



NG SURVEYOR

From Offshore Vessel to Advanced Survey Platform for Deep-Water Habitat Mapping

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Next Geosolutions

is a leading international marine survey contractor providing geoscience survey and offshore construction support services to the energy sector and the marine infrastructure industry.

Key Markets

We operate primarily in the following market sectors:



Submarine Cables



Offshore Renewables

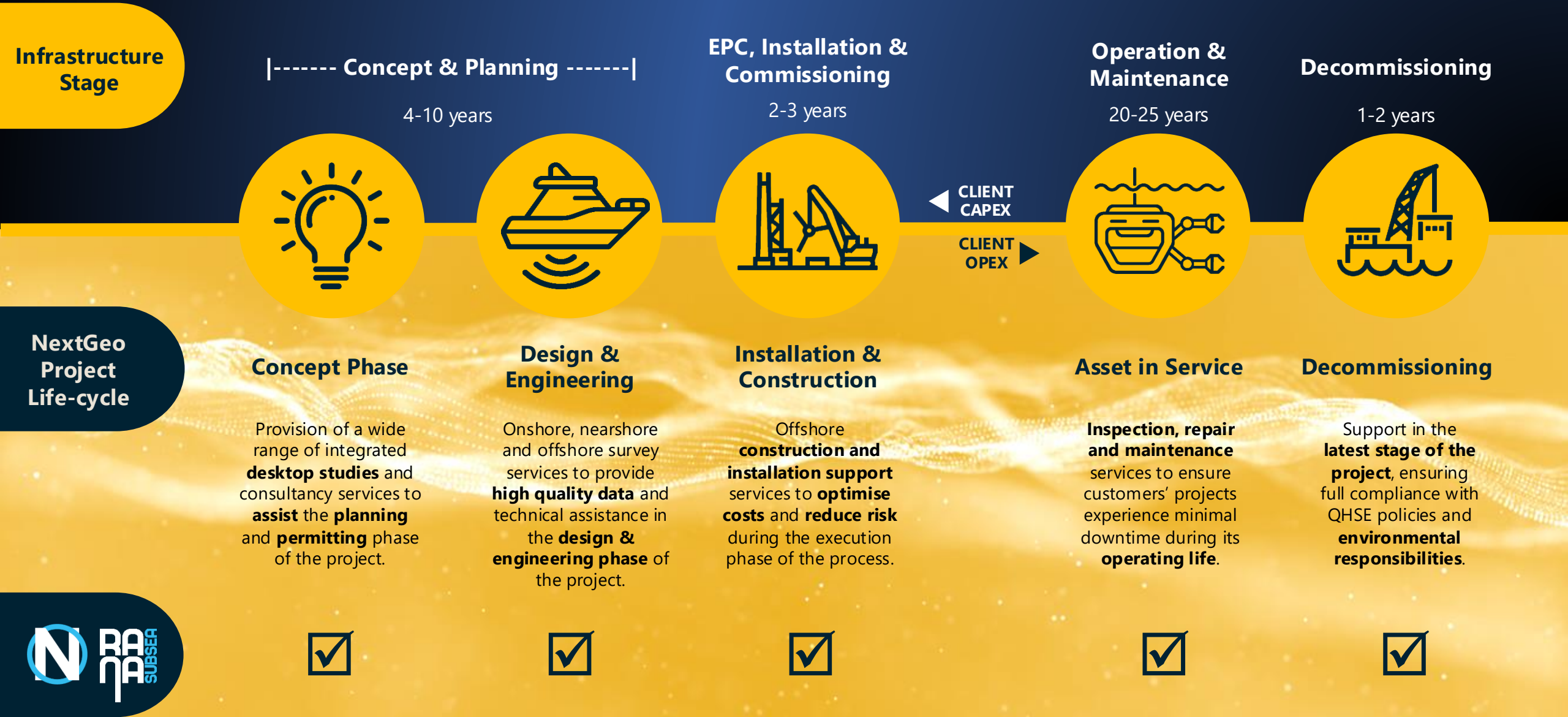


Oil & Gas



Other markets, incl. Defense, Science and Environment, Archæology, etc.

Covering the entire life-cycle of offshore infrastructures



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Vessel Introduction

NG Surveyor

Owned and operated by Next Geosolutions (NextGeo), the NG SURVEYOR is an offshore DP2 survey and ROV vessel. Italian flag, 65m LOA with 20t crane, moon pool, moon tubes, stern A-Frame and full ocean water depth sensors gondola mounded.



- Kongsberg class DP2 system
- Gondola-mounted Kongsberg high-spec full ocean depth survey equipment
- USBL system
- Stern A-frame
- SubSea Man-Riding 20t offshore crane
- Accommodation for 48 persons
- 500 m² deck area
- HS ROV 220Hp

NG Surveyor



3

Vessel Conversion

Why the conversion?

A single, reliable platform for multidisciplinary mapping from shallow water to full ocean water depth

Target

Large-area seabed mapping

Range

Under the MER initiative, investigating 79 seamounts and rocky outcrops up to 3000m water depth.

Integration

Multiple acoustic systems in the Gondola, ROV and Navigation & Positioning

Service

Hydrographic, geophysical and geotechnical/environmental data

Efficiency

Flexible missions and mobilisation constraints

ONE VESSEL · MULTIPLE SENSORS · ONE REFERENCE AND TIME BASE

Before conversion: vessel capability without survey optimisation

The main challenge was turning a multipurpose vessel into a controlled measurement platform



Baseline

- Multipurpose offshore support vessel
- No dedicated gondola
- Limited survey spaces
- No Sonar Room
- No A-Frame

Challenges

- Sensor location
- Gondola Analyses and fabrication
- Cable routing
- Space allocation
- Reference alignment
- Dedicated Network

The conversion made the vessel itself part of the survey system.

NG Surveyor: Kongsberg Systems

01

Seapath 385 + MGC R3 GNSS-AIDED INERTIAL NAVIGATION

Developed for hydrographic surveying, providing high-precision position, heading, velocity, roll, pitch, heave and timing. The MGC R3 is used as the primary gyro and motion reference.

02

K-Sync ACOUSTIC SYNCHRONISATION

Rack-mounted 12-channel synchronisation unit used to coordinate trigger, blanking and transmit signals between acoustic systems, supporting controlled simultaneous operation.

03

EM 304 MKII DEEP-WATER MULTIBEAM

Deep-water seabed-mapping system merging full-ocean-depth capability with high-resolution coverage. Operating frequency 20-32 kHz with max no. of beams per ping (Dual swath mode) 1600.
The NG Surveyor installation uses the 1° × 1° configuration

04

EM 712 MEDIUM-WATER MULTIBEAM

High-resolution seabed-mapping system designed to meet relevant hydrographic survey standards, with depth capability extending to approx. 3,000 m. It operates at the frequency range of 40 to 100 kHz with max no. of beams per ping (Dual swath mode) 1600. 0.5° × 0.5° configuration

05

EM 2040-04 MKII SHALLOW-WATER MULTIBEAM

True wideband, high-resolution shallow-water multibeam for detailed mapping and inspection. The modular system supports dual-swath operation and water-column acquisition. No. of beams per ping 1024 (Single RX, Dual Swath)

06

TOPAS PS18 SUB-BOTTOM PROFILER

Parametric sub-bottom profiler designed for very-high-spatial-resolution imaging, from water depths below 20 m to full ocean depth, with interfaces for navigation, motion and synchronization. Primary transmission frequencies 15–21 kHz

One vessel reference frame • One navigation solution • Coordinated acoustic transmissions

Gondola Philosophy

LOCATION · FLOW · MOUNTING · PROTECTION · MULTI-SENSOR INTEGRATION



01 Forward location

Select the forward hull area considering hull shape, aeration risk and practical cable installation.

02 Controlled mounting

Use a dedicated frame to secure the modules and maintain the required installation tolerances.

03 Laminar flow

Add a fairing around the transducers to promote smooth water flow and minimise aeration.

04 Bubble mitigation

The gondola helps prevent aerated water from blocking the acoustic path.

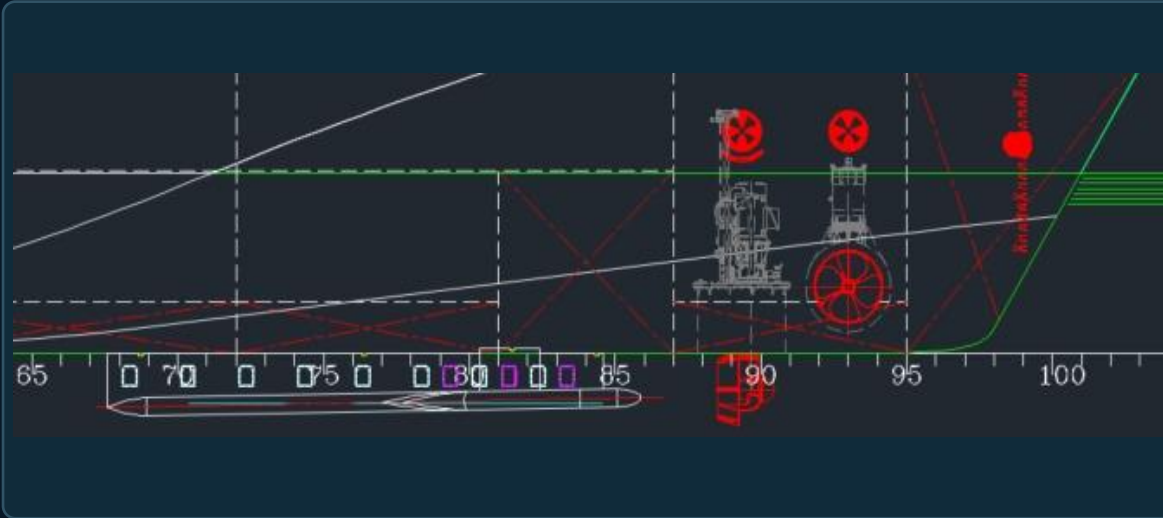
05 Multi-sensor platform

The gondola accommodates 3x MBES and 1x SBP transducers, plus other sensors

Objective: stable acoustic performance through correct location, hydrodynamic treatment and controlled installation

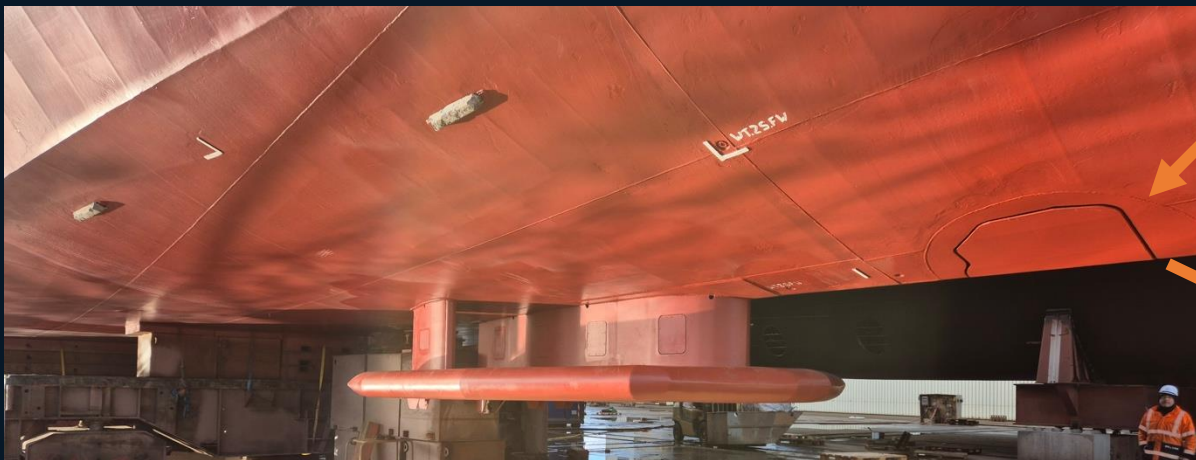
Sensor location and thruster configuration

The gondola arrangement is coordinated with the vessel hull and propulsion configuration



Bow Geometry and Gondola position (forward area)

- **Analysis of bow geometry**, as a bulbous bow can generate significant volumes of aerated water.
- **Dedicated transducer installation below the hull**, designed in accordance with local structural arrangements and hydrodynamic flow conditions.
- **Assessment of vessel machinery**, including engines, auxiliary equipment, pumps and compressors, which may induce noise and vibration.
- **Cable routing design** and integration for all gondola-mounted systems.



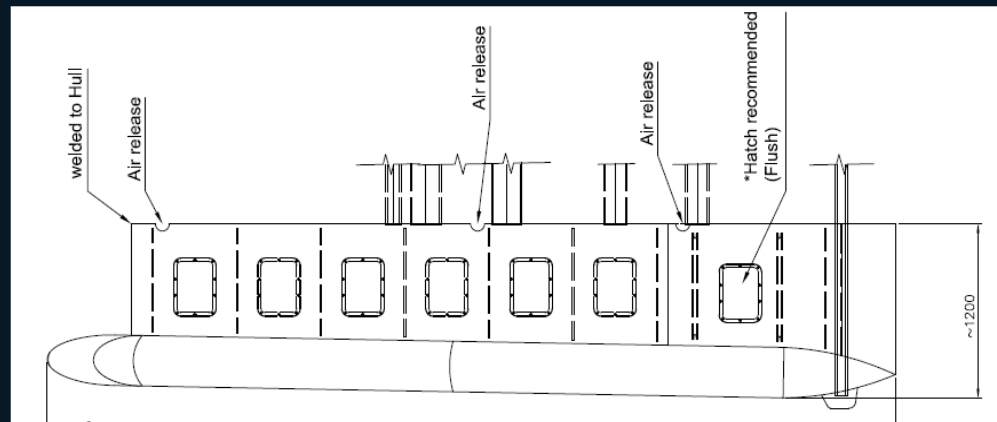
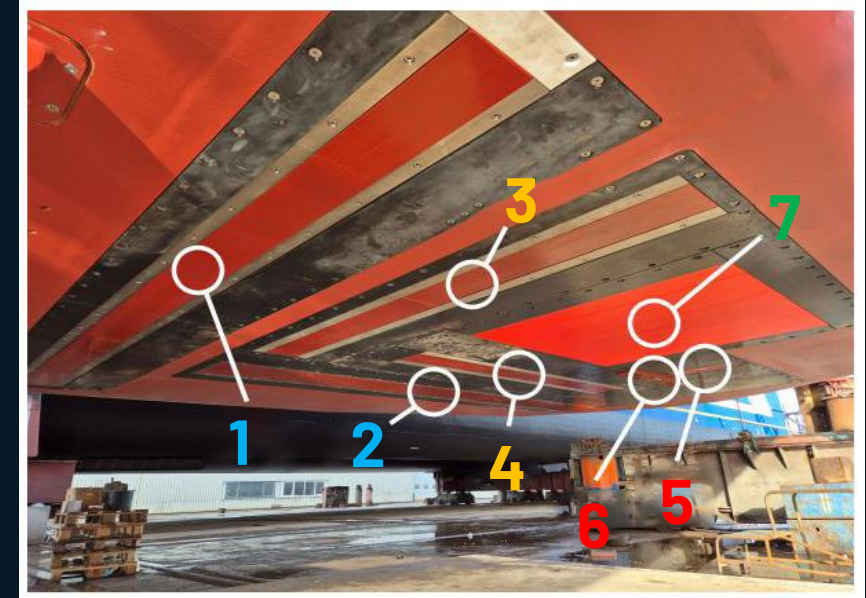
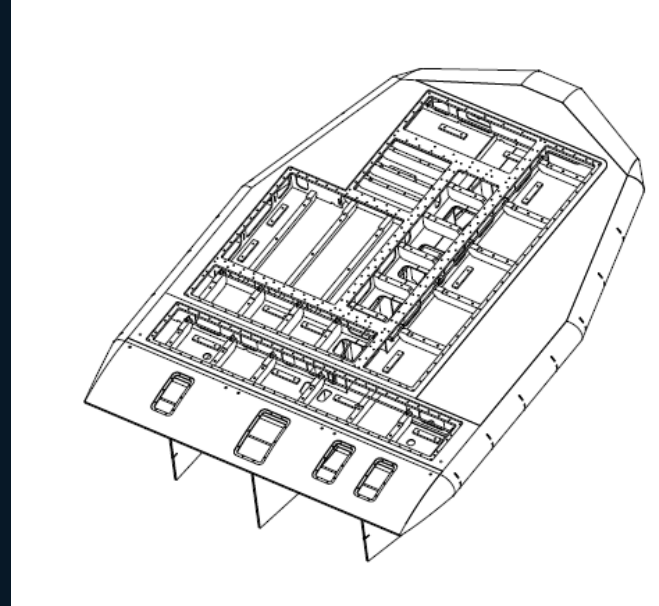
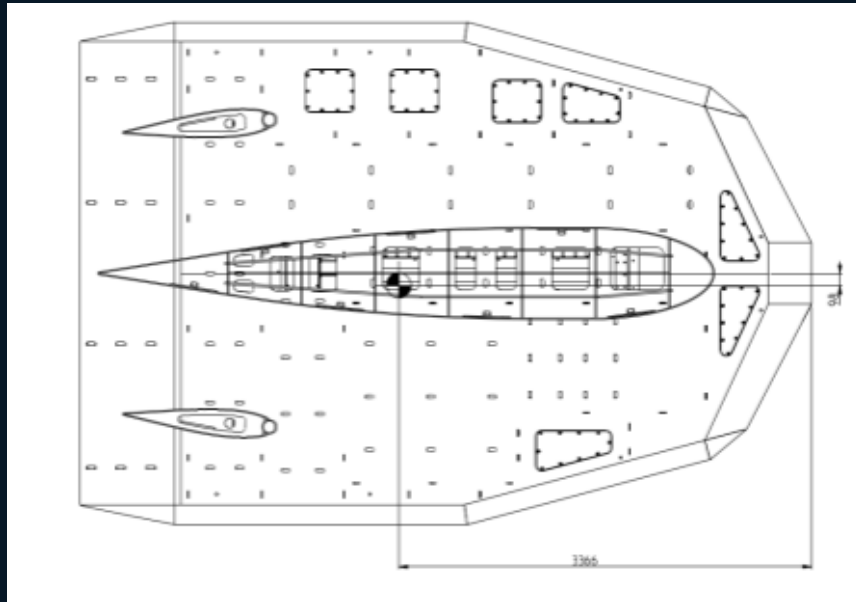
Retractable azimuthal thruster

The thruster is retractable and an engineering solution was developed to close the tunnel to avoid hydrodynamic or fluid-dynamic issues.



Gondola Drawings

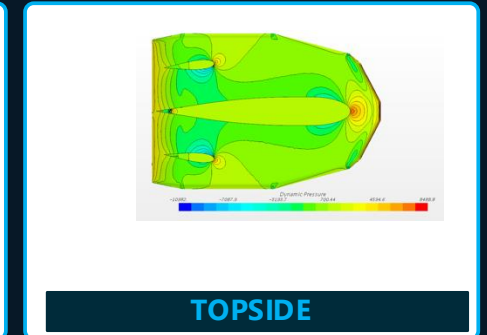
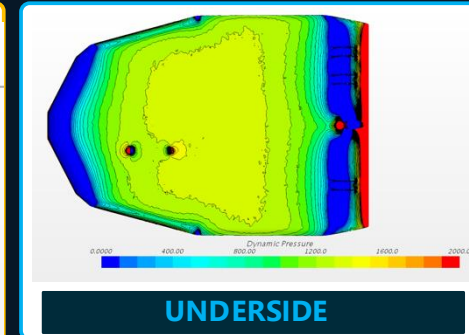
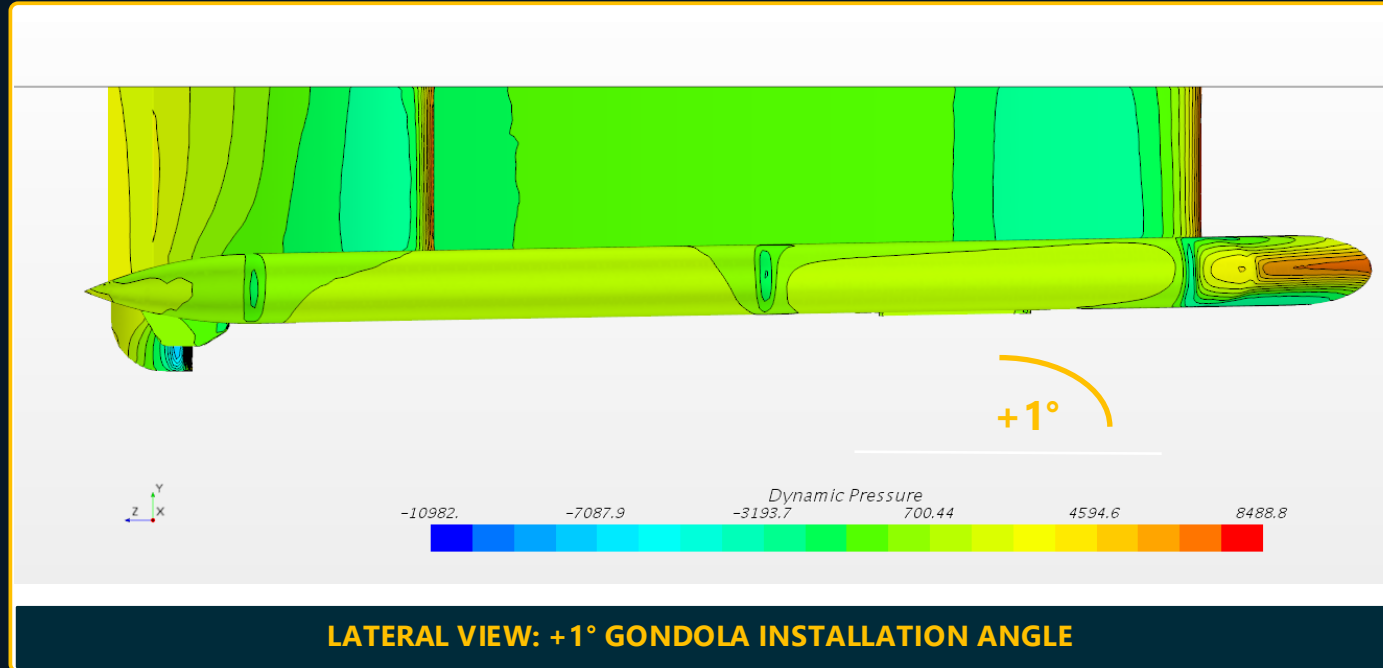
A 6 m × 4 m gondola with 1° mounting angle
The Gondola has been designed and fabricated by GAMP



- EM304 Rx (1) and EM304 Tx (2),
- EM712 Rx (3) and EM304 Tx (4),
- EM2040 Rx (5) and EM304 Tx (6),
- TOPAS PS18 (7).

CFD Pressure Distribution - Installed Gondola Position

A 6 m × 4 m dedicated acoustic platform beneath NG Surveyor
Computational Fluid Dynamics by GAMP



Installed geometry

The vessel is at 0°, while the gondola is mounted with a +1° aft-down incidence.

Pressure mapping

Figures show the dynamic-pressure distribution at the maximum sensor operating speed of 7-8 kn.

Favourable sensor condition

The transducer-facing underside remains in slight overpressure with small pressure gradients.

Gondola & Bow Appendix: CFD Assessment

FLOW INTERACTION AND CAVITATION CHECK, performed with cooperation of NEO

Next Geosolutions "NG Surveyor" Gondola & Bow Appendix - Fluid Dynamics Report

2. THE MODEL

2.1. Geometry model

- 2.1.1. CFD analyses tend to be very computationally expensive. This is even more true for LES simulations, where large eddies are directly and fully solved rather than approximated through simplified and averaged models. To mitigate this, 2D geometries were employed, significantly reducing the cell count and, consequently, the computational effort.
- 2.1.2. In accordance with best CFD practices, the fluid domain was extended upwind and downwind numerous times the characteristic length of the gondola. This approach minimizes the impact of the boundary conditions on the results in the area of interest.
- 2.1.3. The spatial domain assessed in the CFD analysis includes the entire fluid region surrounding the vessel and the gondola, extending over 180m longitudinally and 20m vertically. The boundaries to the fluid imposed by the vessel and the gondola were also modelled.
- 2.1.4. The analysis was conducted on a longitudinal section of the gondola and the vessel. The selected section aligns with the centre of the echo sounder and is located approximately 350mm off the centreline. This choice ensures a conservative assessment, as it captures the most pronounced effects of the echo sounder protruberance.



Figure 2: Geometrical model - Overview

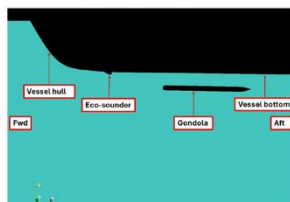
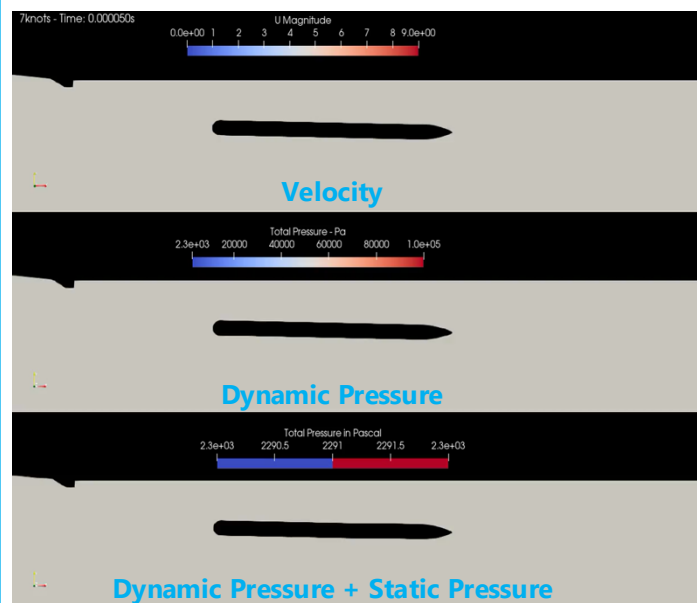


Figure 3: Geometry model - Close Up

MODEL: ECHO SOUNDER + GONDOLA



VELOCITY FIELD and CAVITATION CHECK at 7 kn



VELOCITY FIELD and CAVITATION CHECK at 12 kn

Finding

The echo-sounder appendix creates larger vortices than the streamlined gondola.

≤ 7 kn

No significant cavitation risk around the gondola sensors.

12 kn

Potential small cavitation bubbles may interfere with sensor measurements.



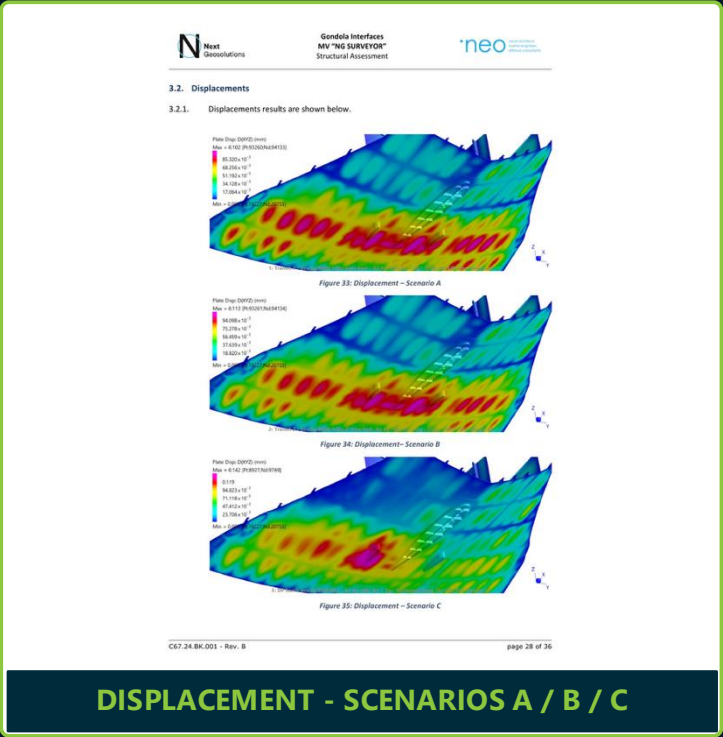
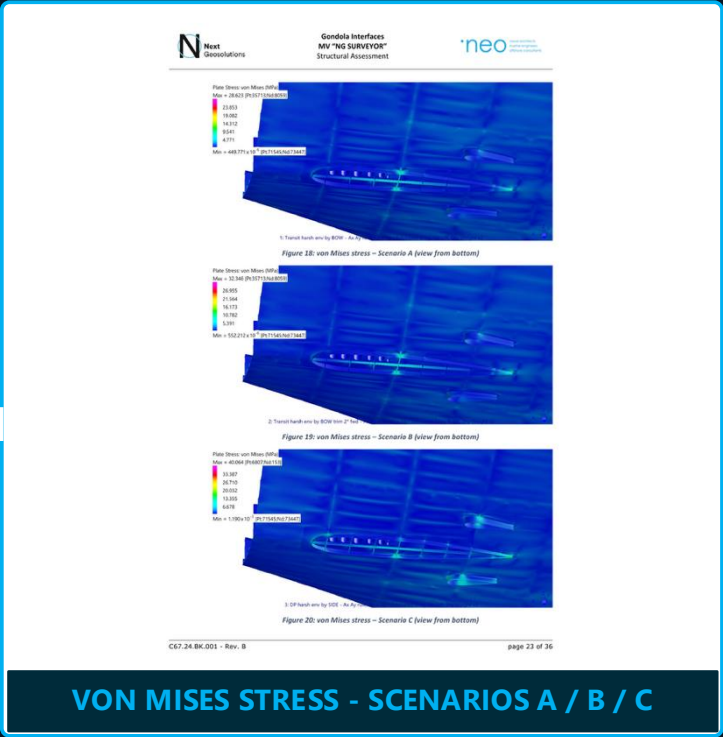
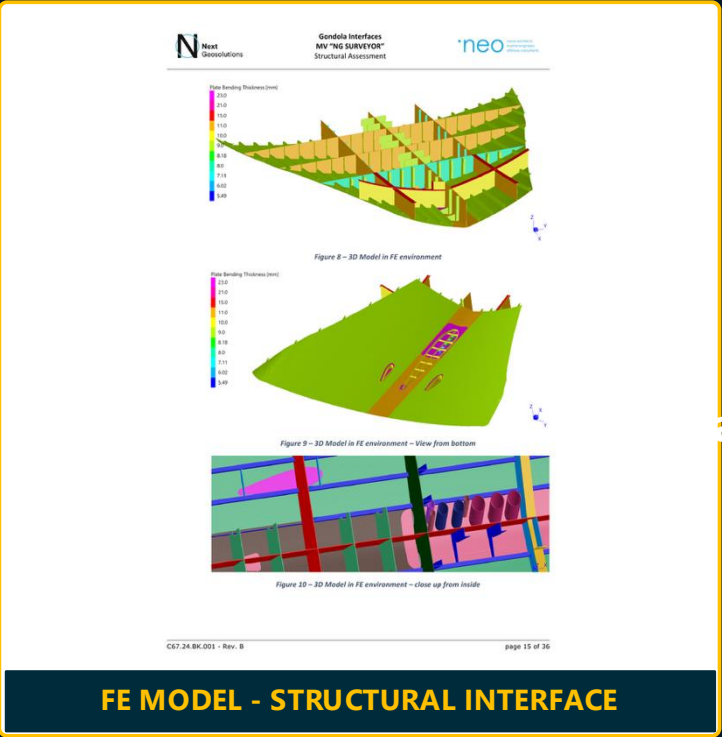
NEXTGEO

neo

naval architects
marine engineers
offshore consultants

Gondola Interface: Structural Assessment

FEA (Finite Element Analysis) RESULTS, performed with cooperation of NEO



8.8 t
GONDOLA DRY WEIGHT

26 MPa
MAX INTERFACE STRESS

88 MPa
ALLOWABLE STRESS

~0.1 mm
DISPLACEMENT

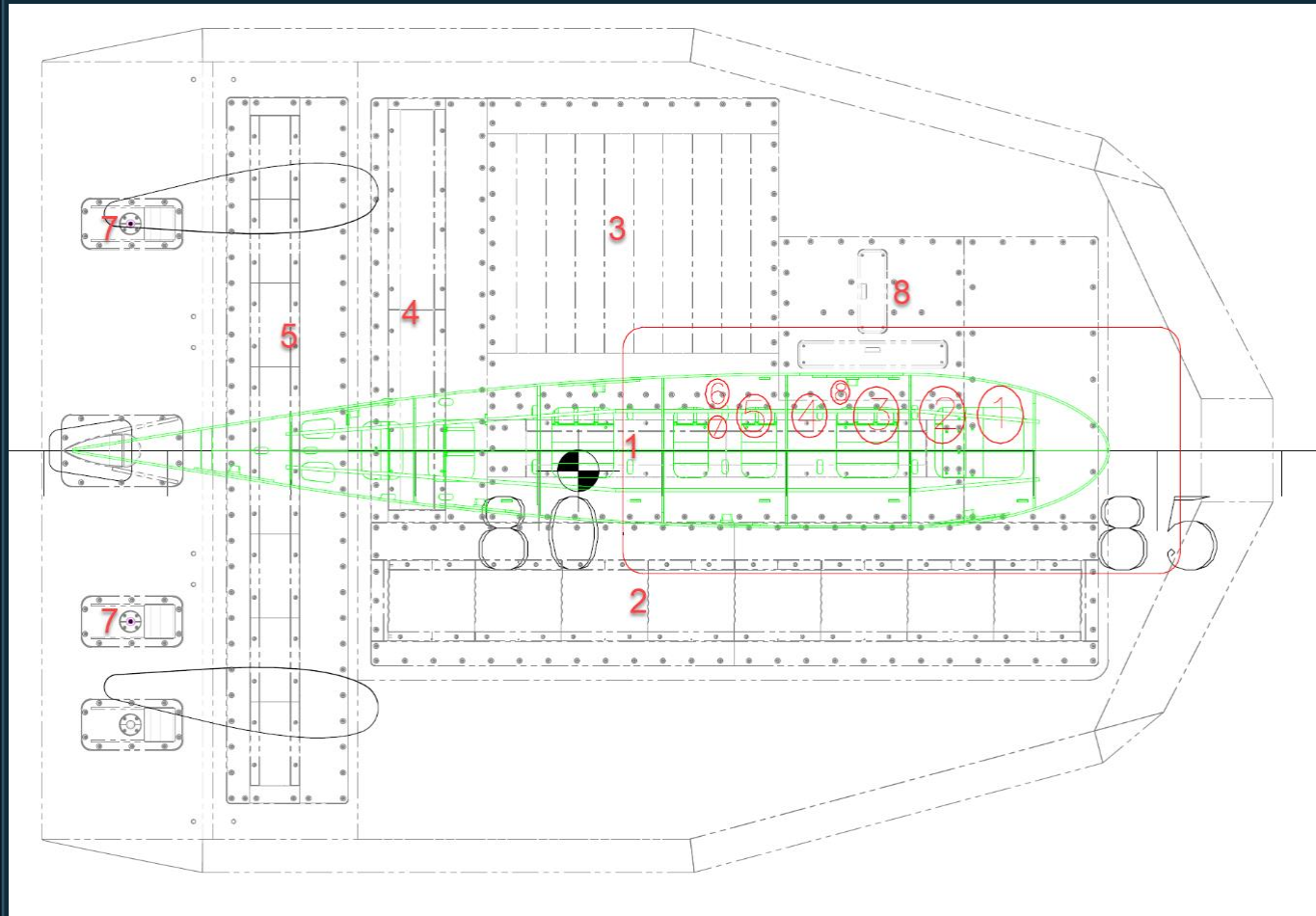
7.2 mm
DISPLACEMENT LIMIT

FIT FOR PURPOSE
Stress · displacement · buckling

Assessed cases: 12 kn transit, even keel · 12 kn transit, forward trim · 8 kn transverse-current DP

Gondola conduit architecture

Dedicated penetrations connect the sonar room to the gondola while separating cable groups



Installed conduits

Design intent

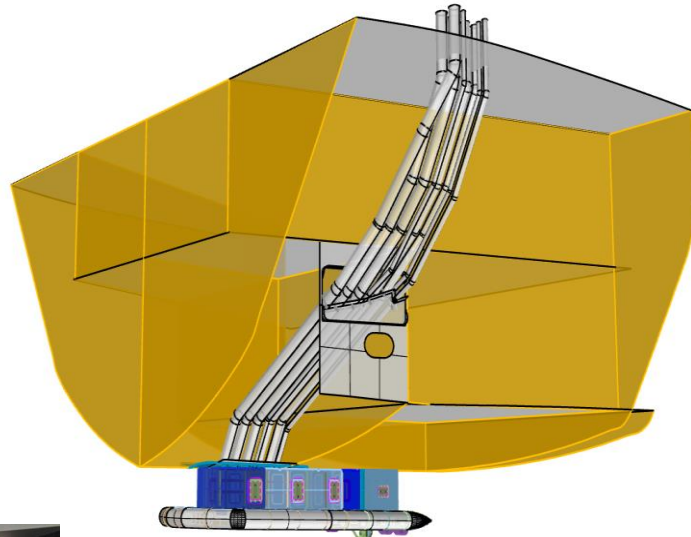
- Defined cable paths
- Controlled routing
- Maintainable access
- Capacity for distributed sensors

Interfaces

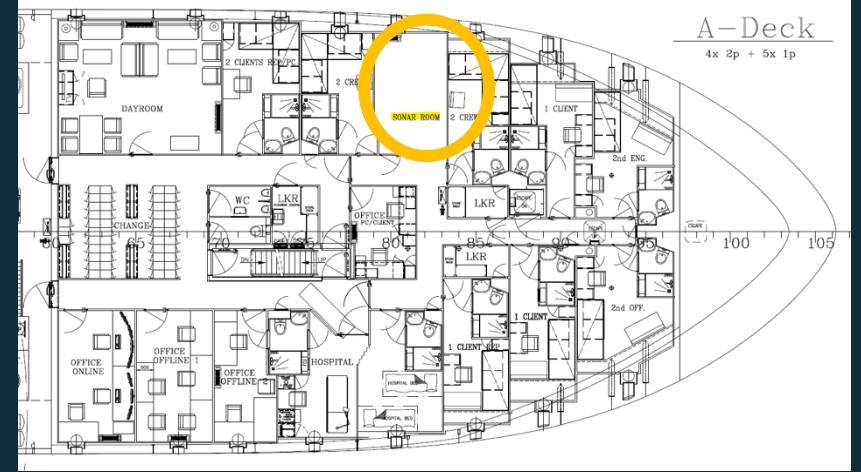
Sonar room → hull route → gondola bottom

From sonar room to gondola

The conduit bundle transitions through the hull in a defined order and geometry, to reduce impact on vessel and in line with MBR (minimum bending radius)



3D ROUTE



Video: from vessel to survey platform

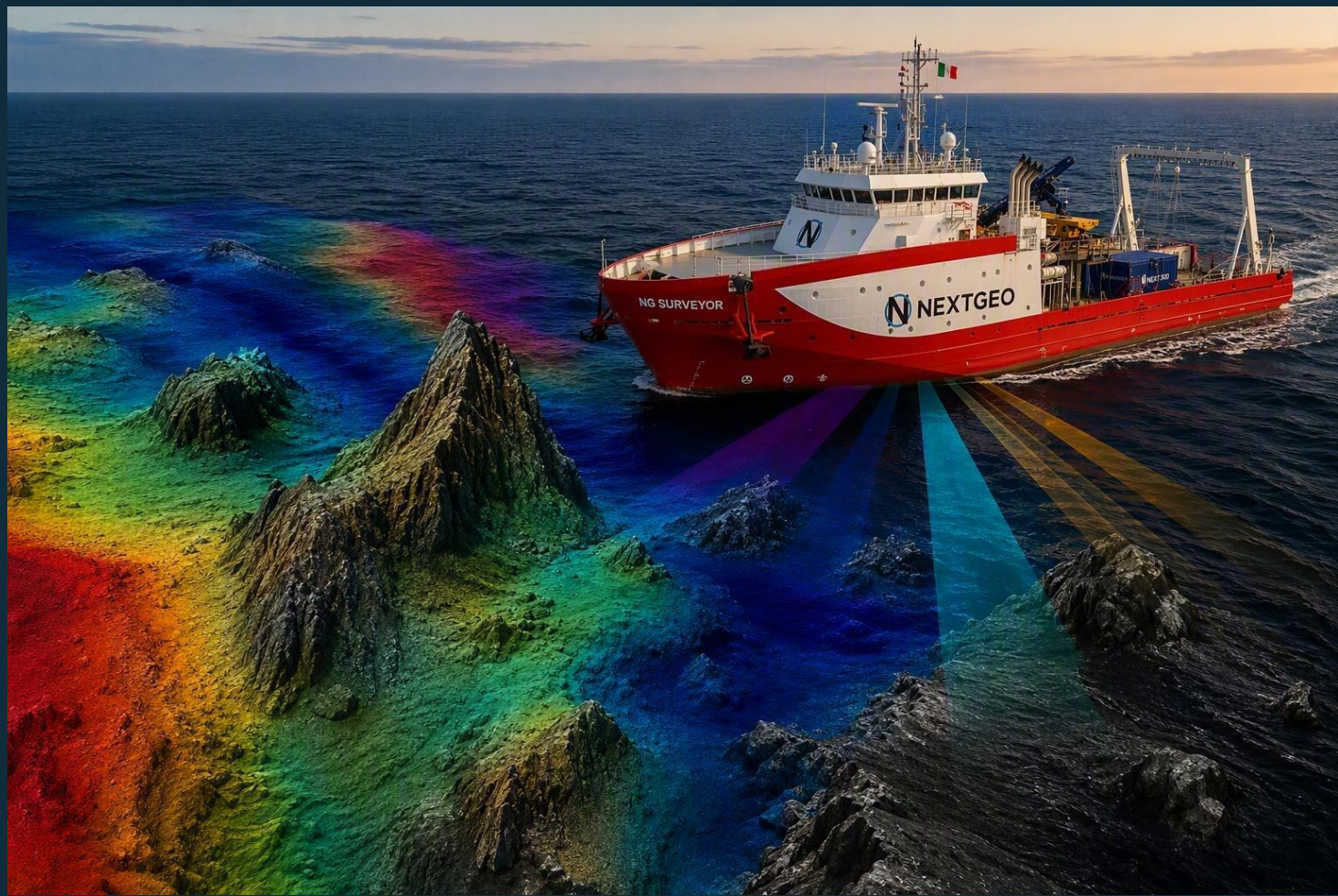


4

MER Results

MER task onboard NG Surveyor

The integrated platform supports complementary outputs for habitat mapping

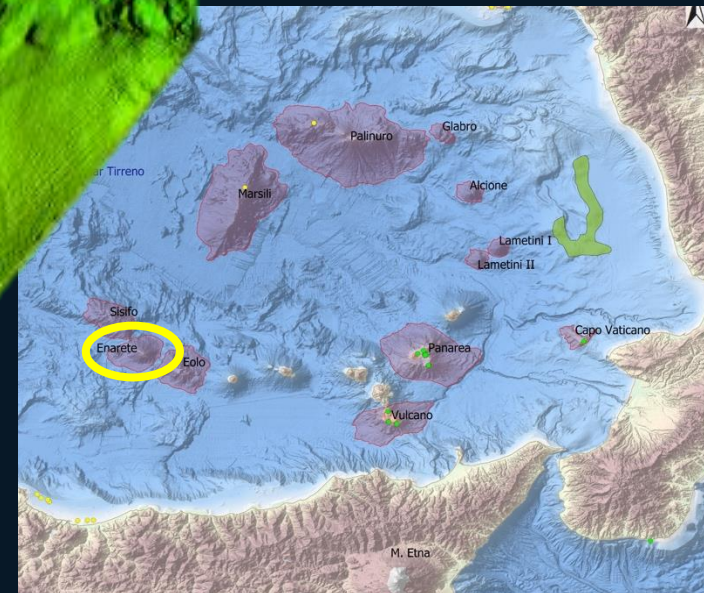
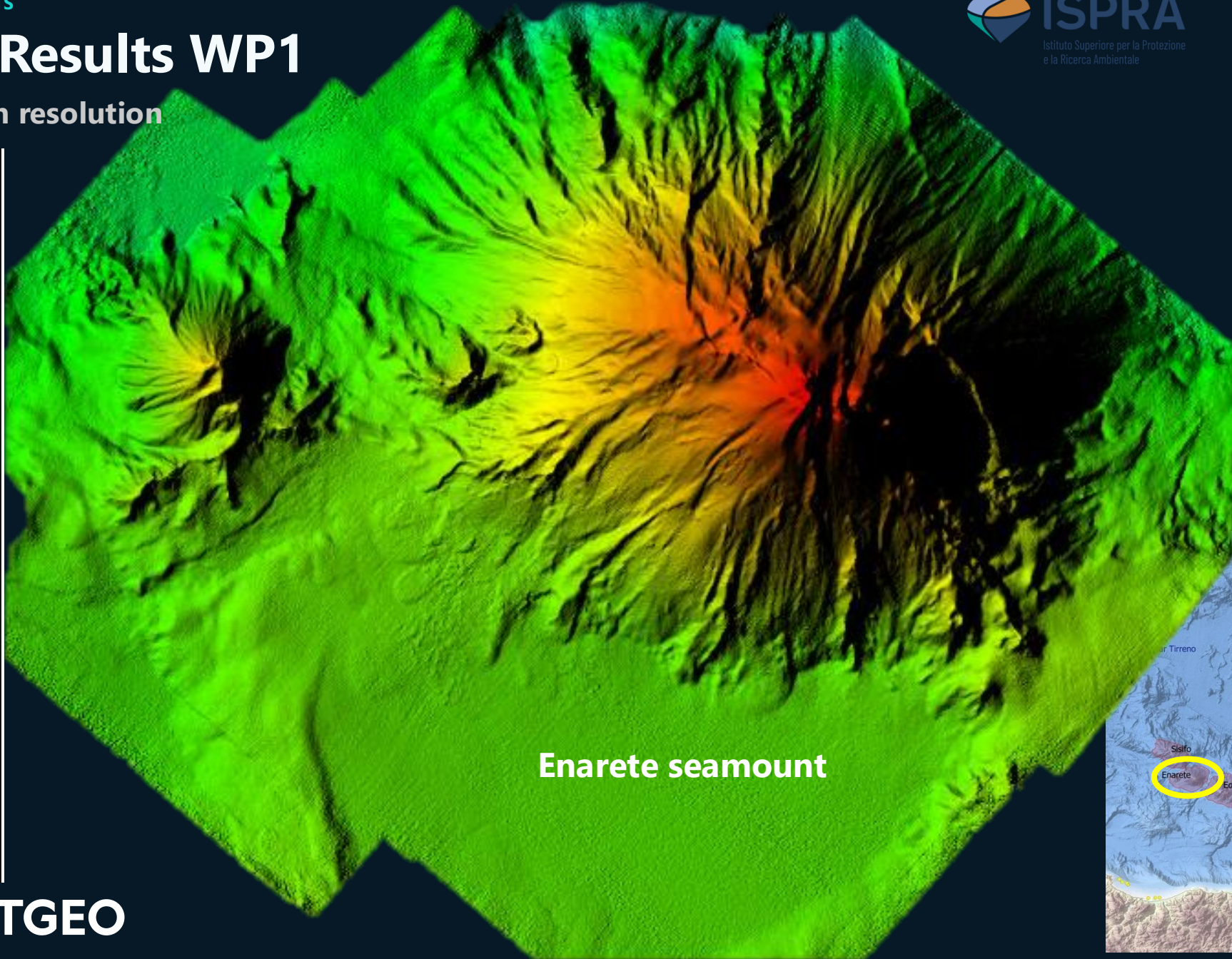
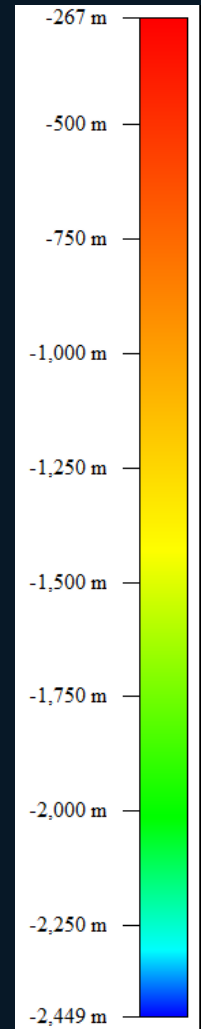


During **MER (Marine Ecosystem Restoration)** 79 seamounts and rocky outcrops were investigated by NG Surveyor up to 3000m water depth (13.500 km²)



MER Results WP1

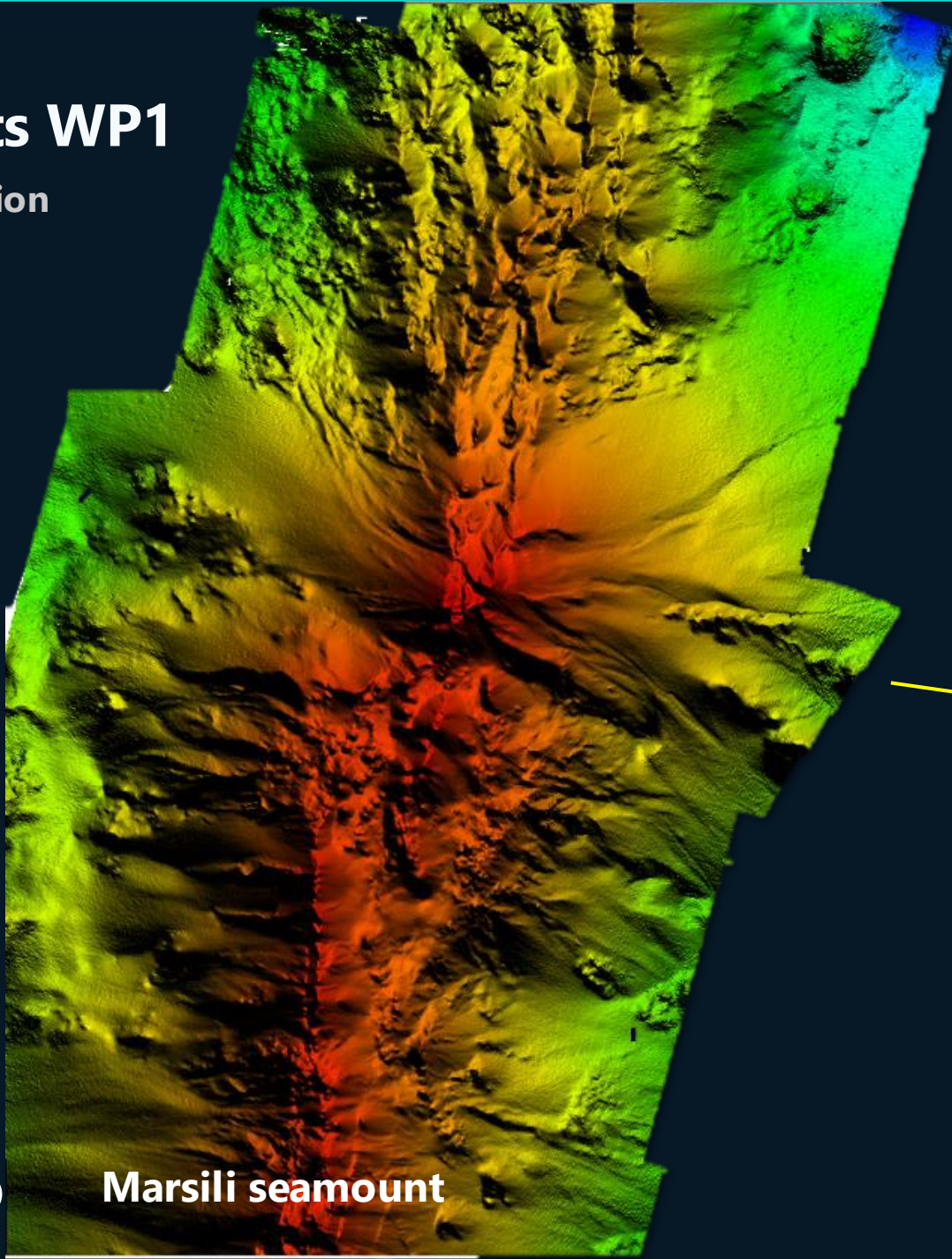
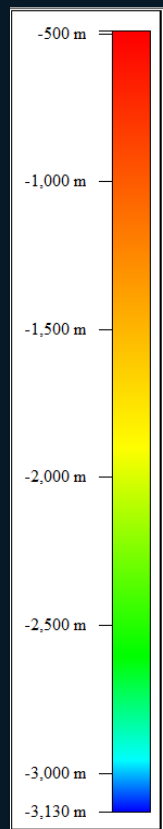
DTM high resolution



MER Results WP1

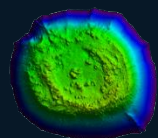
DTM high resolution

It is the largest volcano in Europe, approximately 60 km long and 30 km wide.

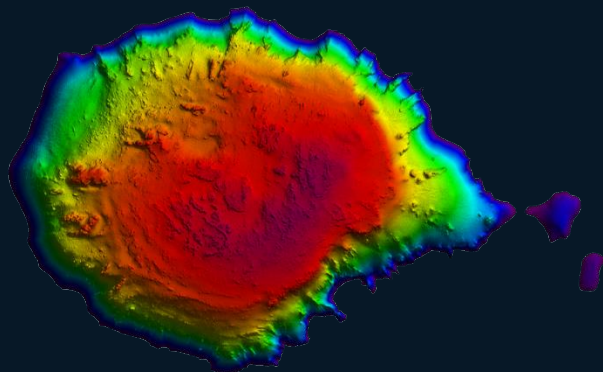


Marsili seamount

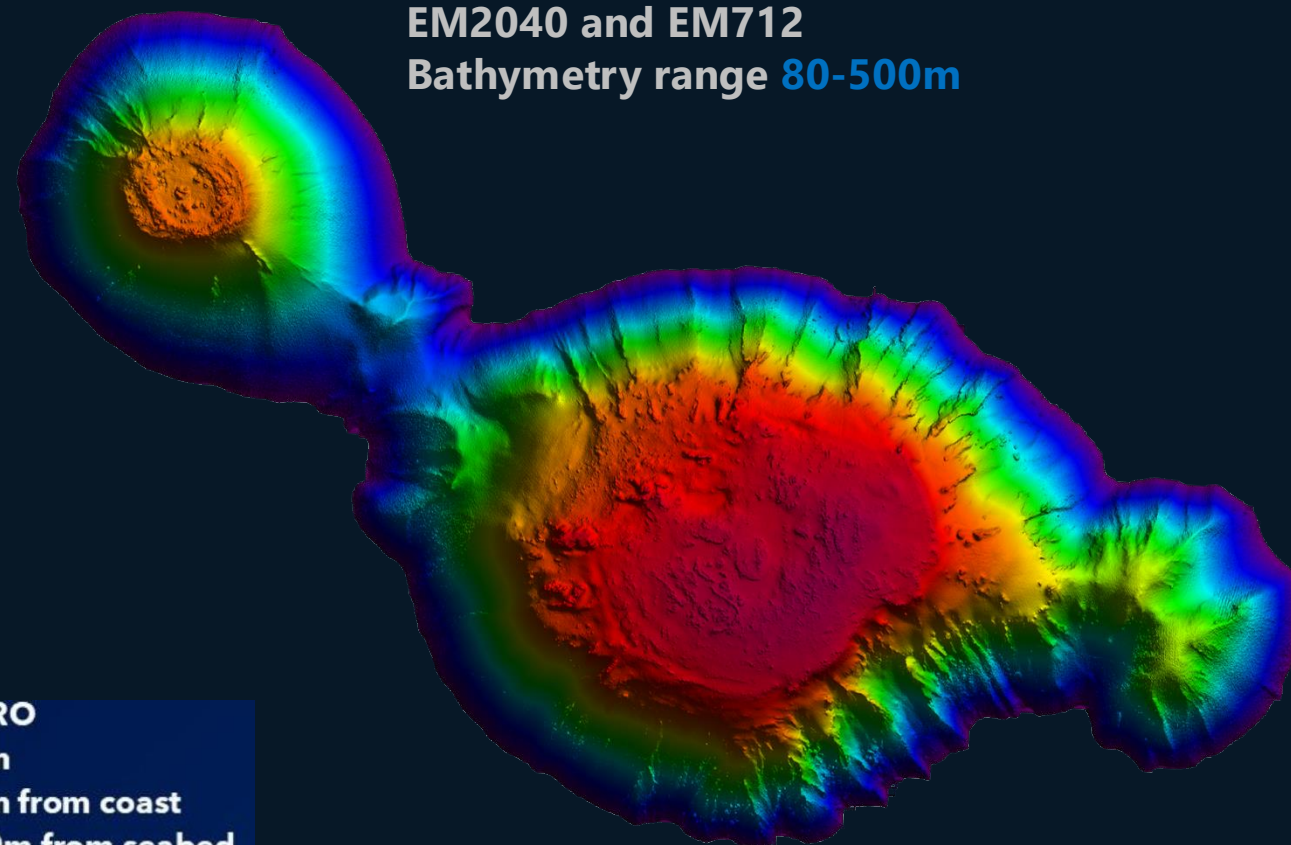
MER Results WP1 – PALINURO



DTM **1m** resolution
EM2040 and EM712
Bathymetry range **80-250m**



DTM **2m** resolution
EM2040 and EM712
Bathymetry range **80-500m**



Seamount: **PALINURO**
Length: **ca. 75km**
Position: **ca. 65km from coast**
Height: **ca. 3200m from seabed**
Depth: **ca. 70m at the top**
Type: **volcanic complex**

MER Results WP1

DTM **5m** resolution
EM2040 EM712 EM304
Bathymetry range **80-1500m**

DTM **10m** resolution
EM2040 EM712 EM304
Bathymetry range **80-2000m**

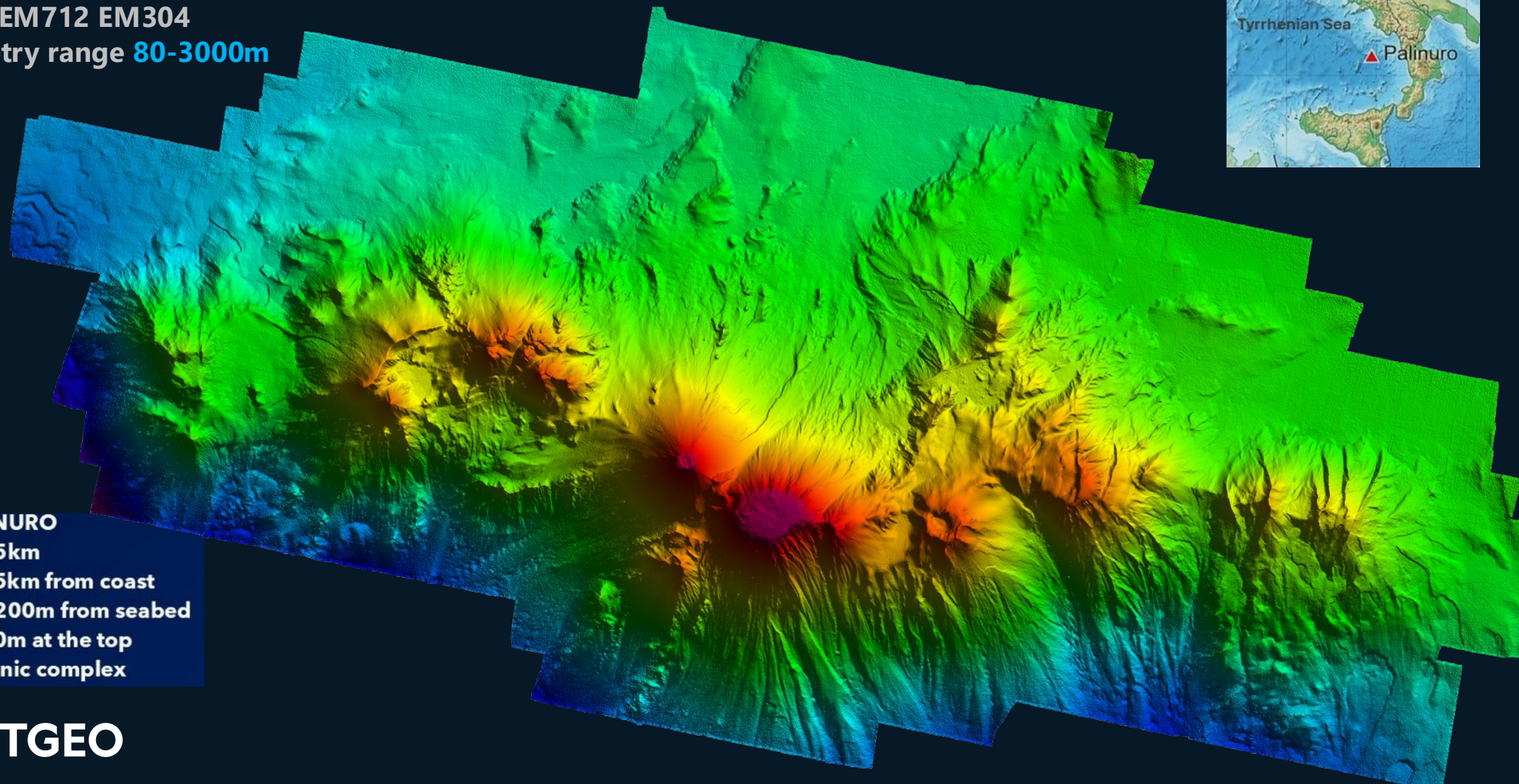
OPERATIONS

MER Results WP1

DTM **15m** resolution

EM2040 EM712 EM304

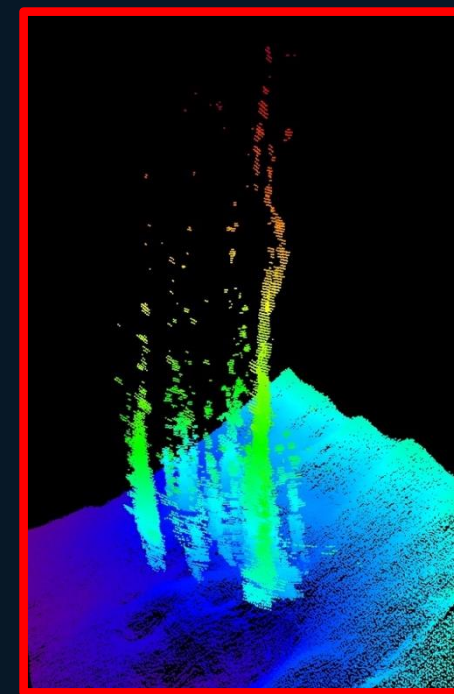
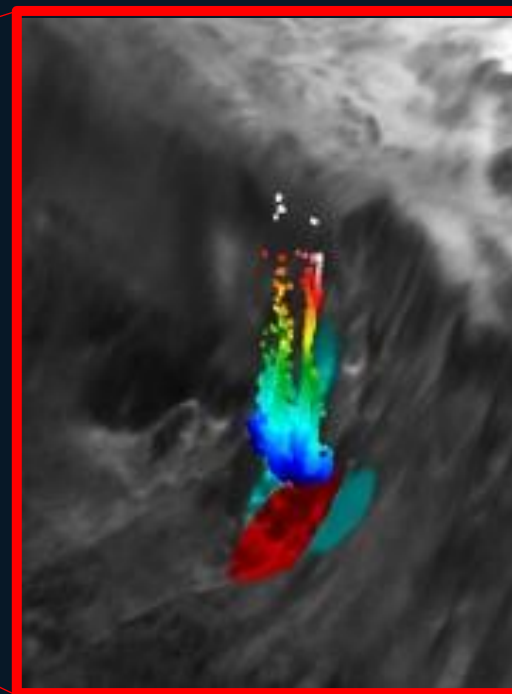
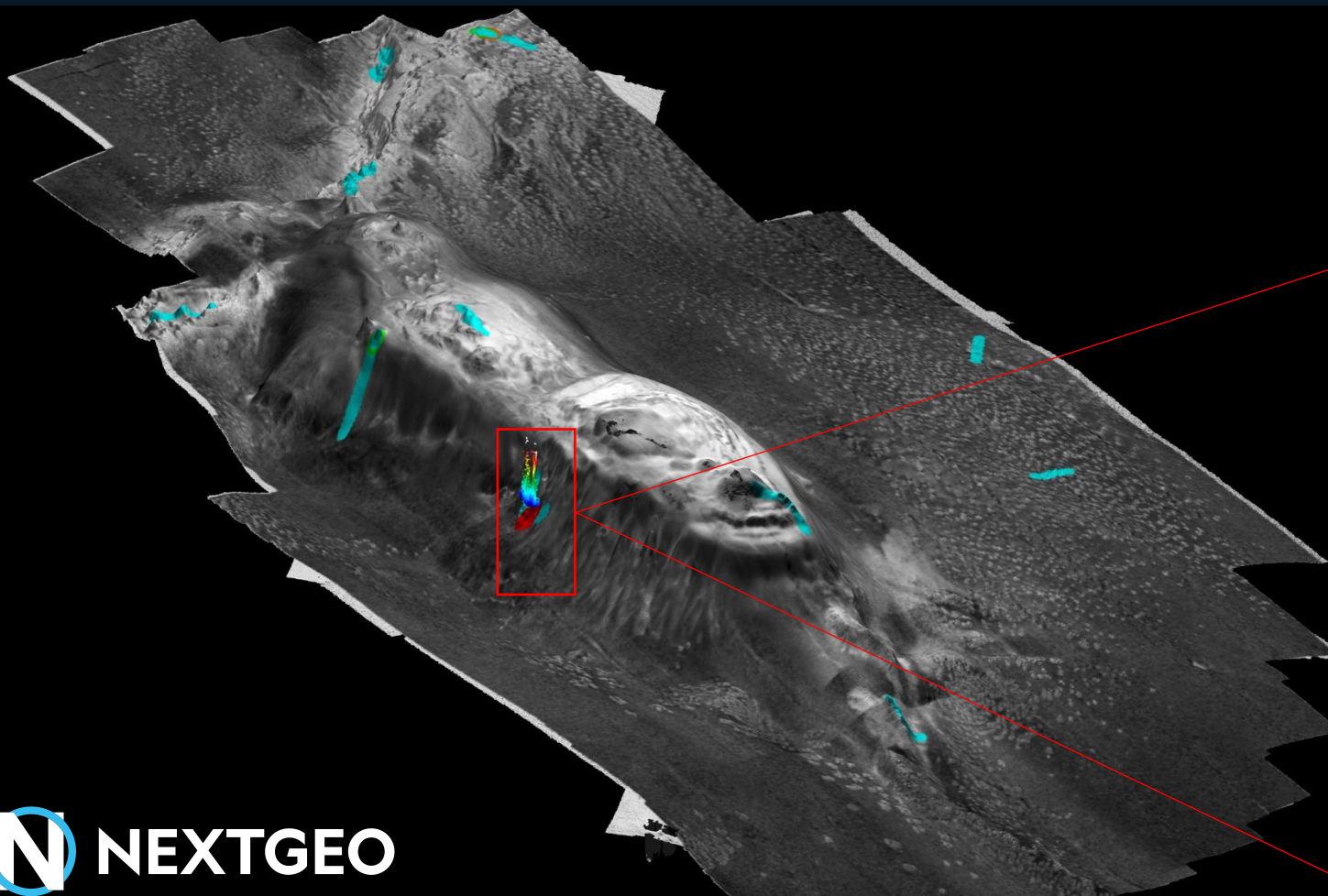
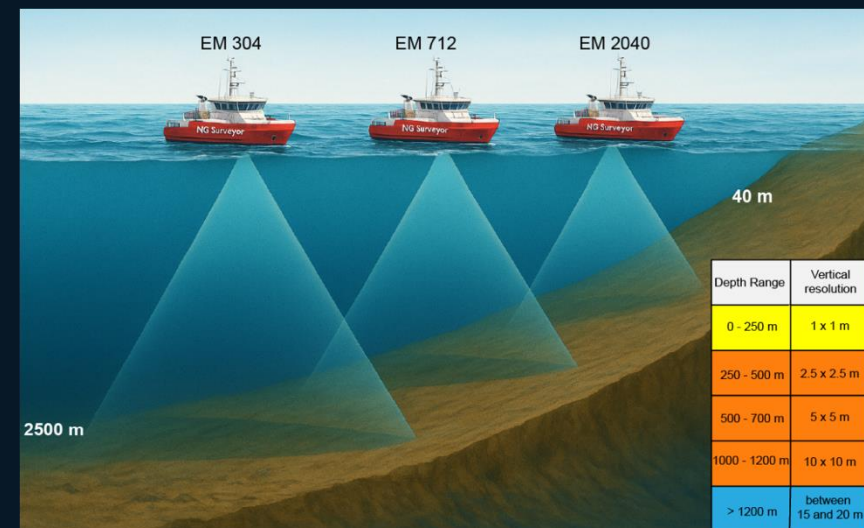
Bathymetry range **80-3000m**



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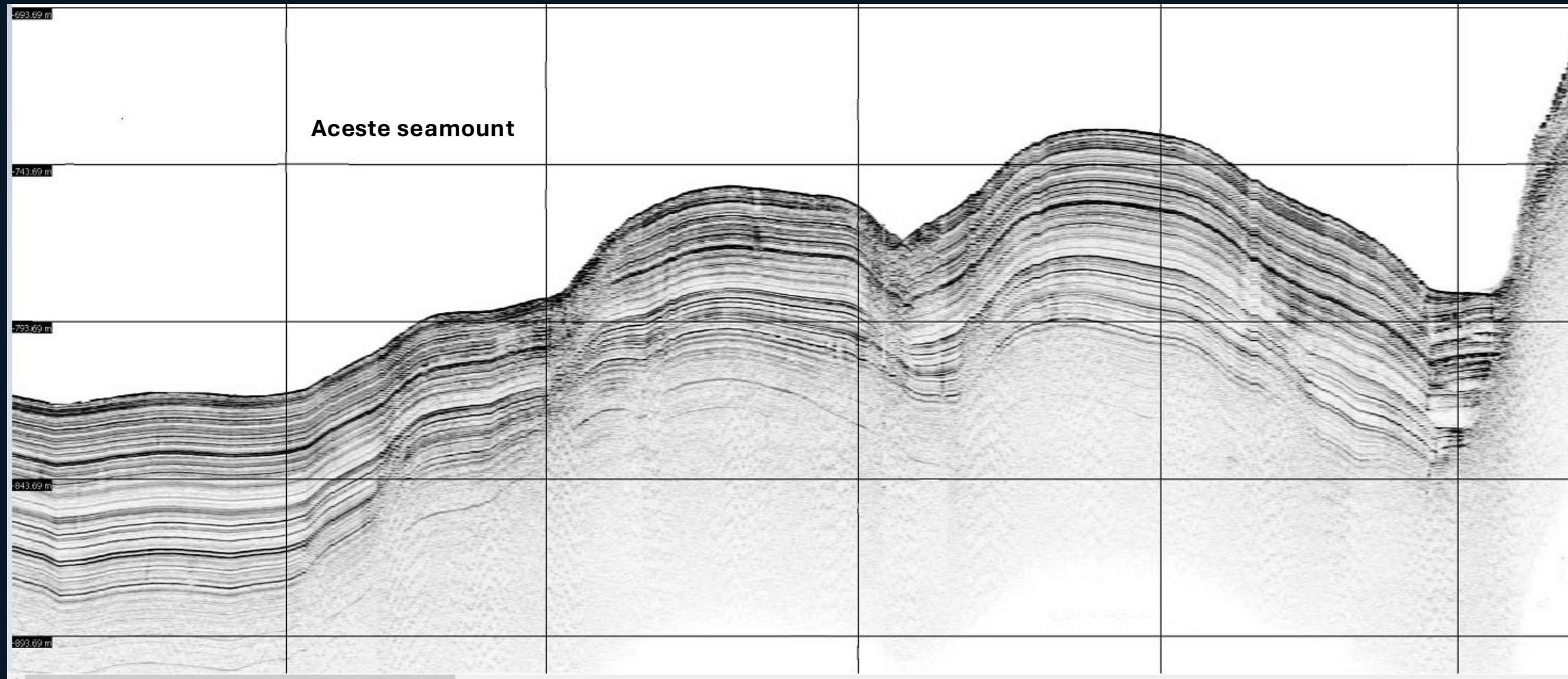
MER Results WP1 - Pantelleria

Water Column (Gas Plume)
Backscatter



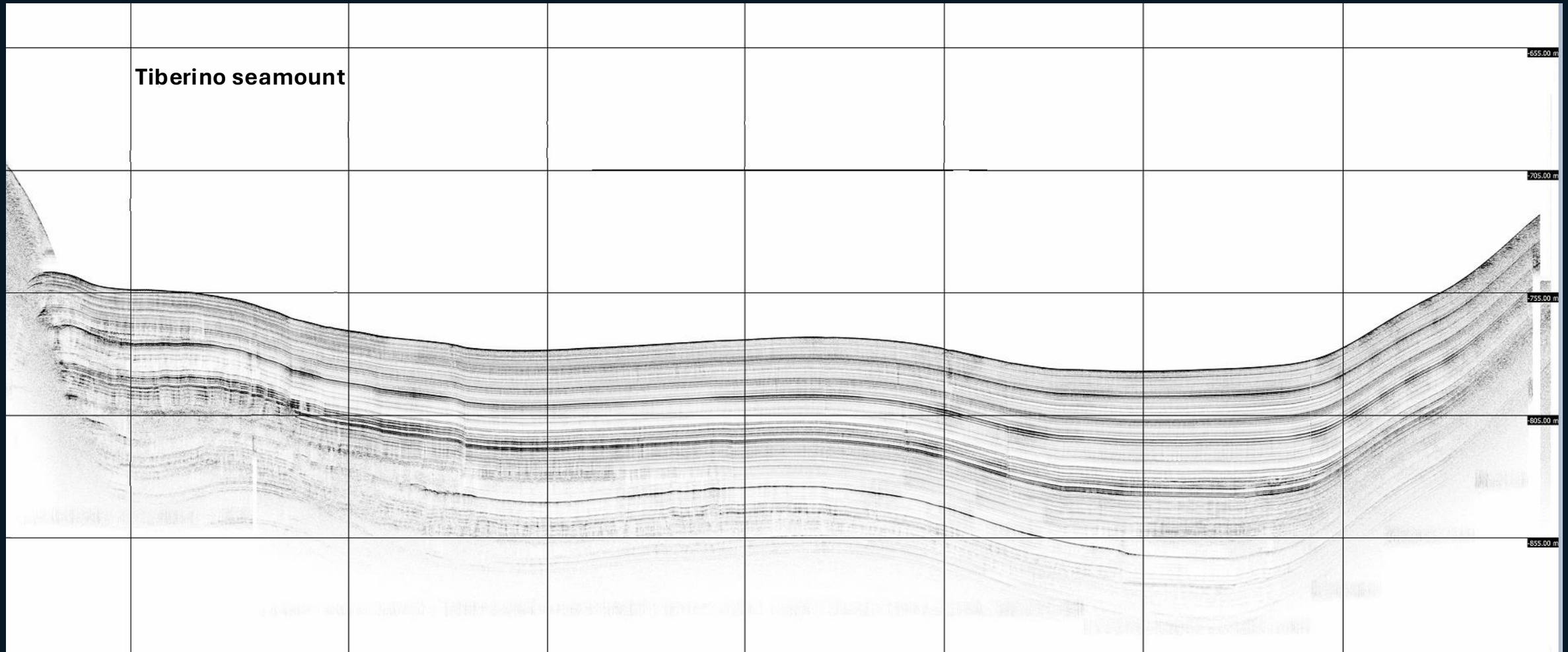
MER Results WP1

Topas PS 18 SBP profiles



MER Results WP1

Topas PS 18 SBP profiles



Many thanks for your attention!

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