



OCEAN INFINITY
SEABED INTELLIGENCE

An effective approach for wide area detailed seabed mapping

Busan, 15th November 2017

11/15/2017

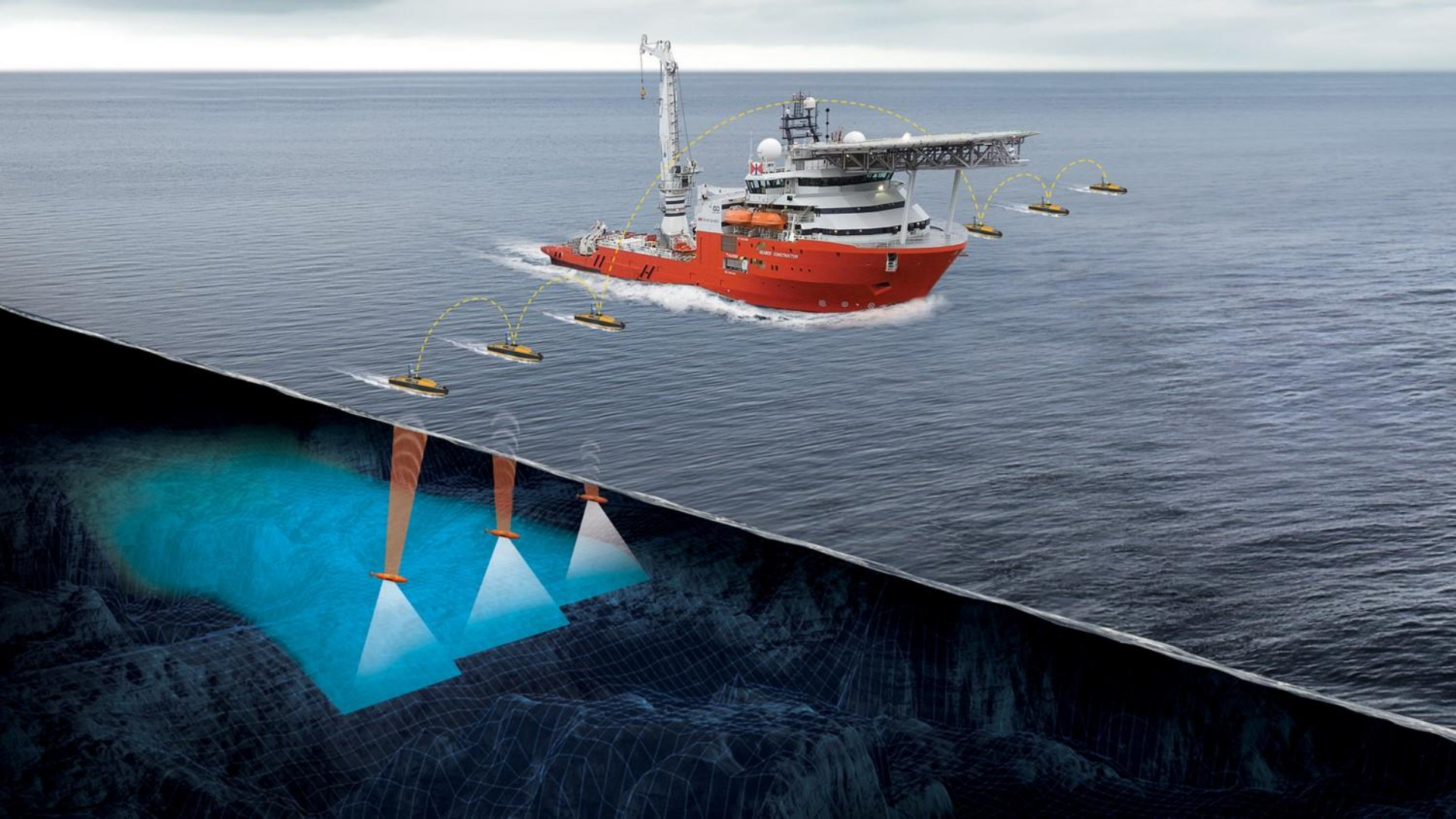
Ocean Infinity & Partner



**WE OPERATE WORLDWIDE
COLLECTING
HIGH RESOLUTION
SURVEY DATA
FROM THE SEABED**

Proving a comprehensive seabed exploration system for water depth down to 6000 meters consisting of 6 (8) AUV's and 6 (8) USV's from one host vessel.

Ocean Infinity is partnered with Swire Seabed who owns and operates the vessel, does all project management, survey support, processing and reporting.



4 Months Ago



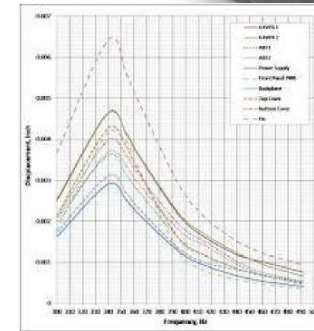
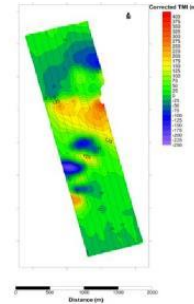
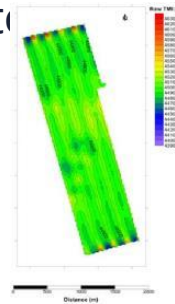
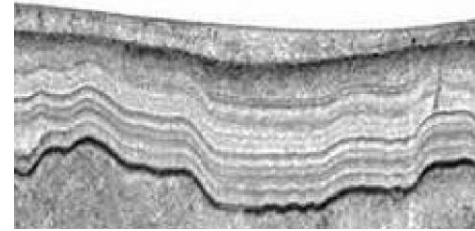
SURVEY EQUIPMENT

Hugin 6000



Sensors

- EM2040 Multi-Beam Echosounder
- Edgetech Sidescan Sonar
- Edgetech Sub-bottom profiler
- Catxh Color Camera
- Conductivity/Temperature/Depth (SAIV)
- Self Compensating Magnetometer



Unmanned Surface Vessels

UNMANNED



Telemetry

Radio Mesh

Acoustic HiPAP 502

Collision Avoidance

Radar

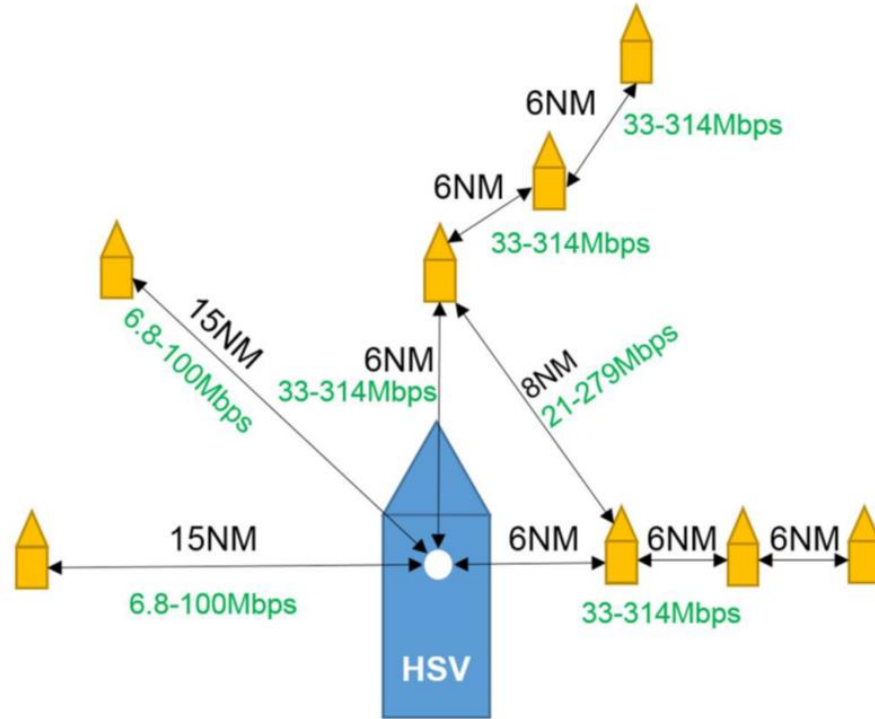
AIS

Warning / Stop Systems

Daylight Camera

Thermal Camera

Radio Telemetry



VESSEL SYSTEMS

Seabed Constructor

Seabed Constructor	
Design	MT 6022 MKII
Year	2014
Length	115.4m
Breadth	22m
Accommodation	102 PAX
Crane	250 Tonne AHC
Moonpool	7.2m x 7.2m
Cargo Deck	1300 m ²

HOST SURFACE VESSEL



Launch and Recovery Systems



AUV STINGER

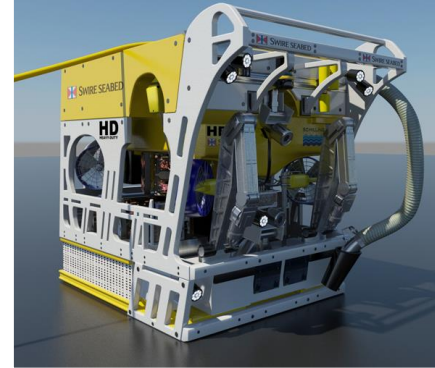


USV DAVIT
L&R & Painter Boom &
Popping nose cone for
recovery

Workclass ROV

Schilling HD

- Heavy Duty Work Class ROV
- 150 shaft horse power (shp)
- 5000 meter depth rating
- Schilling TITAN 4 & ATLAS 7R Manipulator
- Payload 200 kg



Kystdesign Supporter

- Work Class Deepwater ROV
- 150 shaft horse power (shp)
- 6000 meter depth rating
- TITAN 4 Schilling Manipulator (7 Function) & Rigmaster Schilling Manipulator (5 Function)
- Payload 200 kg



DATA MANAGEMENT AND PROCESSING CHALLENGES

HARDWARE SOLUTIONS



STORAGE

ALL-FLASH ARRAYS

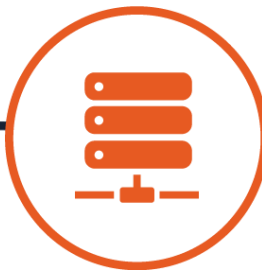
- Reliability, performance and instant access to huge data sets.
- The storage on-board the ship can handle **120TB** of generated monthly survey data, or over 600 average sized PC hard drives being filled up each month.



NETWORK

LOW-LATENCY SWITCHES

- Scalable network architecture
- The **160Gbps** backbone across the platform is equivalent to simultaneously transferring 100 high-definition movies every 30 seconds.



COMPUTE

HIGH-DENSITY SERVERS

- Deployed in building blocks, and joined together with virtualization to form a larger compute cloud.
- Each node is packed with the capability to run complex algorithms and image processing whilst independent enough to tolerate hardware failures.

Data Processing

Each AUV per 24 hours:

- 1 TB digital data
- 430.000 still images

Processing packages:

- Delph iXblue
- EIVA NaviSuite
- ESRI ArcGIS

Deliverables:

- SSDM format GIS data
- .bag compatibility
- Mosaic raster catalogs
- Field Reports

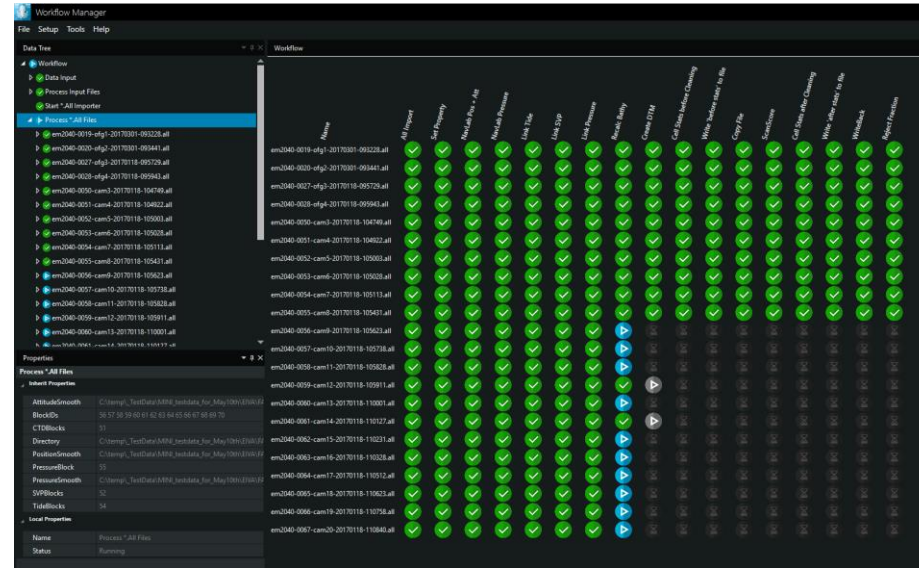
Turnaround production:

- Preliminary results within 24 hours after data on disk.

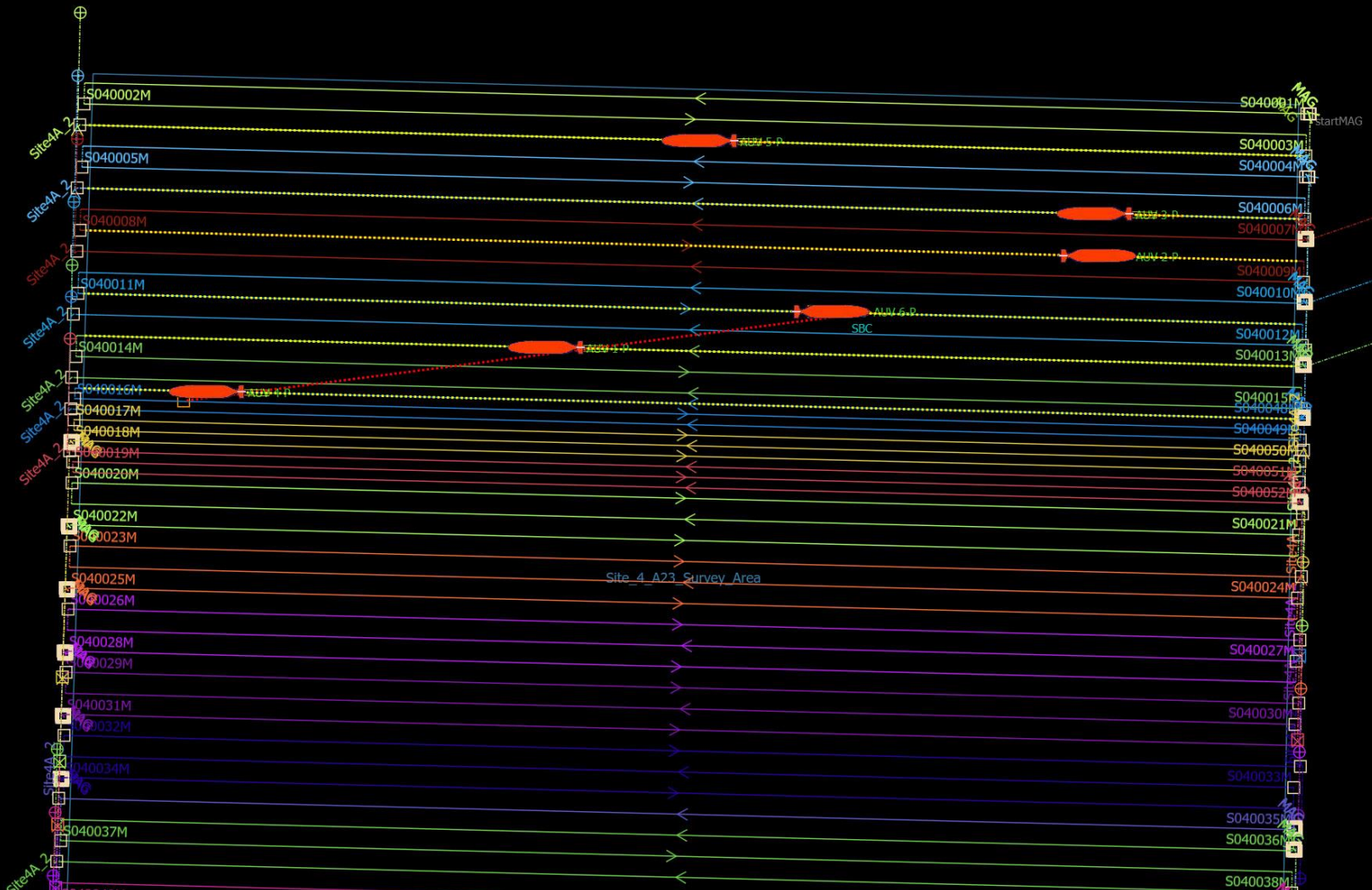


Automatic Data Processing

- Virtual machines set up on 7 workplaces; 3-5 monitors depending on use
- One virtual machine workplace is for the Eiva WFM user interface. This in turn remote controls one or more additional virtual machines.
- One data processor on shift dedicated to navigation and MBE basic processing only.
- Record so far is processing of 3 AUV dives in less than one 12h shift. Total of 125h of data.



MISSION PLANNING



Mission Planning

Simultaneous Mission Issues

- Maintenance management of multiple USV and AUV
- HSV position management to maximise radio telemetry to USV
- Payload management with multiple survey specifications
- Launch and recovery bottlenecks
- Emergency intervention

Simultaneous Mission Solutions

- Integrated maintenance schedule into MP software
- HSV mission planning component
- Payload command bank available pre-dive and mission simulator for payload settings QC
- Reactive planning learning from realtime L&R timing, intelligent launch staggering
- Emergency protocols for various emergency events

OPERATIONAL STATUS



WILSON CONSTRUCTION

WILSON

WILSON CONSTRUCTION
OCEAN SERVICES

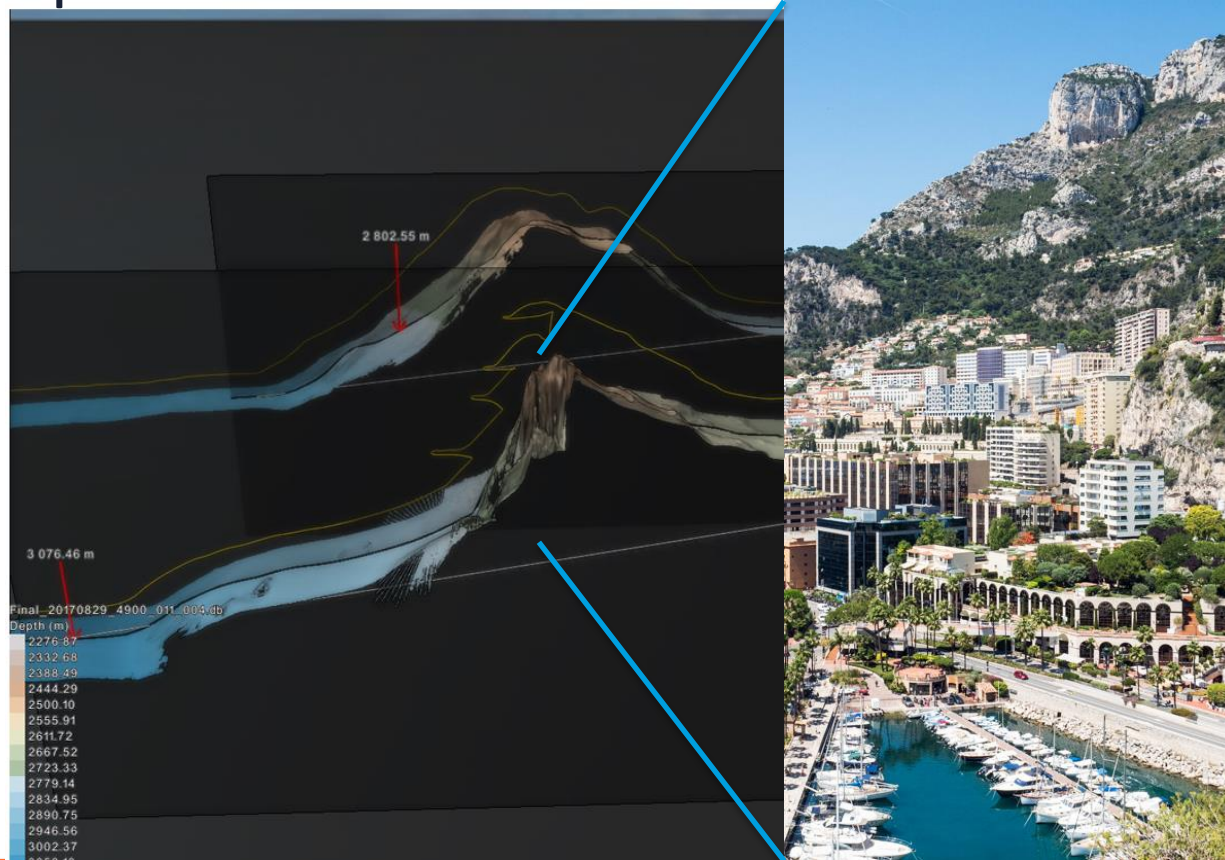
Operational Status

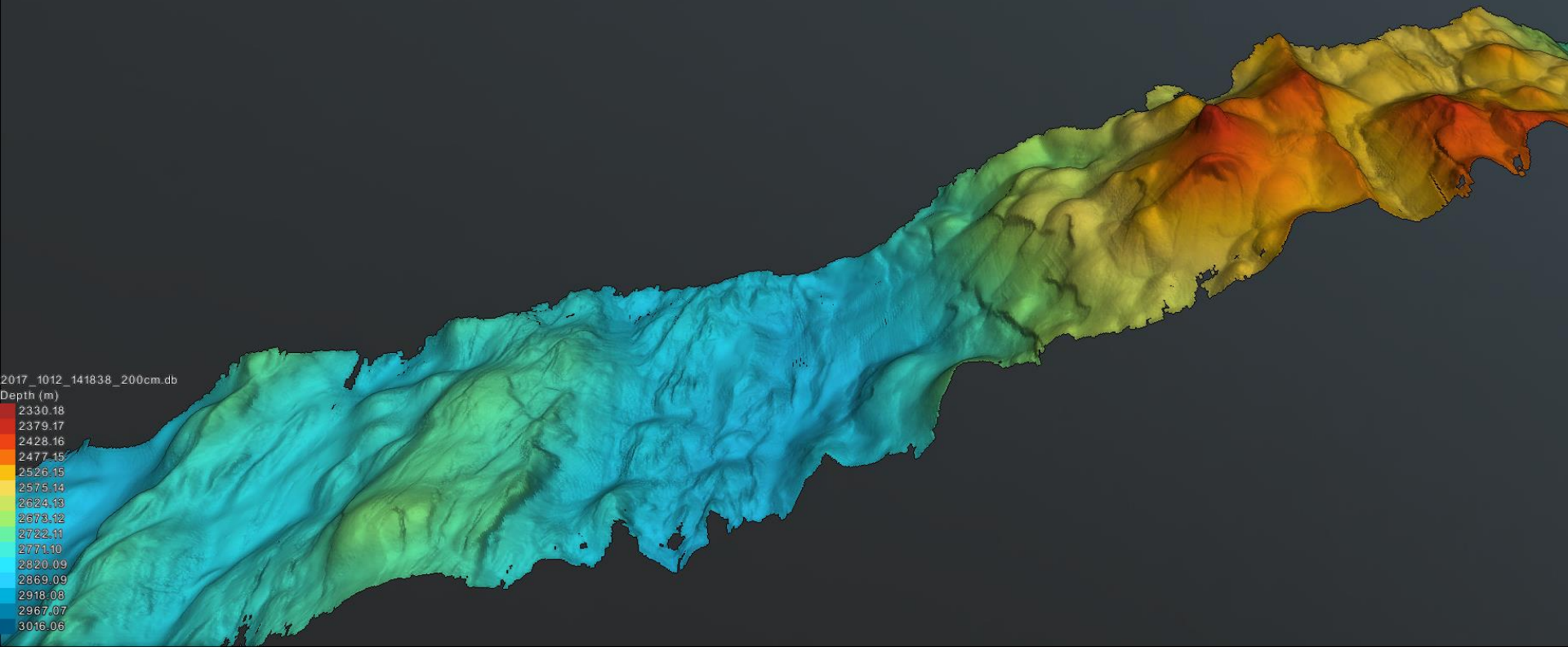
Performed 6 projects so far with the AUV solution:

- 1st project was the size of Singapore in 9 days; 1700 km². Primarily SSS and MBE data logged and processed within 24 hours
- Last project was 8200 km² in 10 days
- Longest dive 68 hours; average 45-54
- Longest distance 350 lkm
- 6 AUV's doing survey simultaneously
- Surveyed more than 25000 sq km in just a few months



Un-aided Operations



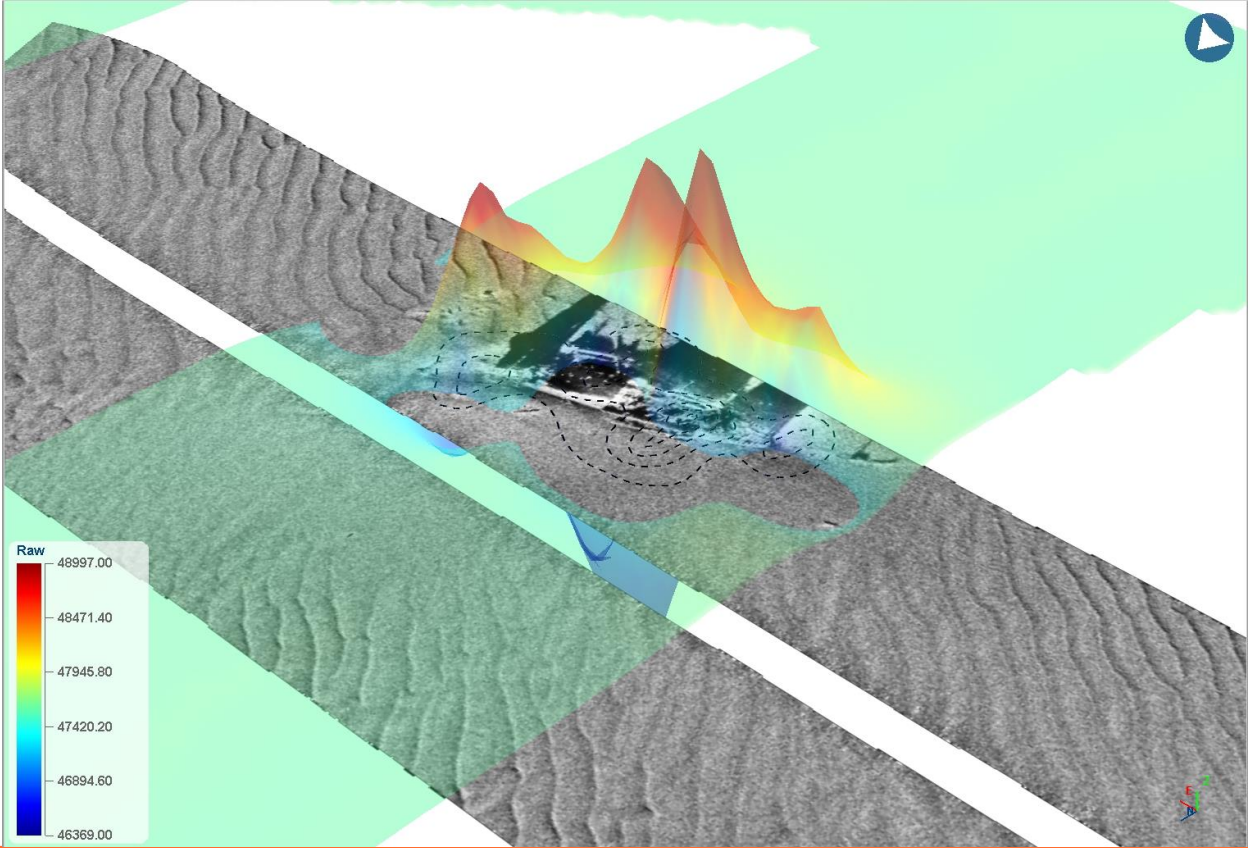


2017_1012_141838_200cm.db

Depth (m)

- 2330.18
- 2379.17
- 2428.16
- 2477.15
- 2526.15
- 2575.14
- 2624.13
- 2673.12
- 2722.11
- 2771.10
- 2820.09
- 2869.09
- 2918.08
- 2967.07
- 3016.06

Magnetometer Data



Thank you for your attention

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