Sonardyne
MARITIME SECURITY

SUBSEA TECHNOLOGY

Mobile Mapping of the Underwater Environment

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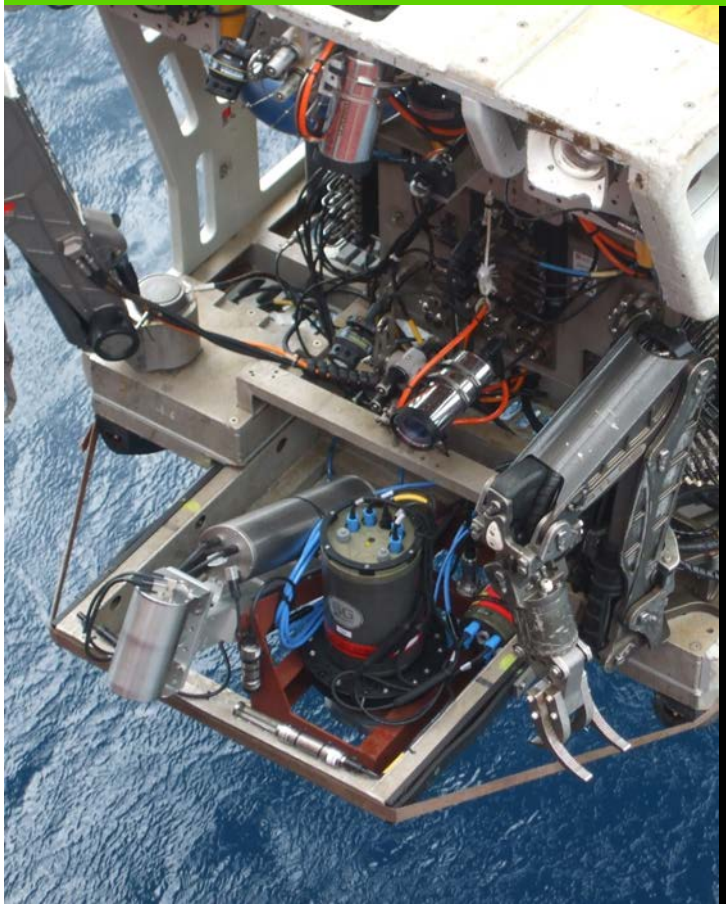
Sales Manager – Maritime Security

POSITIONING
NAVIGATION
COMMUNICATION
MONITORING
IMAGING

Agenda

- SPRINT –Mapper – key enabler in going dynamic
  - How it works – what do you need to do?
  - Metrology verification trial
  - Track record highlights
- Solstice –Seabed Imaging
- Subsurface imaging for navigation and obstacle avoidance

Sonardyne provides the key enabler – SPRINT-Mapper



- Traditionally scanners had to be installed statically in fixed locations on the seabed leading to prolonged subsea operations.

- Sonardyne's SPRINT-Mapper is the tight integration of in-house raw DVL (Syrinx), LBL acoustics (6G) and INS (SPRINT) which provides the centimetric positioning to enable mobile mapping from a ***single supplier.***

Track record - NOAA

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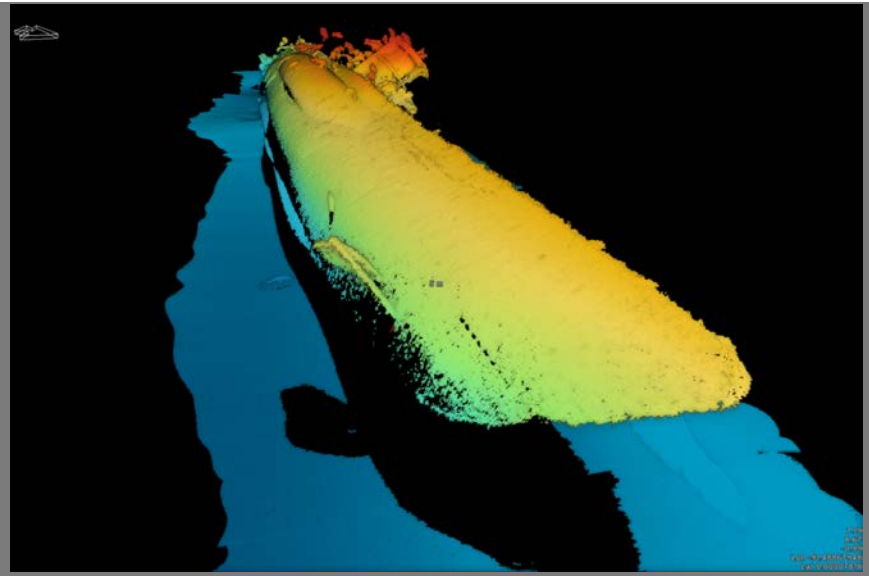
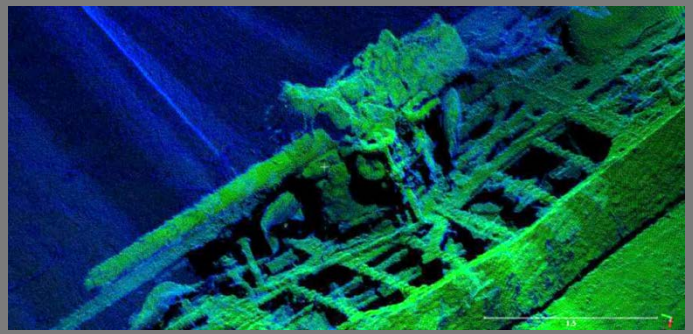
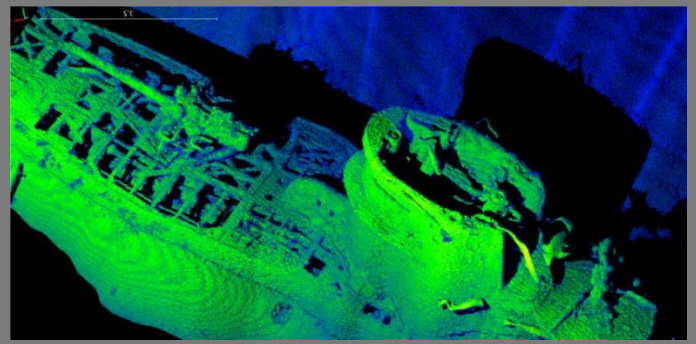
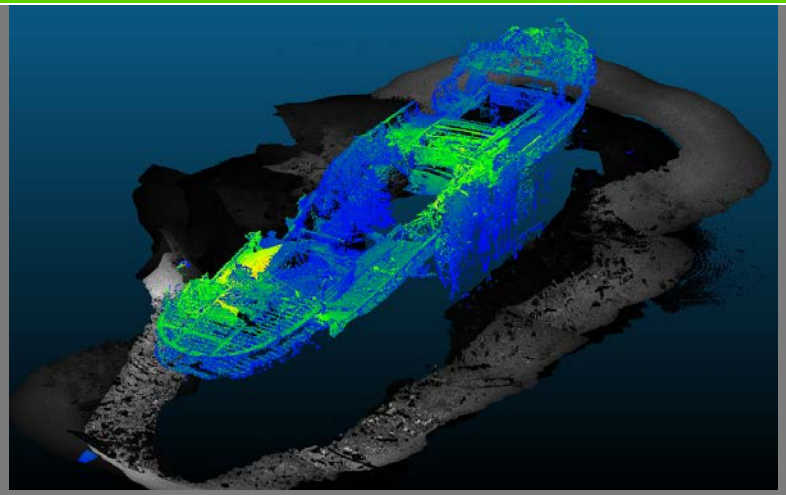
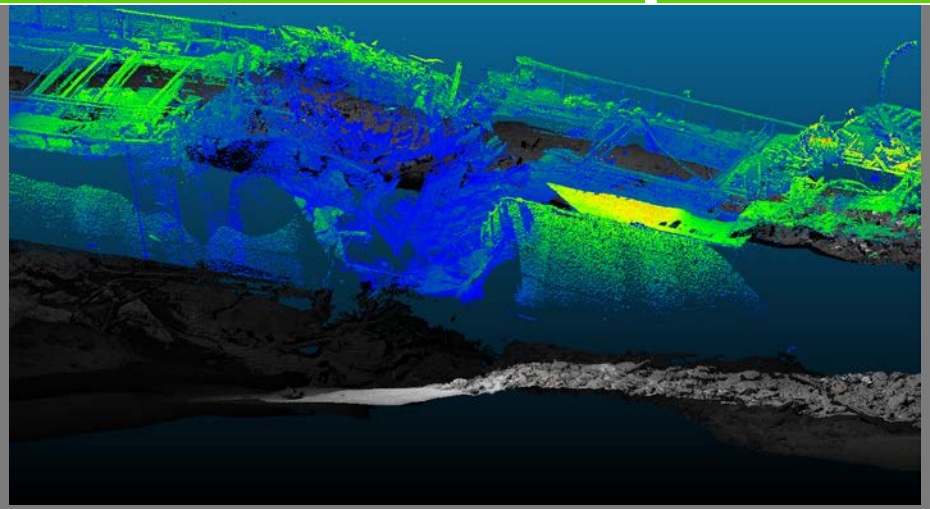


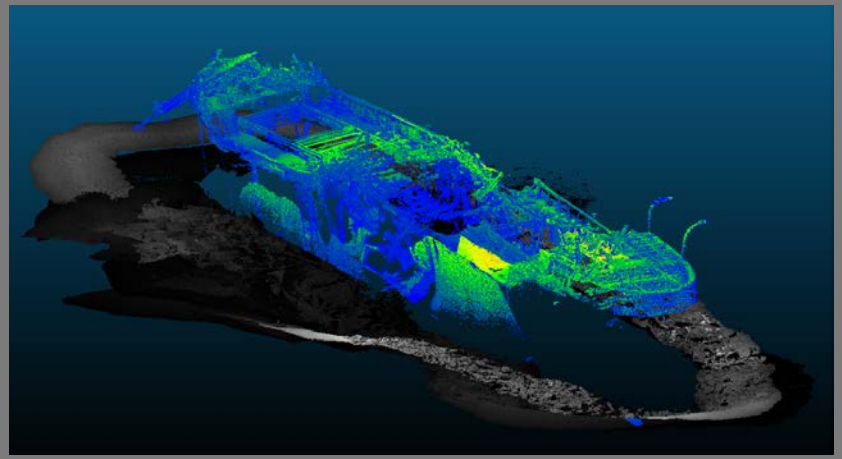


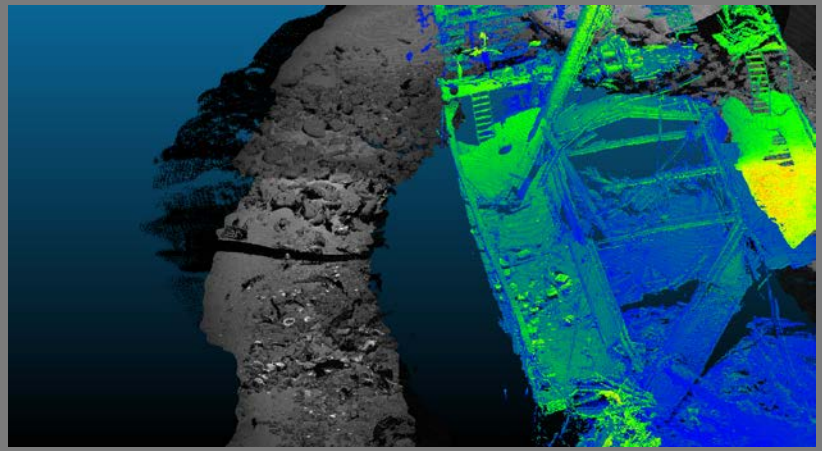


Track record - NOAA

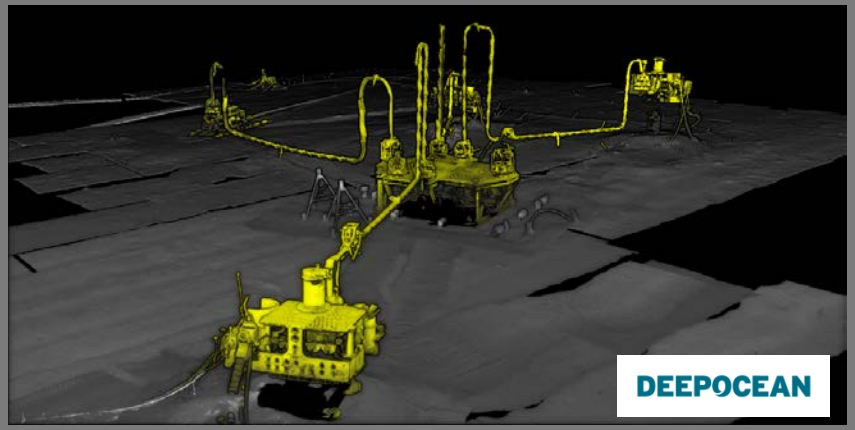




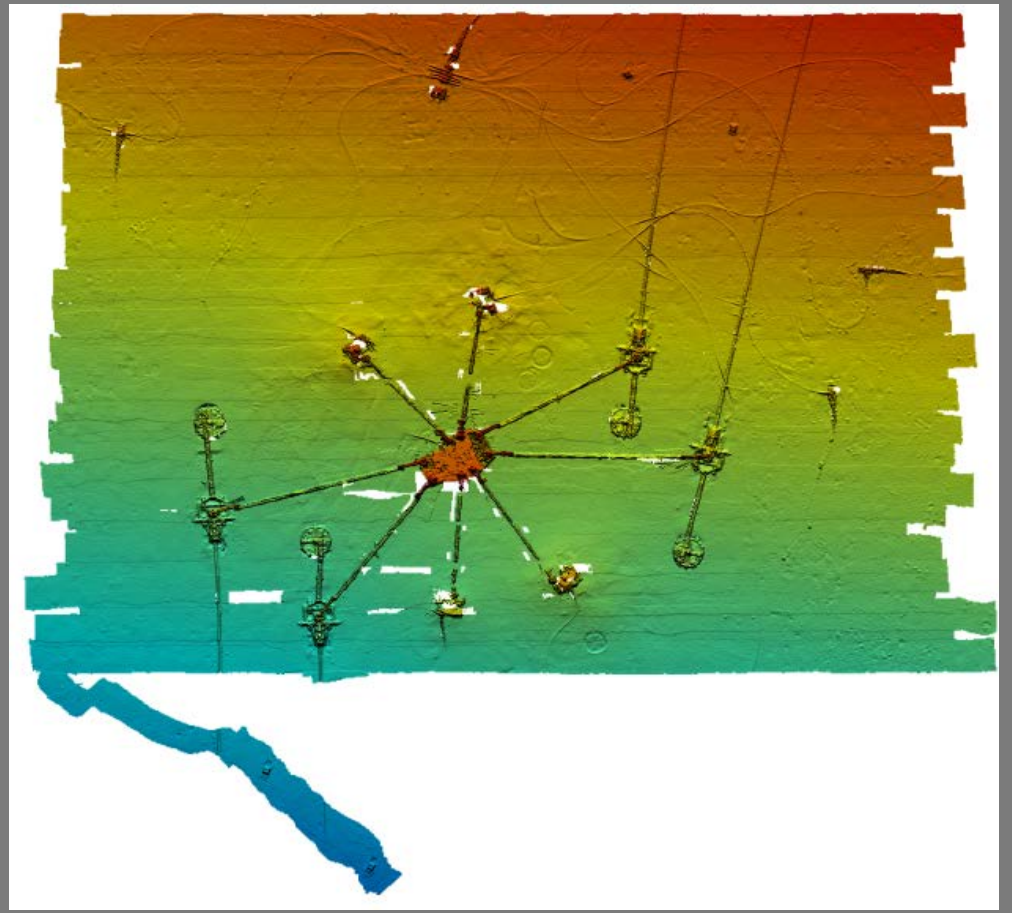




Track record – ADUS DeepOcean



Track record – ADUS DeepOcean



Conclusion – Sonardyne systems for dynamic laser scanning

Benefits of going dynamic

- Ultra fast for wide area hi-res mapping, inspection and metrology.
- 2 hrs of seabed time for metrology has been achieved.
- Contactless and without the requirement for previous dimensional control.
- Turbidity (visibility) affecting operation is minimal – can fly closer.
- Trusted QC from comparison with 6G acoustic ranges.

Challenges

- Requires complex INS / DVL / acoustic system to achieve centimetric positioning.
- This is solved with Sonardyne's unique ability to merge and post process all sensors at the raw data level.
- Sonardyne understands how to optimally operate all of it.

SPRINT-Mapper – uses “off-the-shelf” configurations

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SPRINT-Mapper

Use it for basic underwater mapping applications such as archaeology and ocean science

Capability, Complexity and Precison

- Works with Multi-beam, Laser or LiDAR
- You’ll need a SPRINT INS, Syrinx DVL, a USBL and a depth sensor
- Accuracy is scenario dependent; absolute accuracy determined by chosen USBL system
- Integrity is limited
- There’s no INS Post-Processing
- It’s supported by your personnel

SPRINT-Mapper Plus

Perfect for mapping tasks such as Pipeline out of straightness, civil engineering

Capability, Complexity and Precison

- Works with Multi-beam, Laser or LiDAR
- You’ll need a SPRINT INS, Syrinx DVL, a USBL and a depth sensor
- Expect~10 cm accuracy (relative) over 50m distance. Absolute accuracy dependent upon USBL
- Limited integrity
- INS Post-Processing using Janus
- It’s supported by your personnel

SPRINT-Mapper Pro

Pro lets you map areas up to 500 metres and is suitable for asset inspection and monitoring activities

Capability, Complexity and Precison

- Works with Laser or LiDAR only
- You’ll need a SPRINT INS, Syrinx DVL, 6G LBL spread and a depth sensor
- <5cm level typical accuracy for single run-line distances of ~20m. 10cm level typical area (e.g. 50-500m square) mapping accuracy
- Trusted QC with 6G acoustic range aiding
- INS Post-Processing using Janus
- Pre-planning services included and support for your personnel

SPRINT-Mapper Elite

Suitable for confined area mapping, anchor chain, riser monitoring and metrology in areas between 100 and 200 metres

Capability, Complexity and Precison

- Works with Laser or LiDAR only
- You’ll need a SPRINT INS, Syrinx DVL, 6G LBL spread and a depth sensor
- 1cm level typical accuracy for single run-line distances of ~20m. 5-10 cm level typical area (e.g. 50-200m square) mapping accuracy
- Trusted QC with 6G acoustic range aiding
- INS Post-Processing using Janus
- Pre-planning services and expert offshore personnel supplied by us

SPRINT / SPRINT-Nav –variants to suit requirements

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<1m / 24hr StationKeep

(Standalone DVL-INS) **Position error 0.12% of distance travelled**	(USBL-DVL-INS) **3 to 7 times USBL precision**	*Non ITAR ***Commerce Controlled** ***No US Re-Export Licence Needed (SPRINT-Nav)**
(Standalone DVL-INS) **Position error 0.06% of distance travelled**	(USBL-DVL-INS) **4 to 10 times USBL precision**	(LBL-INS) **3cm confined area 20cm wide area**
(Standalone DVL-INS) **Position error 0.04% of distance travelled**	(USBL-DVL-INS) **6 to 13 times USBL precision**	

Only Sonardyne manufacturers all the required technology

SPRINT INS with timing and synchronisation at the micro-second level. **SPRINT provides subsea timestamp to laser system**

+

Syrinx DVL providing individual beam level velocity data – maintain bottom lock and tracking with reduced beams

OR

INS can compensate each individual Syrinx DVL beam for heading, pitch, roll which removes some of the drift rate errors

Sub centimetric 6G acoustic ranges with rich, low level, quality metrics that can be used online and in post processing

Janus extremely powerful forwards – backwards post processing optimised for laser mapping

All-in-one skid – pre-calibrated

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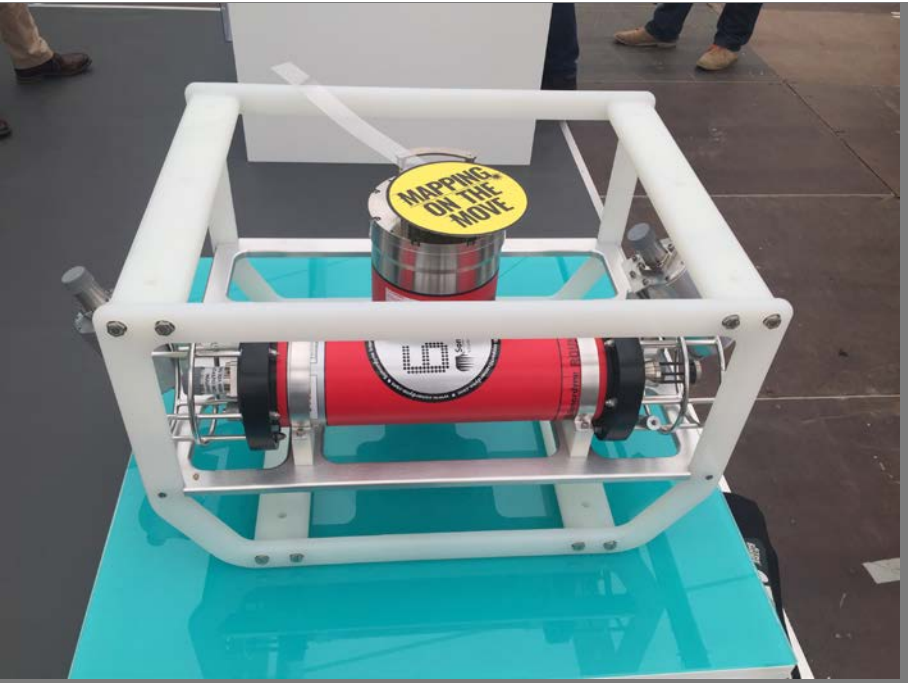
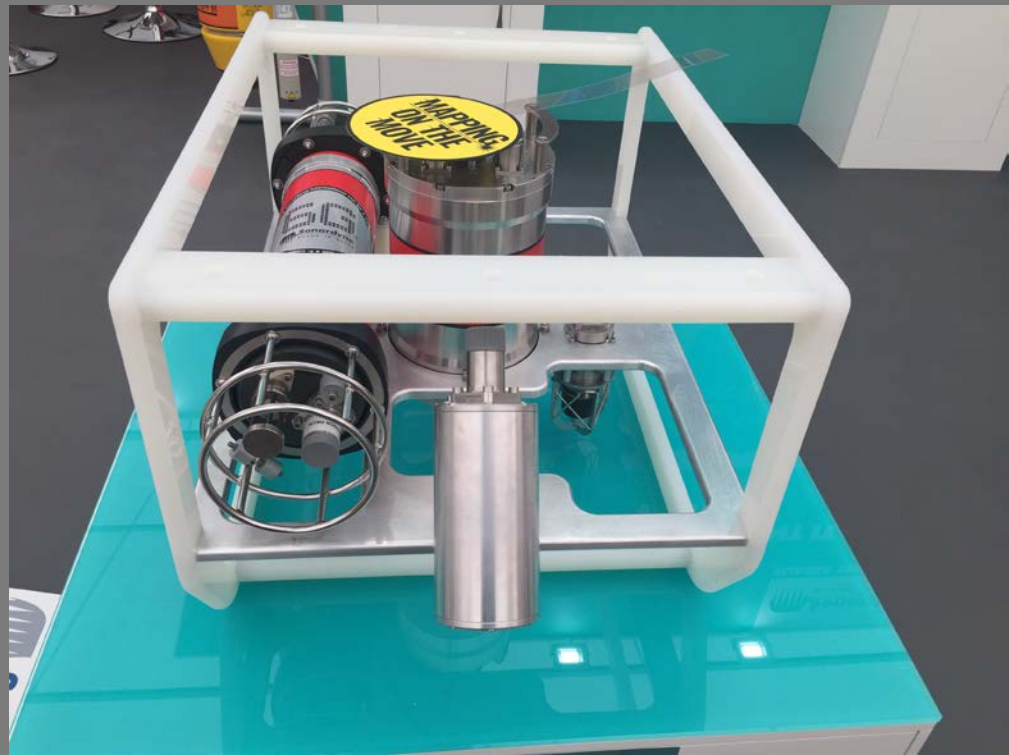
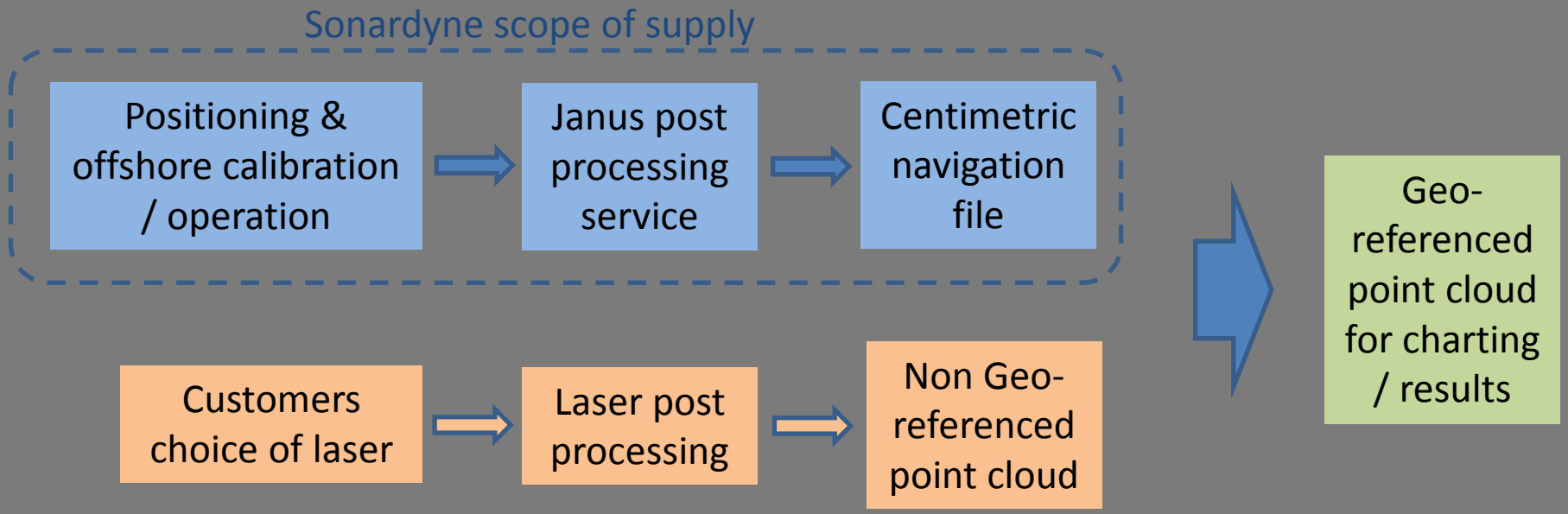


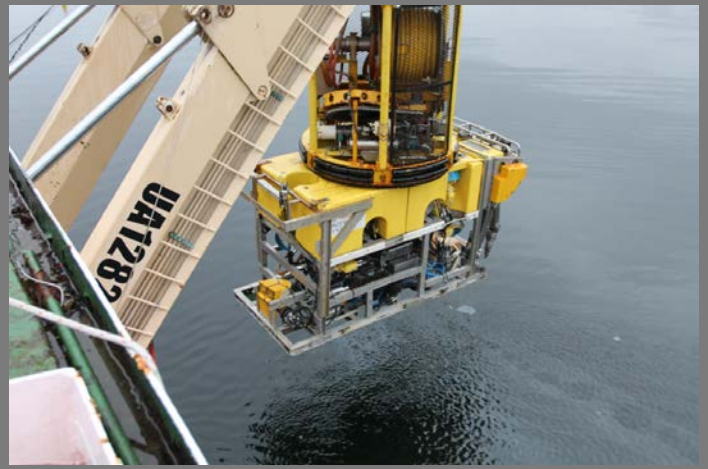


Sonardyne provides the positional data required

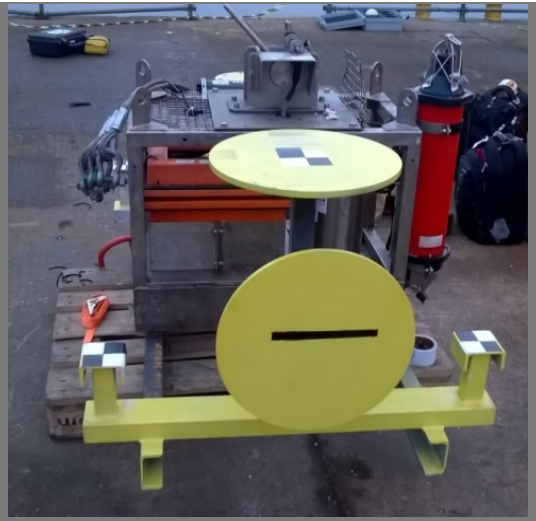
- Sonardyne supplies the positioning equipment and can also supply specialist LBL / INS offshore engineers

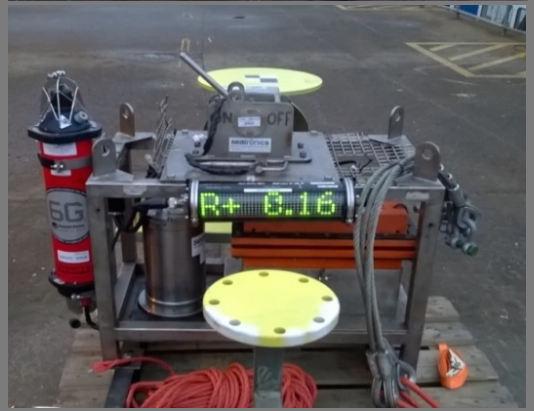


Worksite

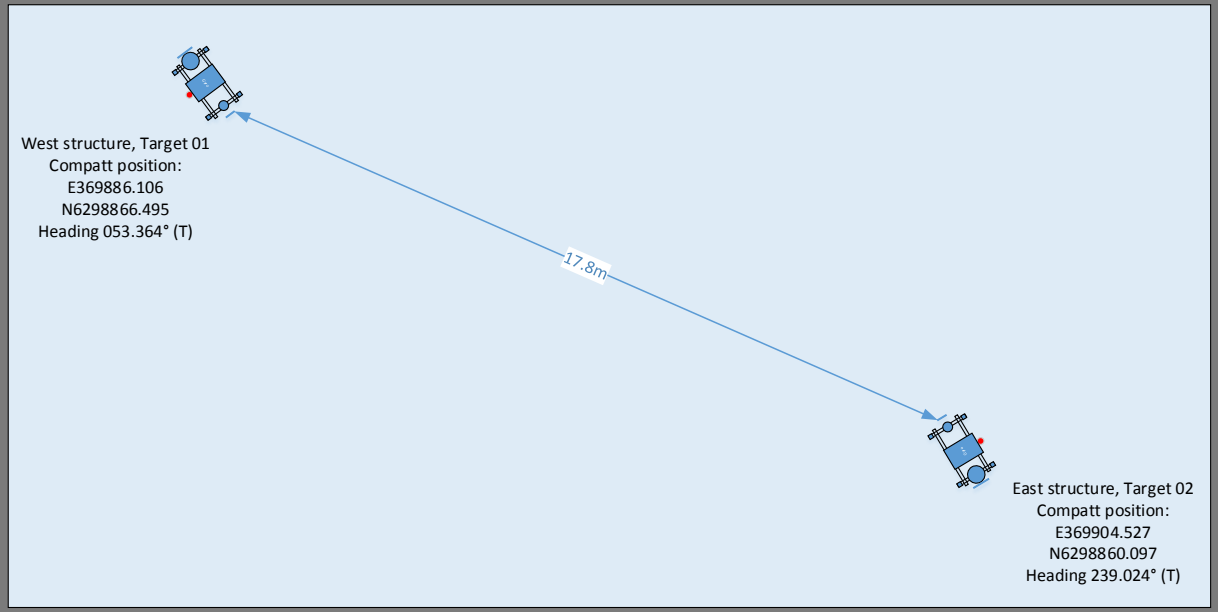


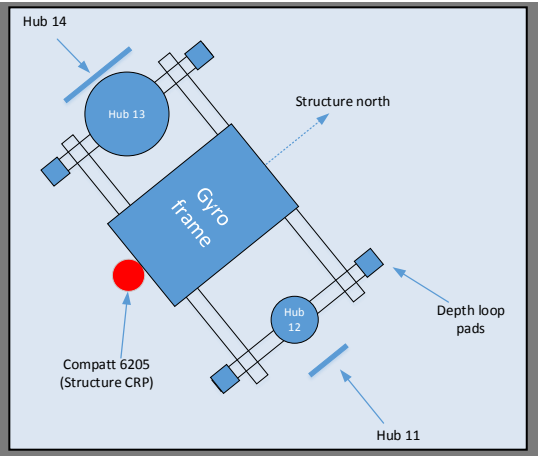
Seabed deployment

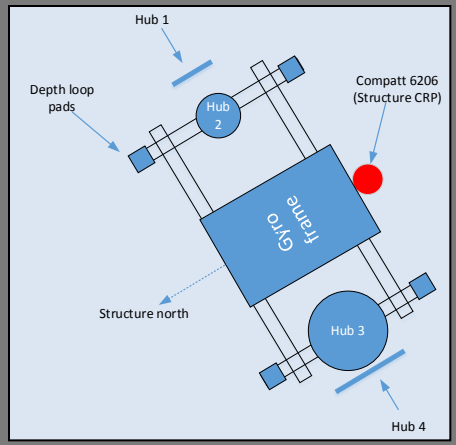




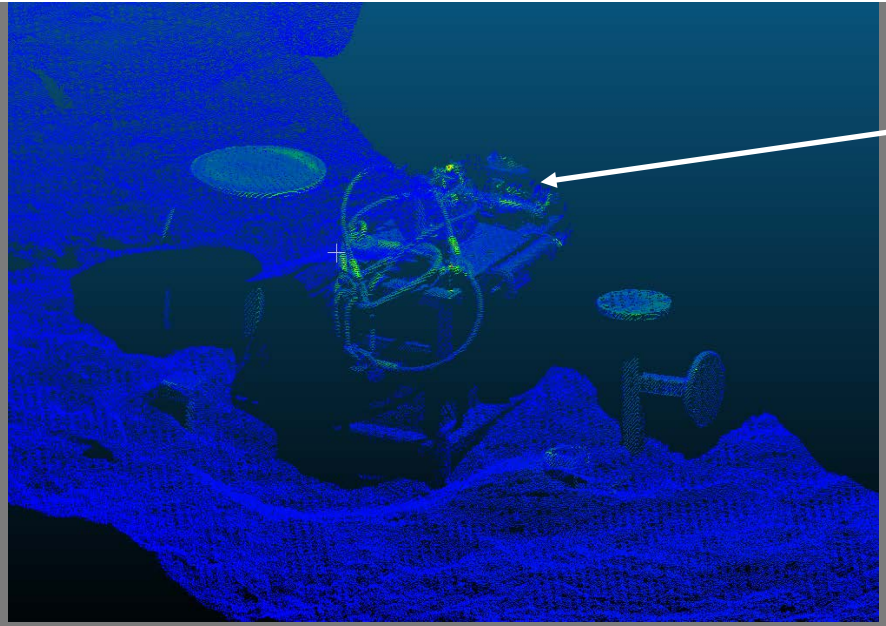
Seabed deployment



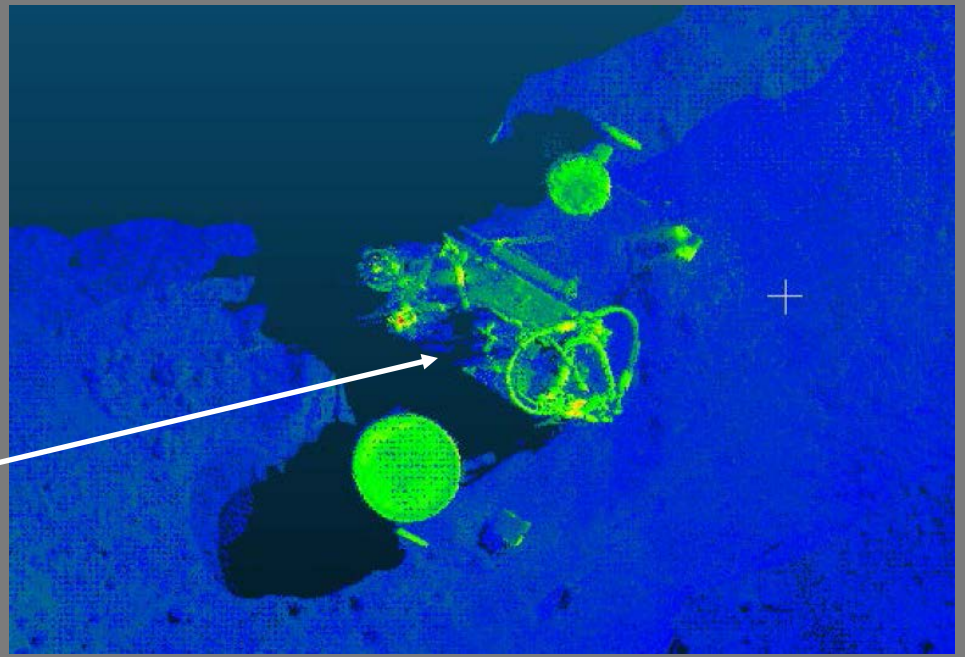




Point cloud images – pseudo structures



Point cloud from single run



2 runs overlaid on top of each other

Point cloud fly through – pseudo structures

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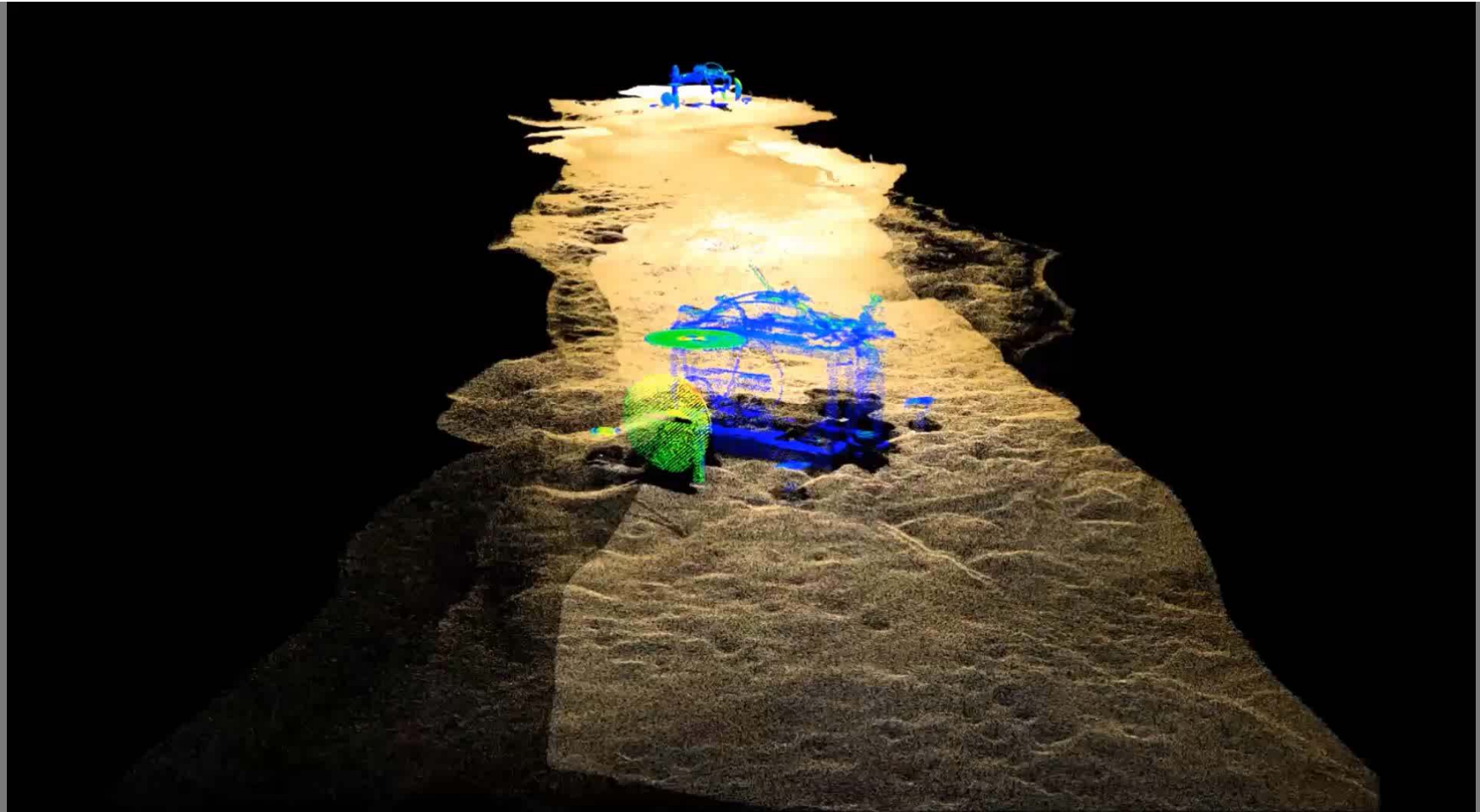
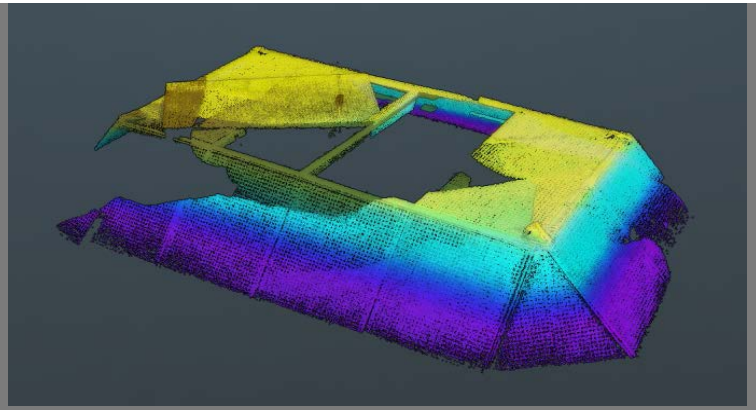
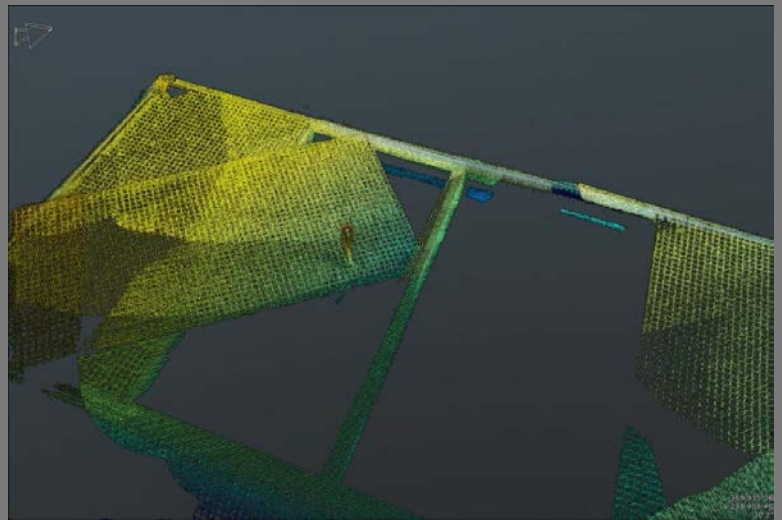
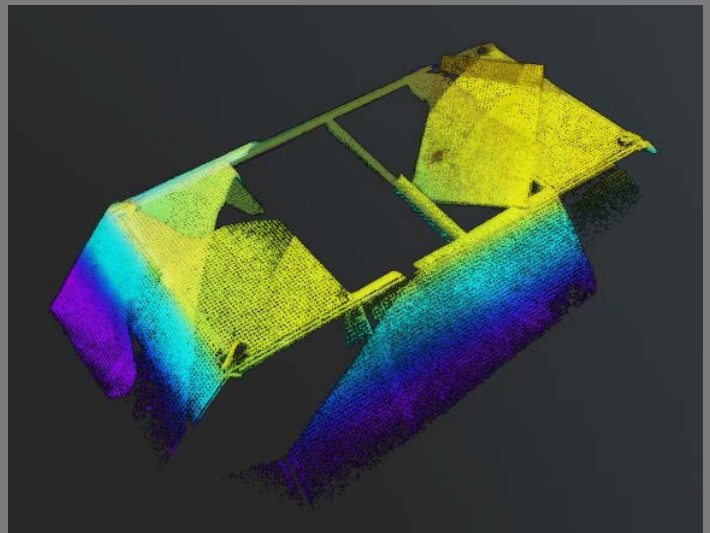


Point cloud images – existing structure at TUC







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“Despite the extreme conditions and not being able to carry out our full program, results are within metrology tolerance of the truth…”

Track record highlights – who is using it…

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DEEPOCEAN

MBARI Monterey Bay Aquarium Research Institute

UTEC

DCF Subsea

McDERMOTT

2G ROBOTICS

NOAA

seatronics

adus DEEPOCEAN 3D INTERACTIVE SUBSEA SURVEYS

Track record - MBARI

MBARI Monterey Bay Aquarium Research Institute

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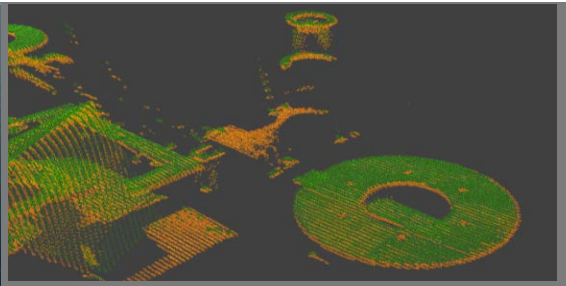

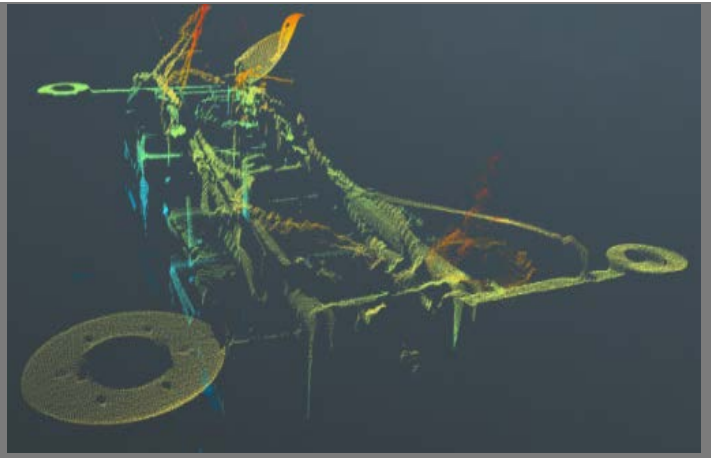

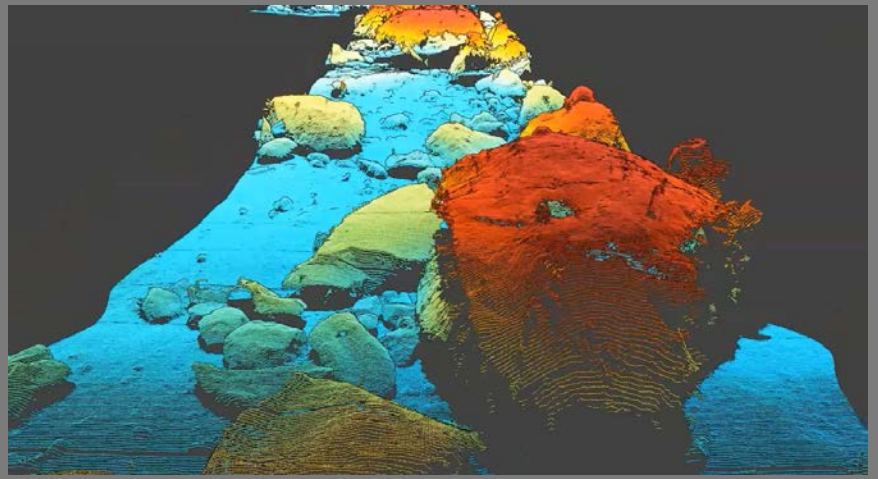

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“Using Sonardyne SPRINT-Mapper underwater mobile mapping, including metrology, is achievable to the required level of accuracy…”

What's possible - virtual real world assets…

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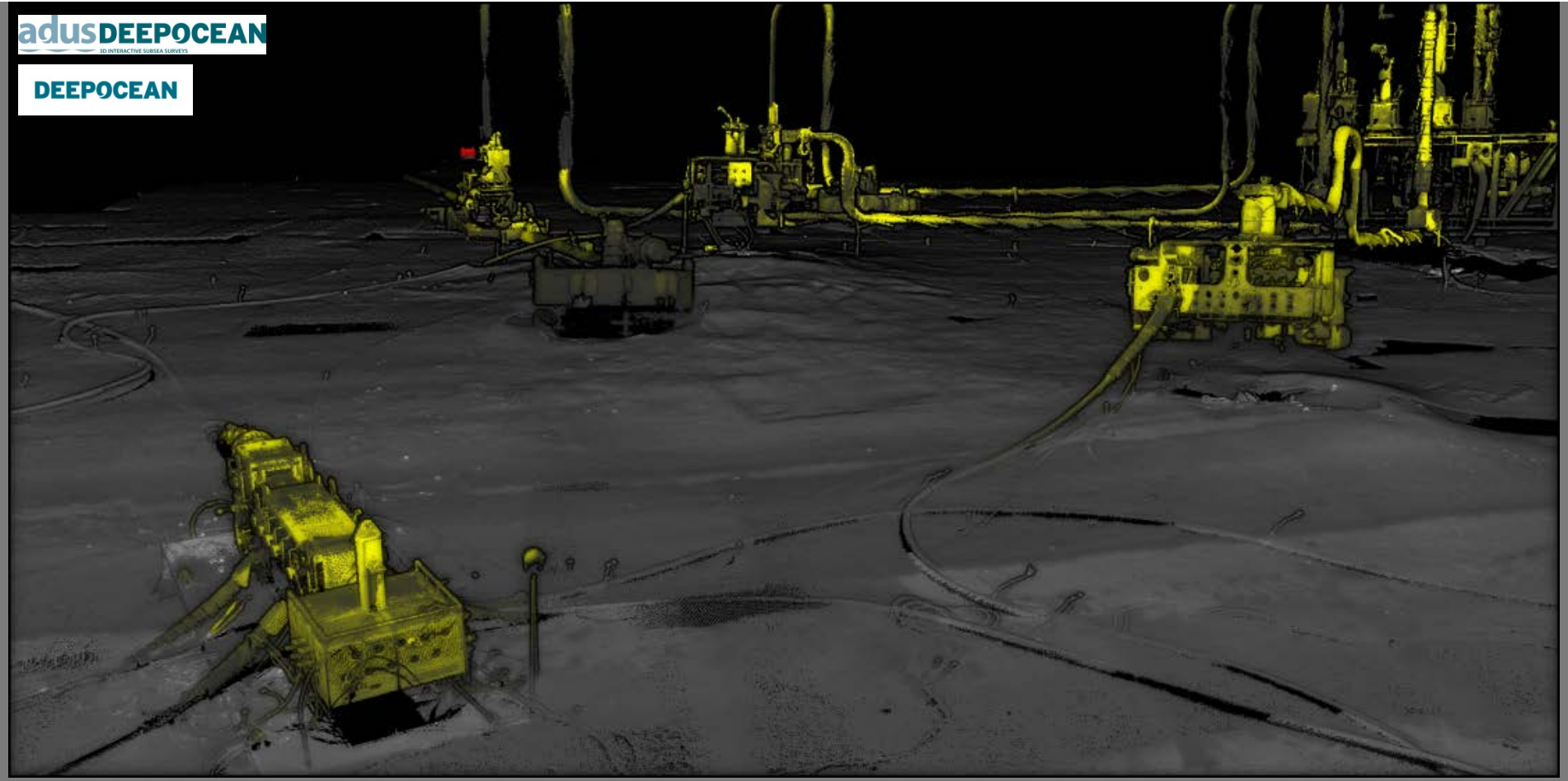

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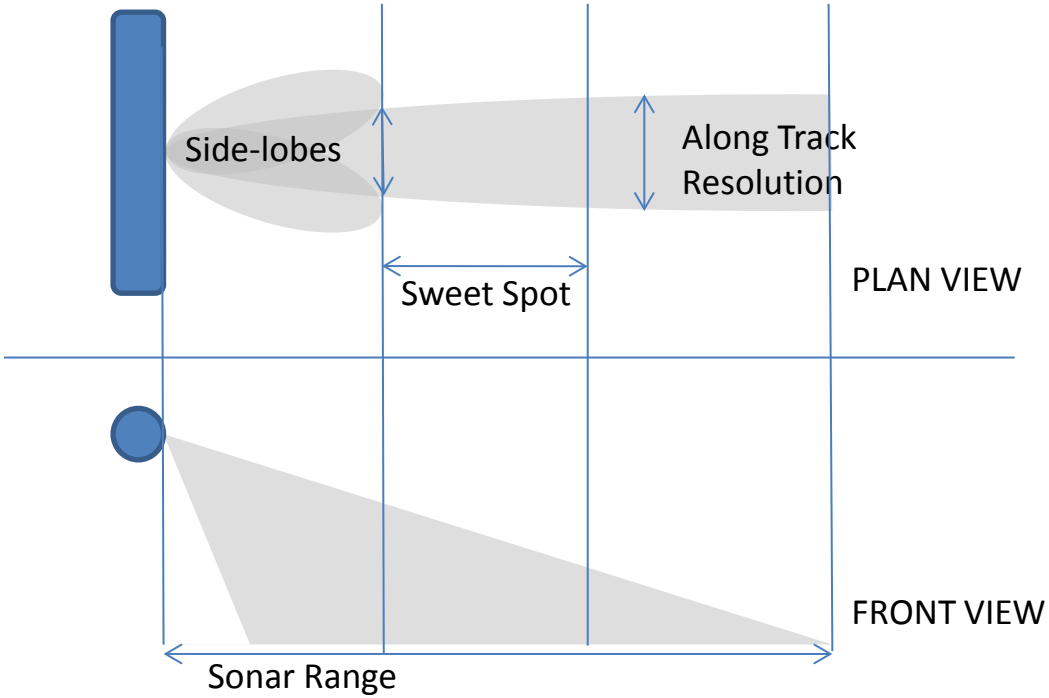
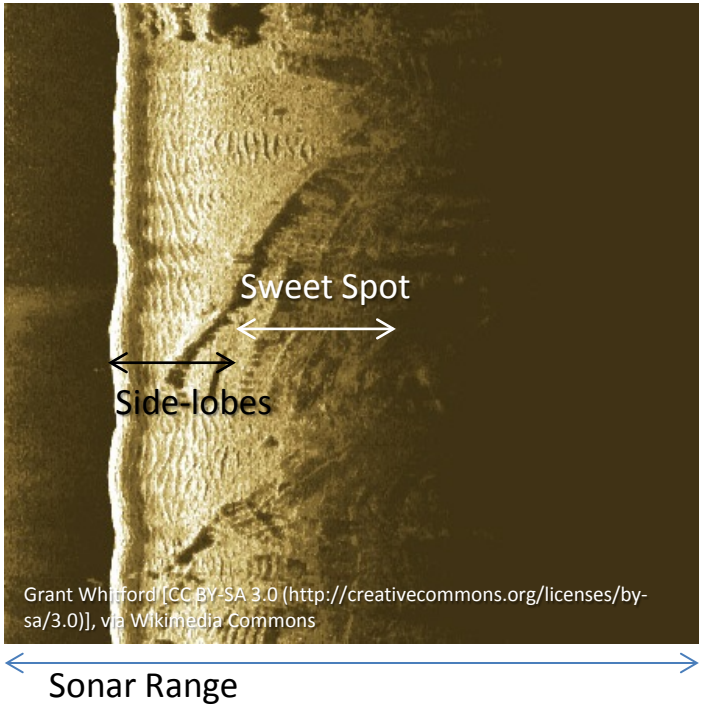
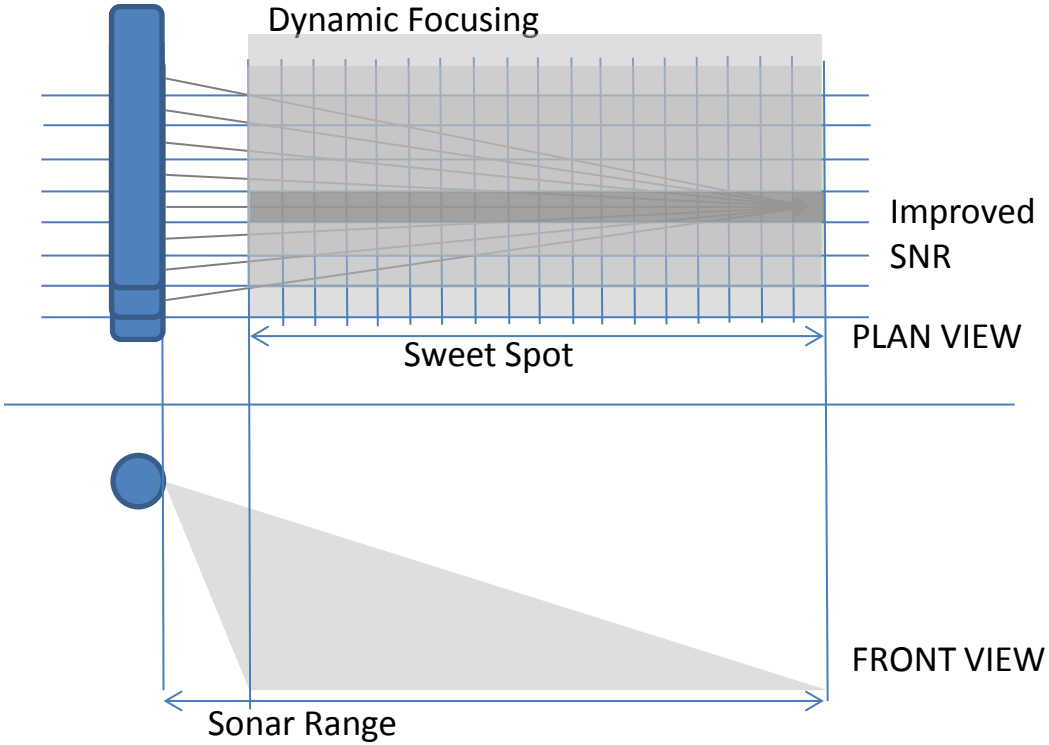
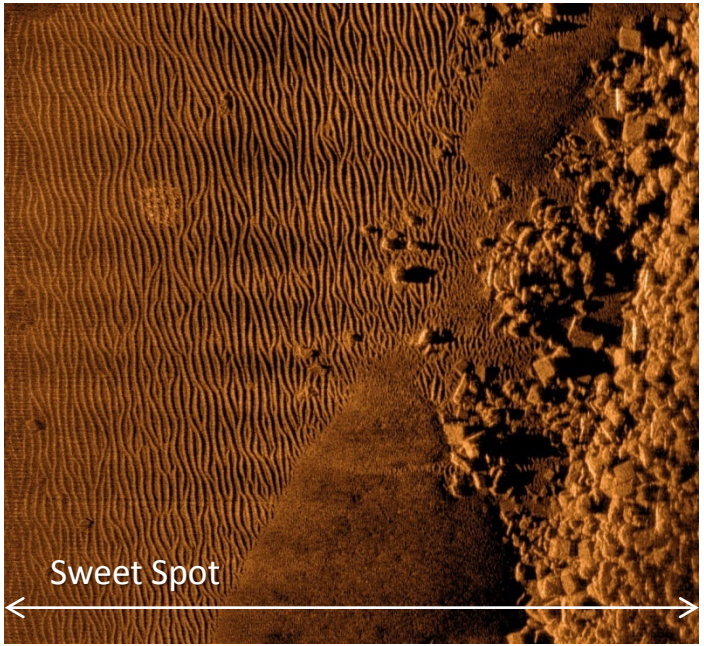
Multi Aperture Sonar for Low-logistic AUVs





Multi Aperture Sonar for Low-logistic AUVs





Best in Class Along Track Resolution 0.15°

Multi Aperture Sonar for Improved MCM Using Low-logistic AUVs

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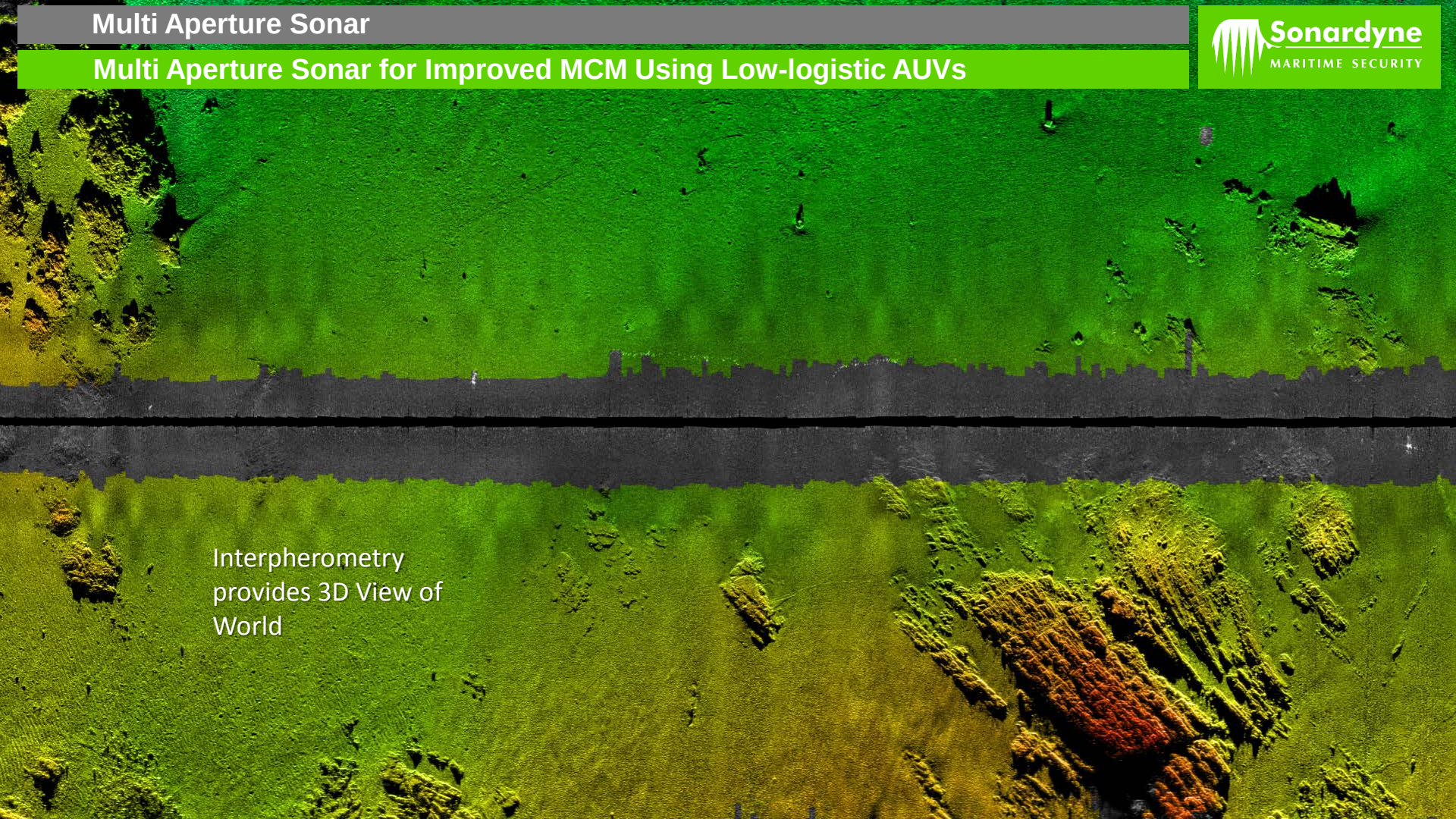

Multi Aperture Sonar Ultra-High Definition at Long Ranges

Multi Aperture Sonar for Low-logistic AUVs

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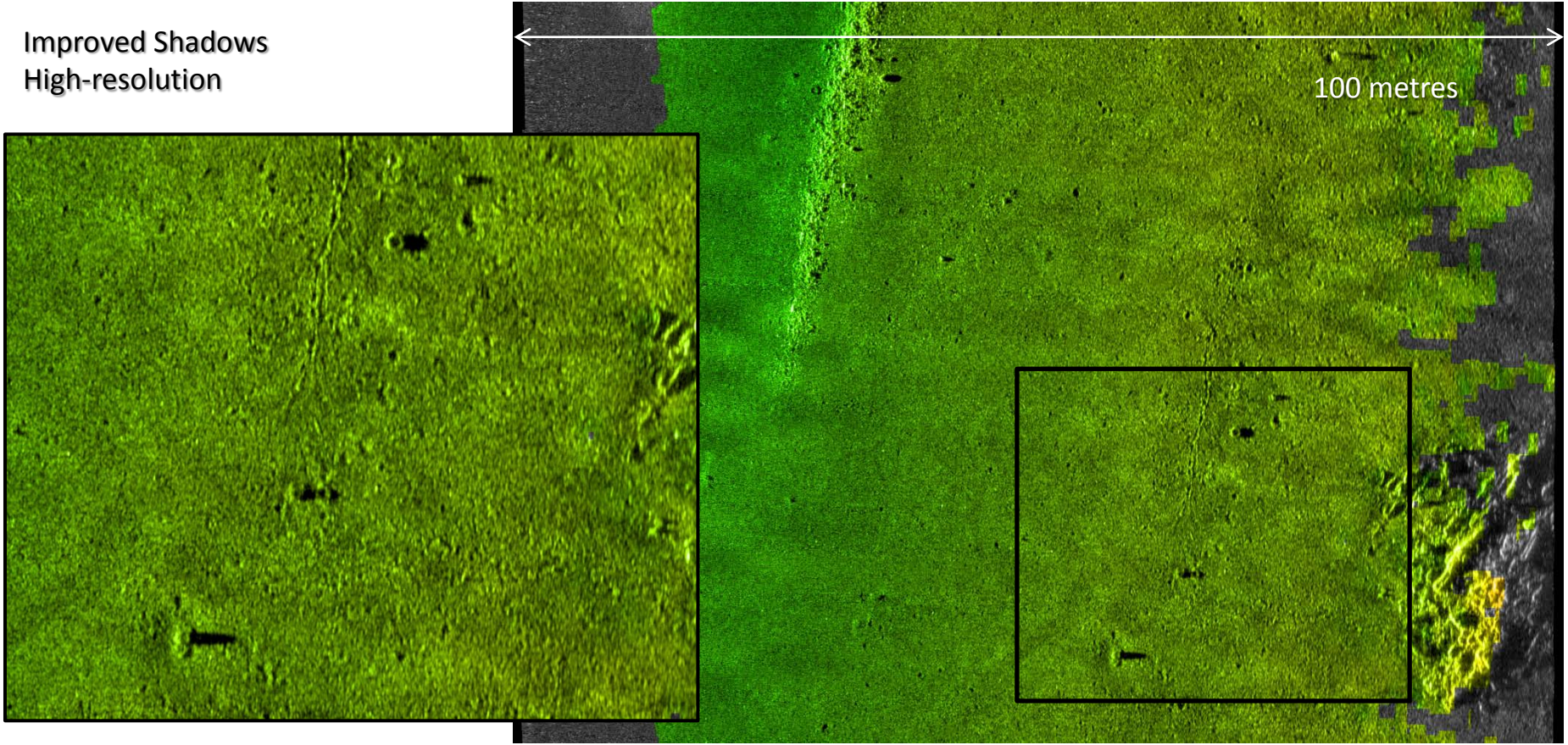
Improved Shadows
High-resolution



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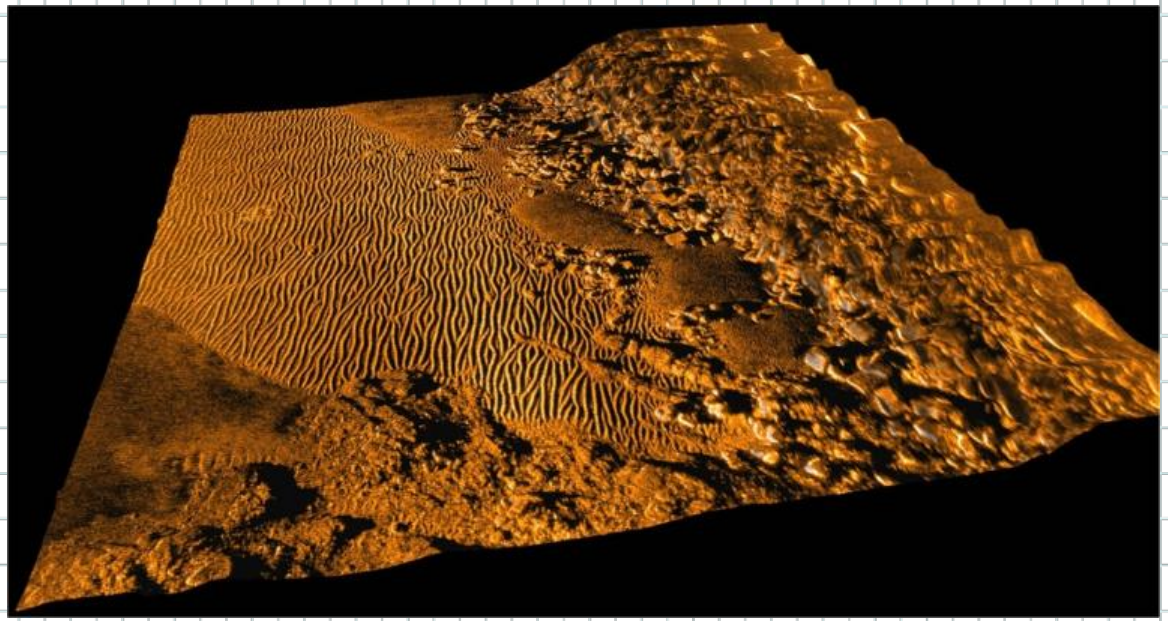
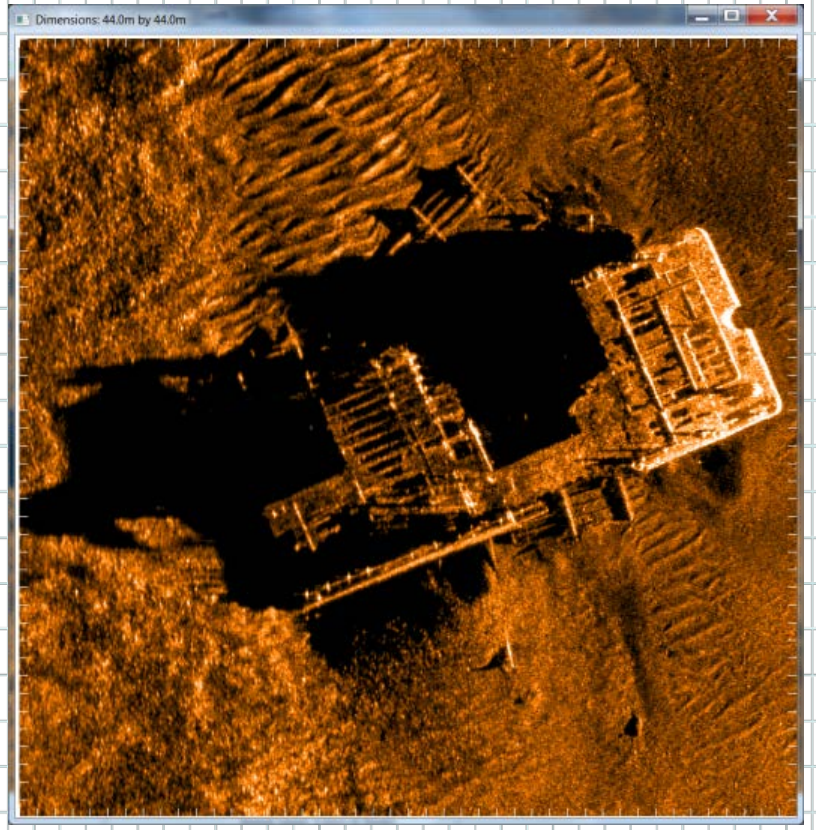
- Creates 3D terrain map co-registered with side-scan
- Seeking to evaluate performance of bathymetry against IHO standards



Solstice

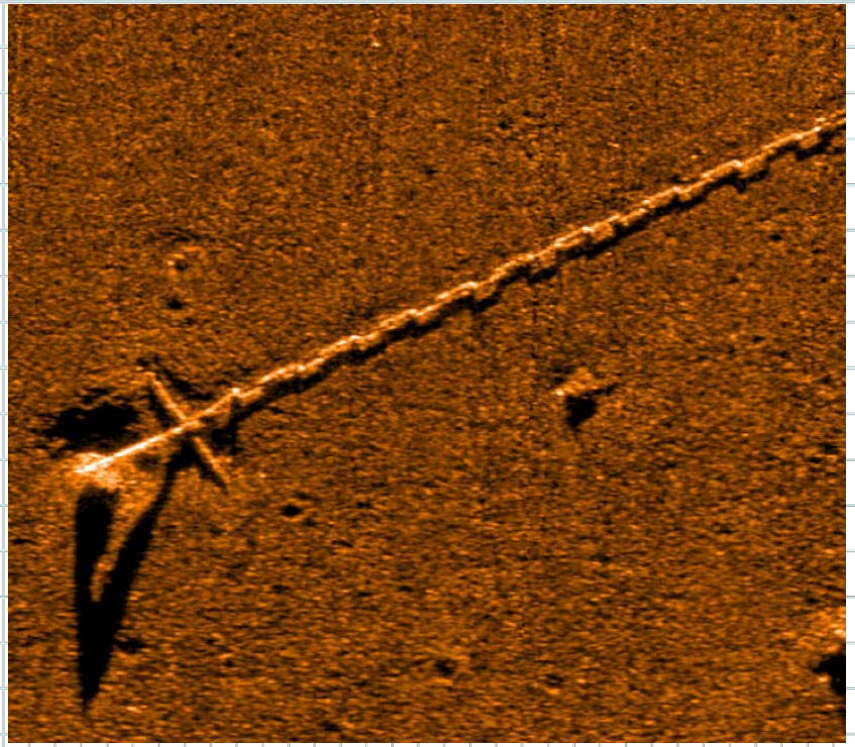
- Results from Solstice 3000 on a Bluefin 12 AUV
- Trials conducted in Boston Harbour in May 2014
- Image shows a sunken barge



APSS - Solstice

Pipeline, template and mattresses; scouring on seabed due to cable movement

- Seafloor 25 m x 22 m area with ship anchor at 40 m range.



Solstice Sonar

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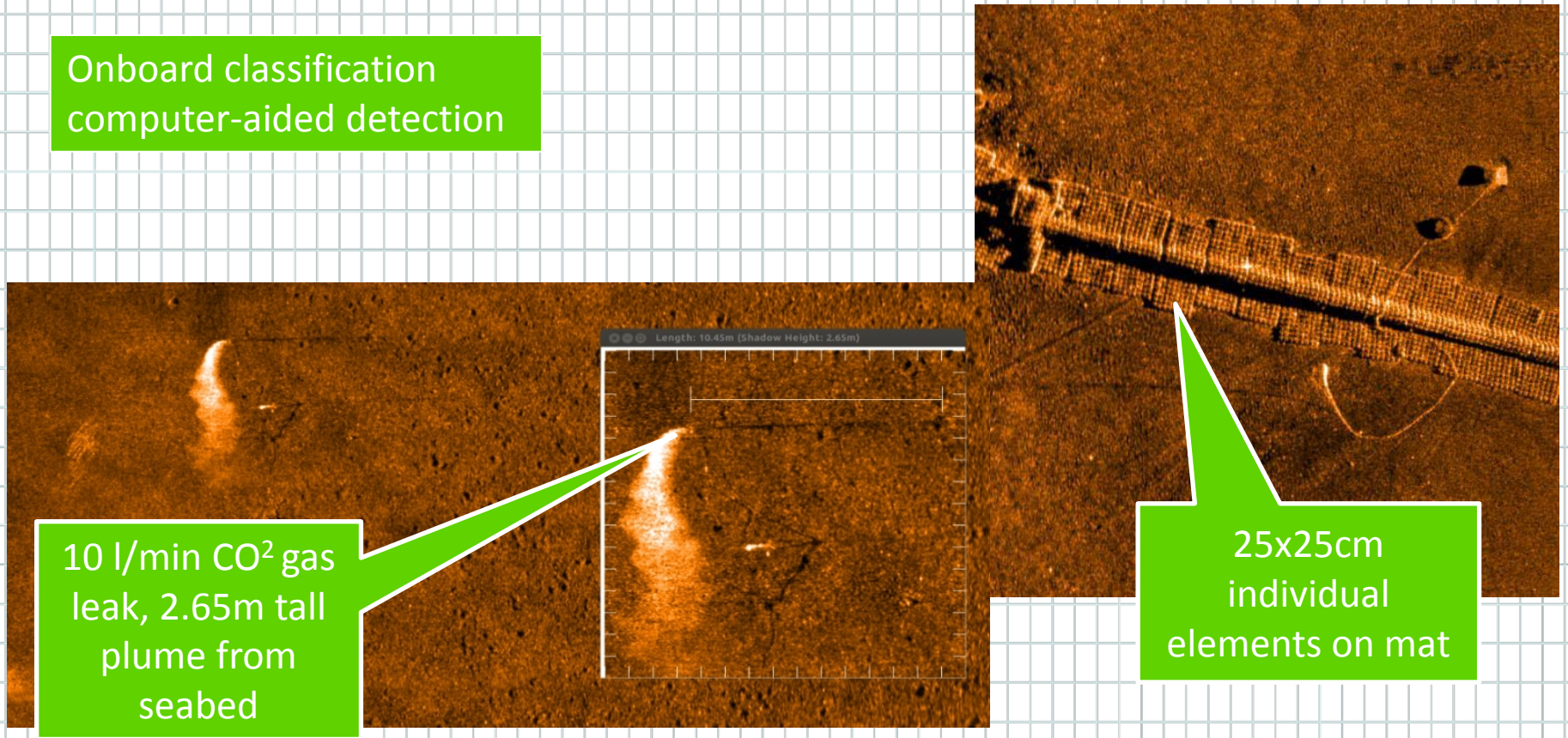
Onboard classification computer-aided detection



Solstice

Bathymetry View

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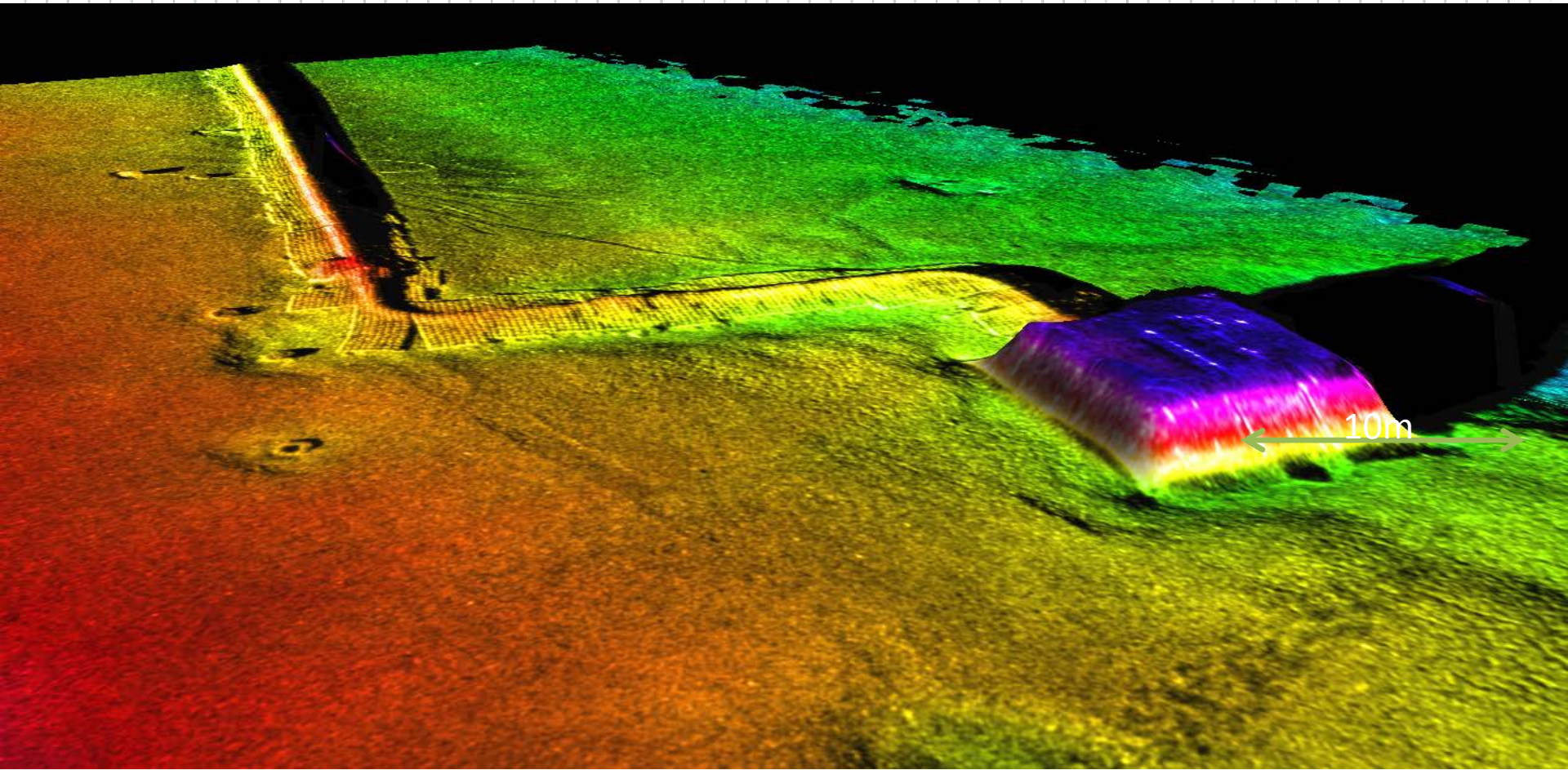

Solstice

Sunken Liberty Ship - JAMES EAGAN LAYNE

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Max Depth: 24m (79 feet)
Location: 50°19.54N; 4°14.65W
Length: 130 metres (427 feet)
Description: 7,000 ton US Liberty Ship, hit by a torpedo from a German U-boat near the Eddystone reef. The James Egan Layne was towed towards Whitsand Bay near Plymouth in order to save the cargo. However, on the way back, her stern collapsed causing her to sink.

Solstice

Key Technology Features

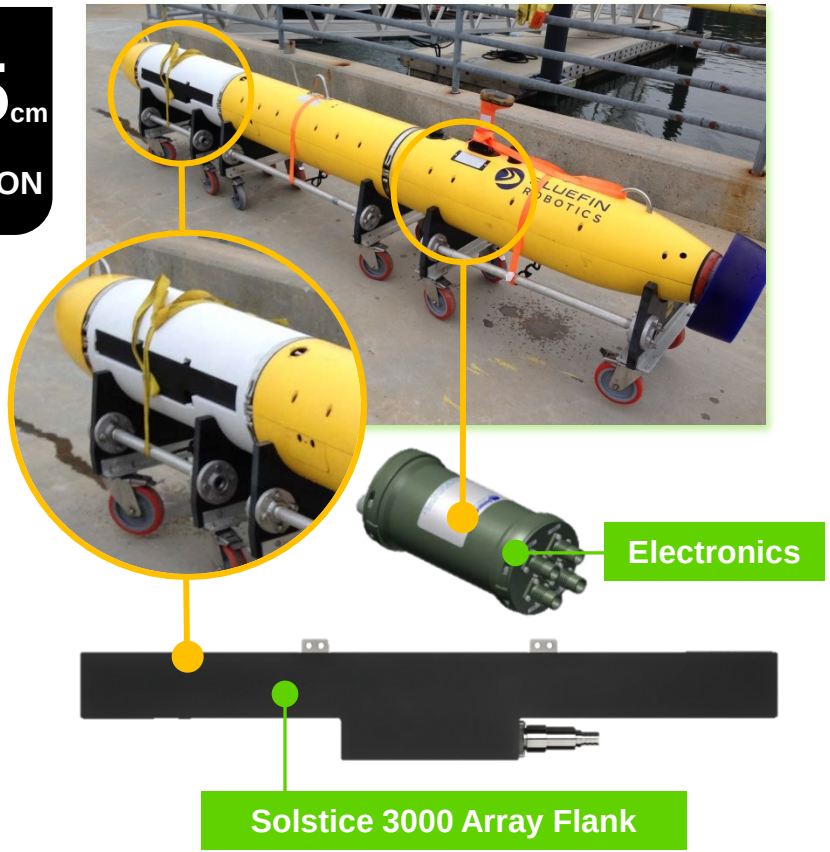
200M SWATH

10W POWER

100% COVERAGE

3.75cm RESOLUTION

- Solstice is a new generation of search and classify side-scan sonar with integrated swath bathymetry
- High-fidelity images are created using a back-projection beamforming technique to focus at every single pixel in the image.
- Very low power to maximise AUV mission time with optional real-time mode for use on tethered vehicles
- Real-time array calibration is used to dynamically re-calibrate each individual hydrophone element several times a second to compensate for any dynamical strains causing array non-linearity



Solstice

Mine Counter Measures

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SUBSEA TECHNOLOGY

Subsurface imaging for navigation and obstacle avoidance

POSITIONING
NAVIGATION
COMMUNICATION
MONITORING
IMAGING

Surface & Subsurface Vessel Navigation

Are your vessels always heading in the right direction?

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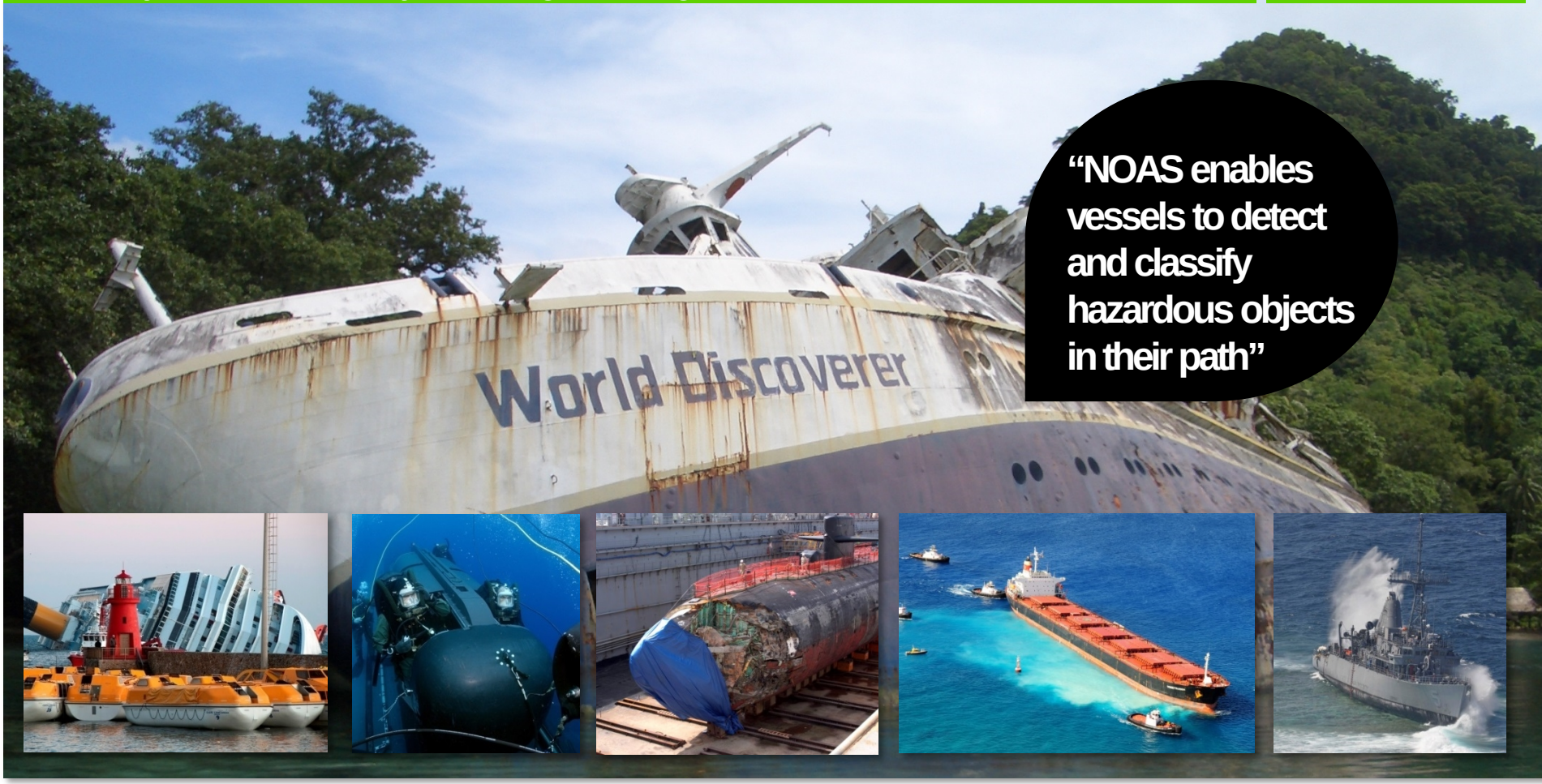

"NOAS enables vessels to detect and classify hazardous objects in their path"

NOAS - Key Technology Features

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1500M SONAR NAVIGATION

600M 3D NAVIGATION

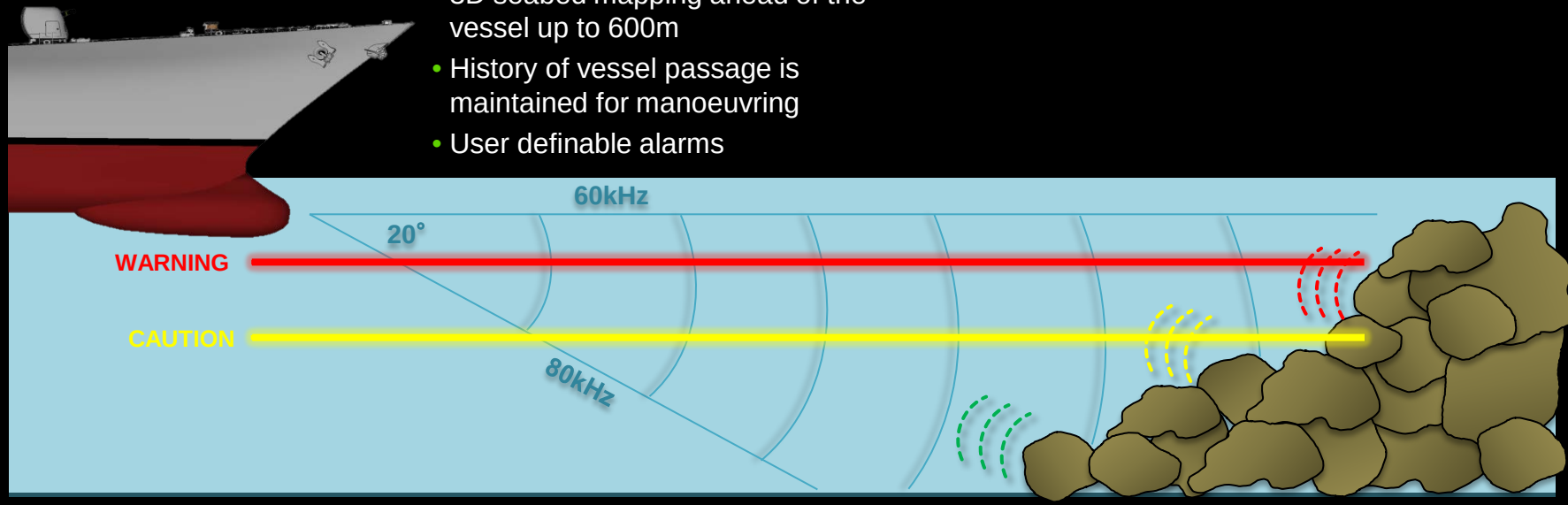
50M MAX DEPTH

90deg AZIMUTH

70kHz OPERATING FREQUENCY

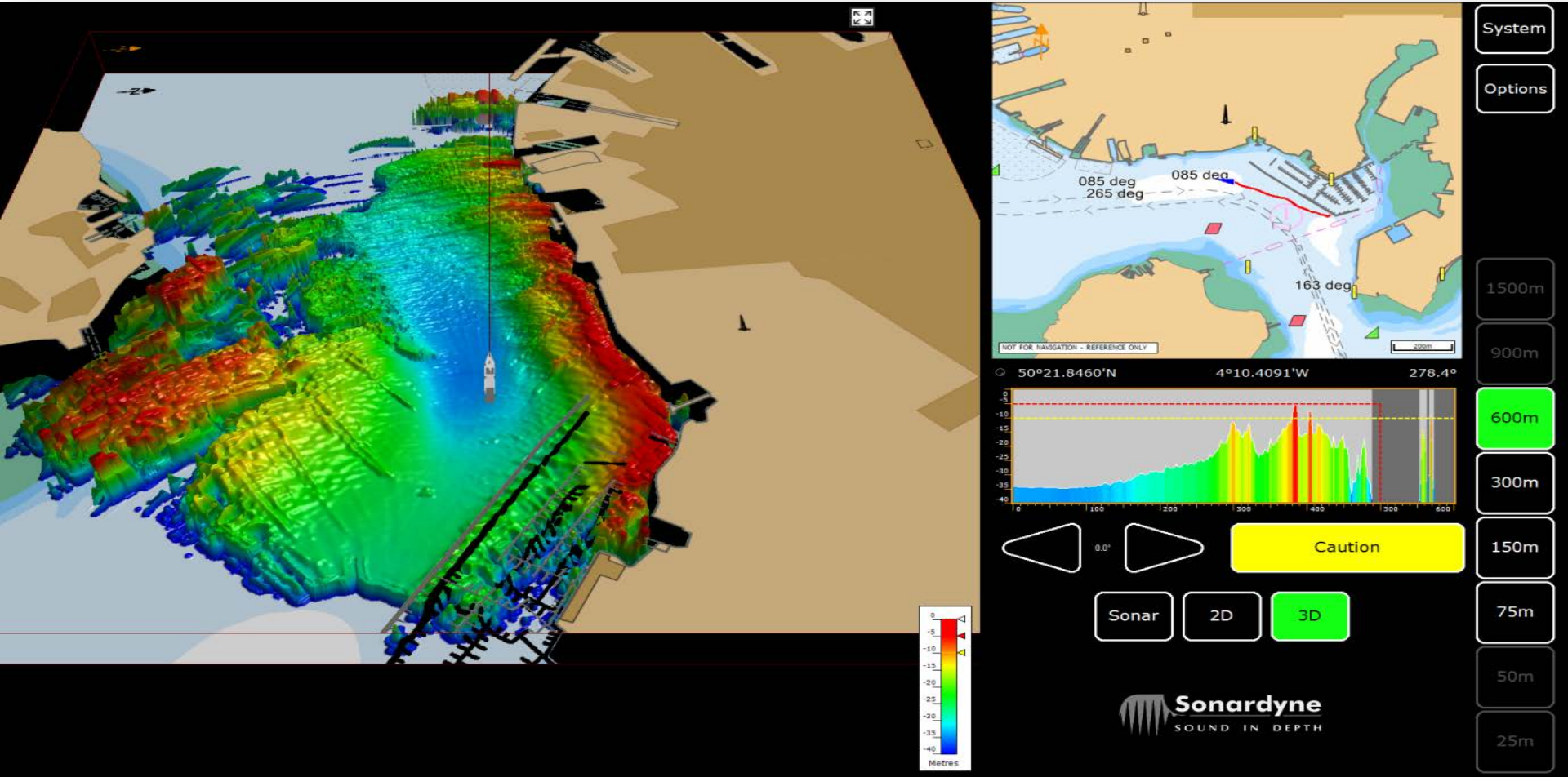
180° INTRUDER DETECTION

- 3D seabed mapping ahead of the vessel up to 600m
- History of vessel passage is maintained for manoeuvring
- User definable alarms



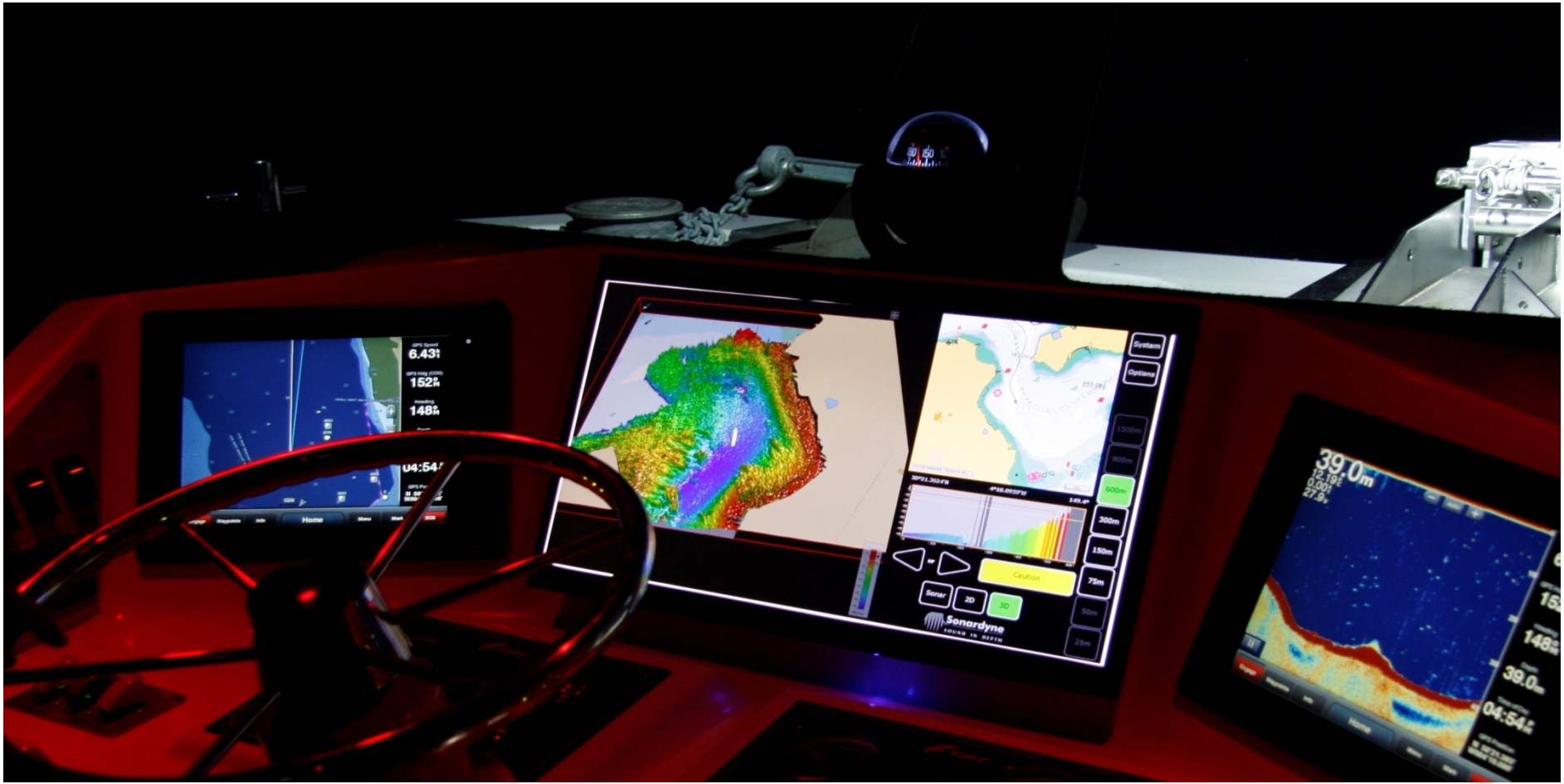
Vessel Navigation

NOAS – User Interface – 3D DEPTH Mode



Vessel Navigation

NOAS – Remote Bridge Display



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Navigation and Obstacle Avoidance Sonar (NOAS)

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SUBSEA TECHNOLOGY

Thank you for your time today
Any questions?

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