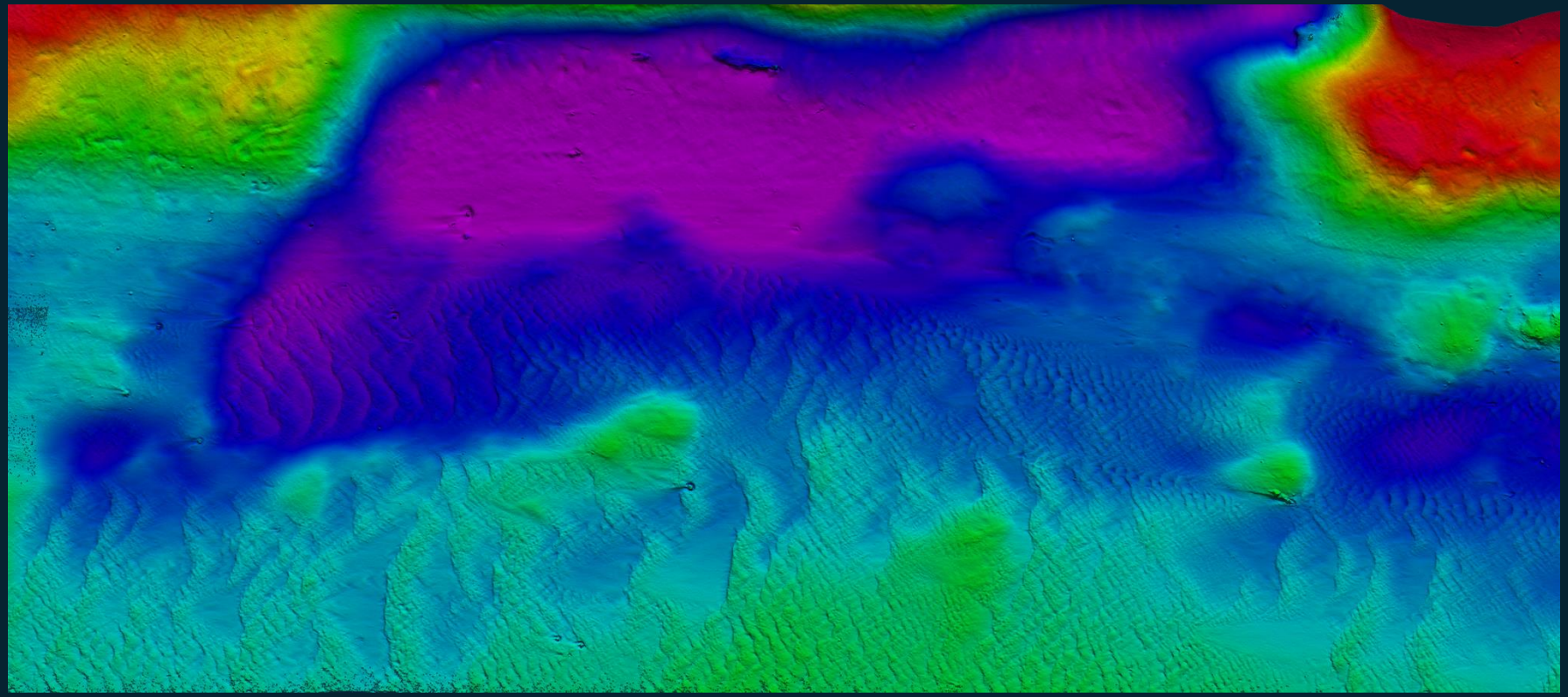

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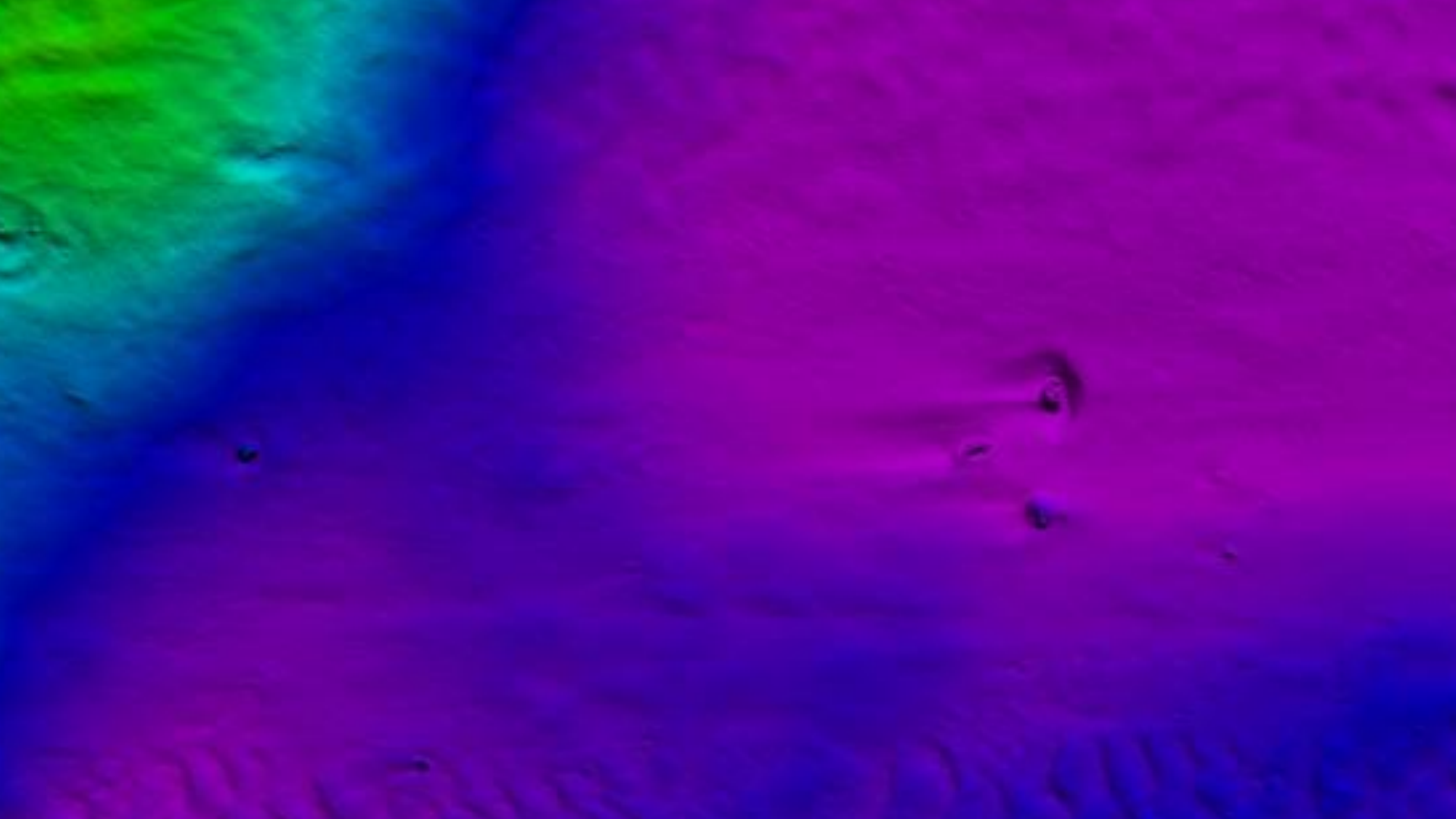

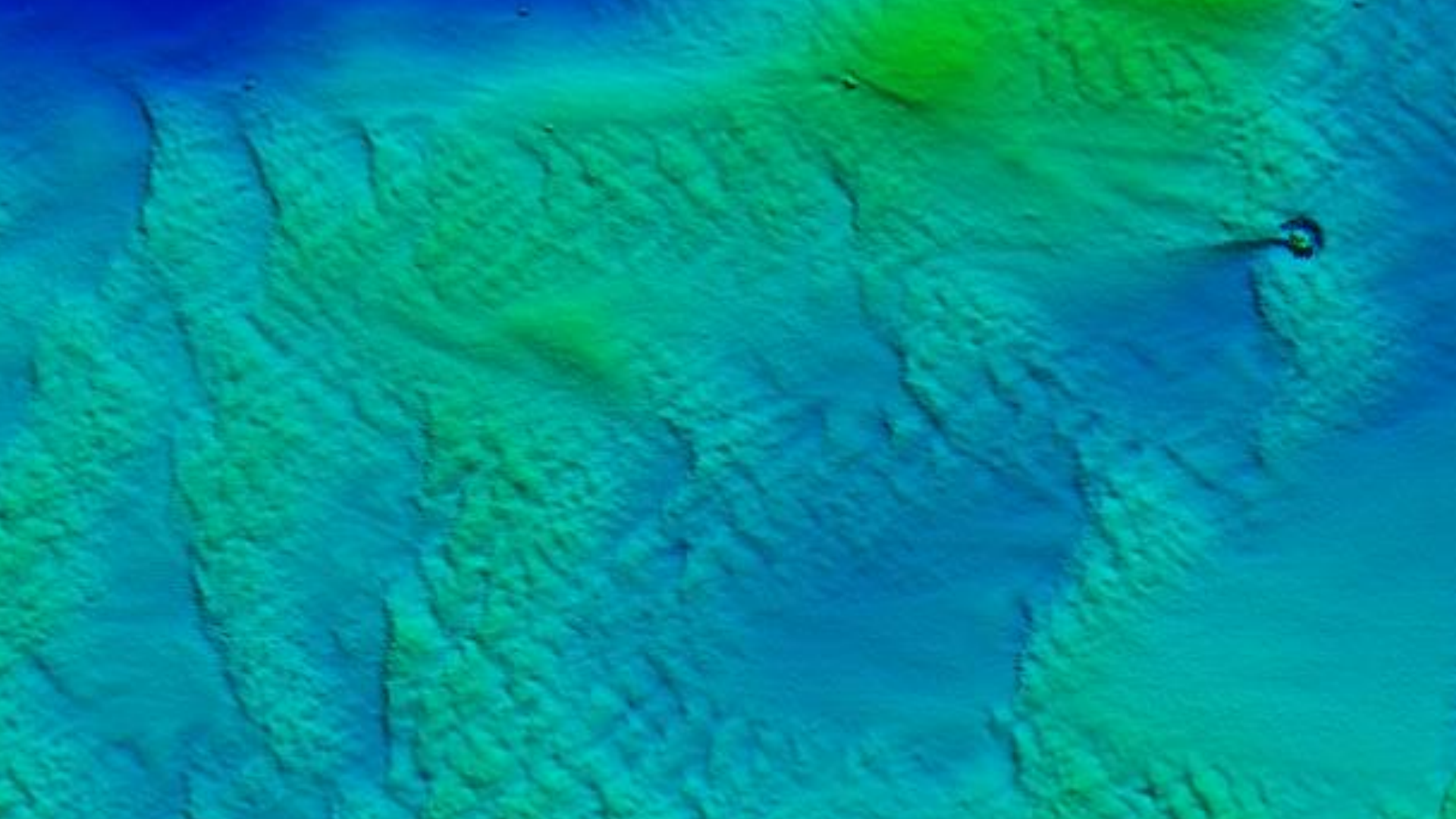

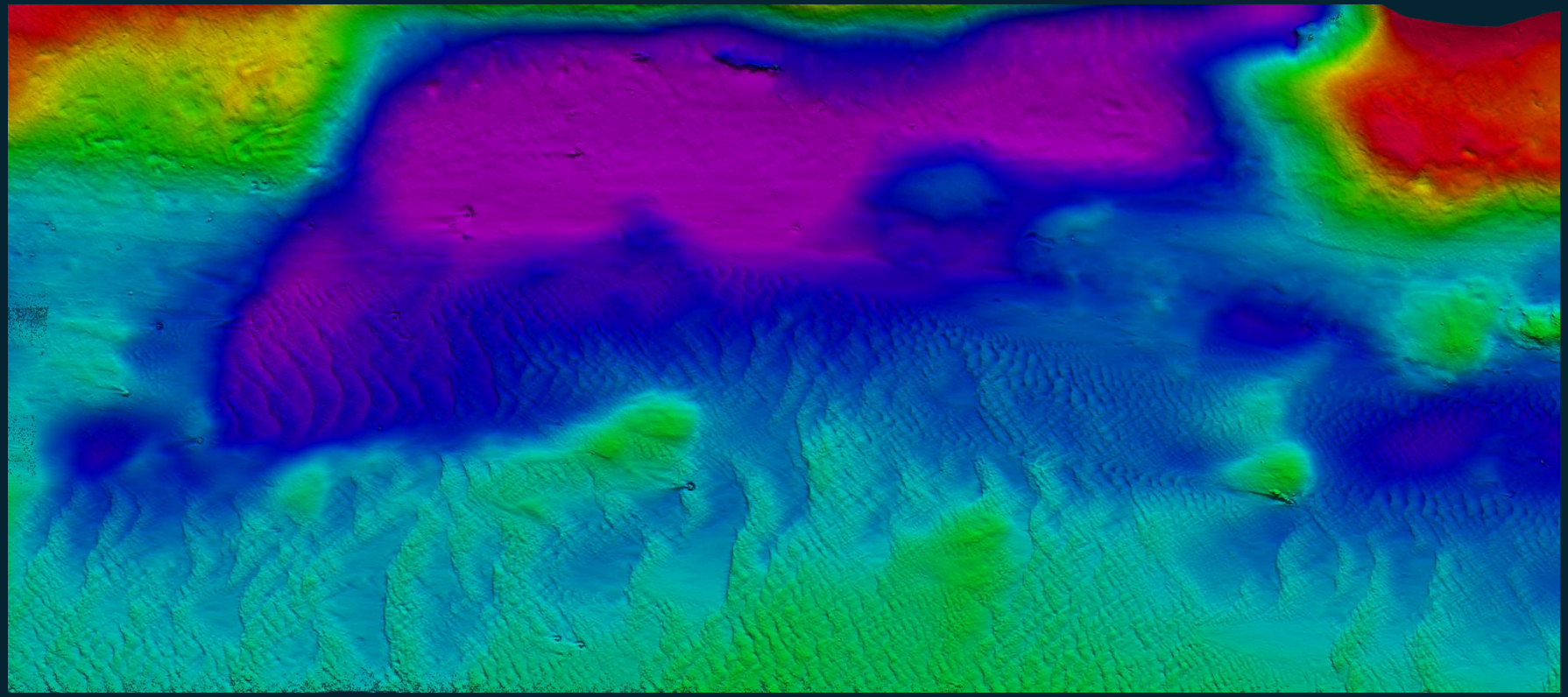

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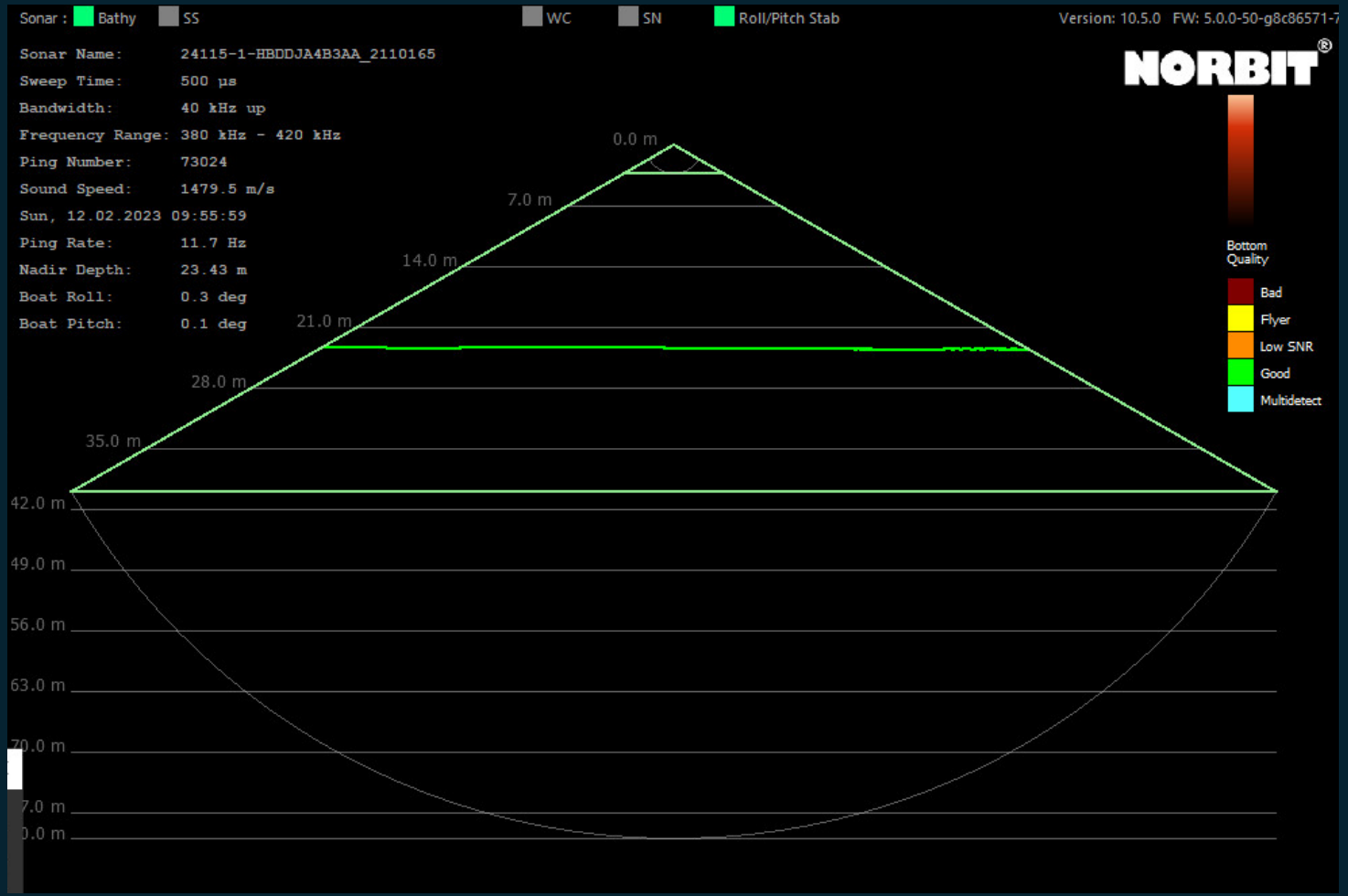

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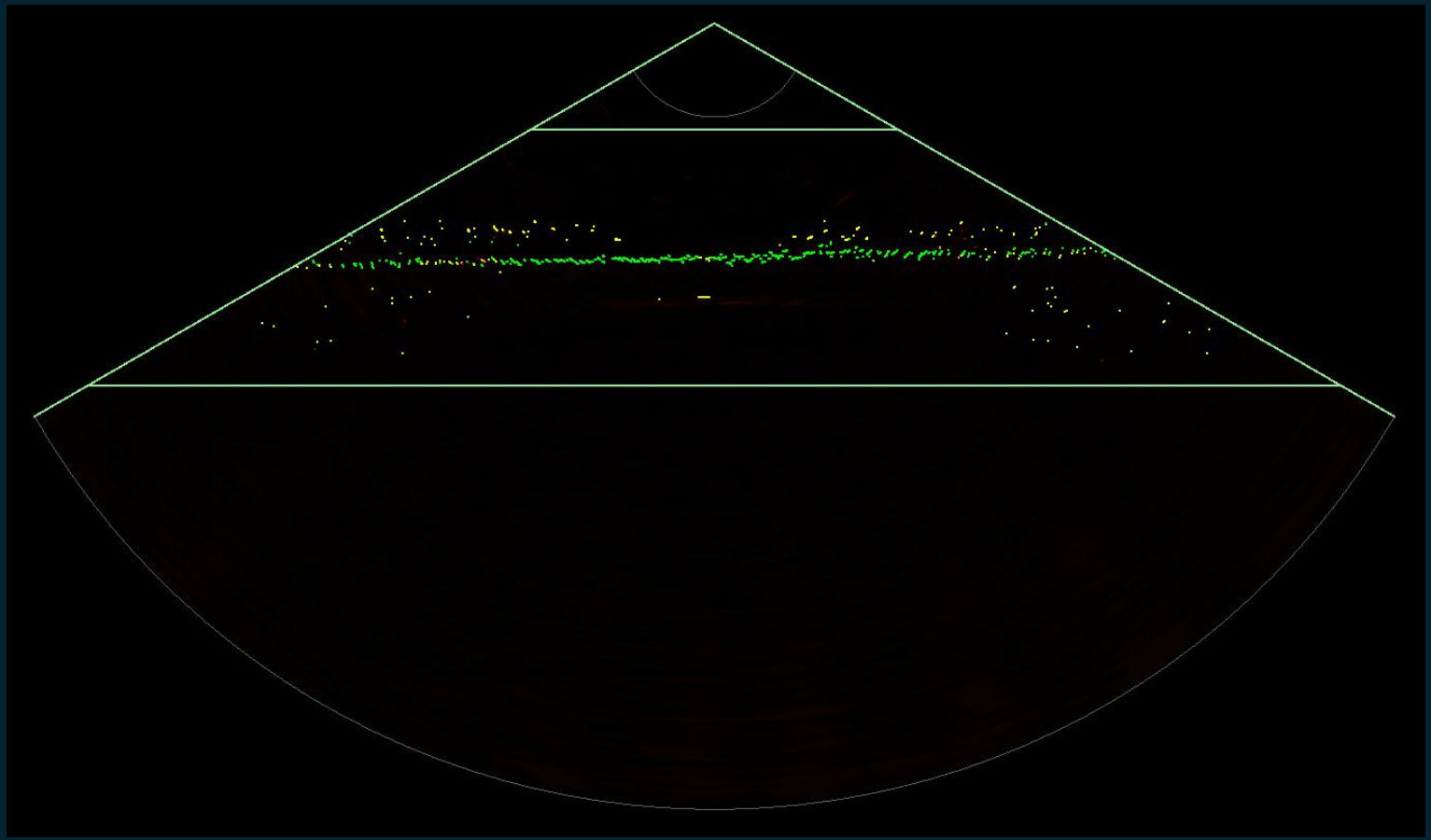

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Seafloor

Fluid mud / fluff

Acoustic challenges

Navigable depth

LMD

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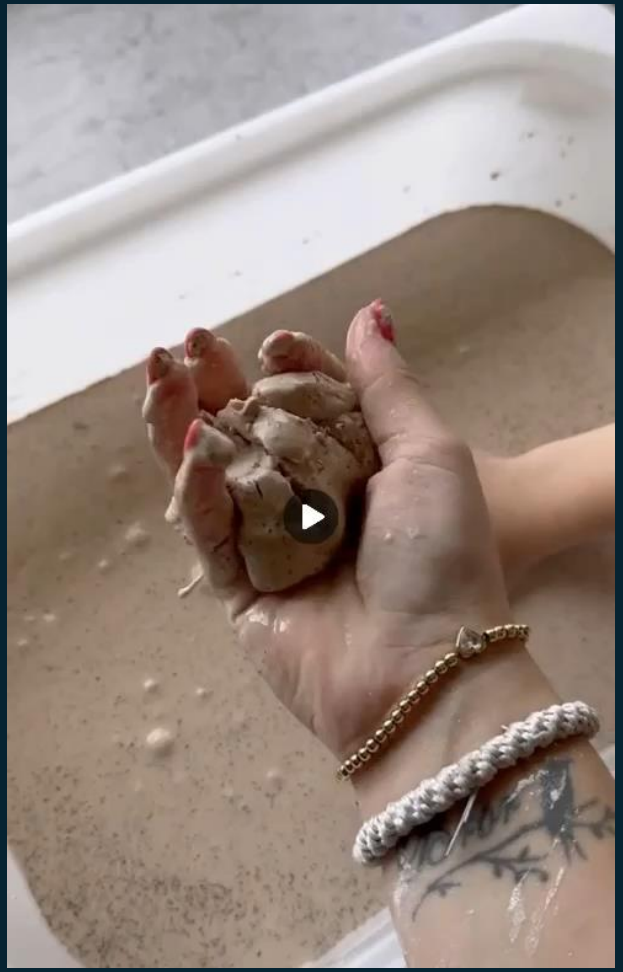

Mud is not just mud…

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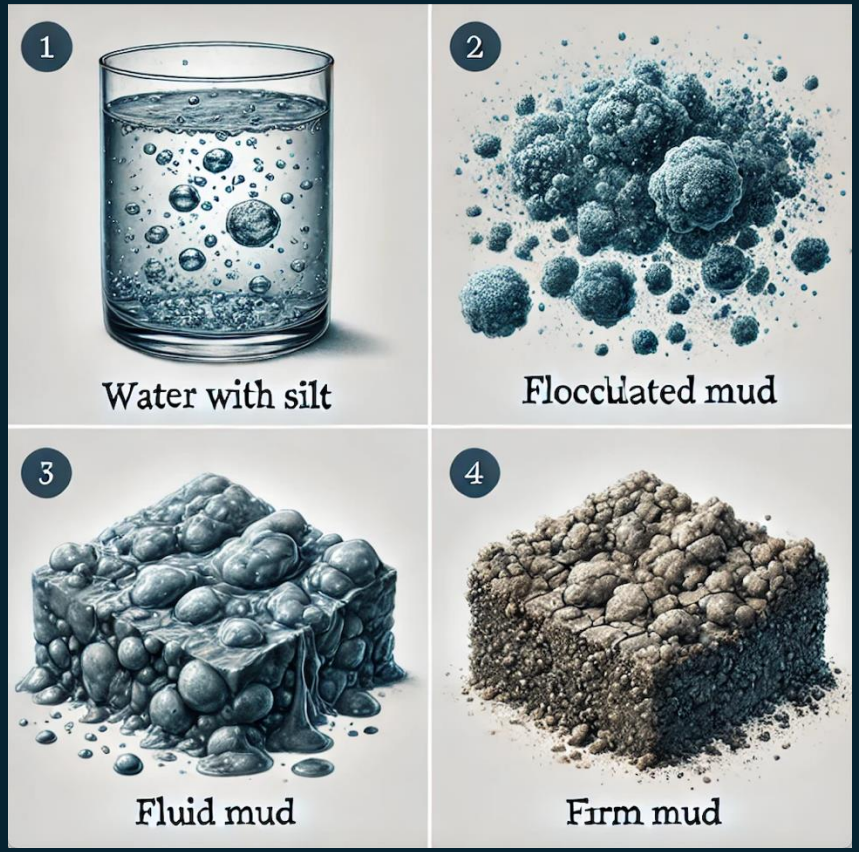
What is fluid mud?

Water with silt
Flocculated mud
Fluid Mud
Firm Mud



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Behaviour
Maneuverability

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- explore more -

Behaviour
Maneuverability

Depth measurements

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Seafloor

Fluid mud / fluff

Acoustic challenges

Navigable depth

LMD

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Lutocline

NORBIT

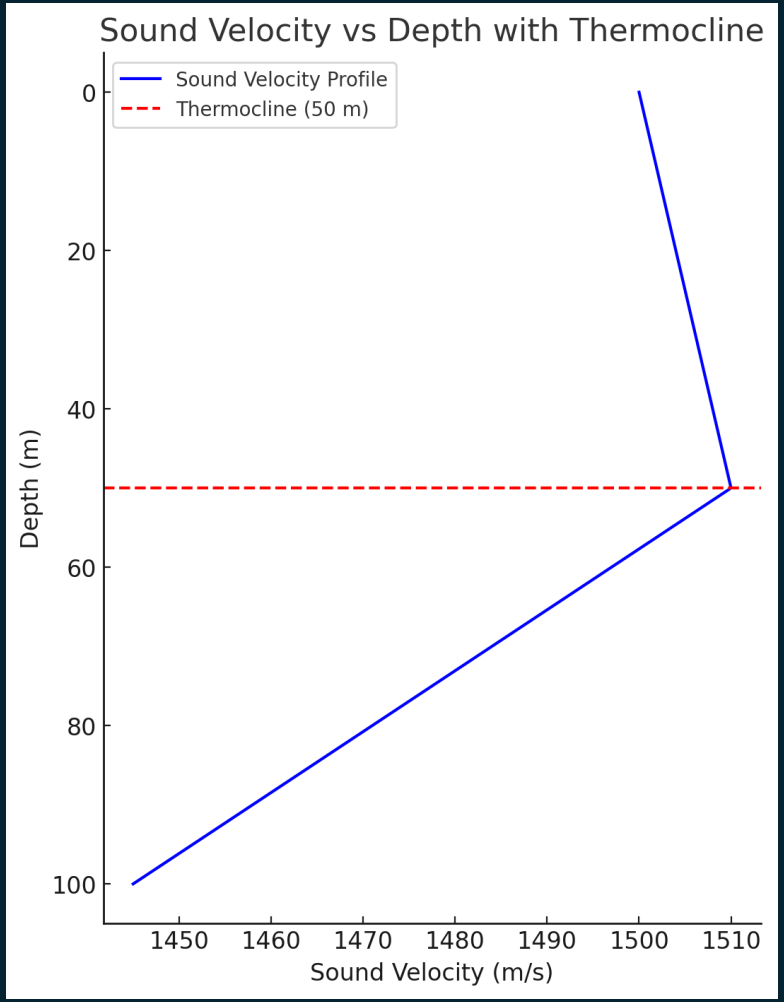
- explore more -

Lutocline

Thermocline

NORBIT

- explore more -



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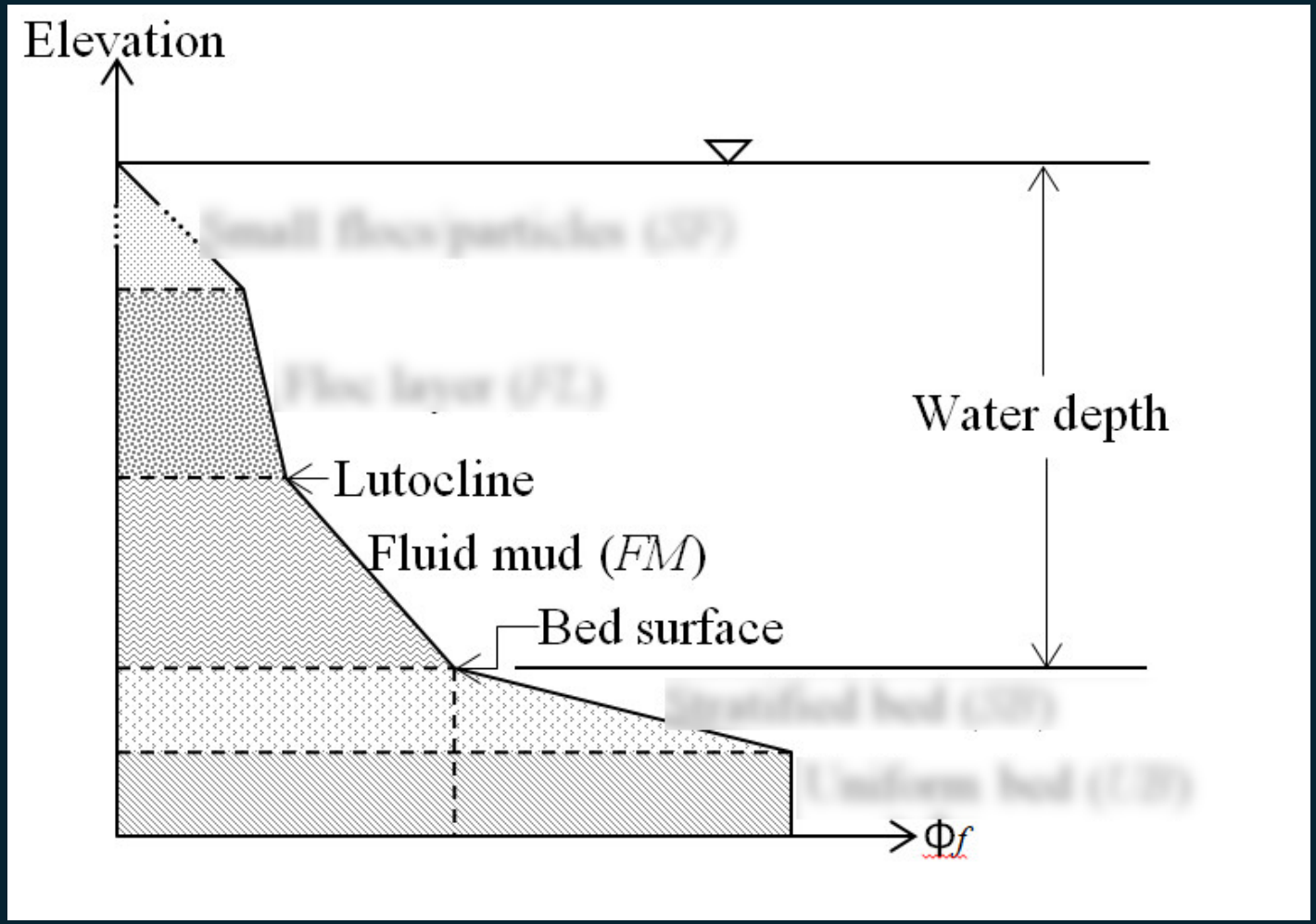

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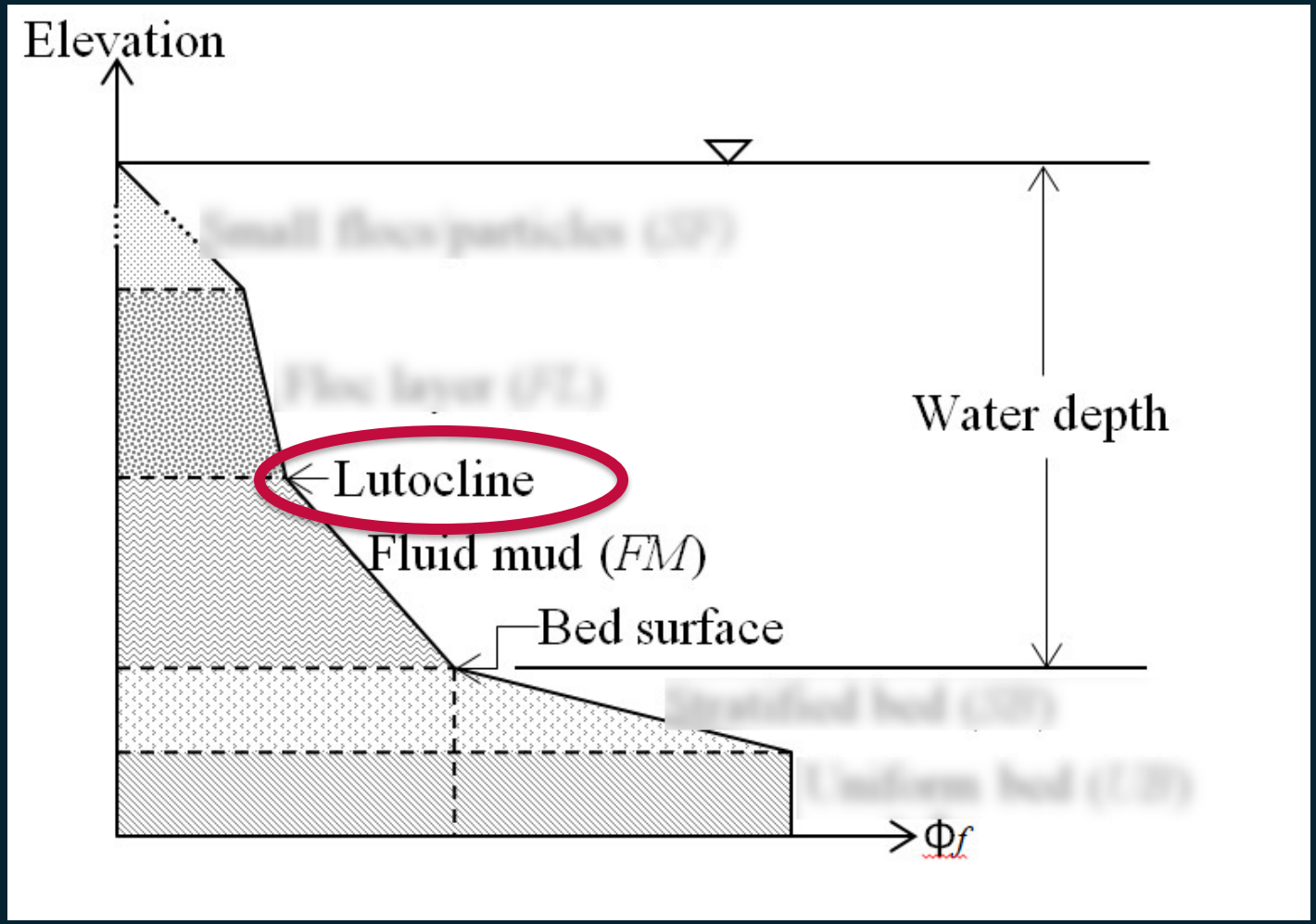

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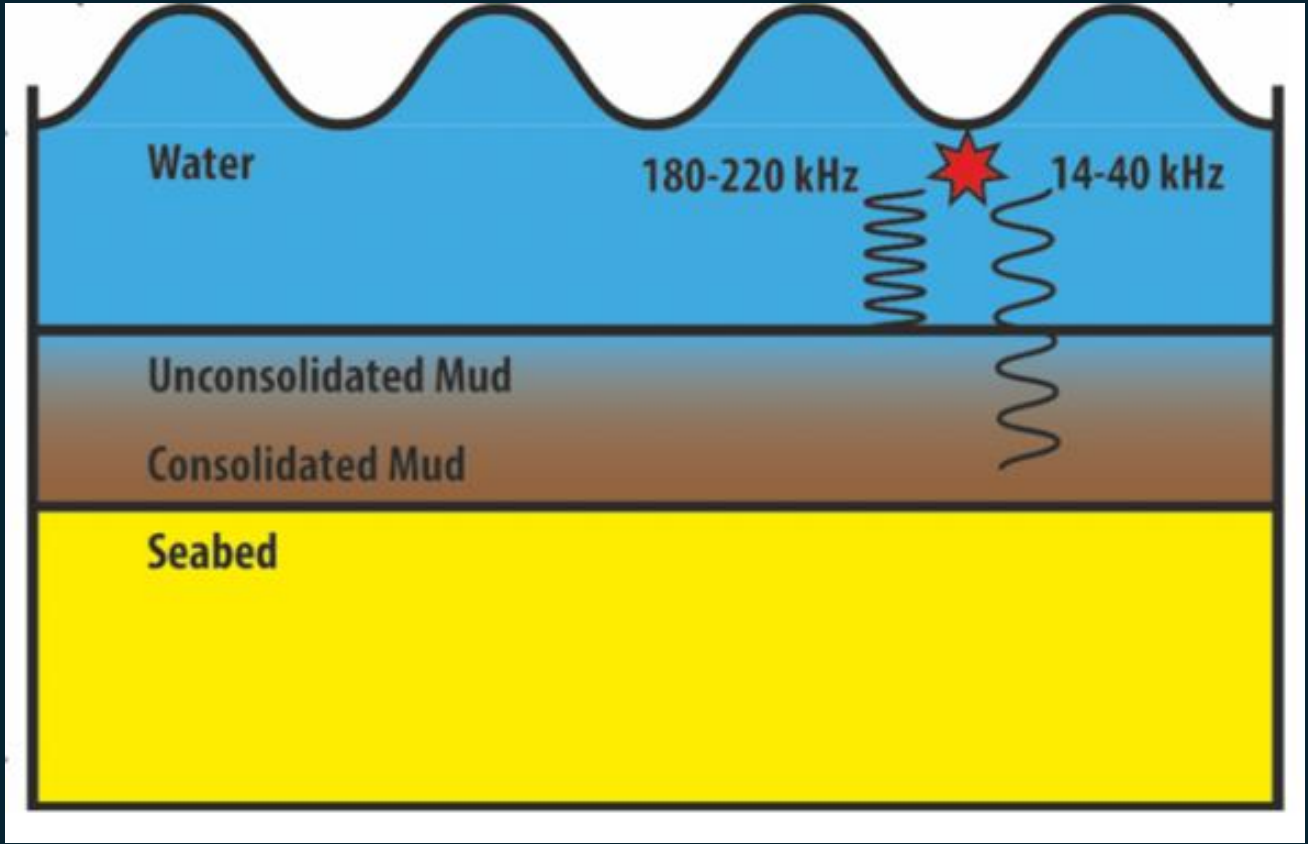

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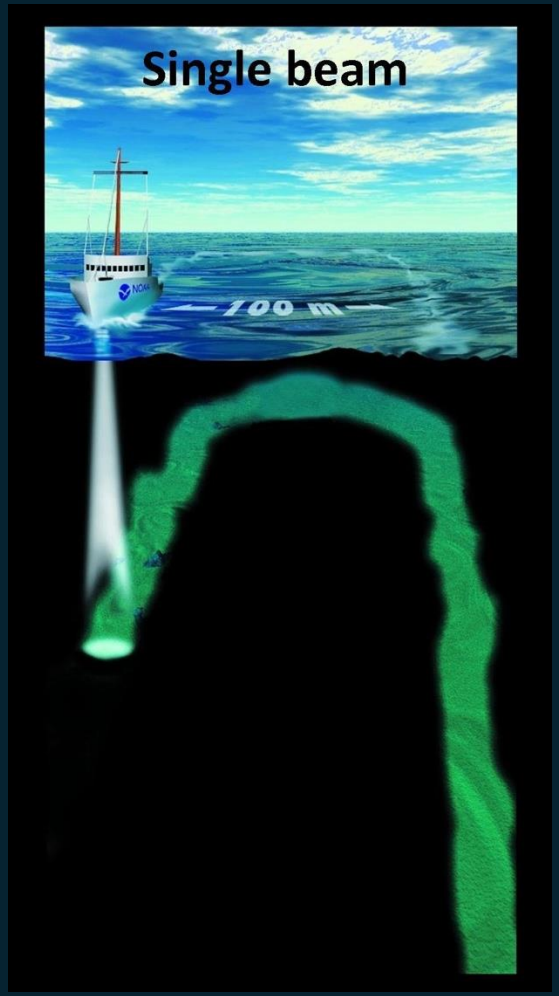

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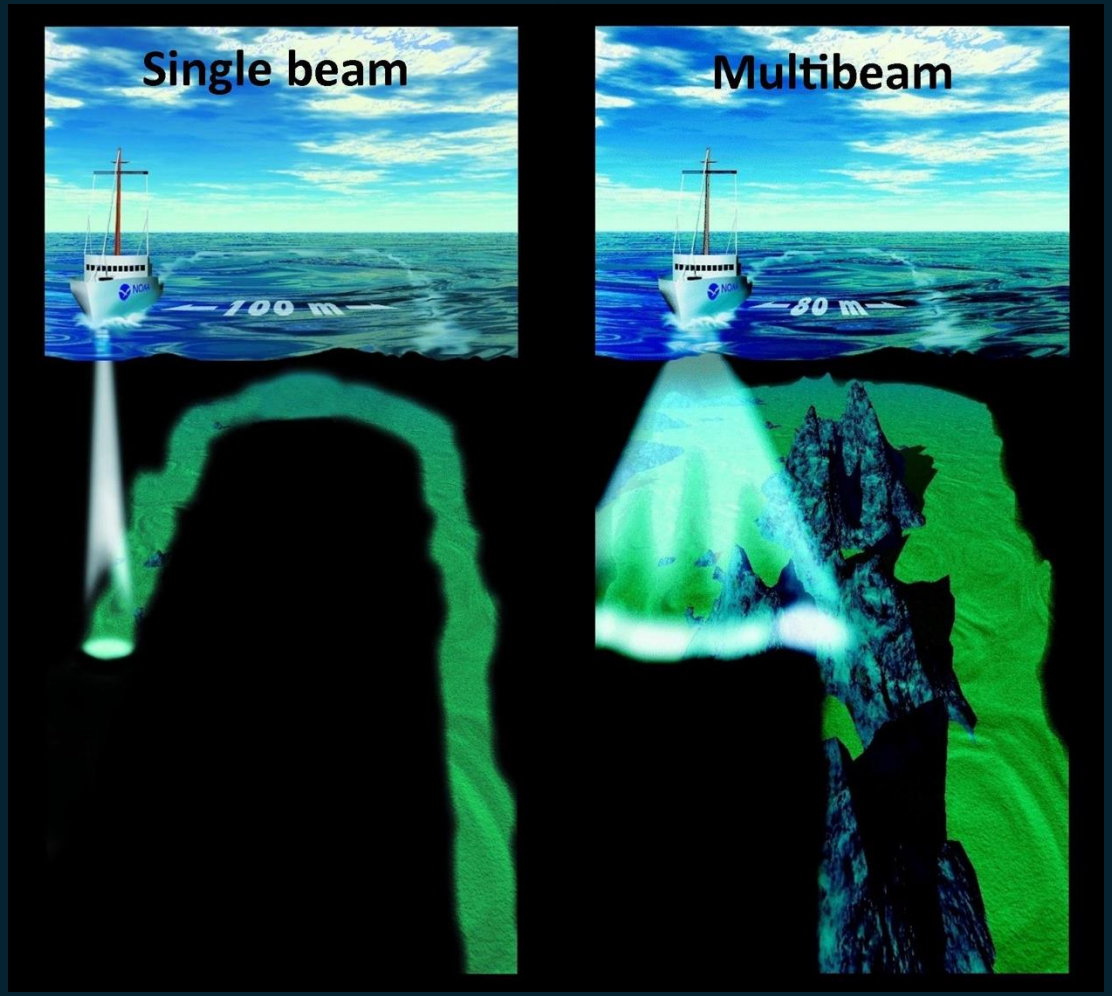

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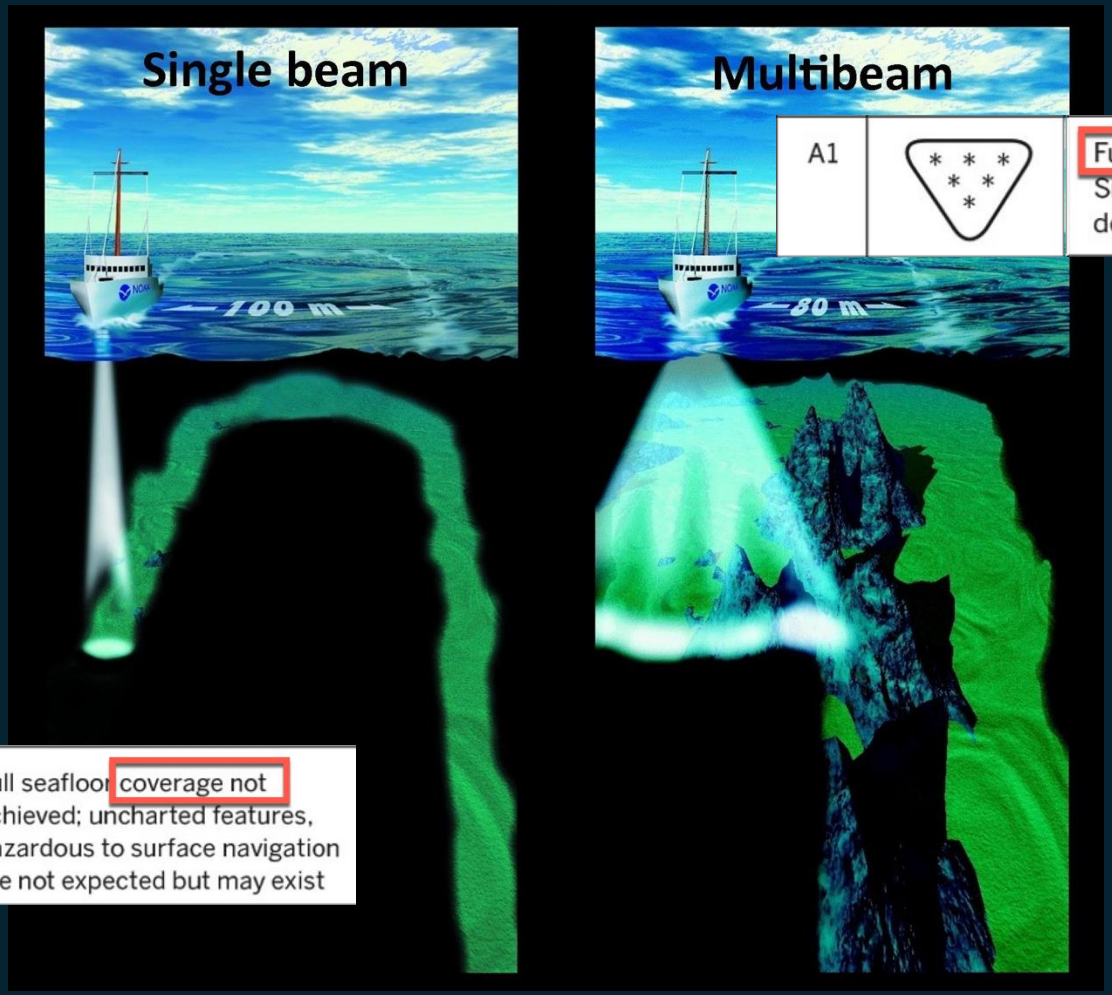

A1	* * * * * *	Full area search undertaken. Significant seafloor features detected and depths measured

B	* * * *	Full seafloor coverage not achieved; uncharted features, hazardous to surface navigation are not expected but may exist

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Surveying for a CATZOC A1 navigable bottom in the presence of fluid mud

Mapping through fluid mud

By Dr Pawel Pocwiardowski, NORBIT

The presence of suspended sediments in water bodies presents significant challenges for the dredging industry. Existing methods to determine nautical depths are intrusive single point methods relying on in situ density or shear strength measurements[1,3] or low-frequency single-beam echosounder recordings[1,2]. The use of single-beam echosounders is however systemically problematic as they are not practical in satisfying the CATZOC A1 coverages required for contemporary electronic navigational charting.

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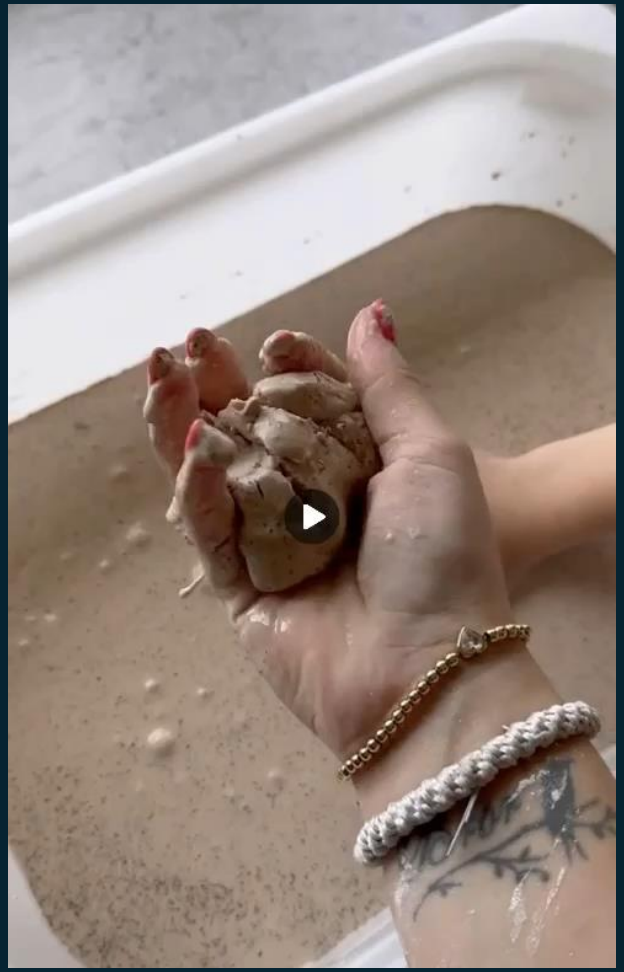
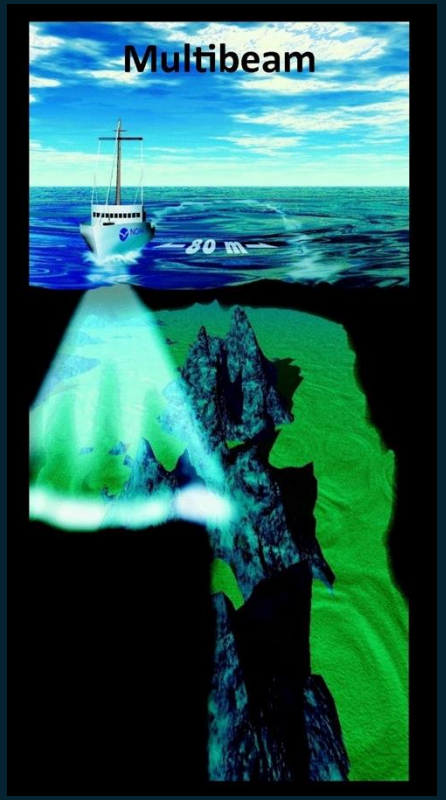


A1		Full area search undertaken. Significant seafloor features detected and depths measured



Challenge

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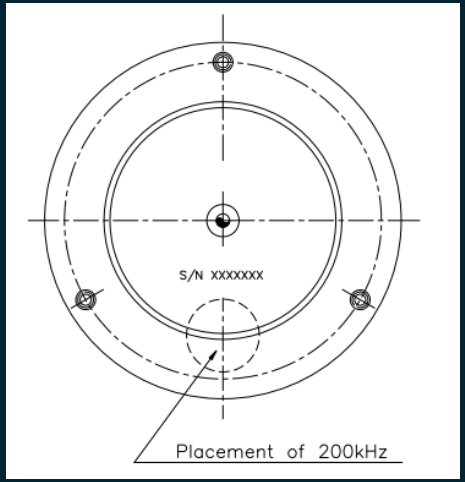

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Seafloor

Fluid mud / fluff

Acoustic challenges

Navigable depth

LMD

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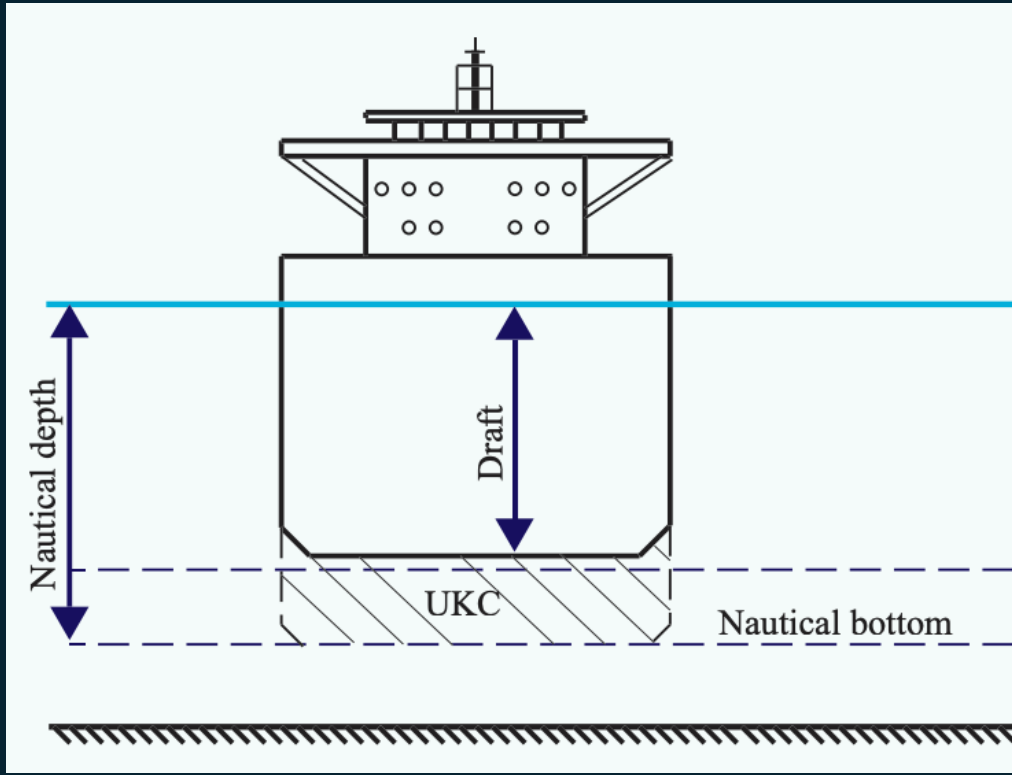
Under Keel Clearance

- Restrict draft
- Maintain depth



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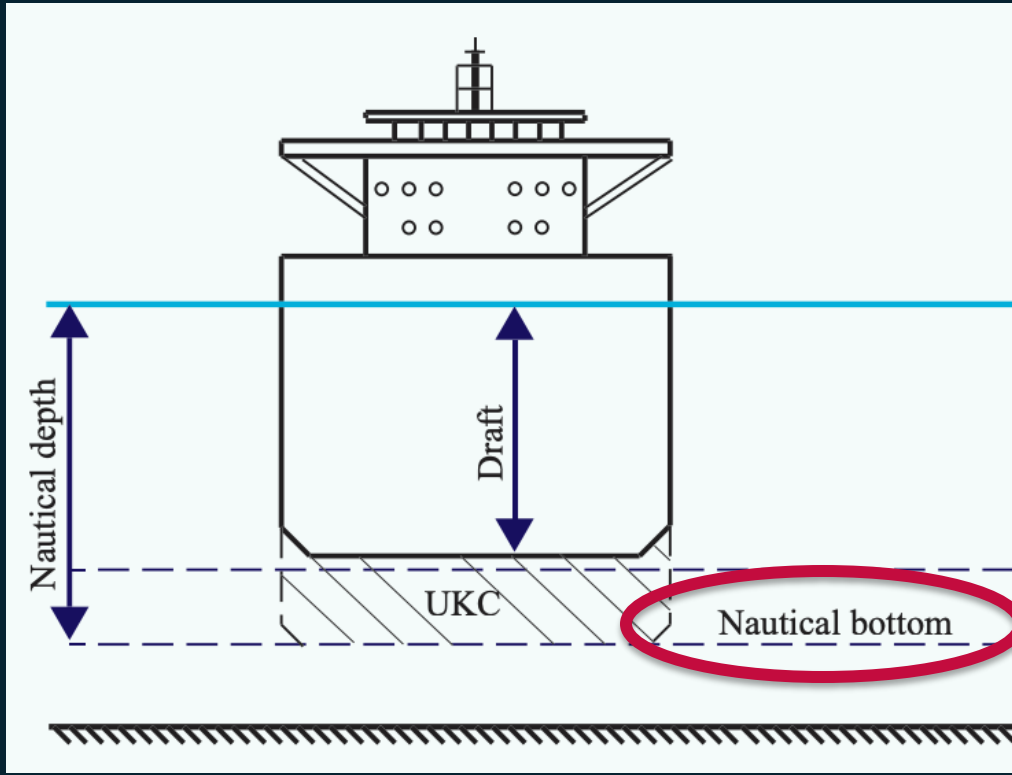
Under Keel Clearance

- Restrict draft
- Maintain depth



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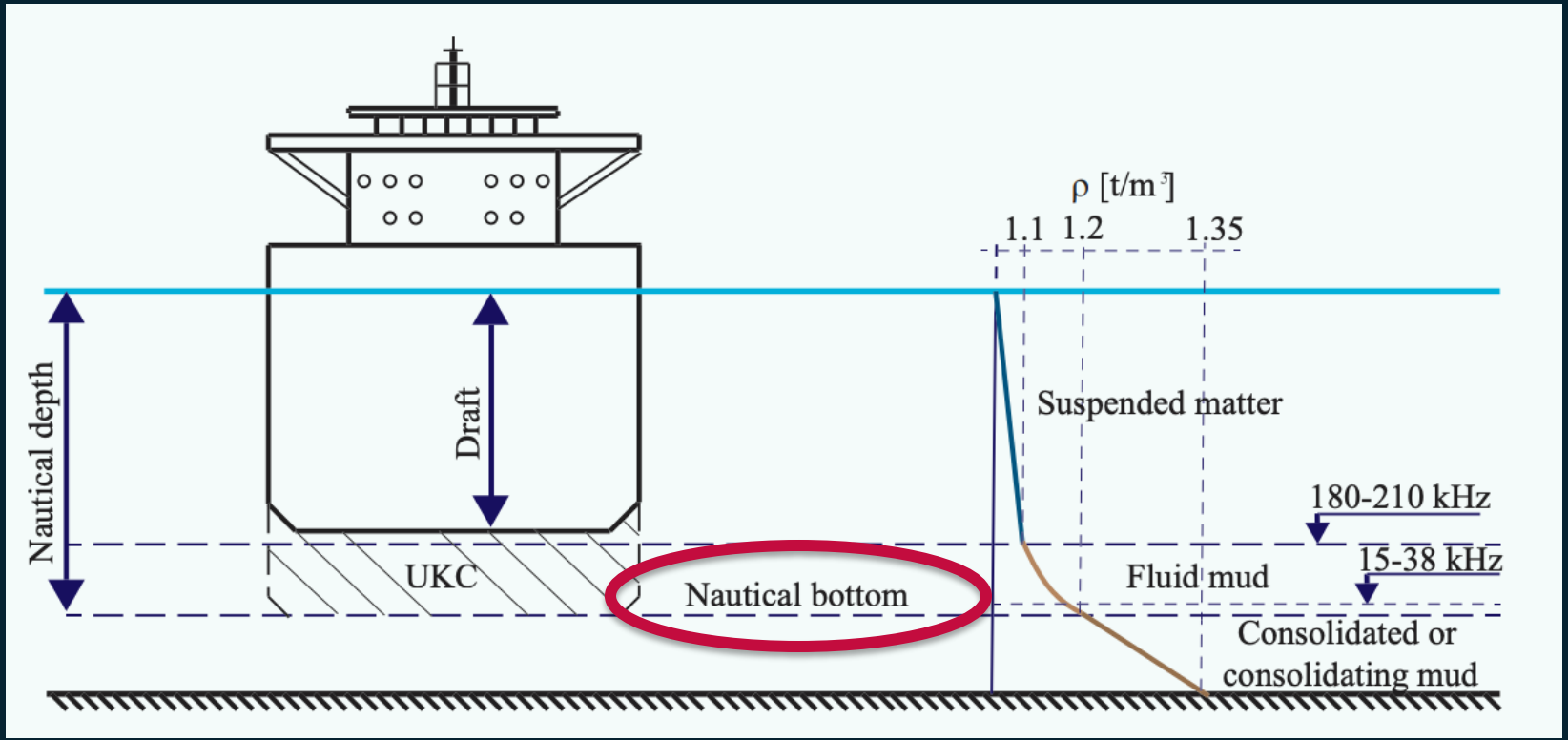

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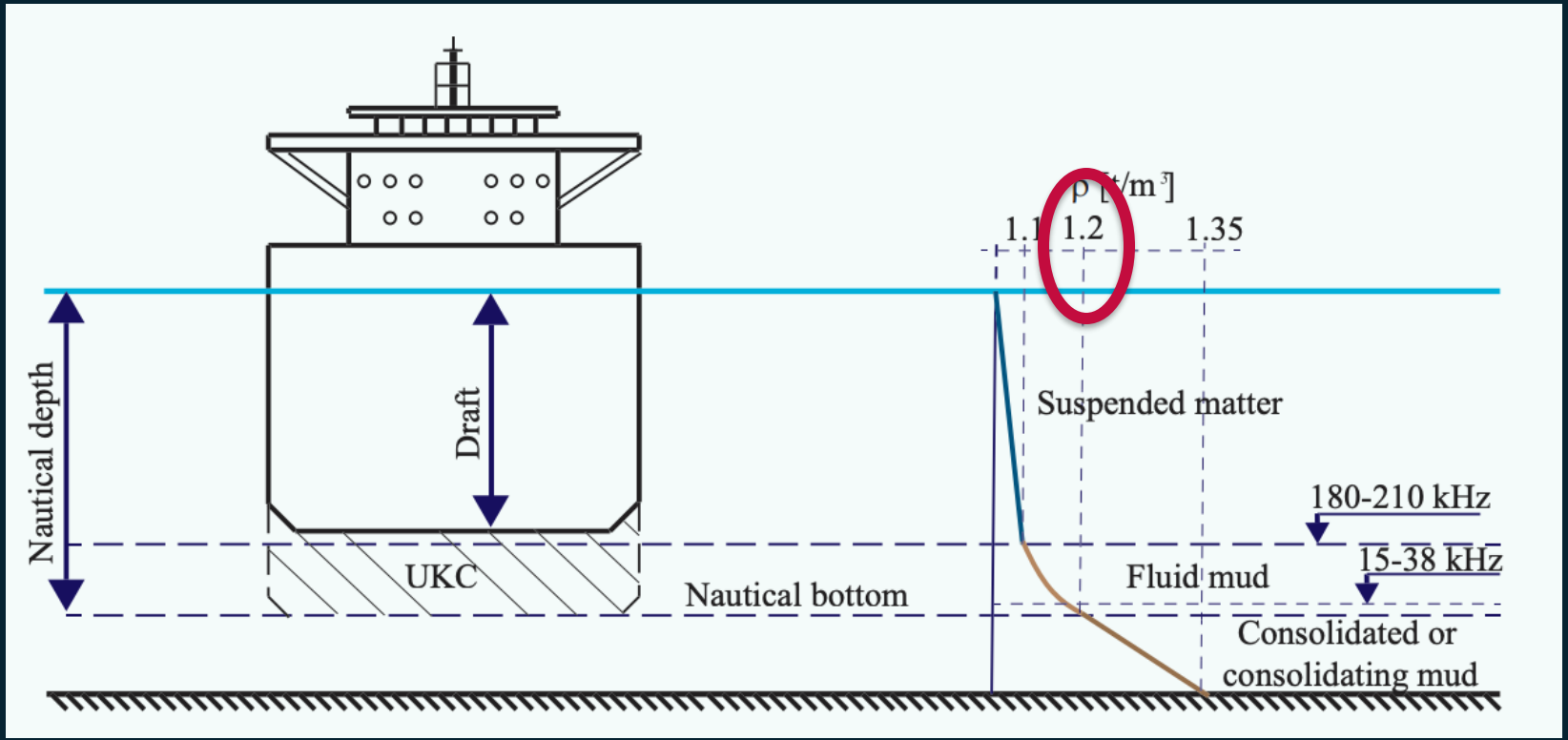

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Seafloor
Fluid mud / fluff
Acoustic challenges
Navigable depth
LMD

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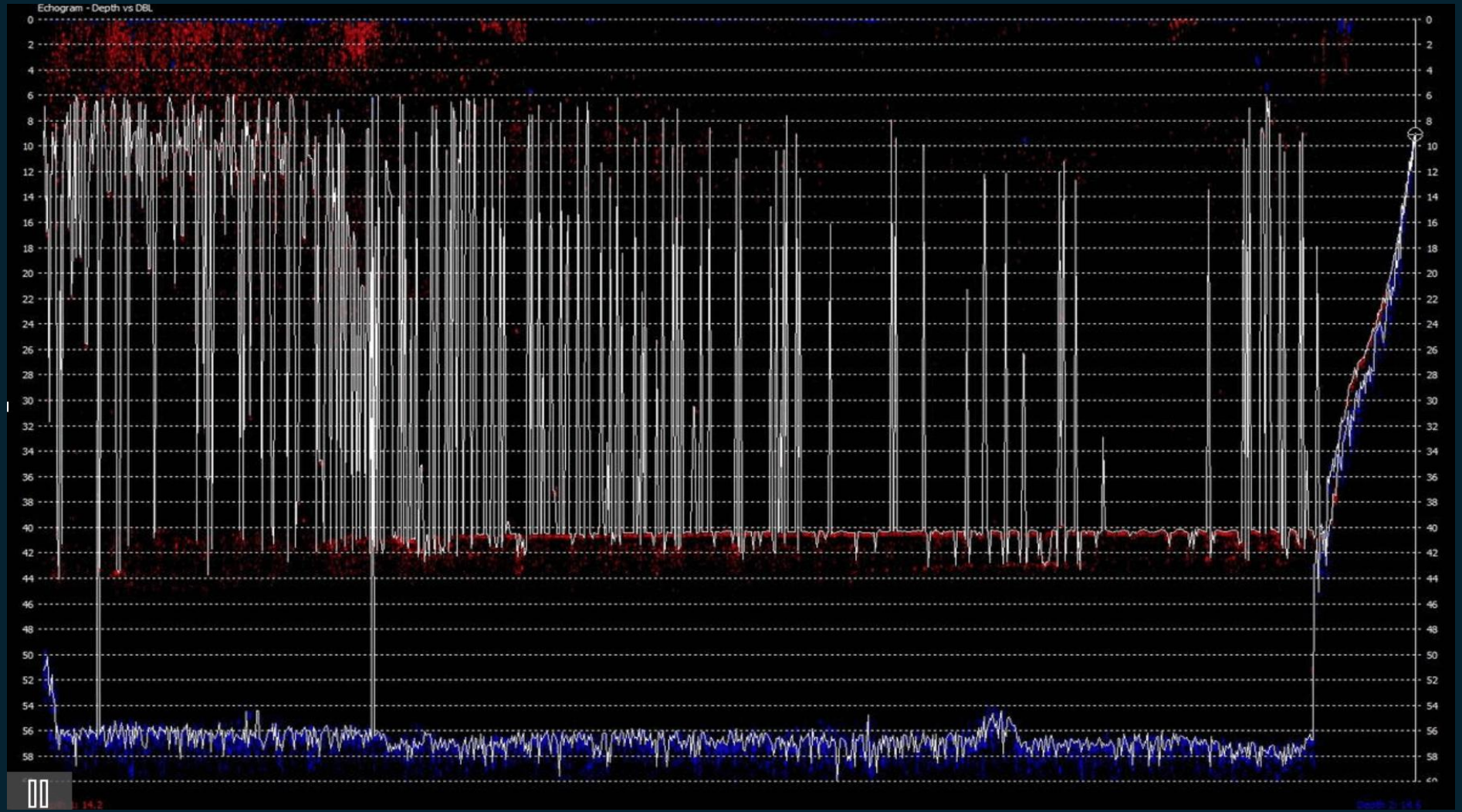
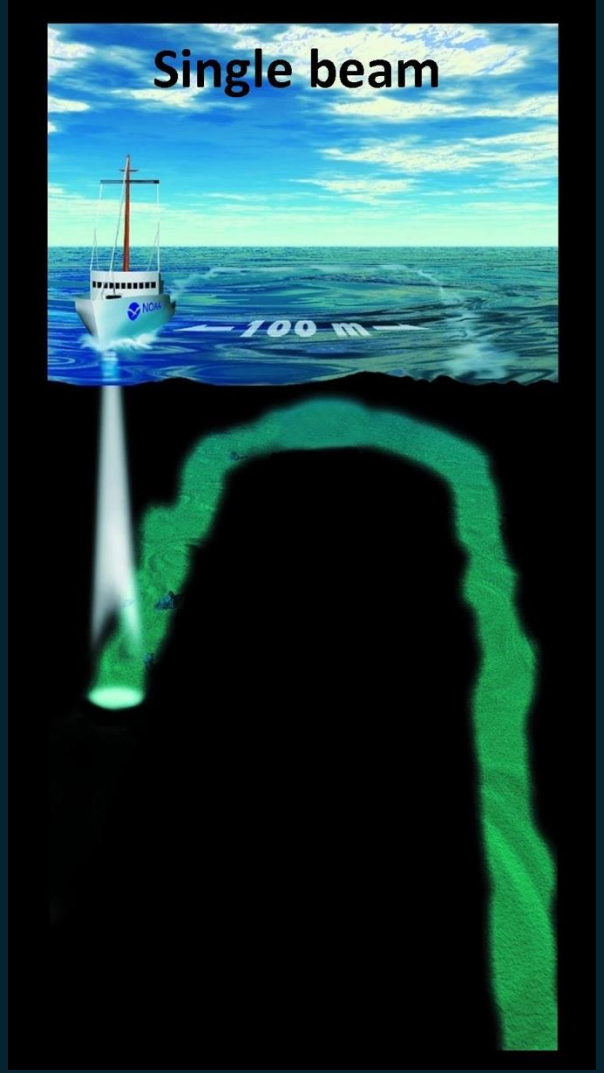

Echogram - Depth vs DBL



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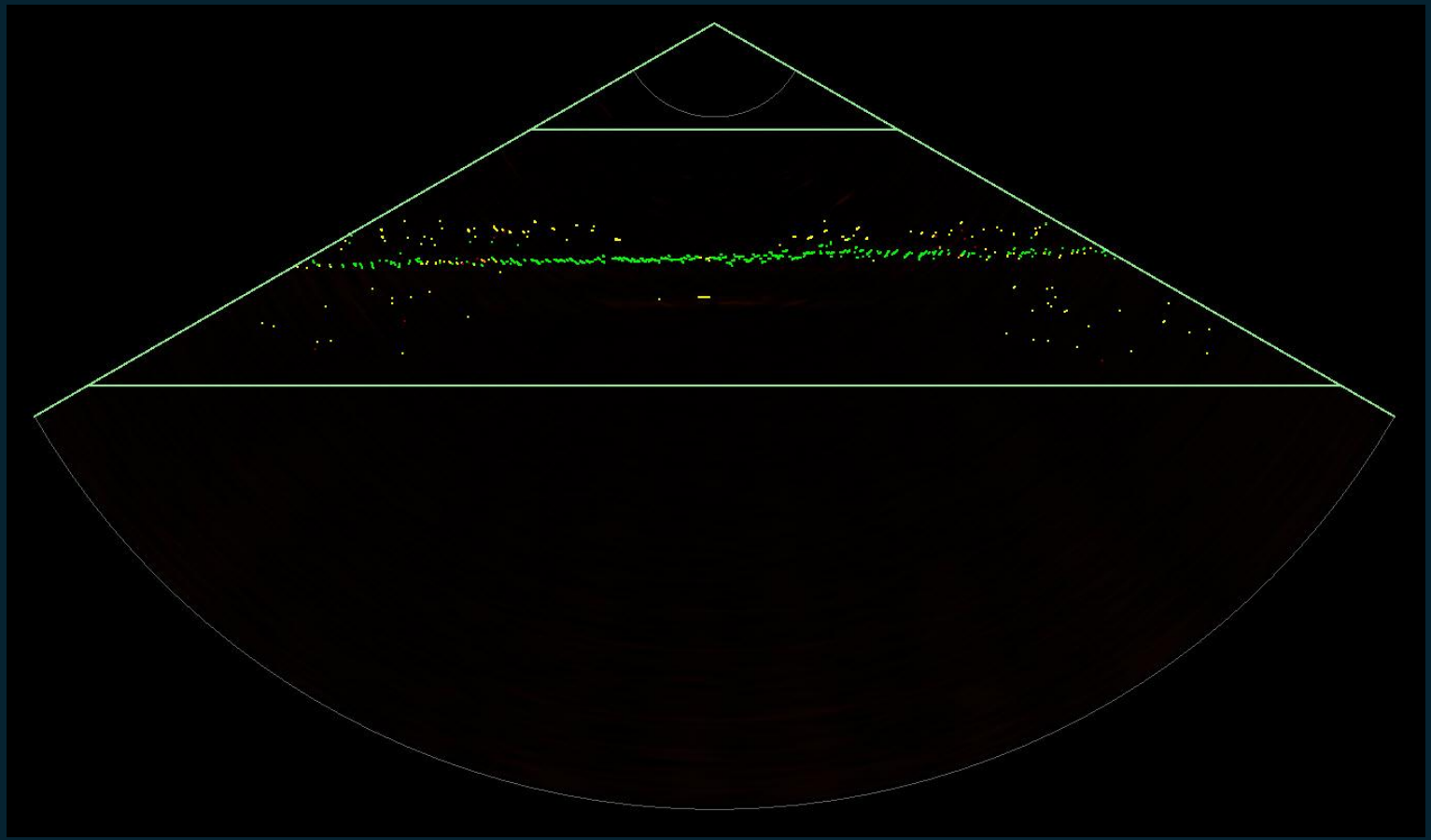

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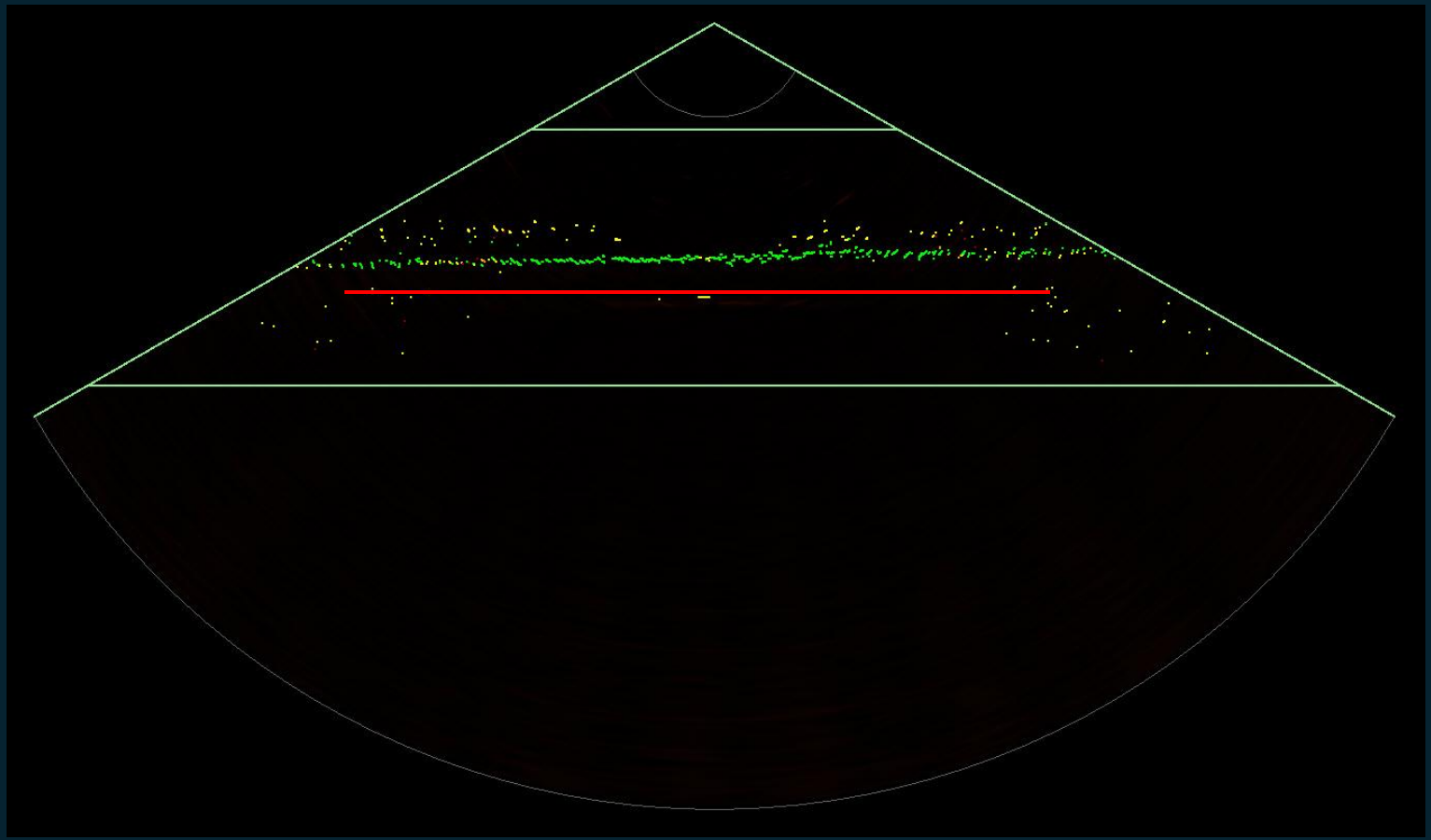

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WINGHEAD i87S
LMD-mode

NORBIT

- explore more -

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LMD-mode

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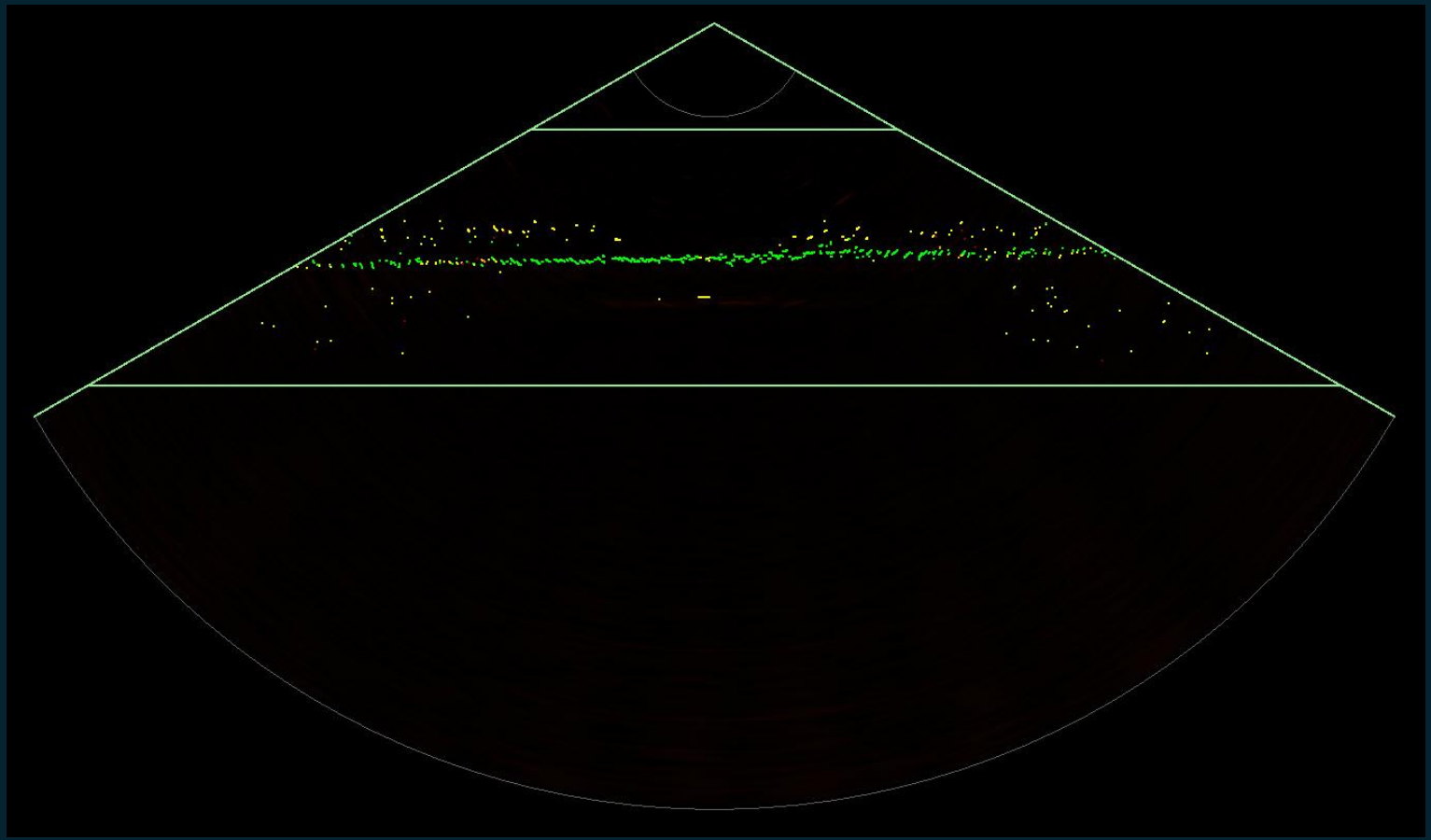

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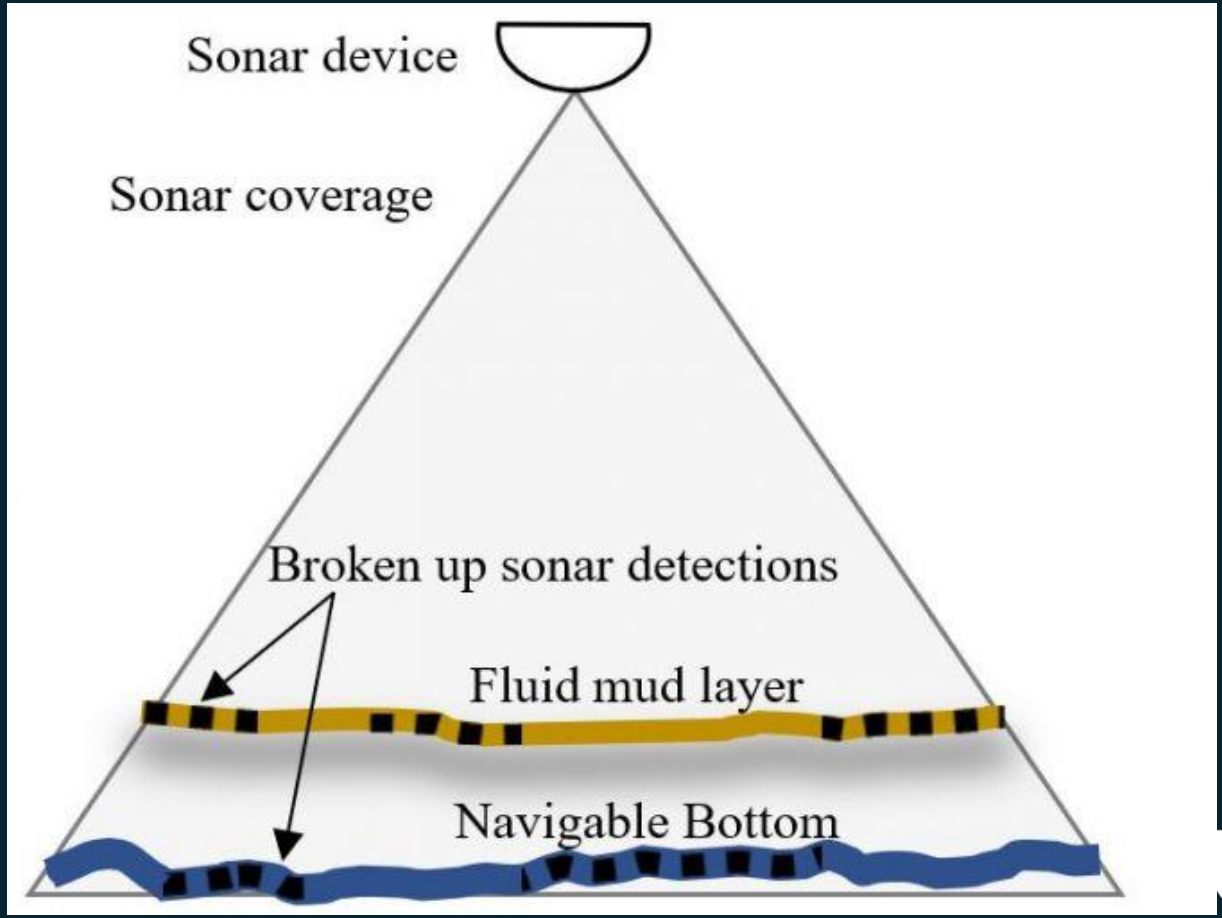

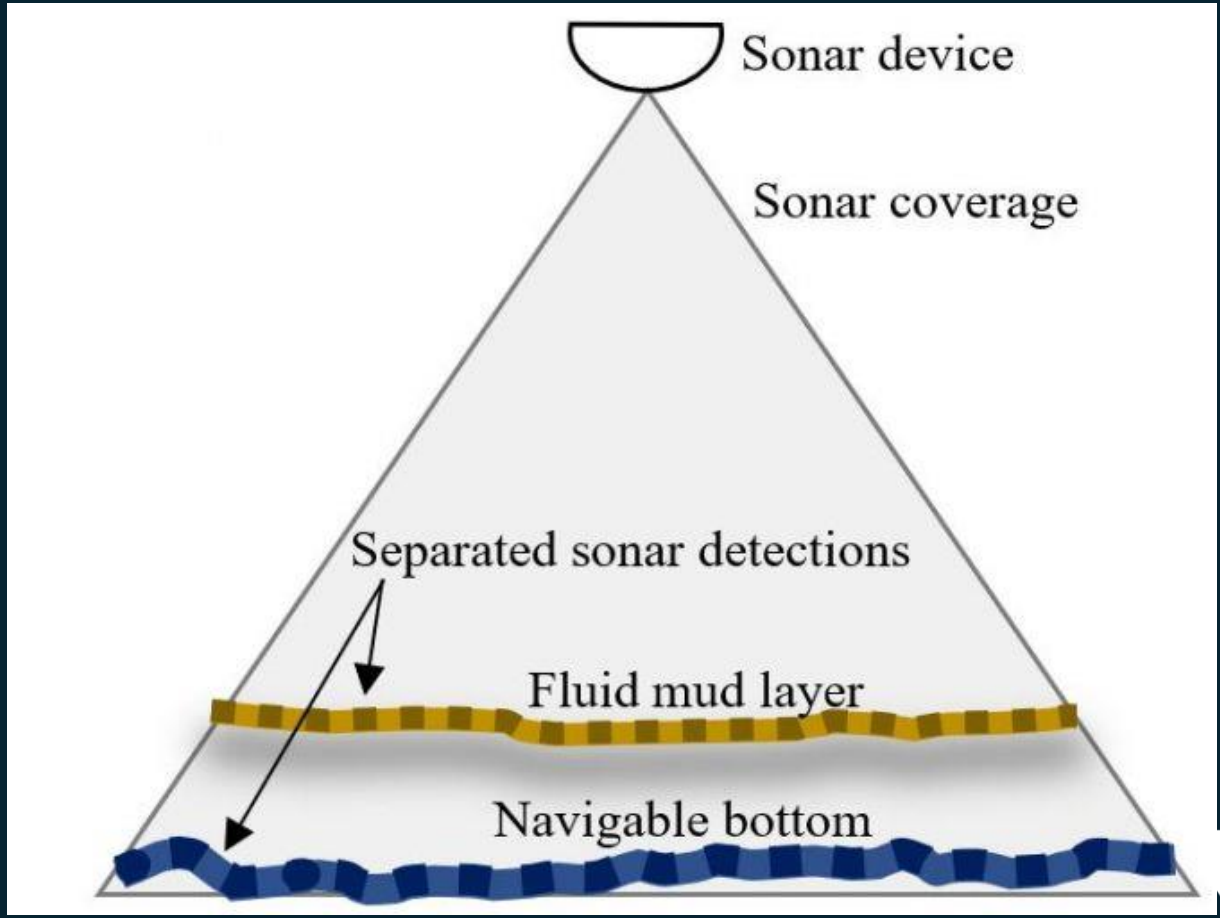

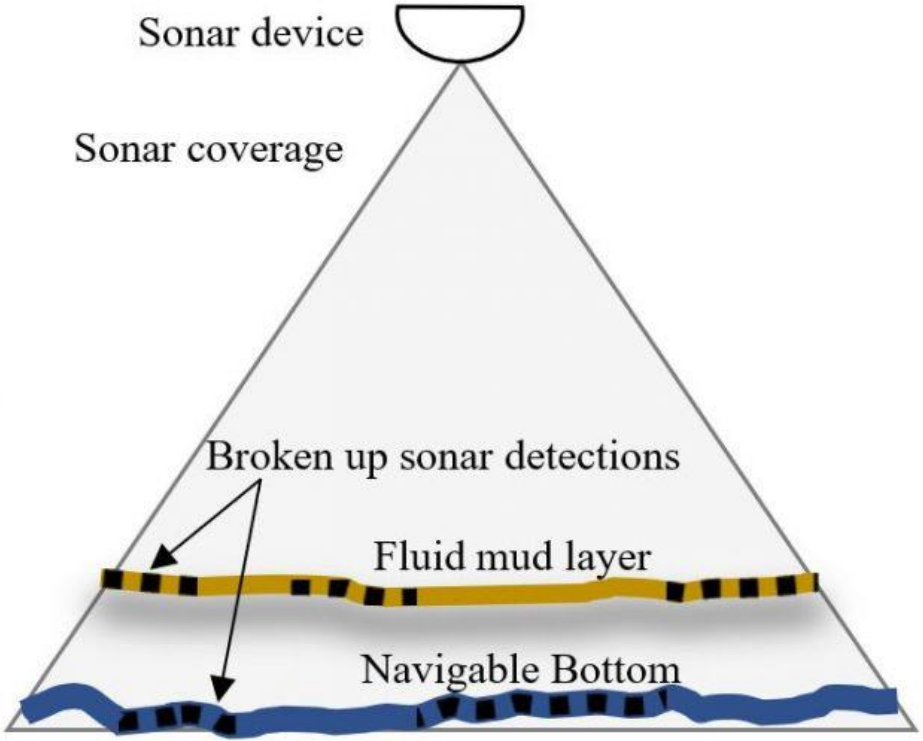

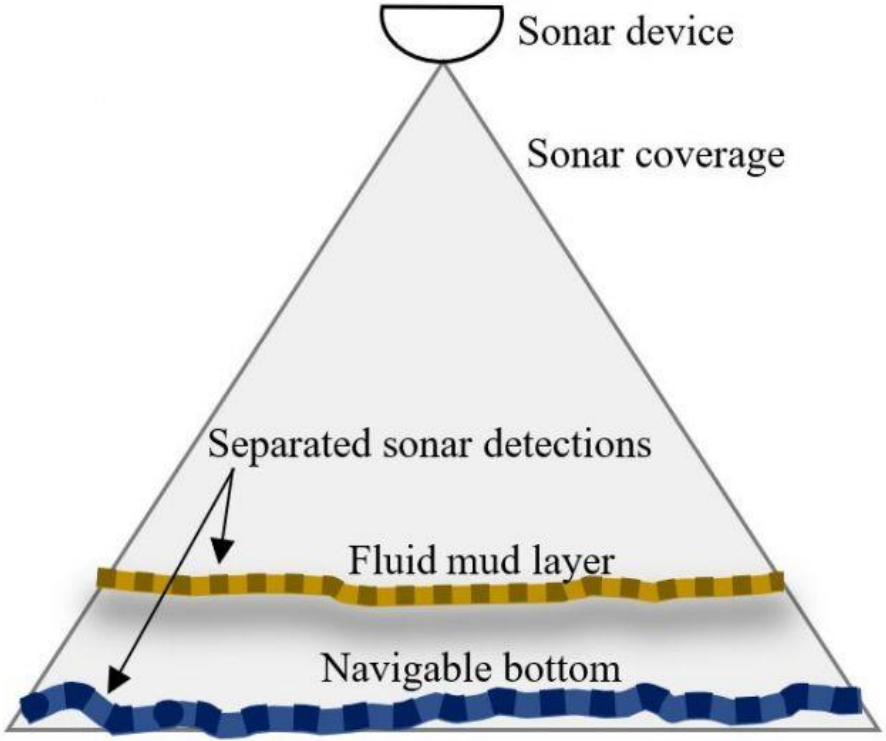

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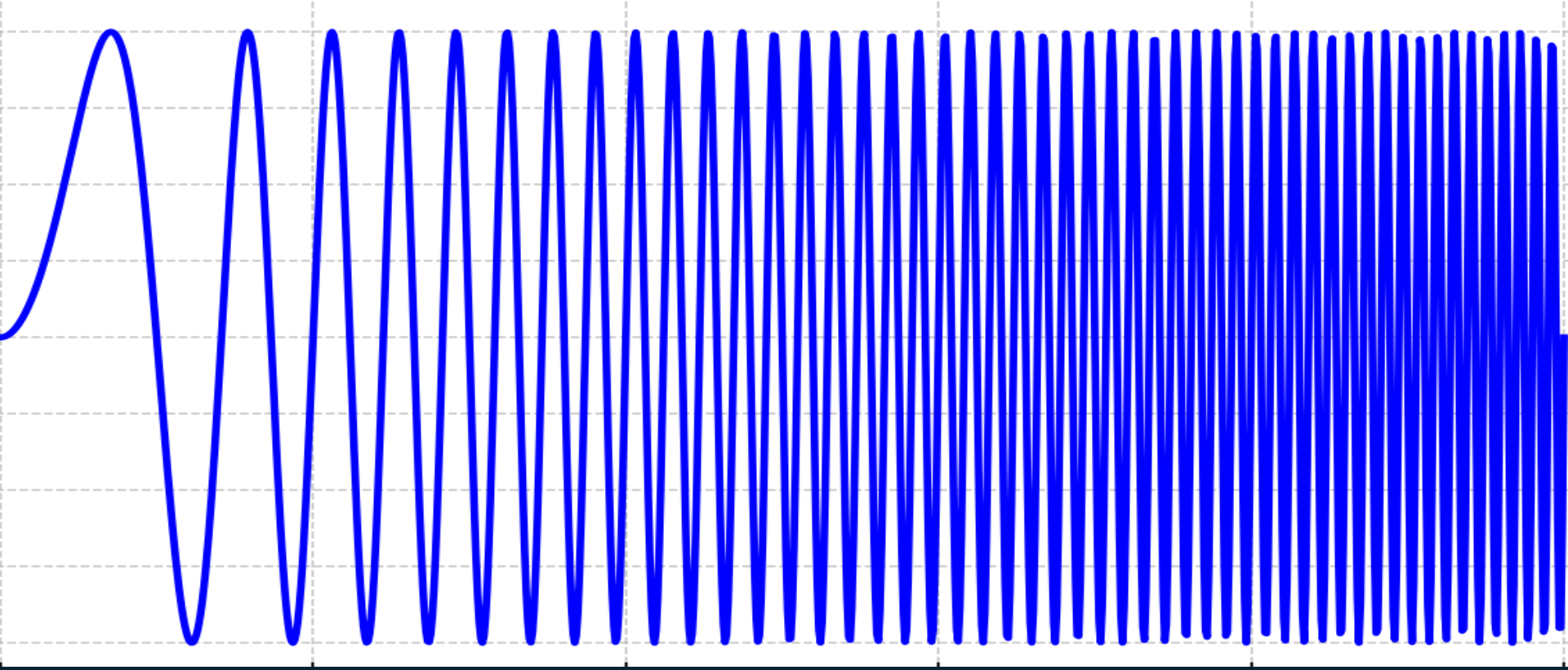

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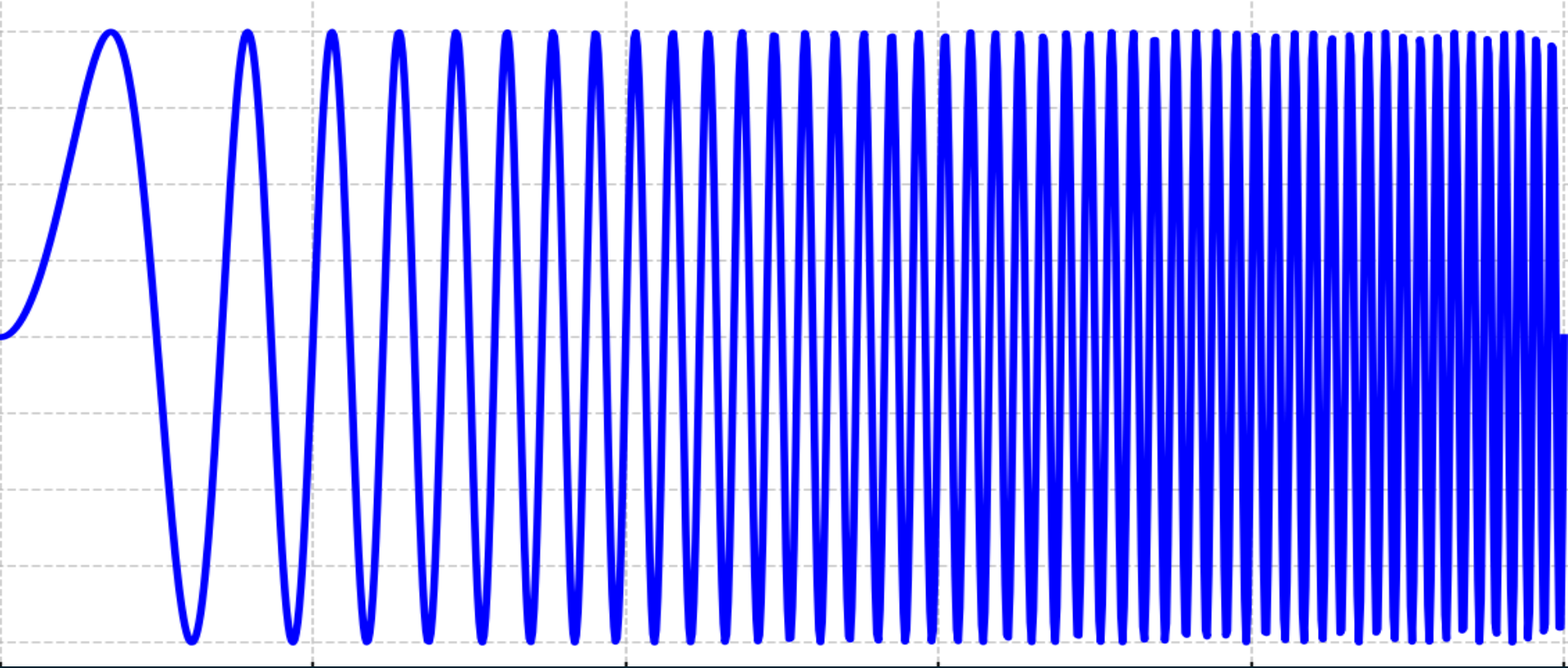

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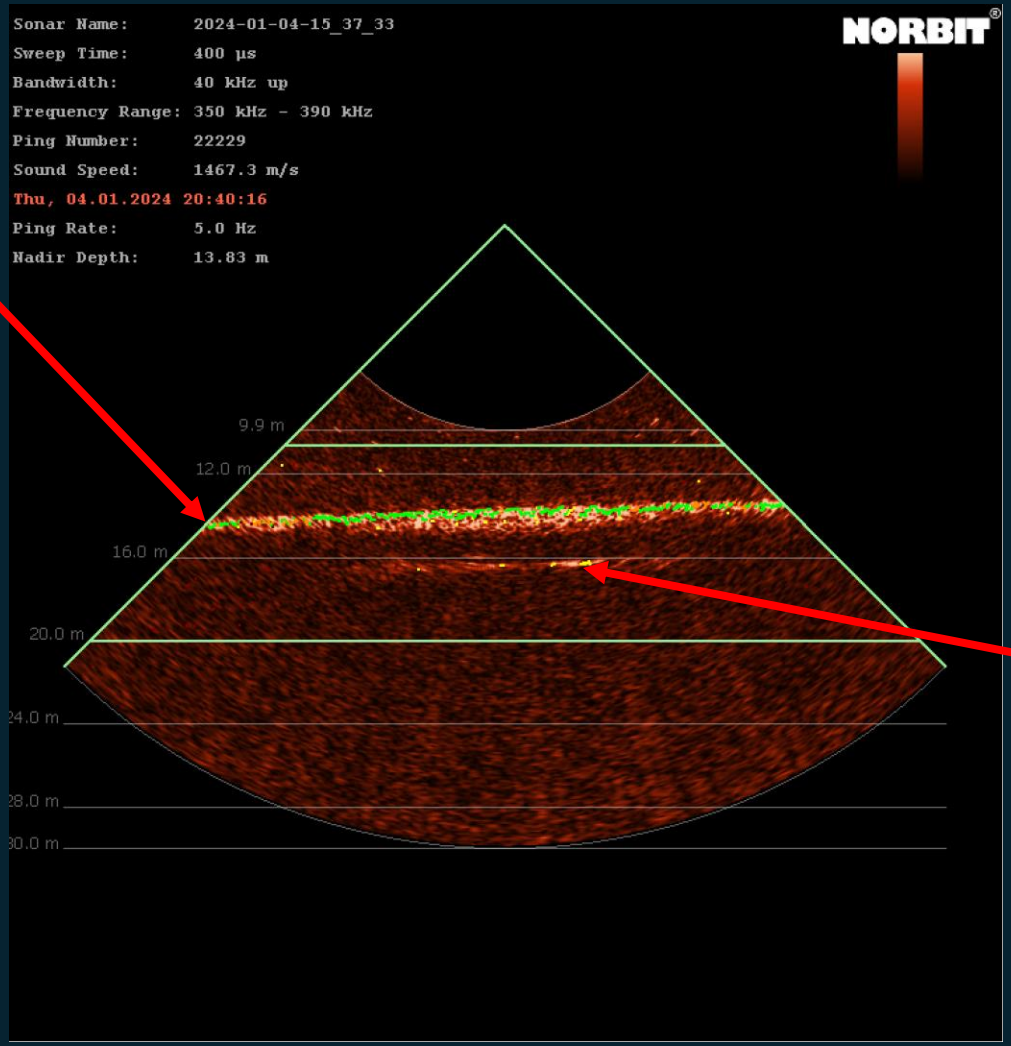

440kHz

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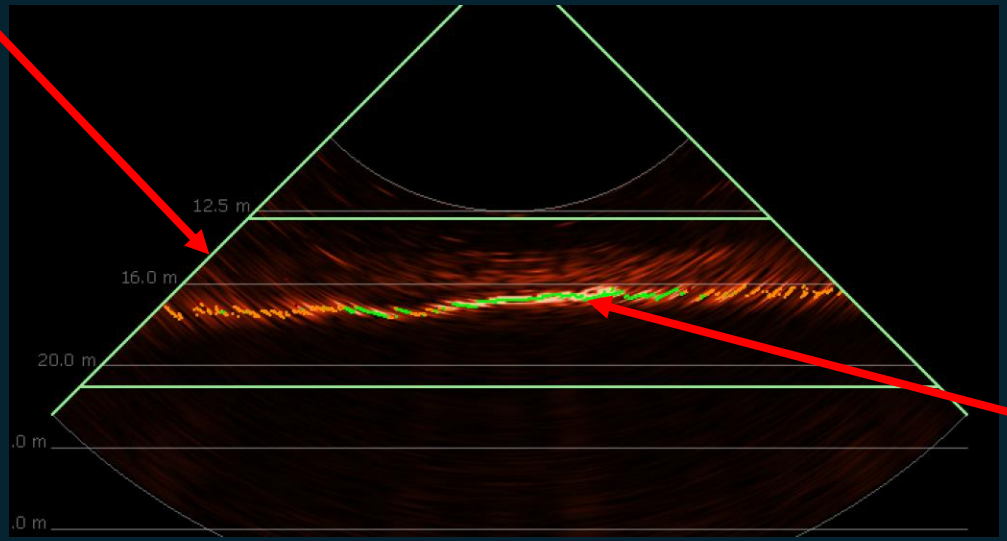
Lutocline

90kHz



LF Bottom
Sub-lutocline detections

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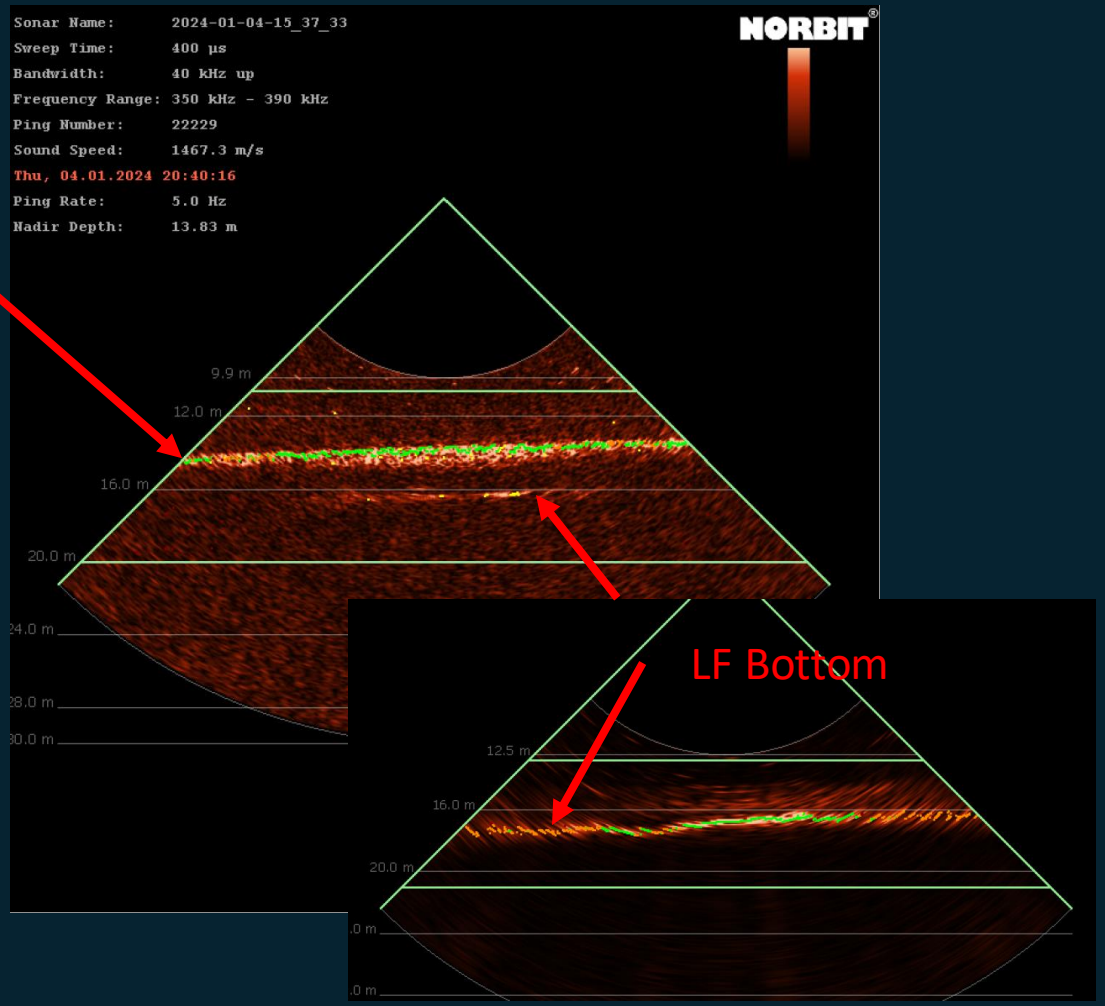

Lutocline

LF Bottom

440kHz
90kHz

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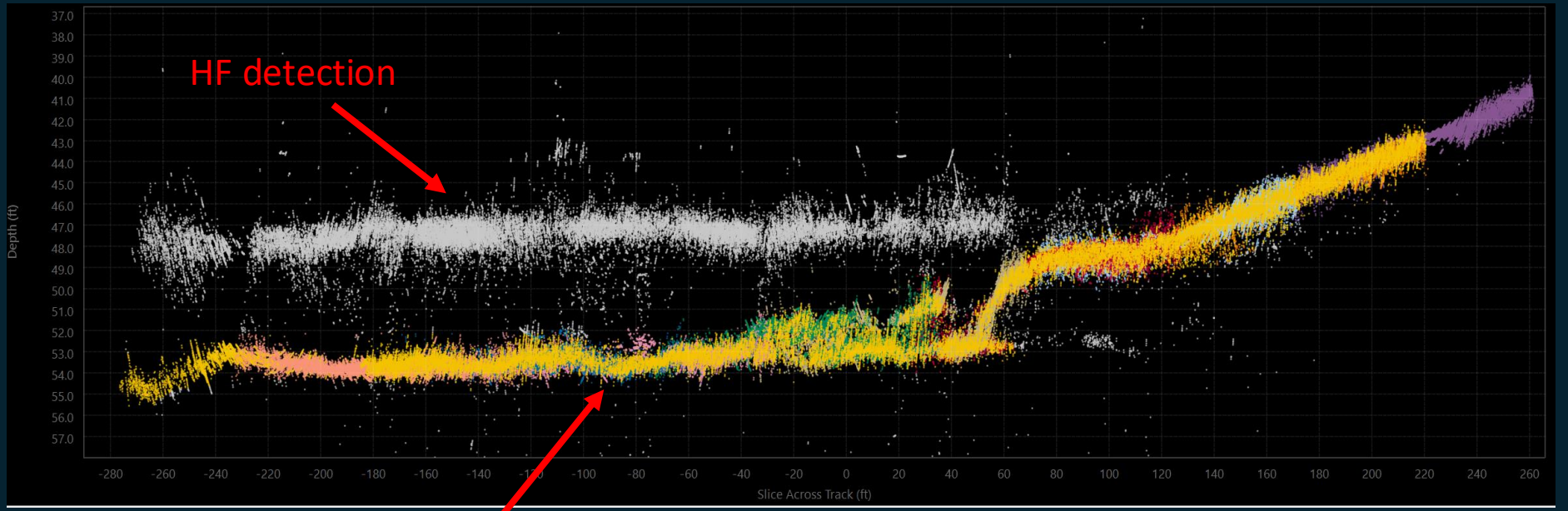

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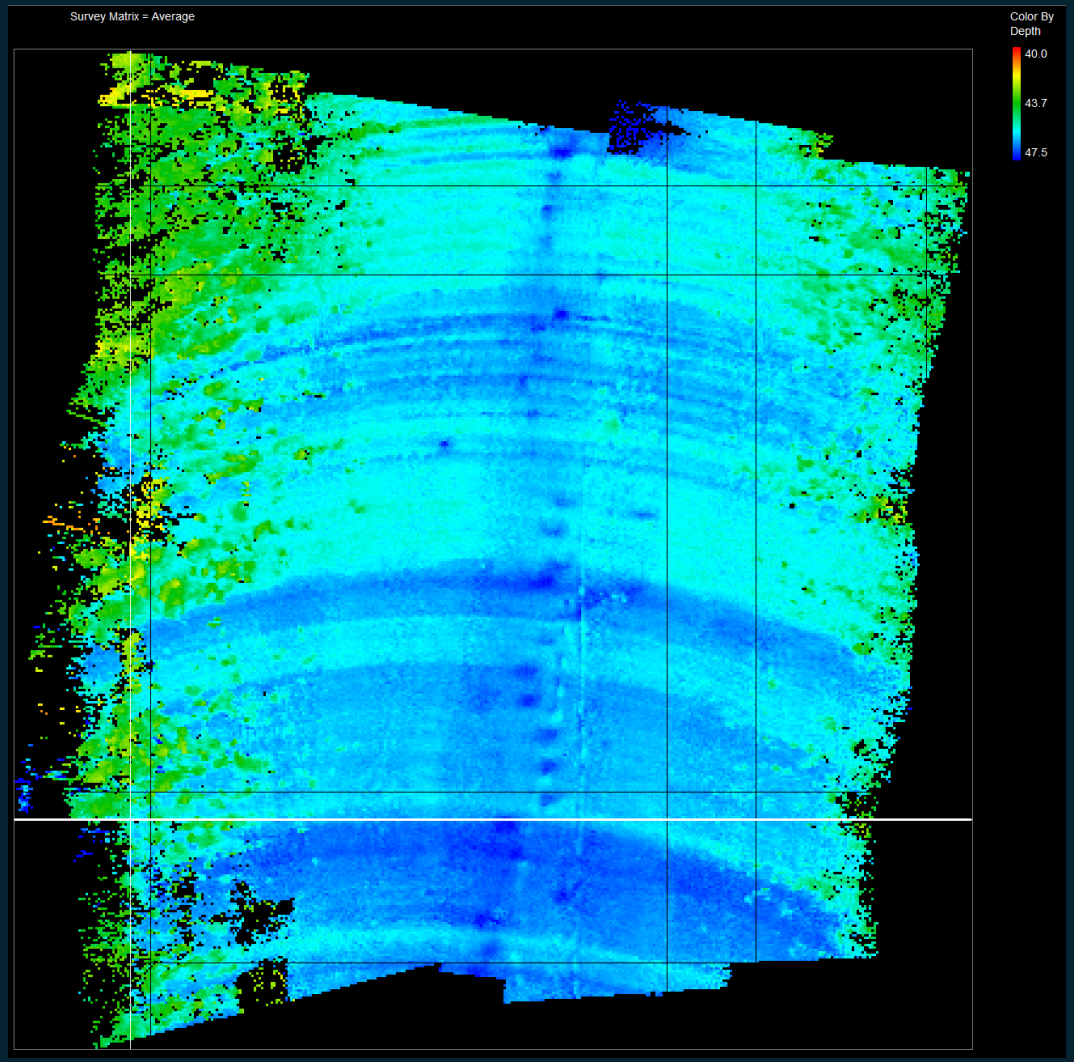

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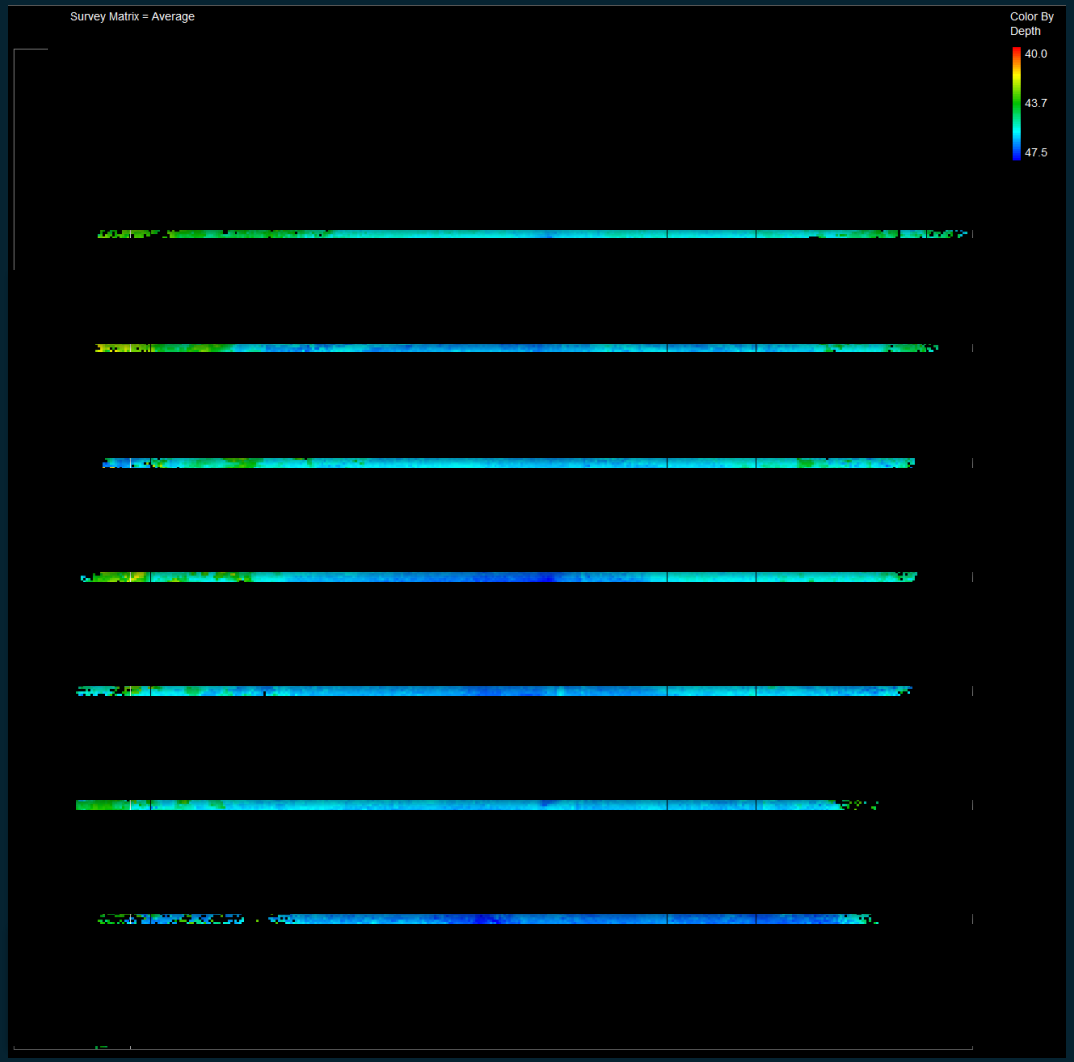

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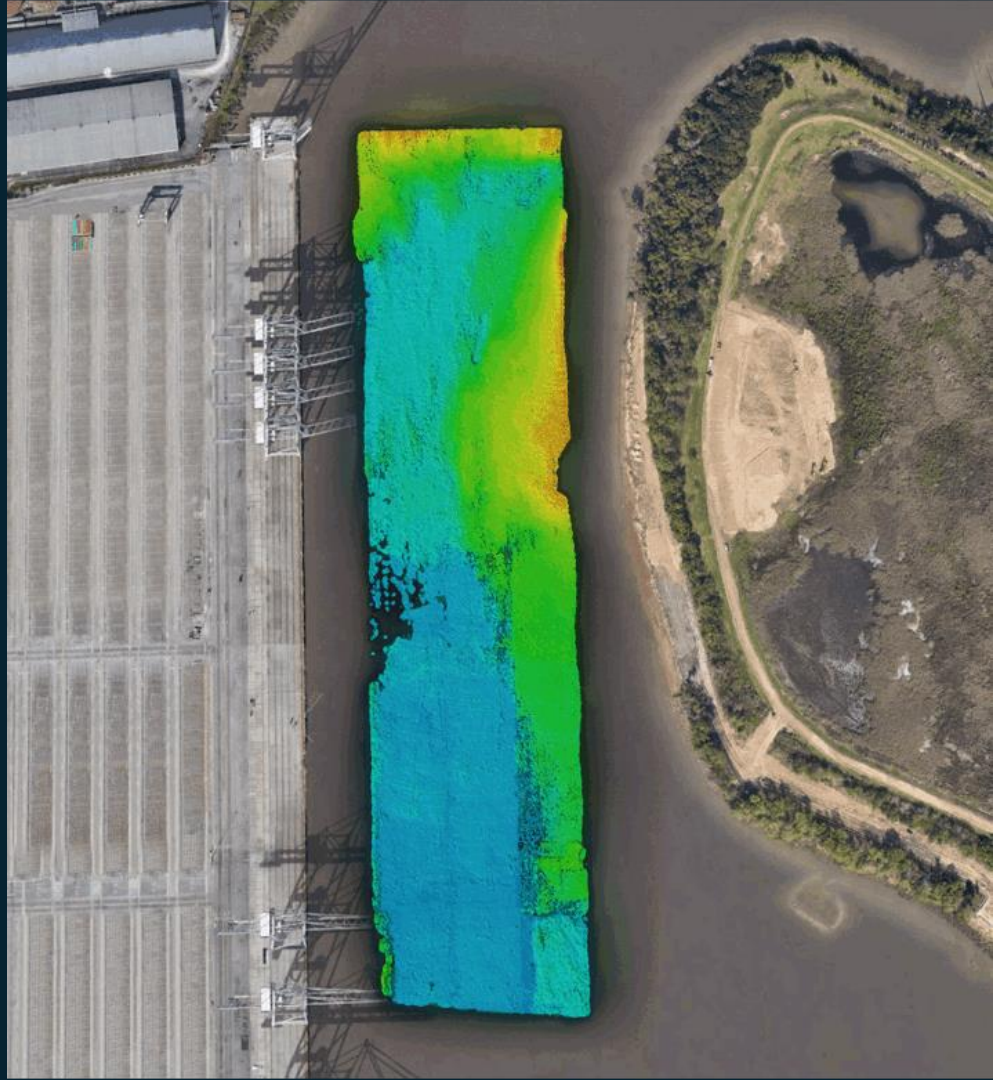
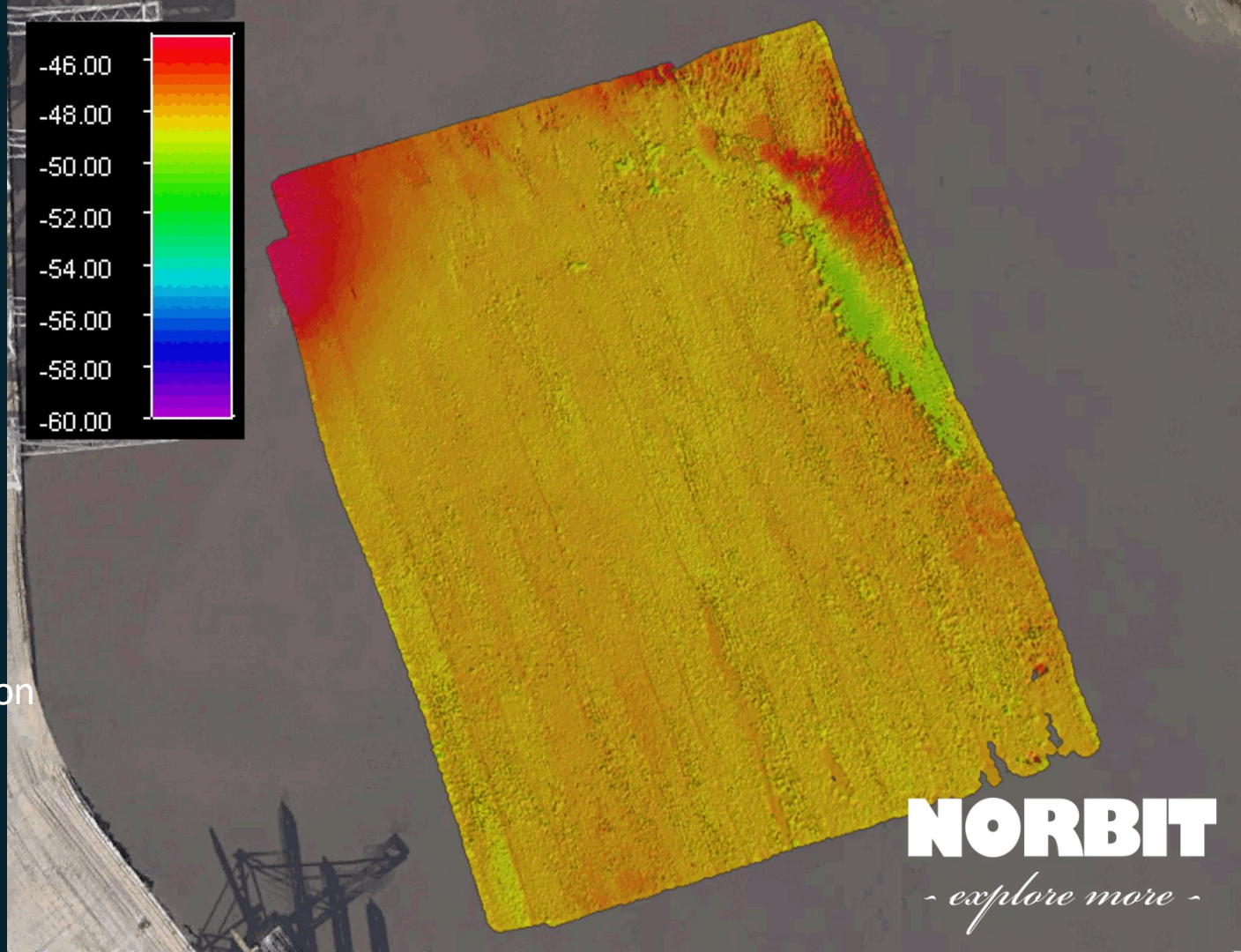
King’s Island Channel
Savannah River, US

3-4 meters of penetration



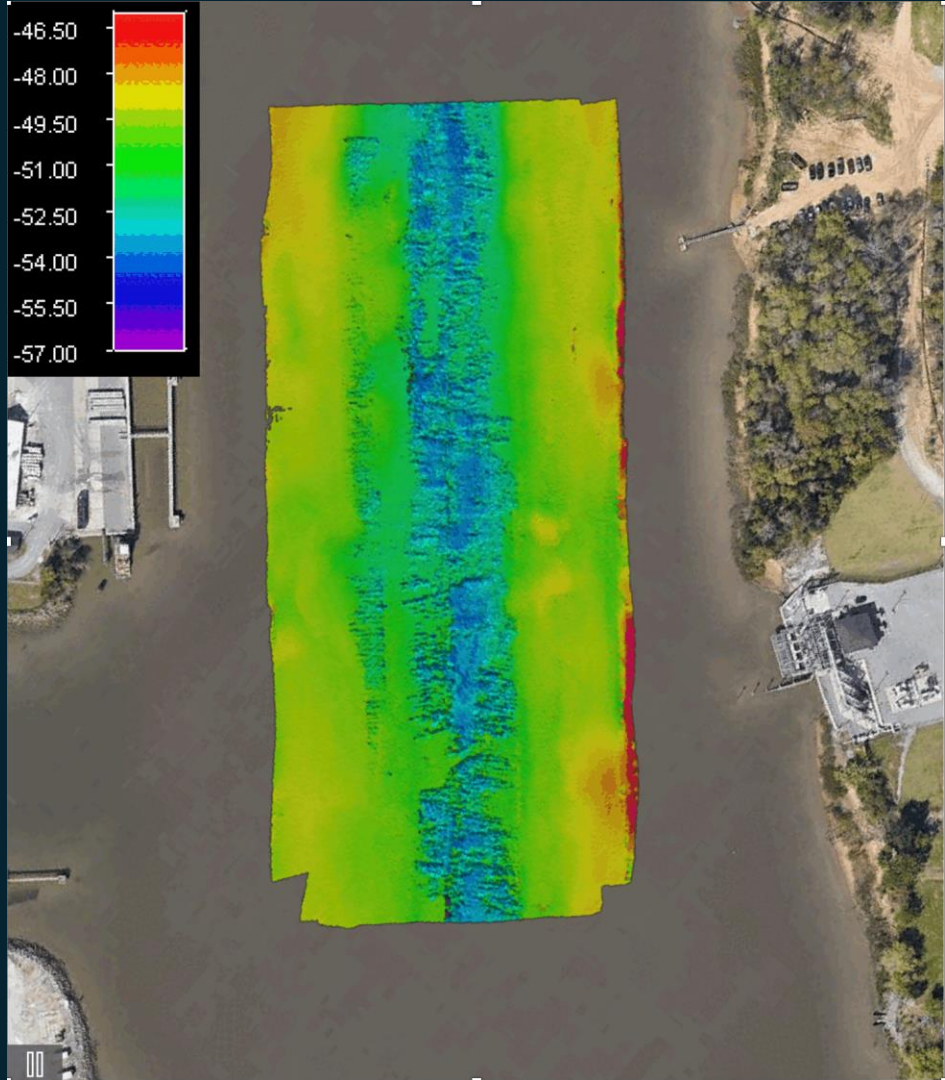
Turning Basin
Savannah River, US

3-4 meters of penetration



Marsh Island Channel
Savannah River, US

2 meters of penetration



- ORIGINS
- HARDWARE
- PROOF OF CONCEPT
- **FIELD VERIFICATION**
- REFINEMENT
- TECHNOLOGY DISTRIBUTION

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More challenges

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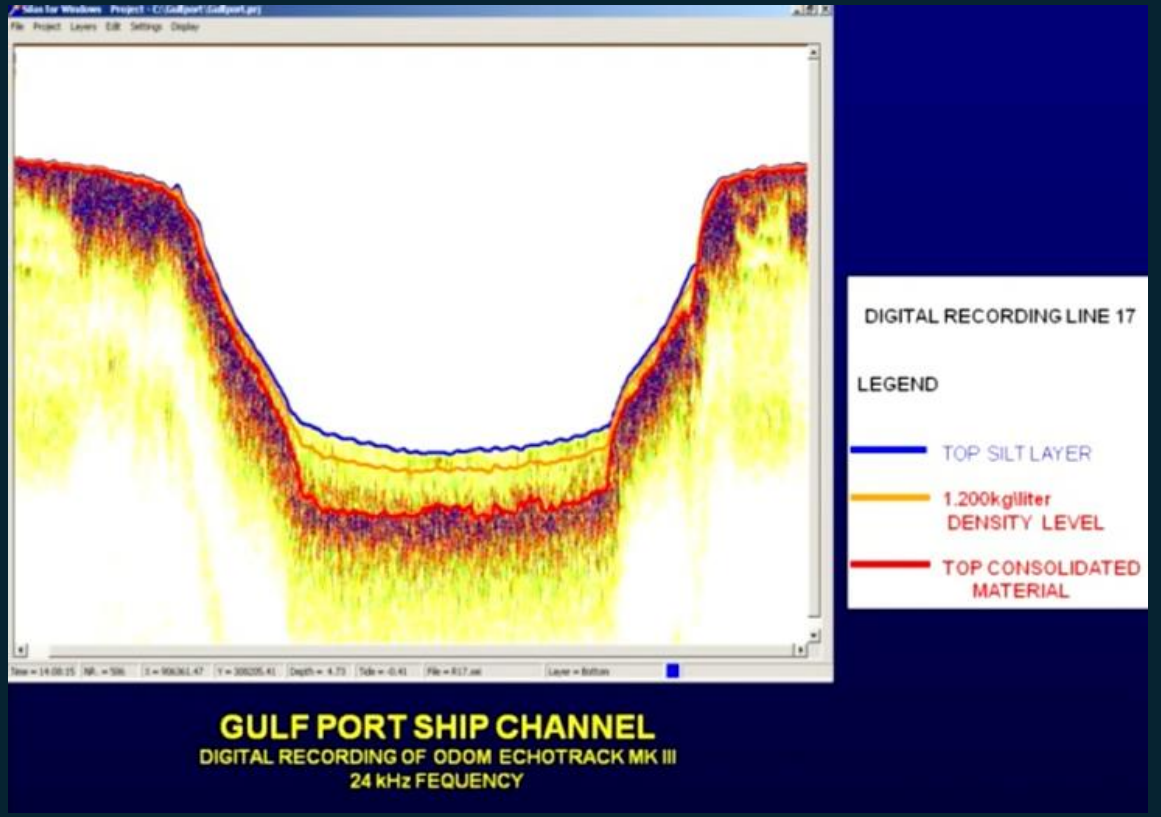

Lutocline – difference in sediment concentration

Navigable bottom – 1200g/l

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WINGHEAD i87S
LMD-mode

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Remember this guy…?
NORBIT
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Remember this guy…?
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LMD
Layered Media Detection

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