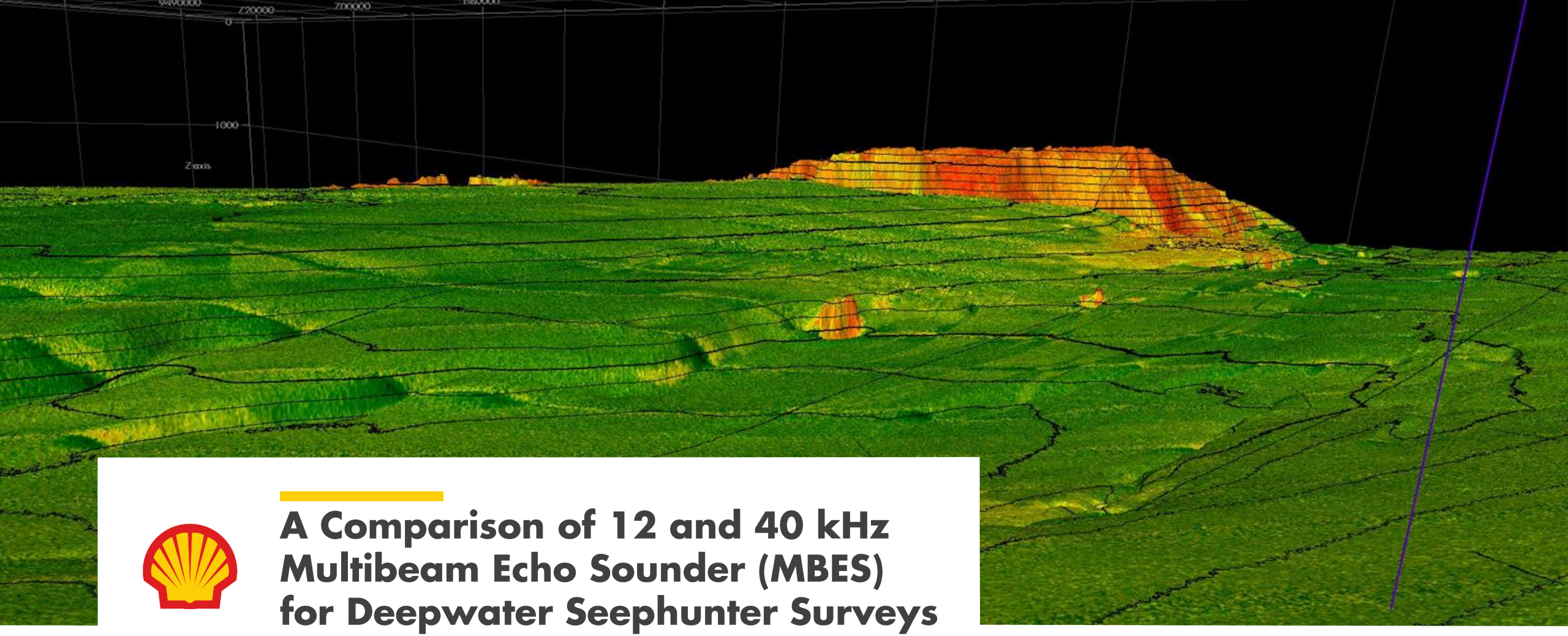

A Comparison of 12 and 40 kHz Multibeam Echo Sounder (MBES) for Deepwater Seephunter Surveys

Experiences and learnings from the Kenya 'Tausi' Seephunter survey

Matthijs Verschuren
Shell: Steve Keedwell, Pieter Van Rensbergen, Ronald Cash, Oyvind Ruden, Arjan van Vliet
Fugro: Jim Gharib and Marco Gilissen

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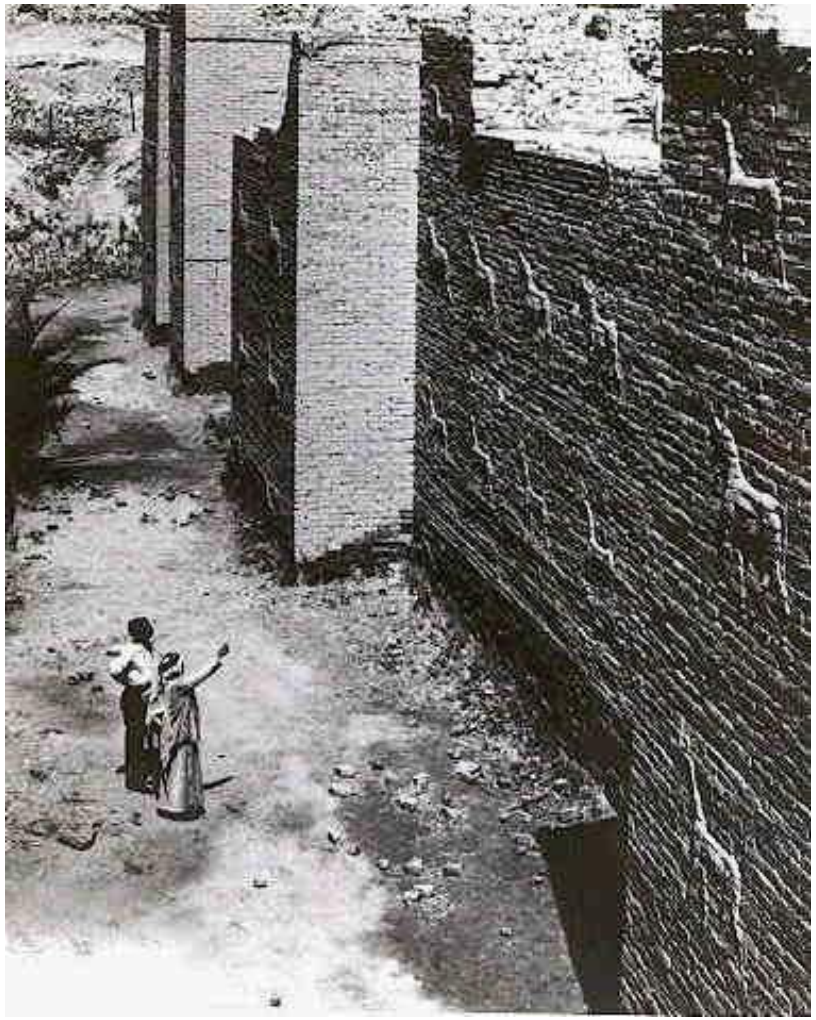
Hydrocarbon Seepage

Gas water and mud seeping from ground. Photo credits: Shell International Limited



Walls of Babylon still standing today. Photo credits: Shell International Limited

Yanar Dag – Flaming Hillside, by Nick Taylor is licensed under CC BY 2.0, cropped by author.

Hydrocarbon Seepage in the Marine Environment

Multibeam Echo Sounder for Seeps Surveys

Range of Kongsberg MBES systems. Image courtesy of Kongsberg Maritime.

Increased penetration, decreased resolution

Decreased penetration, increased resolution

Resolution aiding precise core positioning

Penetration aiding to understand shallow geology of the Seep feature

The Opportunity to Compare

Location: Offshore Kenya (L10A and L10B)

Expected water depths: 500 – 2,000m

Vessel: Fugro Discovery

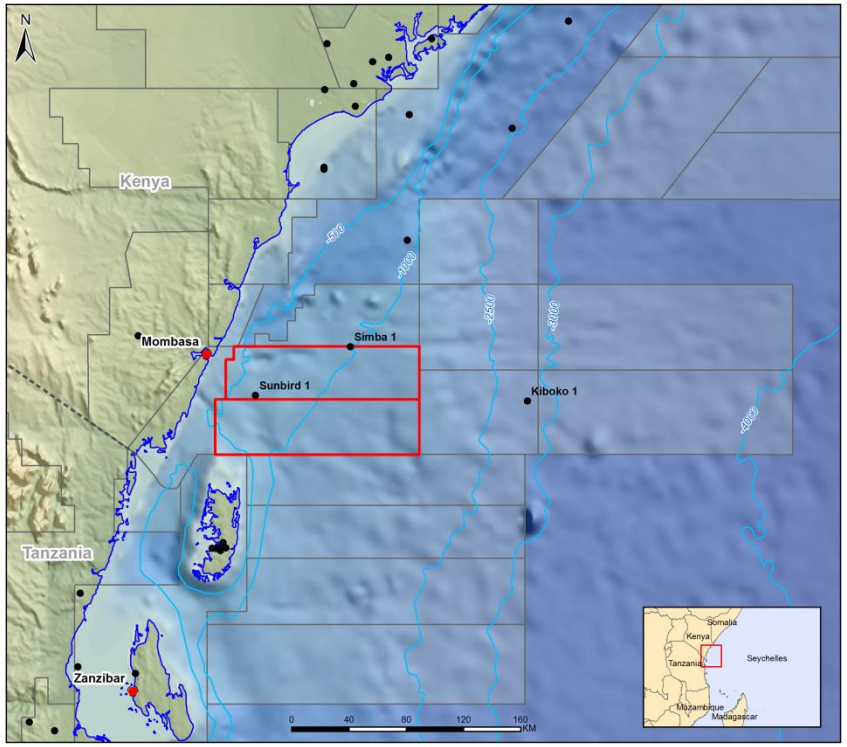
MBES systems: Kongsberg EM122 (12 kHz) + EM712 (40 kHz)

Opportunity:

Simultaneous MBES acquisition to obtain 'best of both worlds':

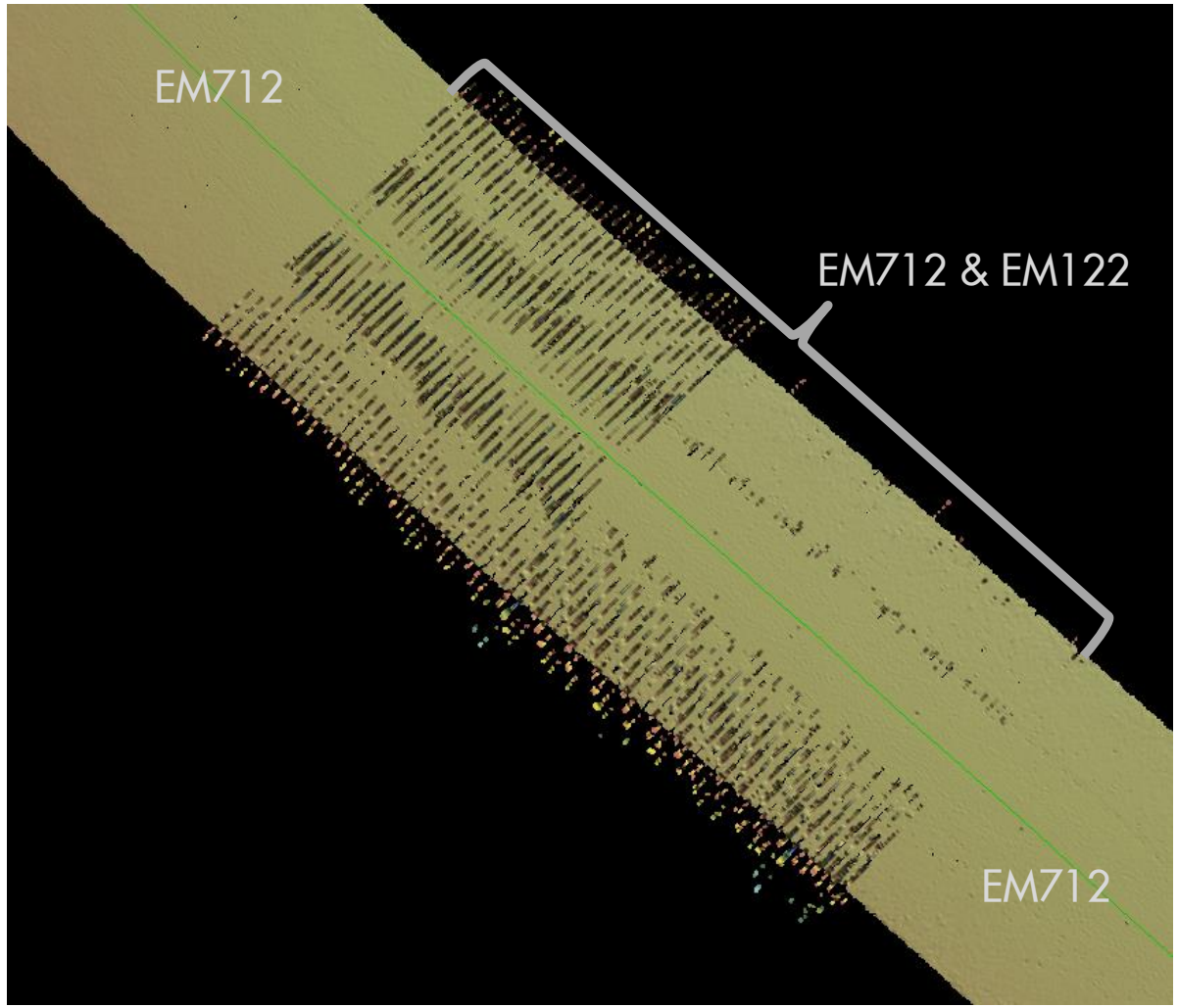
- 40 kHz for high spatial resolution
- 12 kHz for deeper seabed penetration

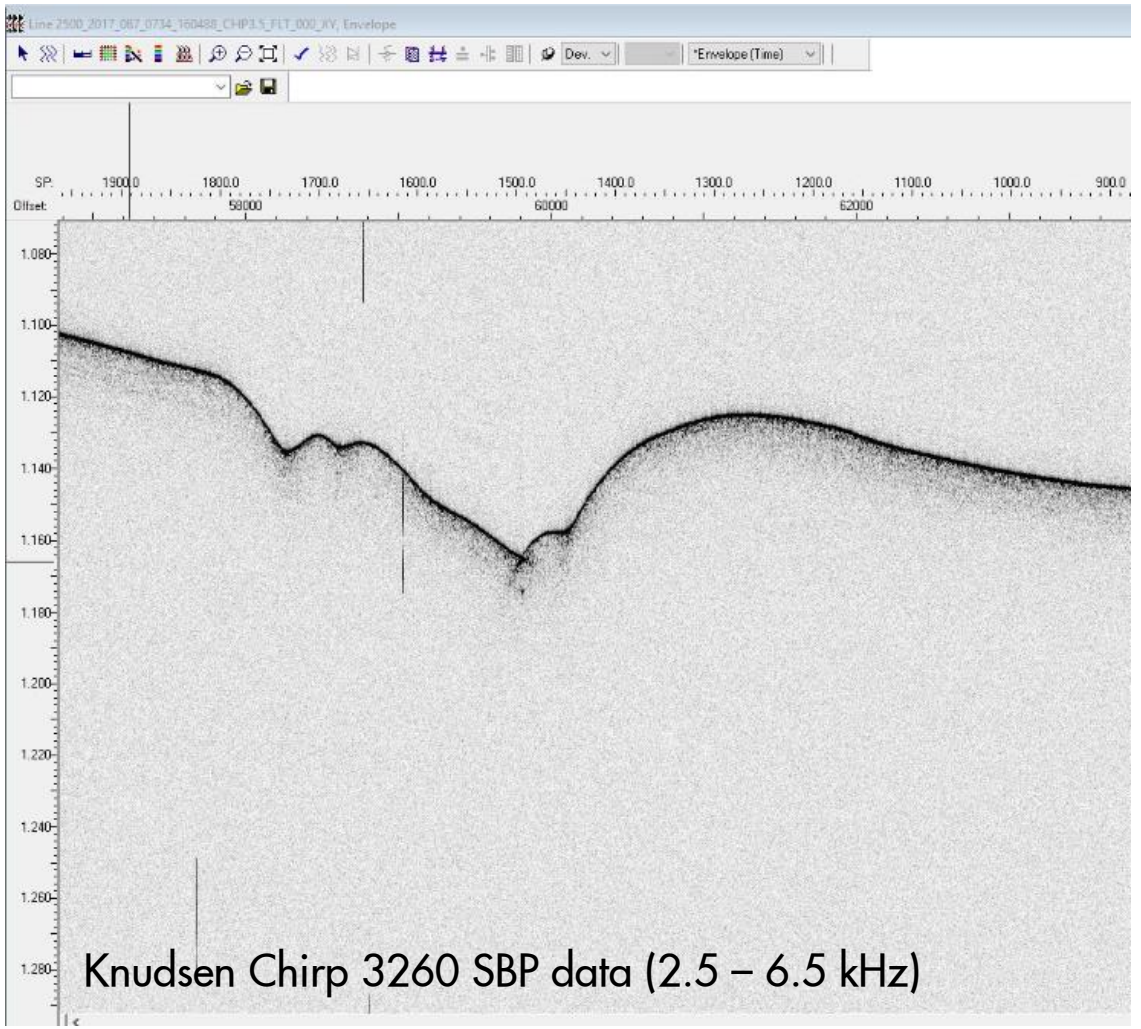
To the author's knowledge this is the first time both EM122 and EM712 were deployed for this type of operation.



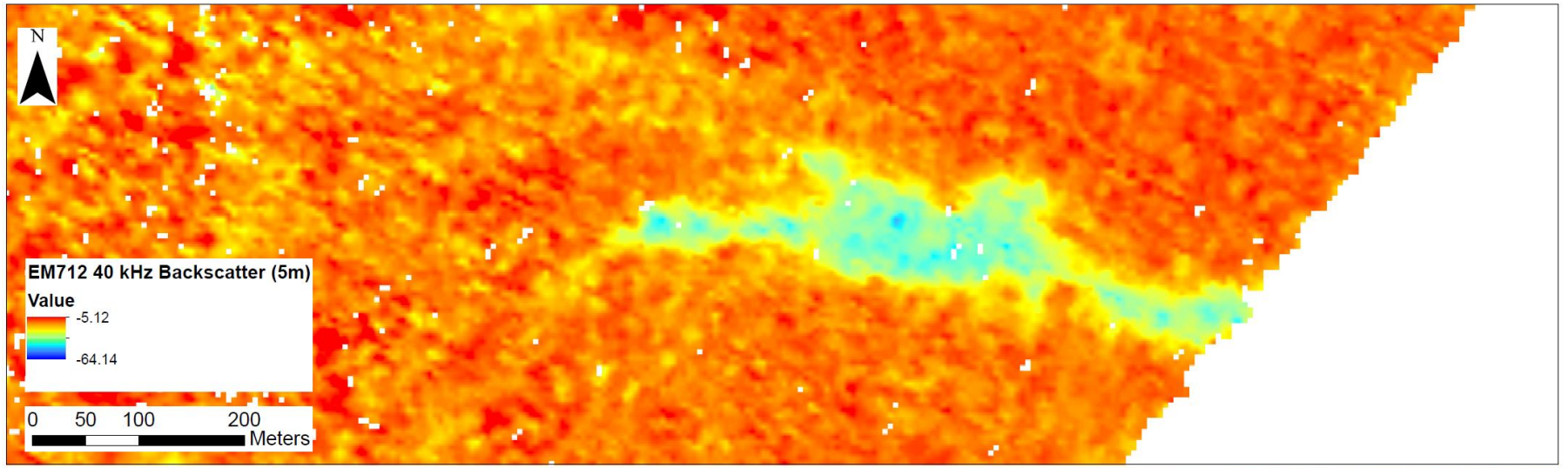
M.V. Fugro Discovery (sourced from www.fugro.com)

What Happened

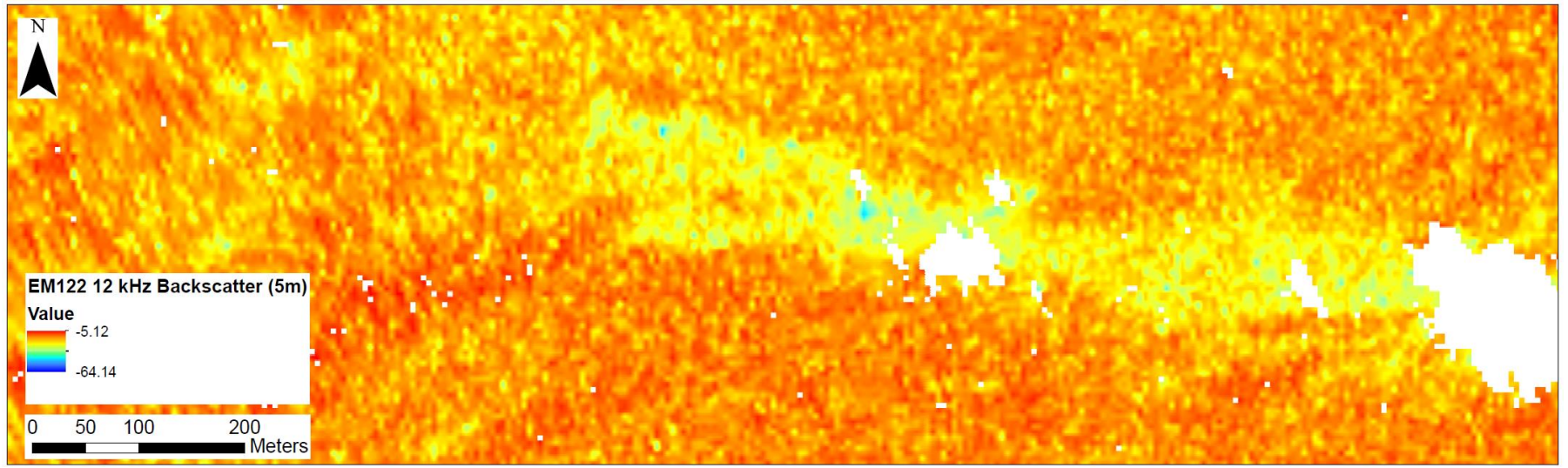




Backscatter Comparison

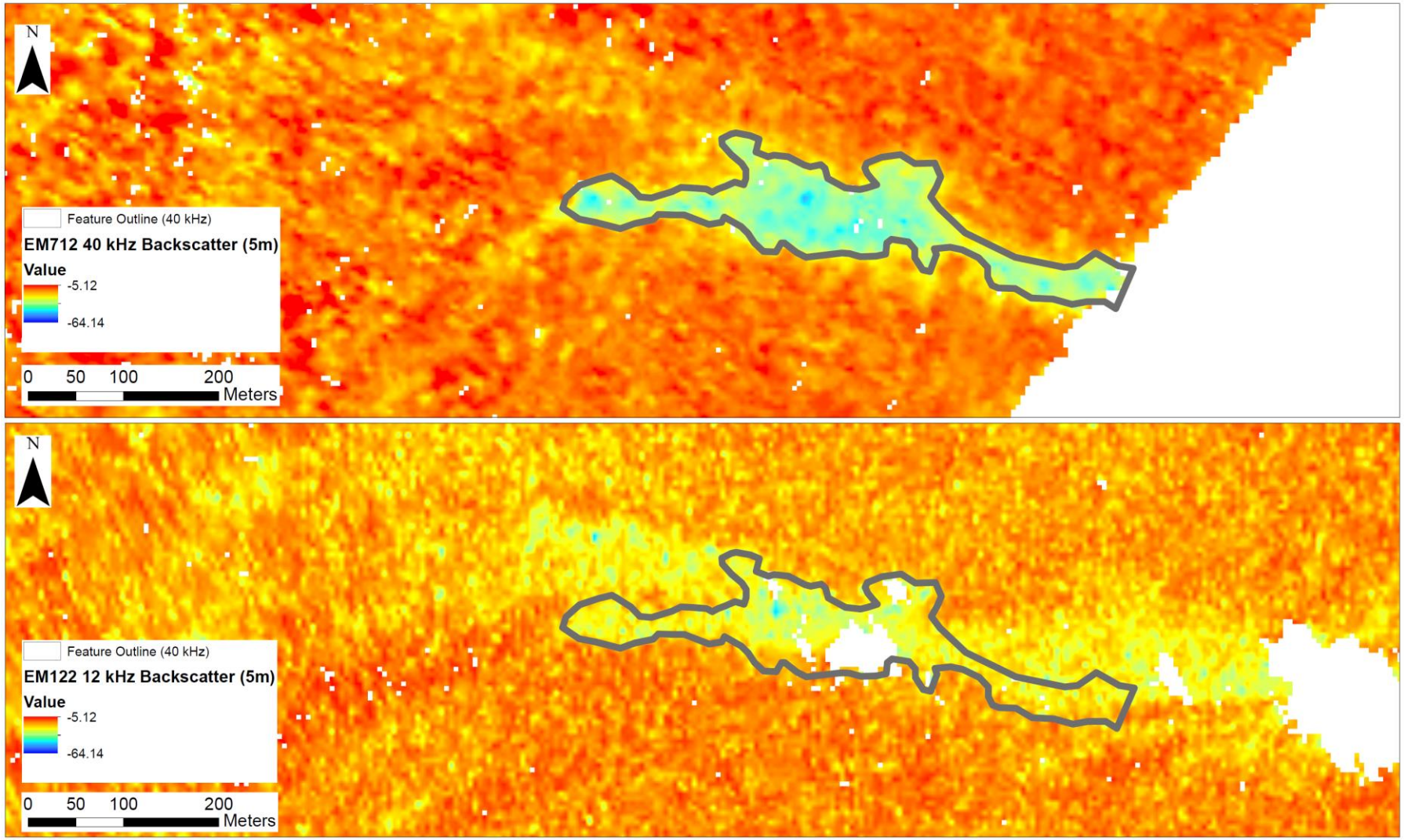


40 kHz



12 kHz

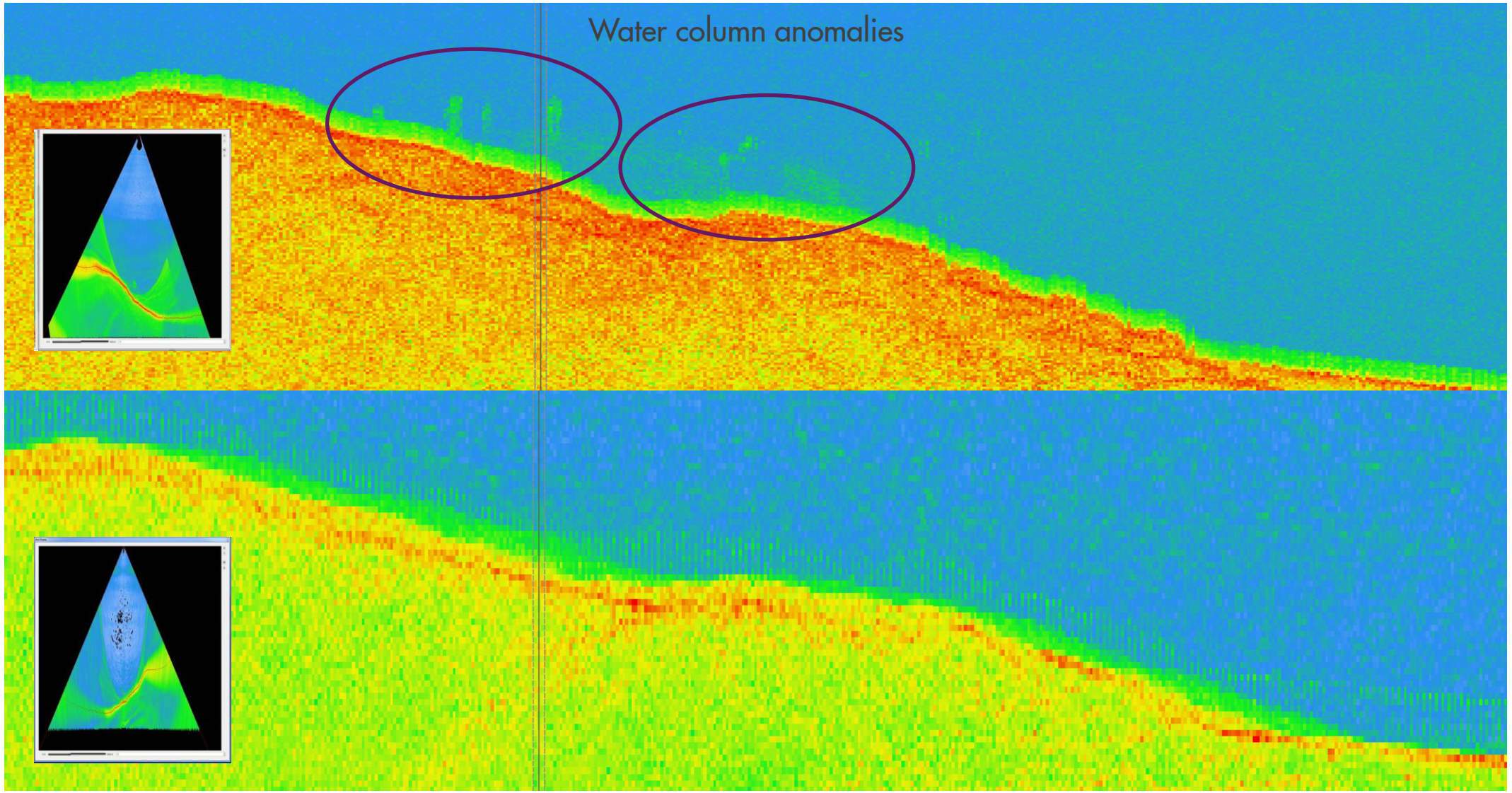
Backscatter Comparison



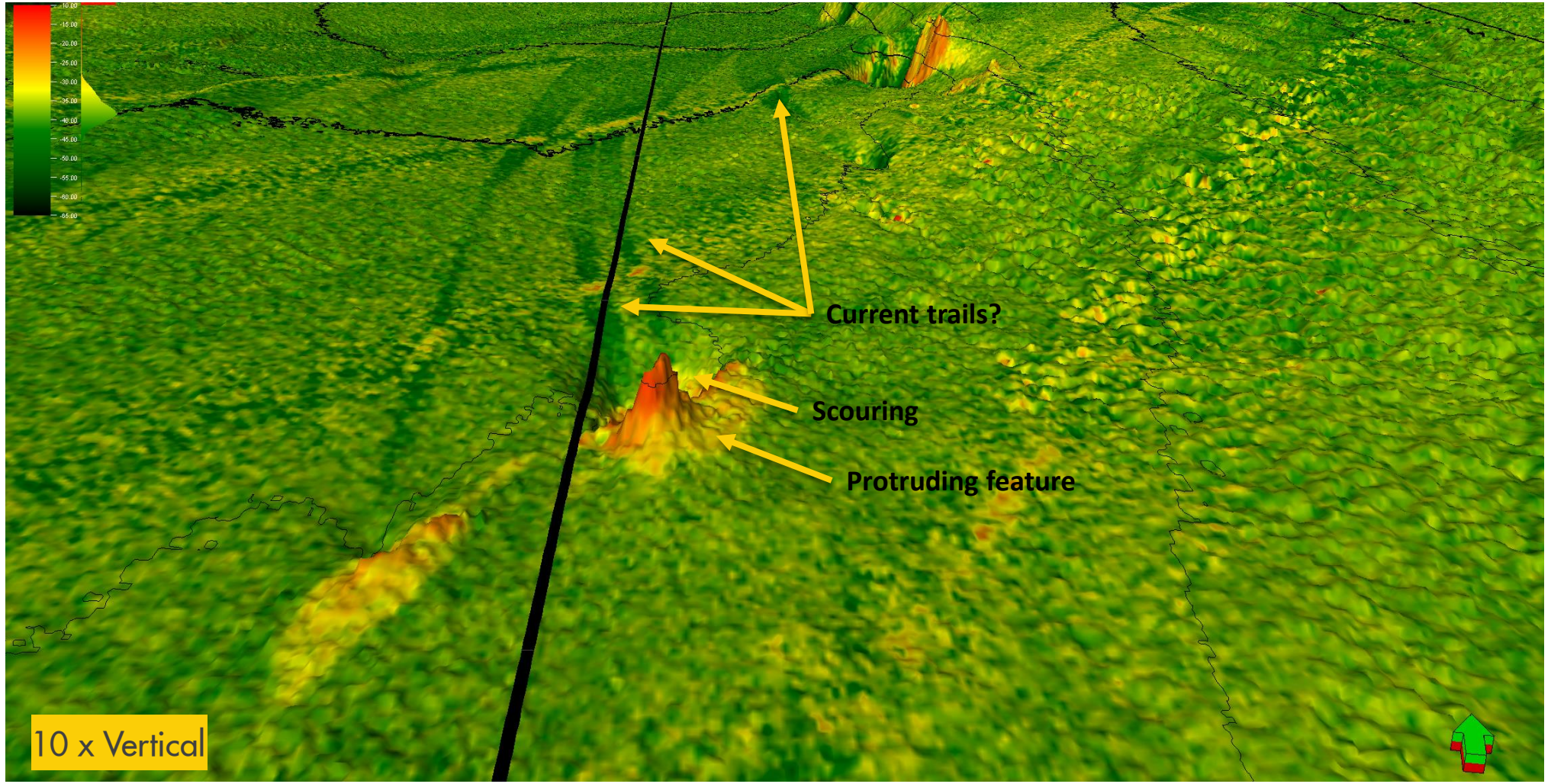
40 kHz

12 kHz

Water Column Data



40 kHz Bathymetry and Backscatter



Discussion, Conclusions and Future Recommendations

Discussion and Conclusions

- Both MBES systems performed well and delivered quality data
- For this project, 40 kHz MBES was preferred over 12 kHz MBES
  - 12 kHz MBES did not provide additional penetration as expected, assumed due to hard seafloor creating hard acoustic reflector
  - 40 kHz Backscatter, bathymetry and water column data were very detailed

  → Accurate core positioning would have been more difficult on 12 kHz only, with potential for piston core to miss the seep feature

  → Coring accuracy key to successful survey, high resolution data needed

	40 kHz EM712	12 kHz EM122
Bathymetry	++	+
Backscatter	++	+
Water column data	++	+

Recommendations

- Additional comparison in an area with a softer seafloor and known water column anomalies to obtain further insights into the differences between the two MBES systems for Seephunter survey purposes
- MBES interference issue to be resolved to obtain 'best of both worlds'

Thank you!