



Combined technology forces revealed encouraging data for a 3D cable tracker with great potential

Results from initial tests in Rostock, Germany

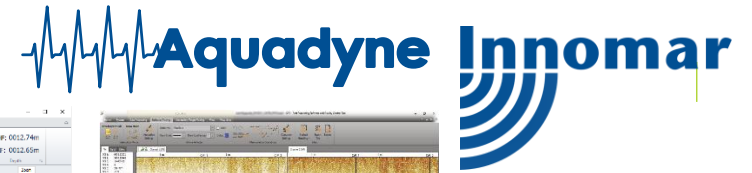
JENS WUNDERLICH (INNOMAR),
JAN-ERIK RYGH & STEIN-ARILD NORDRUM (AQUADYNE)

Innomar “sixpack” SBP

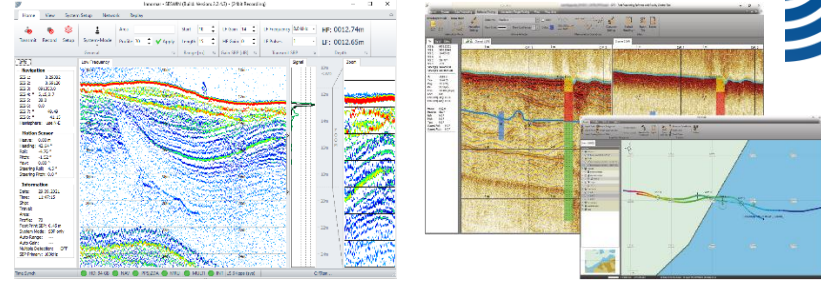
Aquadyne “MagTrack”

Field Test Results

Innomar Parametric Sub-Bottom Profilers



- Innomar founded 1997, Based in Rostock (DE)
- Parametric SBPs for water depths 0.5 – 11,000+m
- Customers worldwide (industry, science, authorities)



Four SBP Product Groups & Software

Shallow Water

- when portability matters
- less than one meter down to 500 meters



High Power

- penetration matters
- water depths from shallow to full ocean



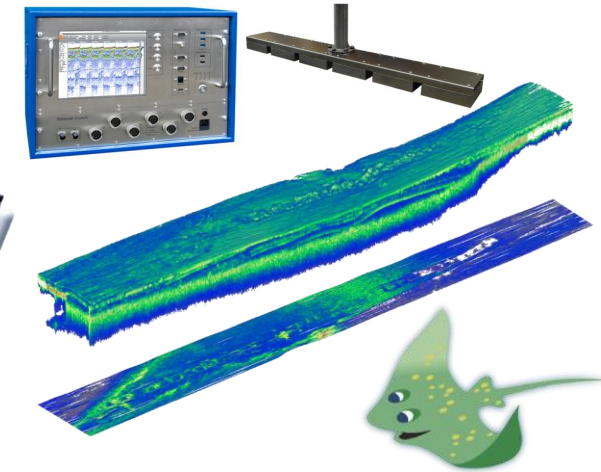
Remotely Operated

- remote / autonomous
- integration into all scales USV / ASV

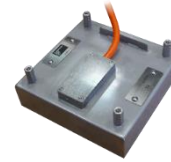


Multi-Transducer

- 3D sub-seabed data
- buried objects, e.g. cables & boulders



Innomar “sixpack” SBP



Technical Specs

- Depth Below Transducer 0.5 ... 30 m
- Seabed Penetration up to 20 m
- Range Resolution 5 cm
- Frequencies 100 / 4...15 kHz
- Beam Width ±2.5°

Applications

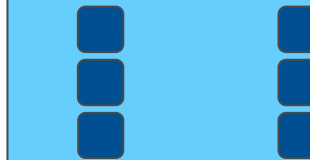
- 3D visualization / mapping of buried objects
- Archaeology
- Boulders / UXO → route / site surveys
- Buried pipelines and cables

Transducers

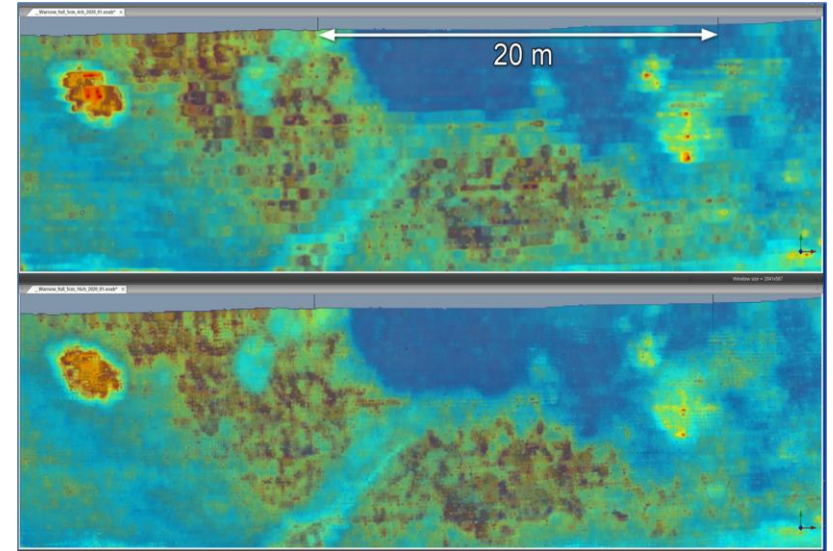
Line Array (variable separation 22...60cm)



Transducer Groups for increased power (variable separation)



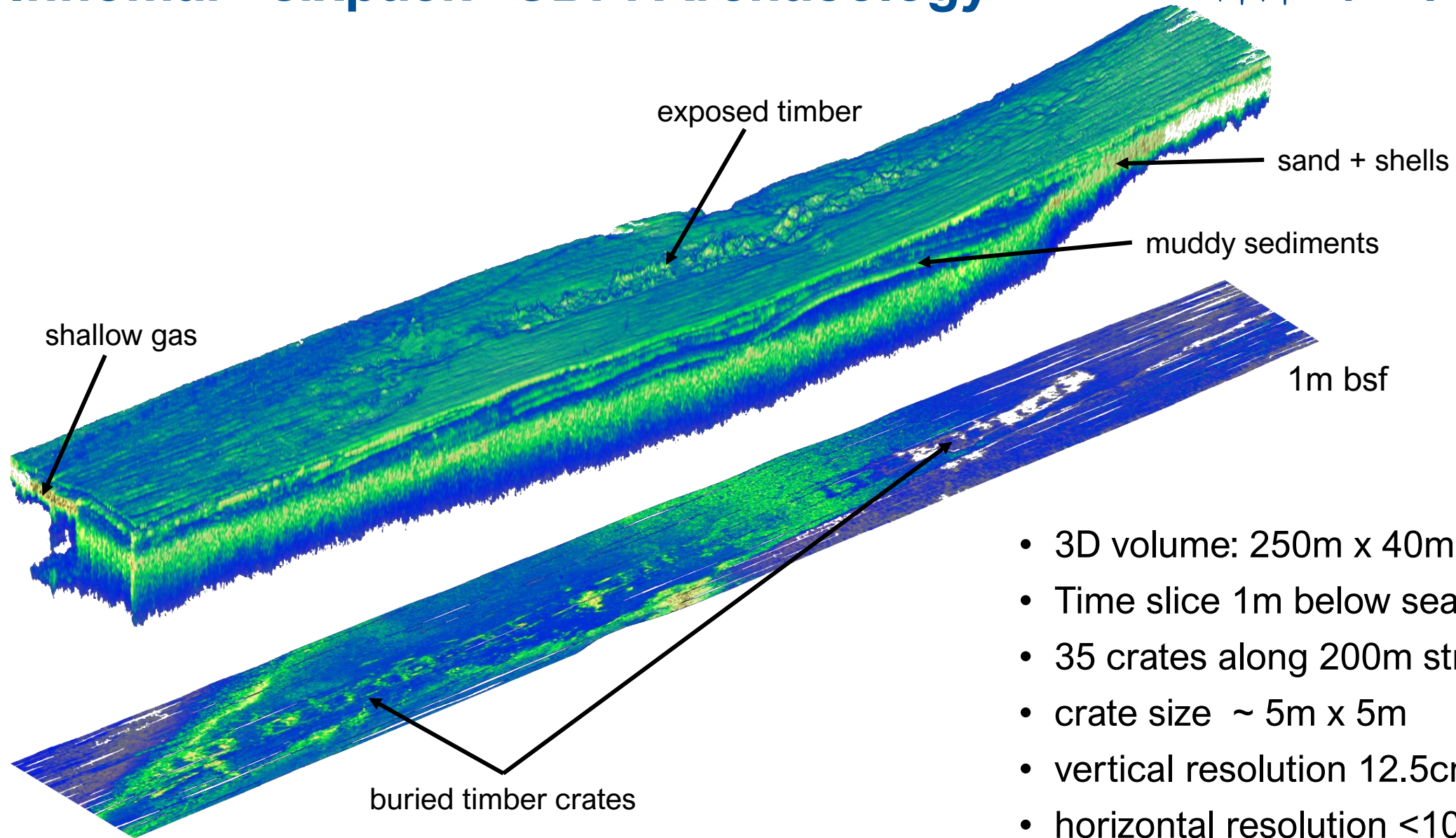
All combined (max power, 1000m)



- First “sixpack” 2017
- Improved data acquisition and processing 2022



Innomar “sixpack” SBP: Archaeology

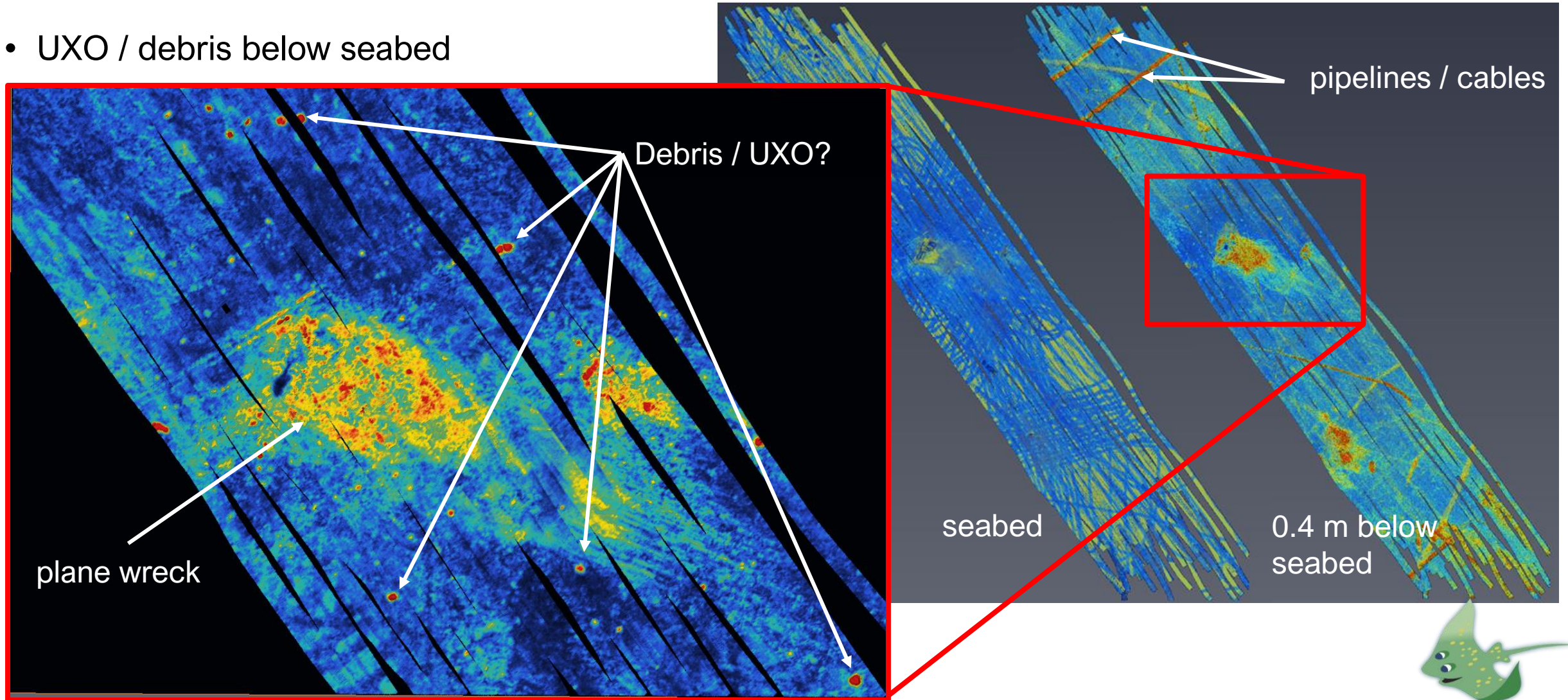


- 3D volume: 250m x 40m x 3.5m
- Time slice 1m below seafloor
- 35 crates along 200m structure
- crate size ~ 5m x 5m
- vertical resolution 12.5cm
- horizontal resolution <10cm



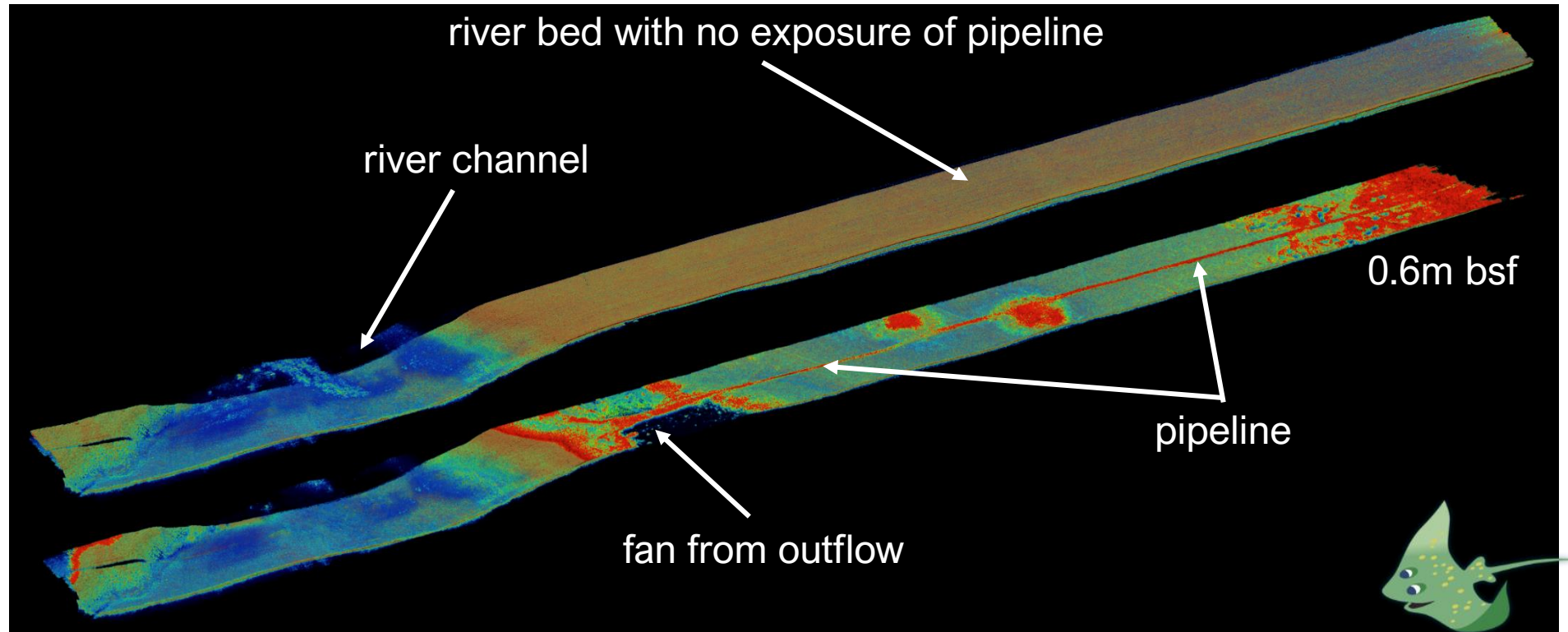
Innomar “sixpack” SBP: UXO / Boulders

- Scour marks at the seabed
- UXO / debris below seabed

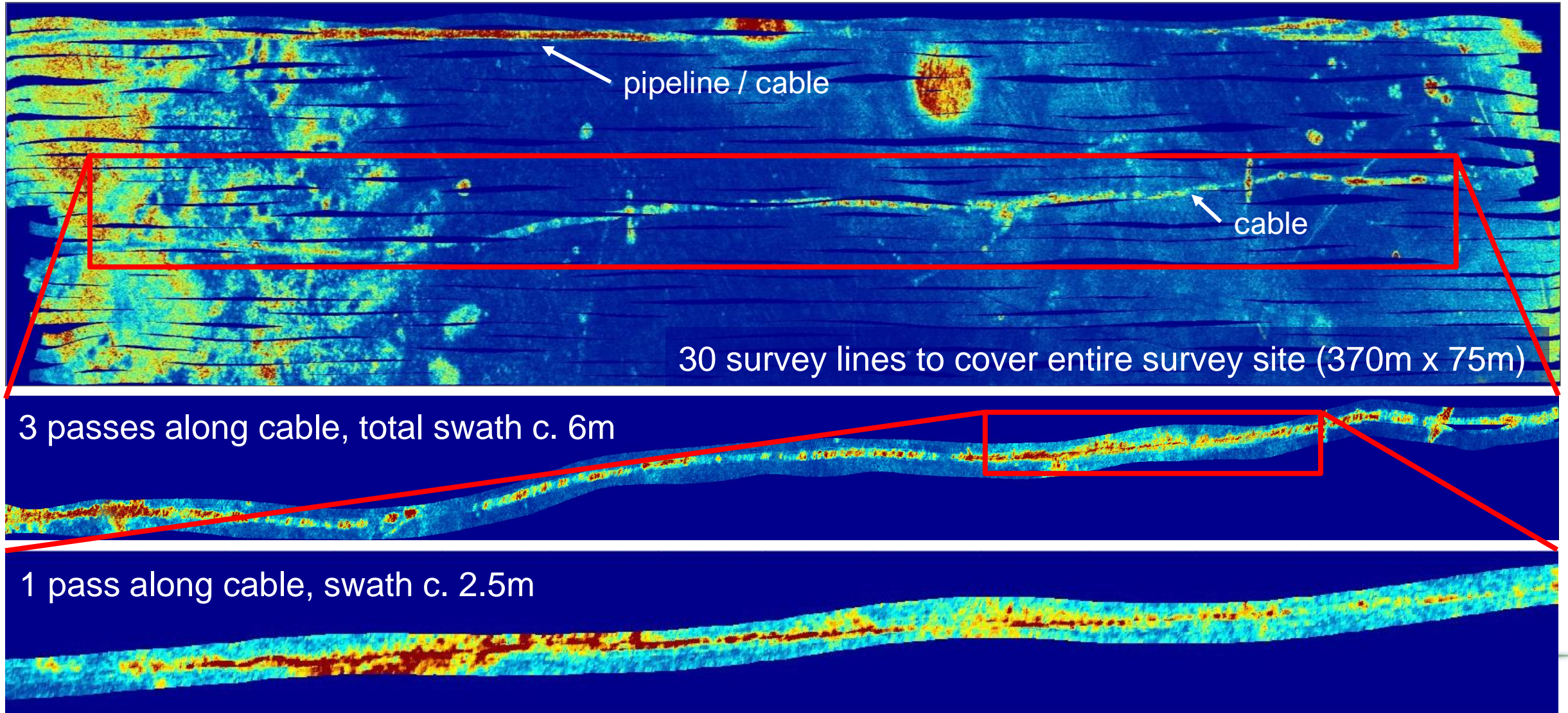


Innomar “sixpack” SBP: Pipelines

- Example with fully buried water pipeline into a river
- 20 survey lines @ 1.5m spacing → 30m x 400m corridor, 3D volume with 20cm cell size
- Burial depth of pipeline c. 0.6m below river bed, water depth c. 2.5m
- The pipeline is out of use, but the buried fan of the outflow is still visible



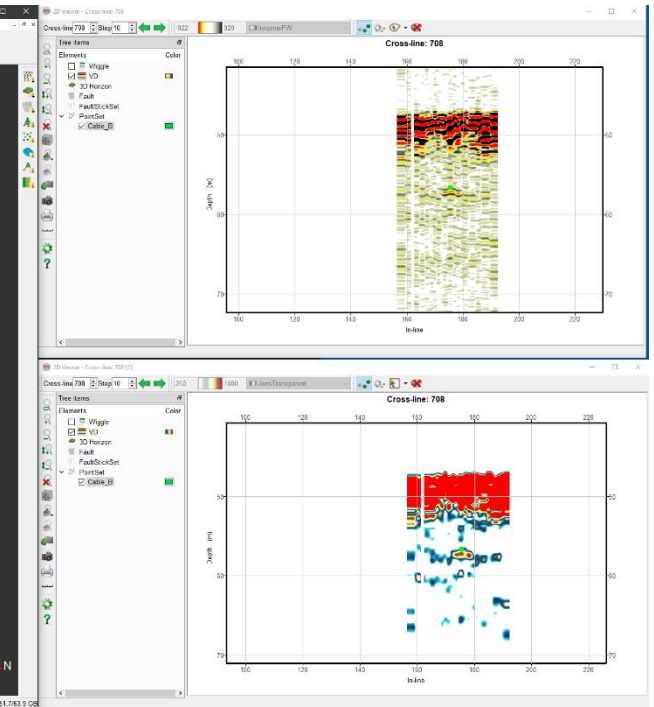
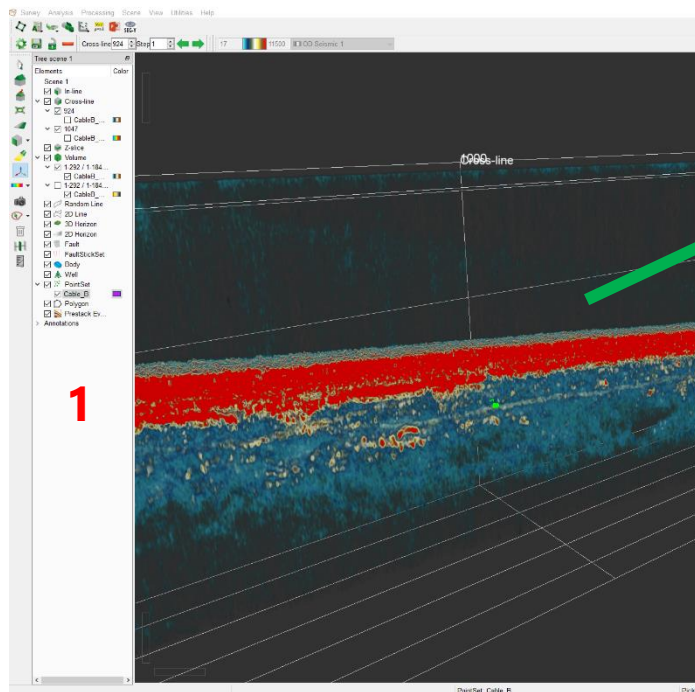
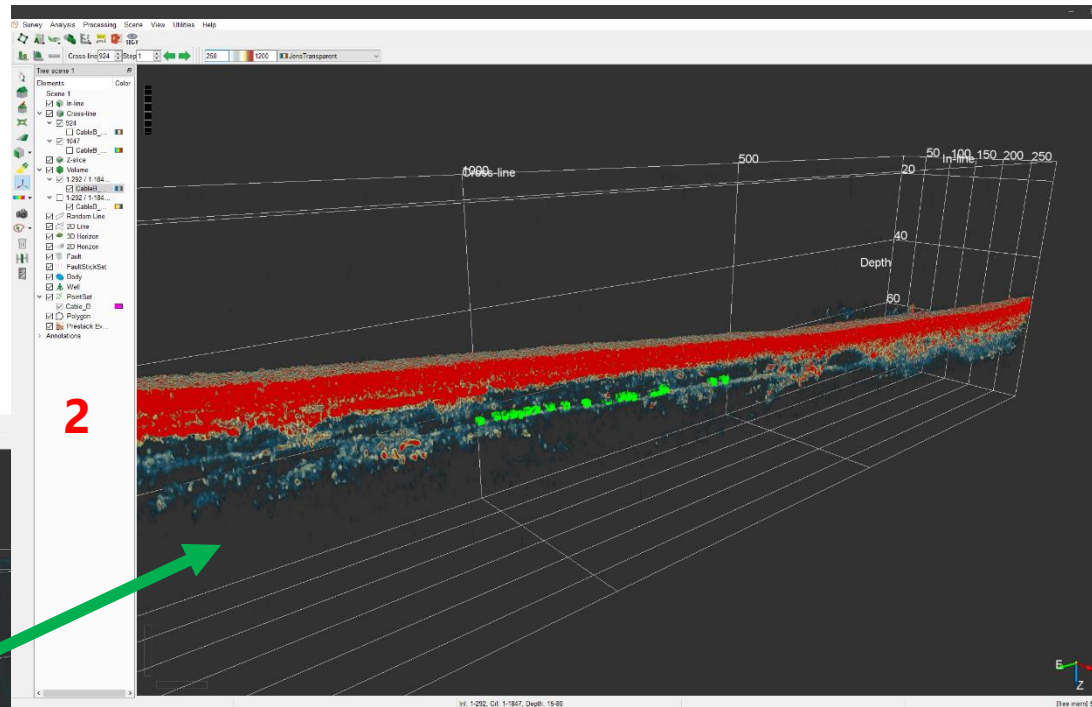
Innomar “sixpack” SBP: Cables



Innomar “sixpack” SBP – 3D Cable Picking



- 3 passes along cable
→ 18 tracks across, ~6m
- Gridded volume
→ shows hyperbolas
- Easy target picking



OpenText screenshots



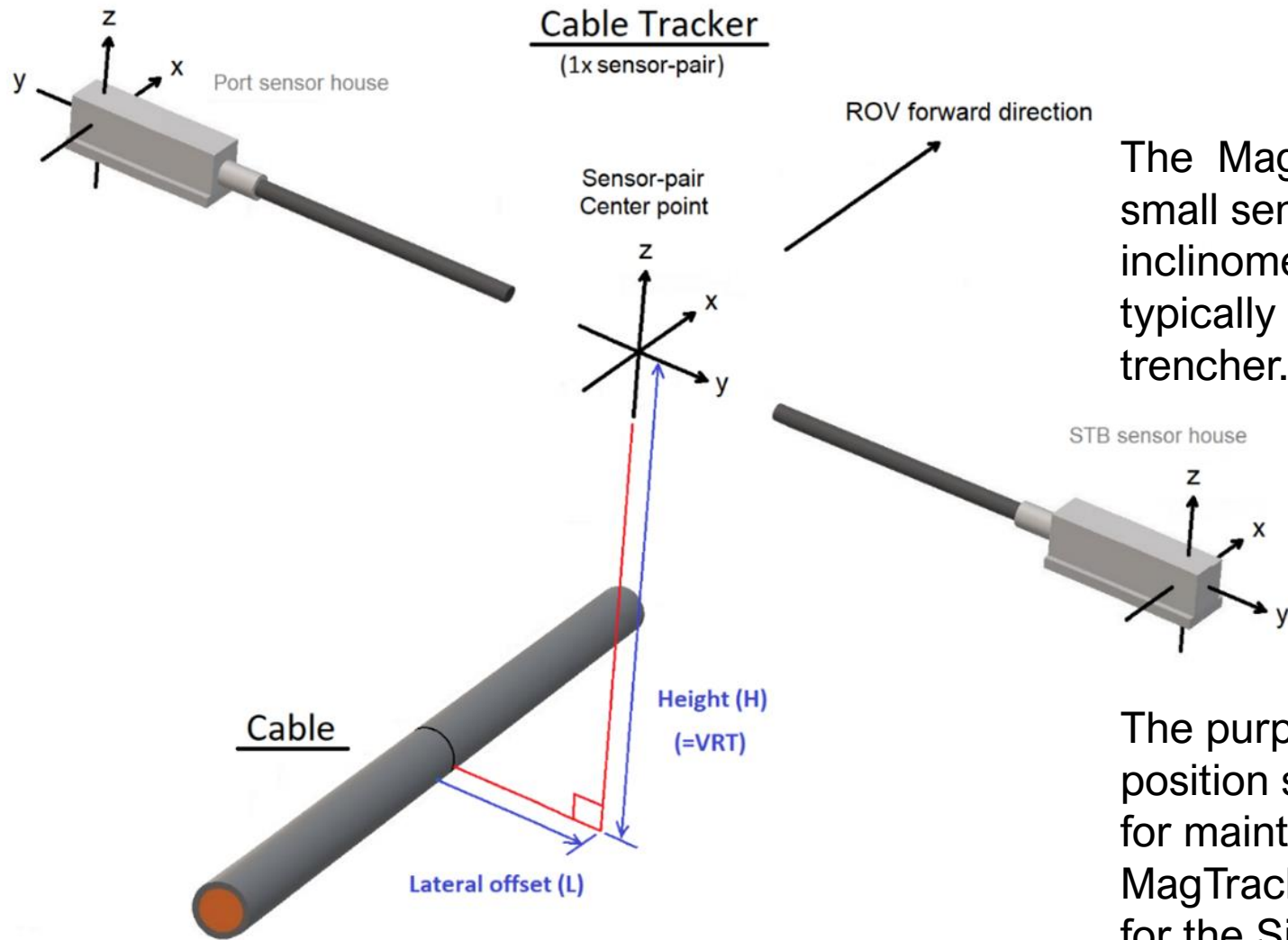


Lab testing multi-sensor system



Testing first system in Asker 2019 with Kennet Leverskjær and Jan-Erik Rygh

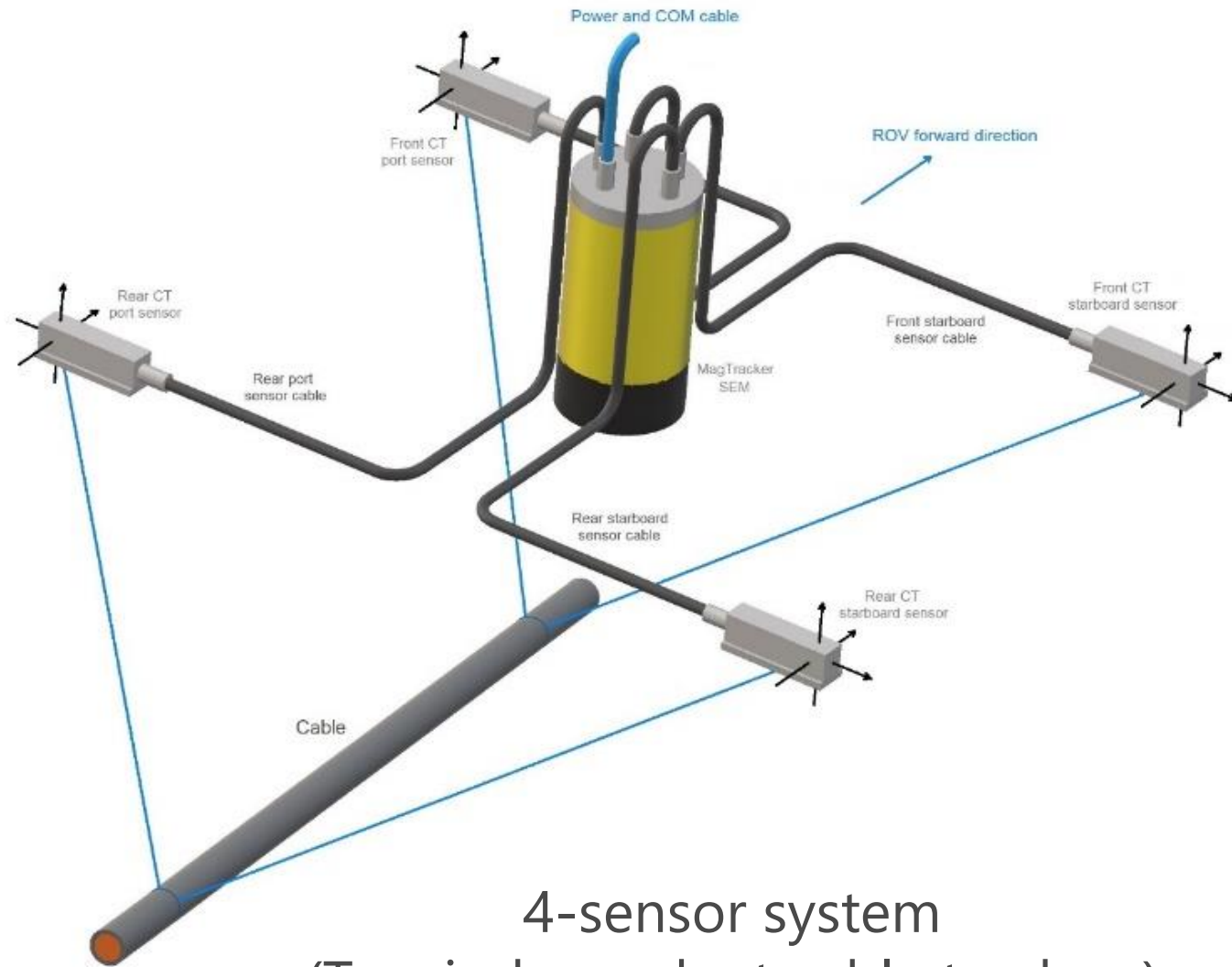
MagTrack Principle



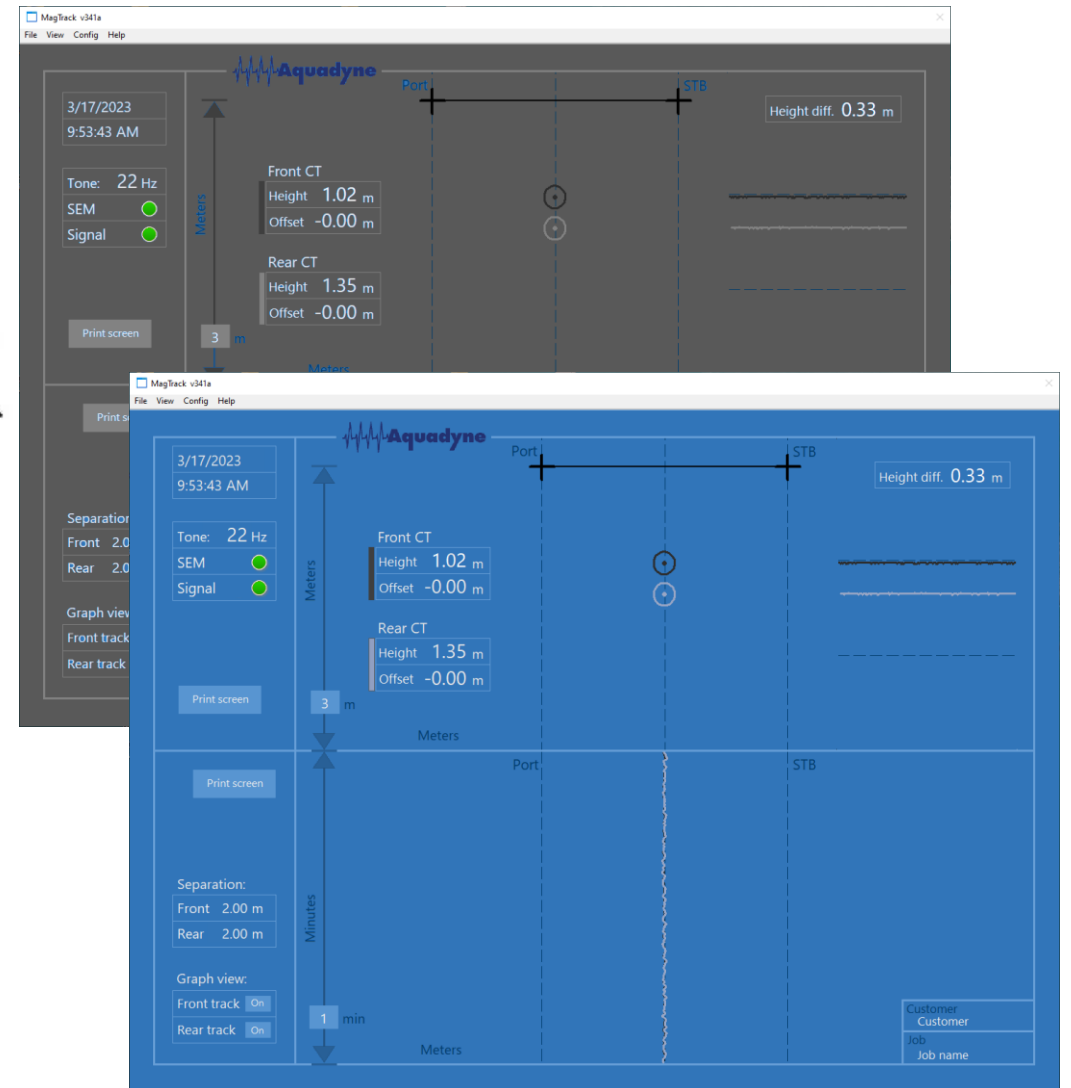
The MagTrack is a cable tracker system with 2 to 8 small sensors which integrate magnetometers and inclinometers. It can detect accurate cable positions, typically in front of and in the rear of an ROV or trencher.

The purpose of the system is to locate and accurately position subsea cables relative to the ROV or trencher for maintenance and cable burial. MagTrack used to efficient find and to position cables for the Sixpack system.

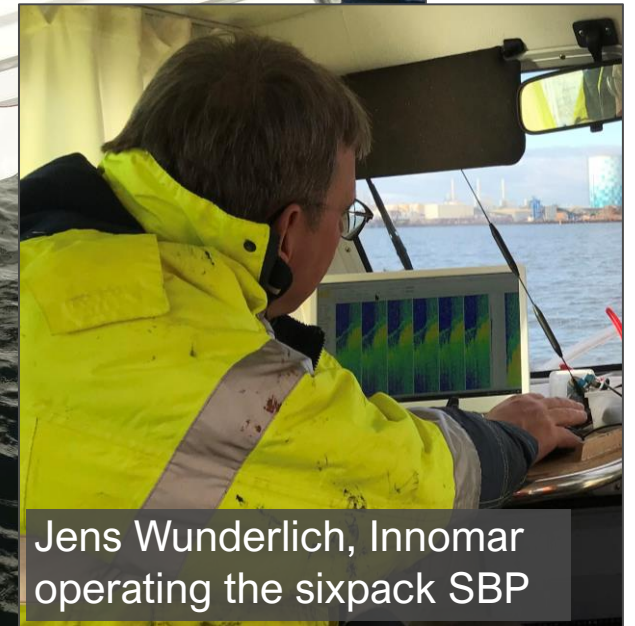
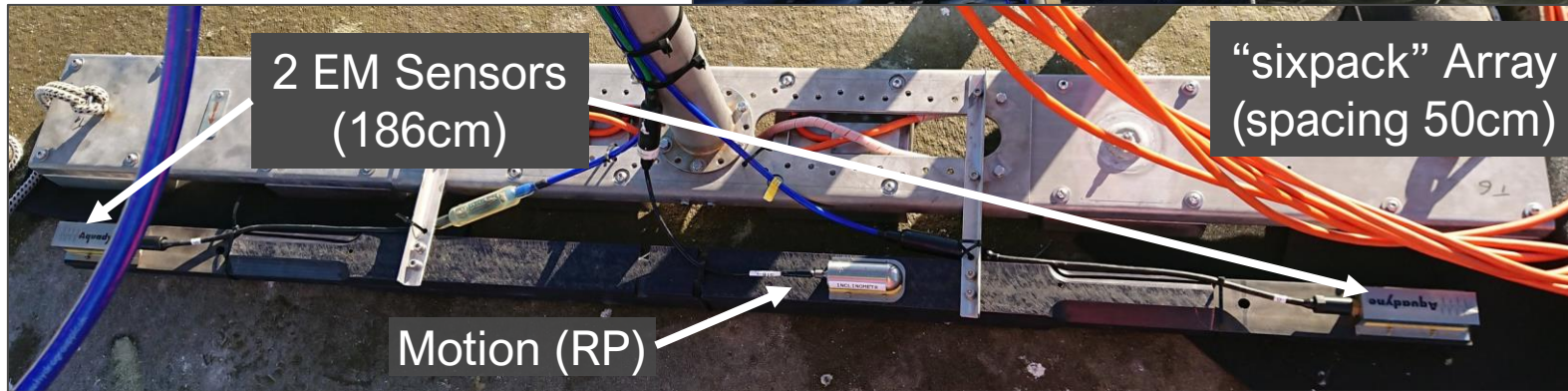
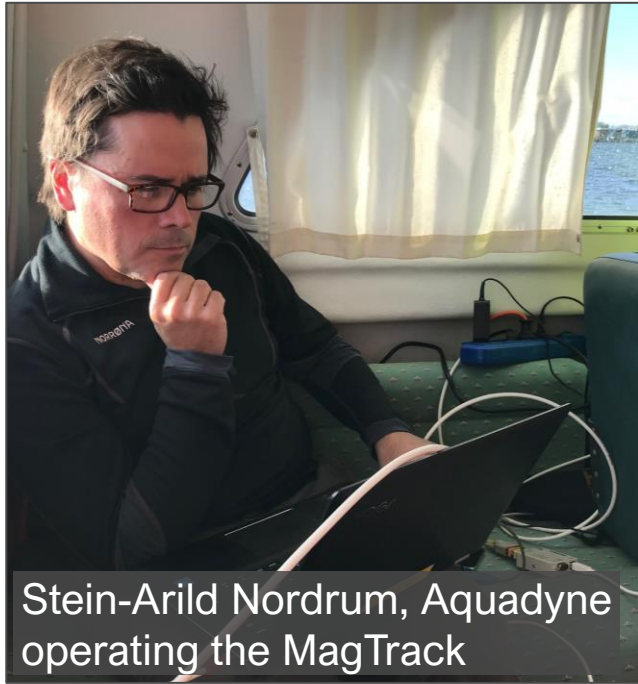
MagTrack with 2,4 or 8 sensors



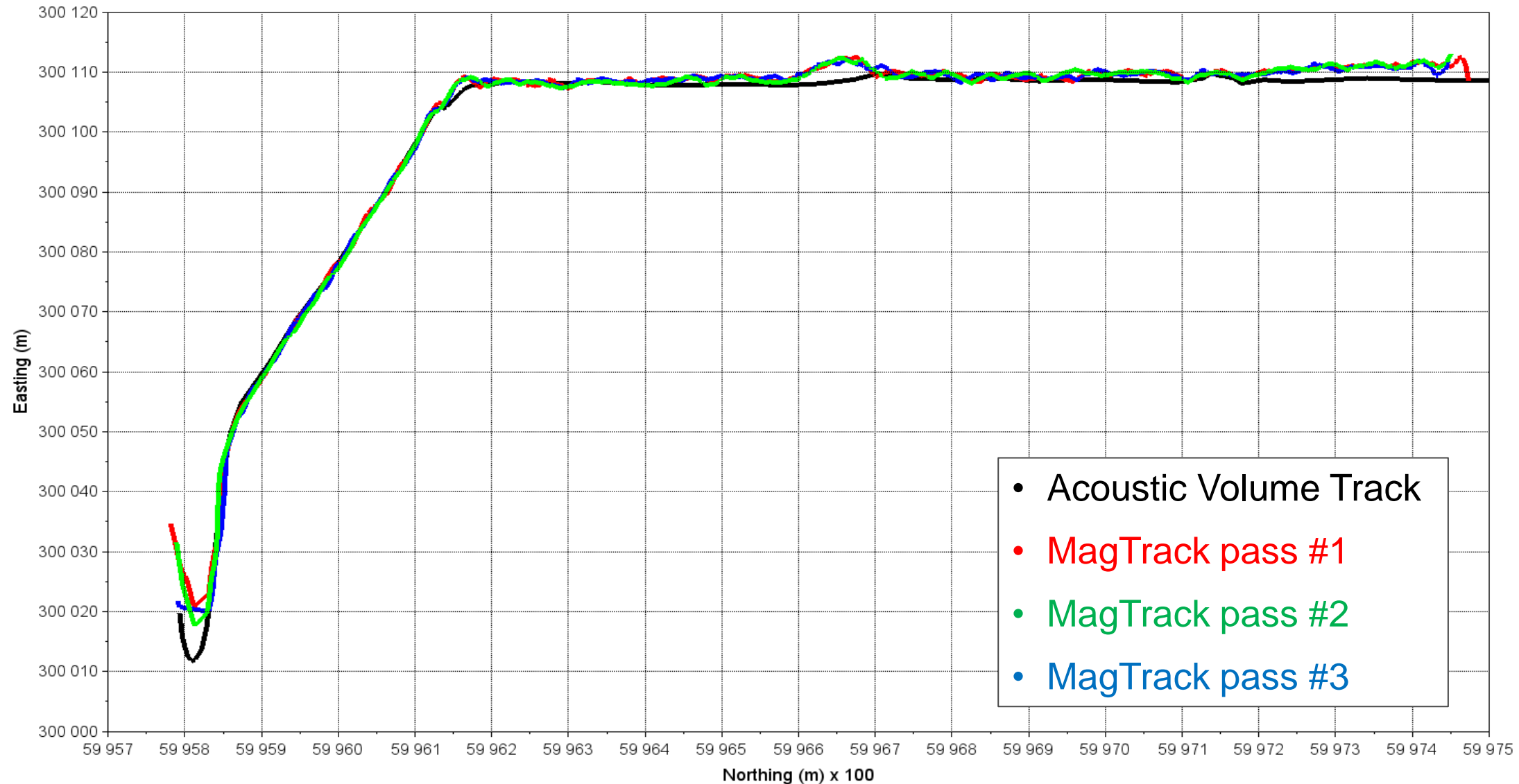
4-sensor system
(Two independent cable trackers)



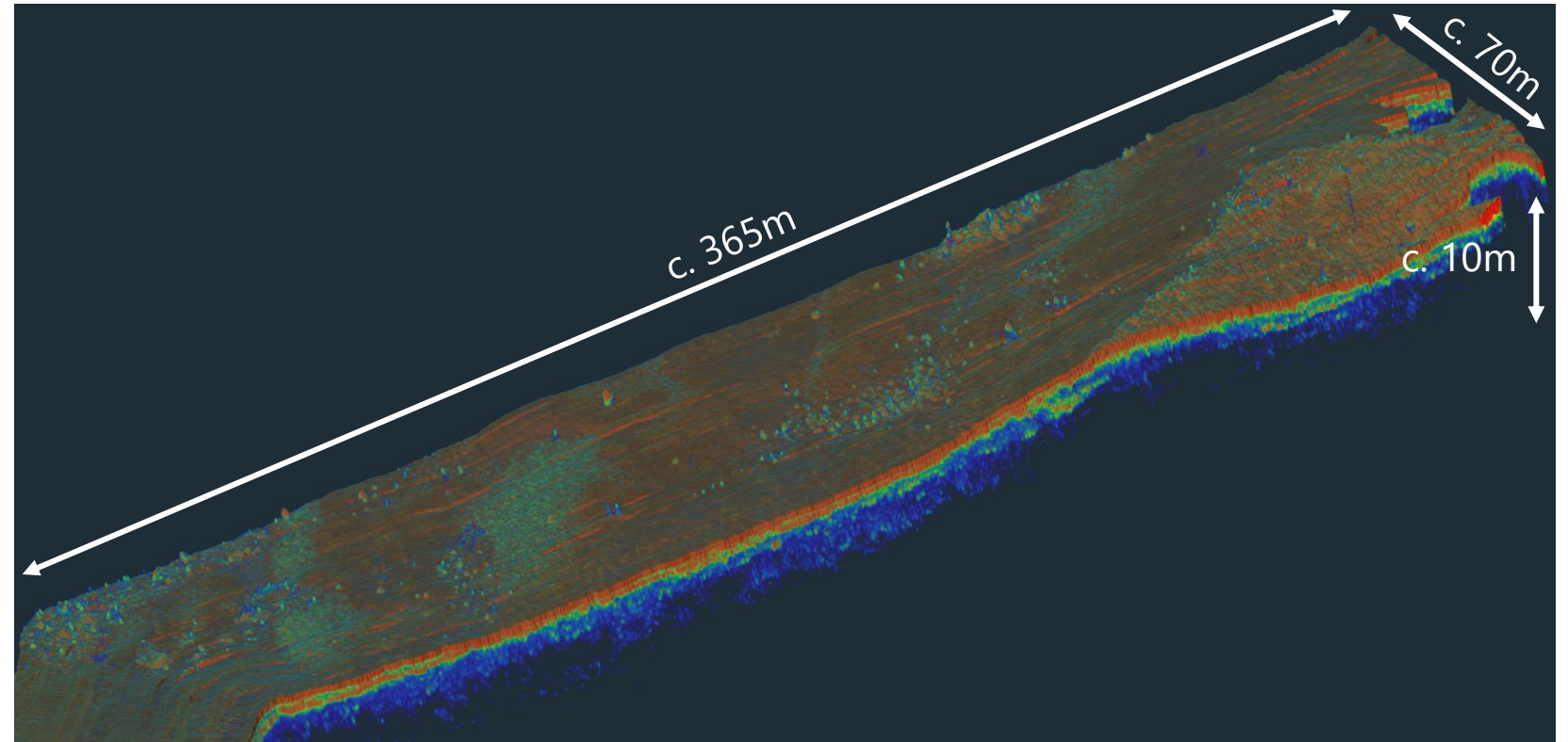
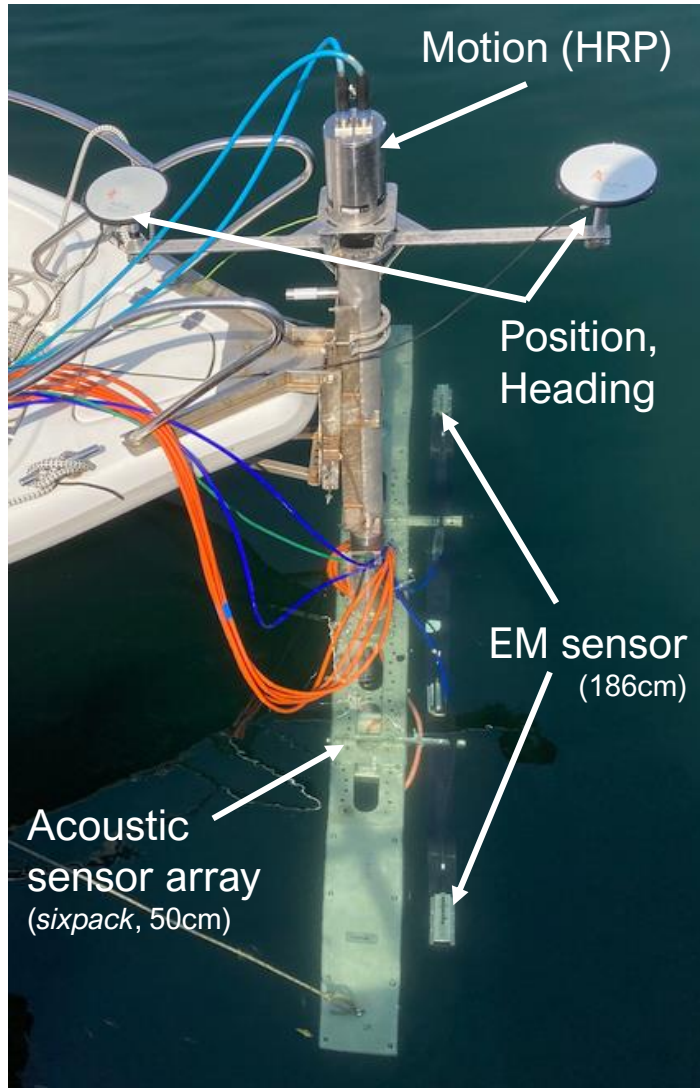
MagTrack + Innomar “sixpack” SBP: Test setup



Aquadyne MagTrack Test Results



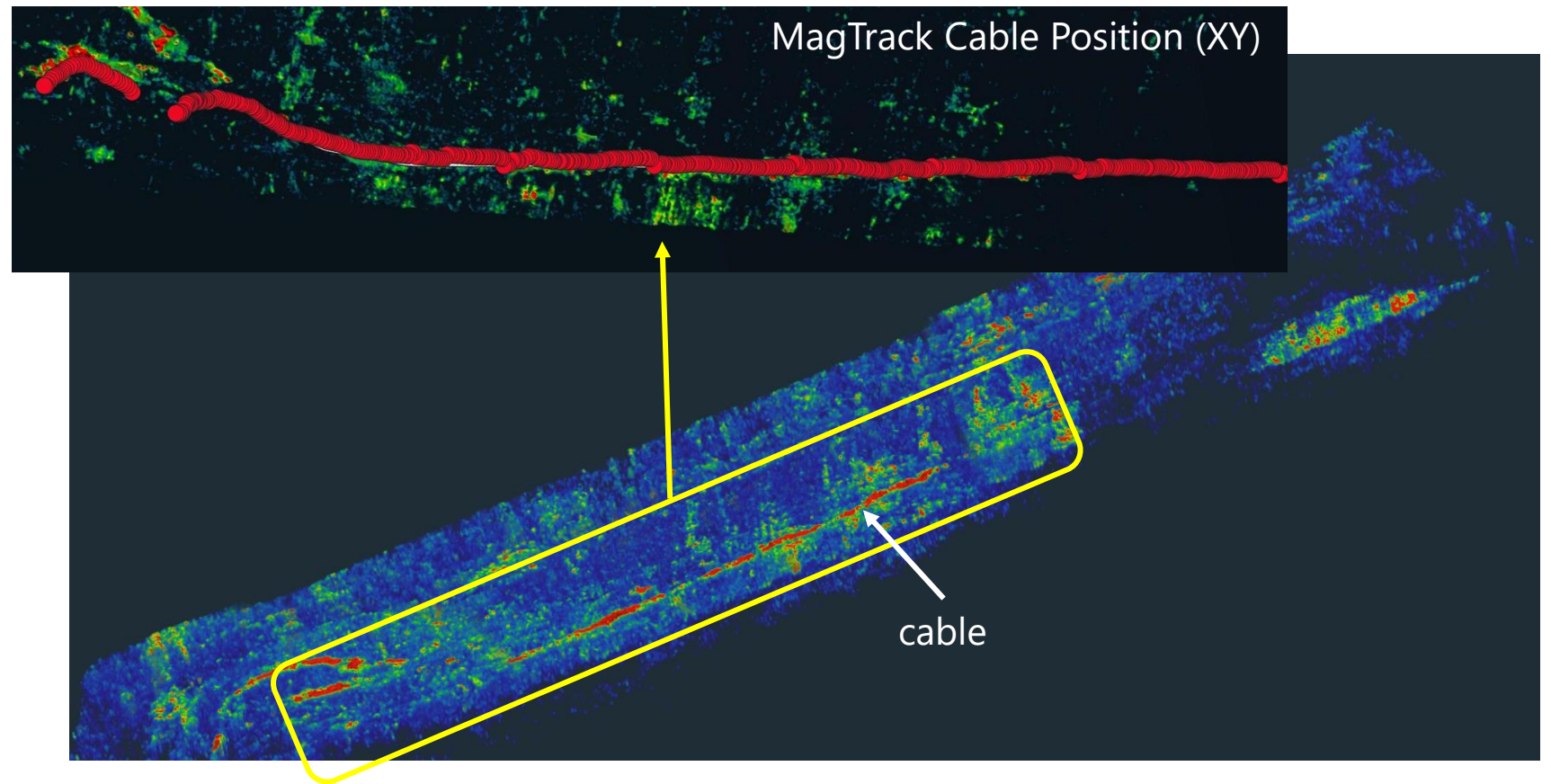
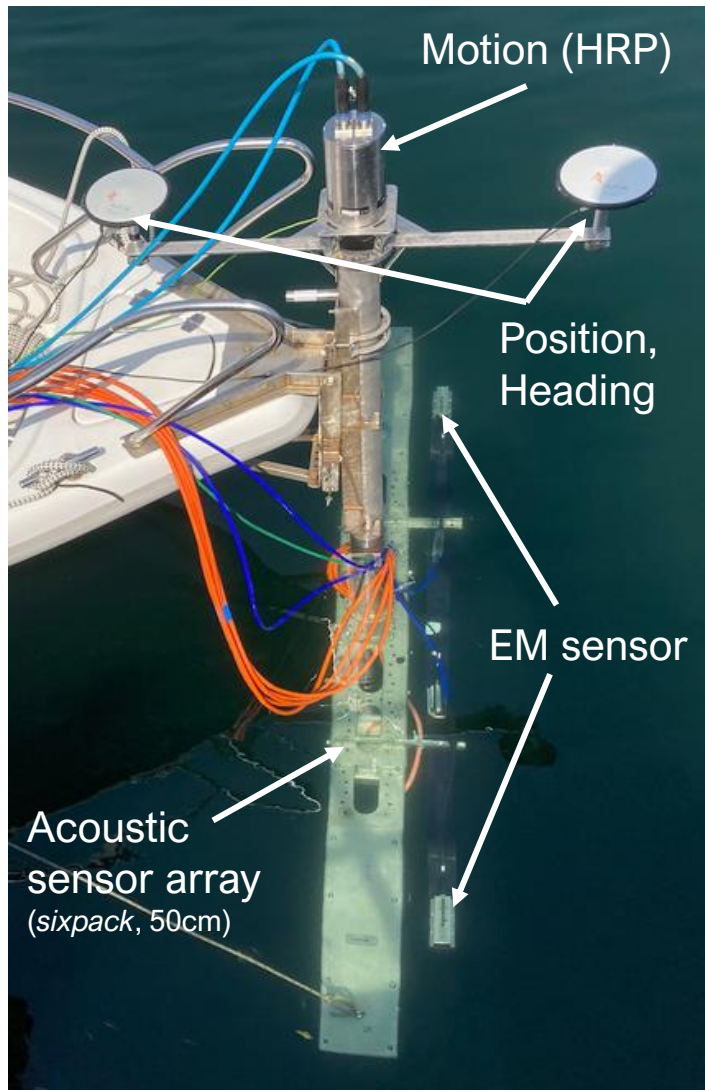
Innomar “sixpack” SBP + Aquadyne MagTrack



- Simultaneous data recording
- Acoustic data for 3D visualisation



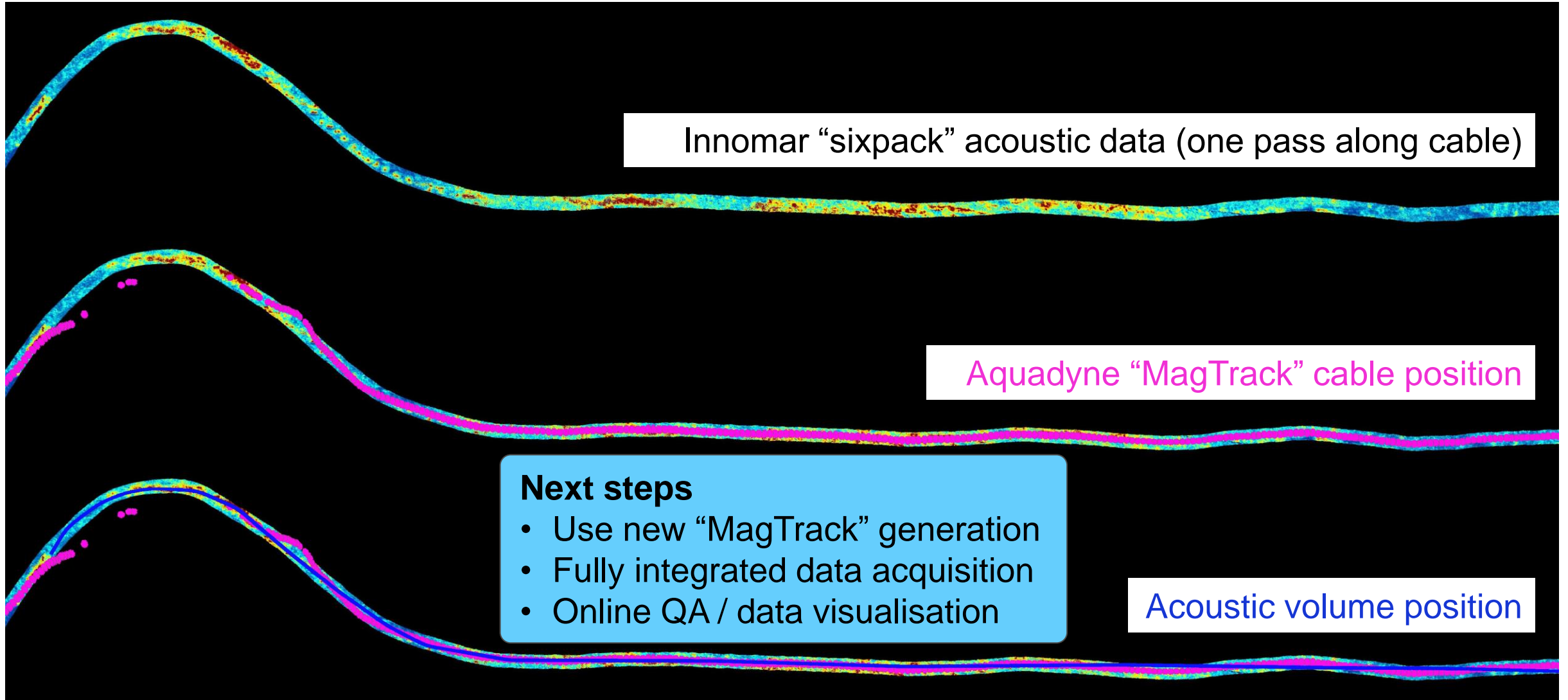
Innomar “sixpack” SBP + Aquadyne MagTrack



- Simultaneous data recording
- Acoustic data for 3D visualisation
- MagTrack data used for track guidance



Innomar “sixpack” SBP + Aquadyne MagTrack





Sea you **ABOVE** and **BELOW**

Thanks for listening. Any Questions?

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