HYDRO 2024
Hydrographic Conference

REPMUS:
A CATALYST FOR INNOVATION IN UNCREWED HYDROGRAPHY

Rui Miguel Cândido, António Tavares, Florin Constantinoiu
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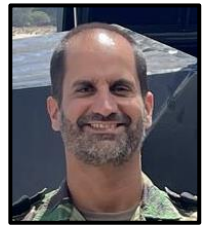



hidrográfico marinha·portugal

60 ANOS DE CONHECIMENTO DO OCEANO

Marinha

NOVEMBER 6TH 2024

AGENDA

WHAT IS REPMUS…

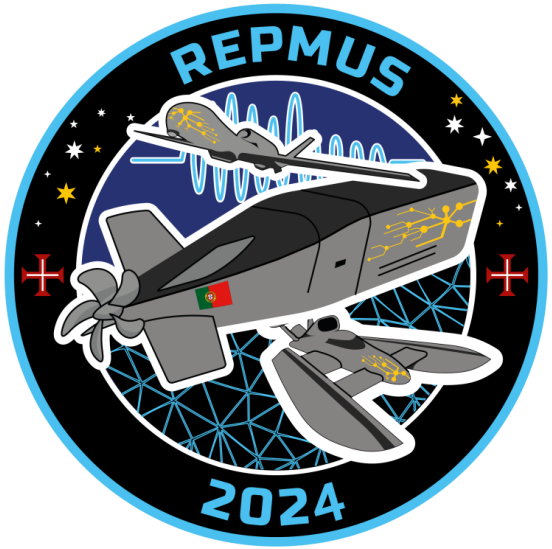
- OVERVIEW
- LOCATION
- PARTICIPANTS
- WORKING GROUPS

RAPID ENVIRONMENTAL ASSESSMENT…

- CONCEPT
- ASSETS
- SENSORS
- PRODUCTS
- CHALLENGES

HYDRO MUS: OTHER USE CASES

- MINES
- SMER
- CUI



Robotic Experimentation and Prototyping with Maritime Unmanned Systems

Support MUS development projects

Drive MUS interoperability and interchangeability

Fulfil maritime capability gaps

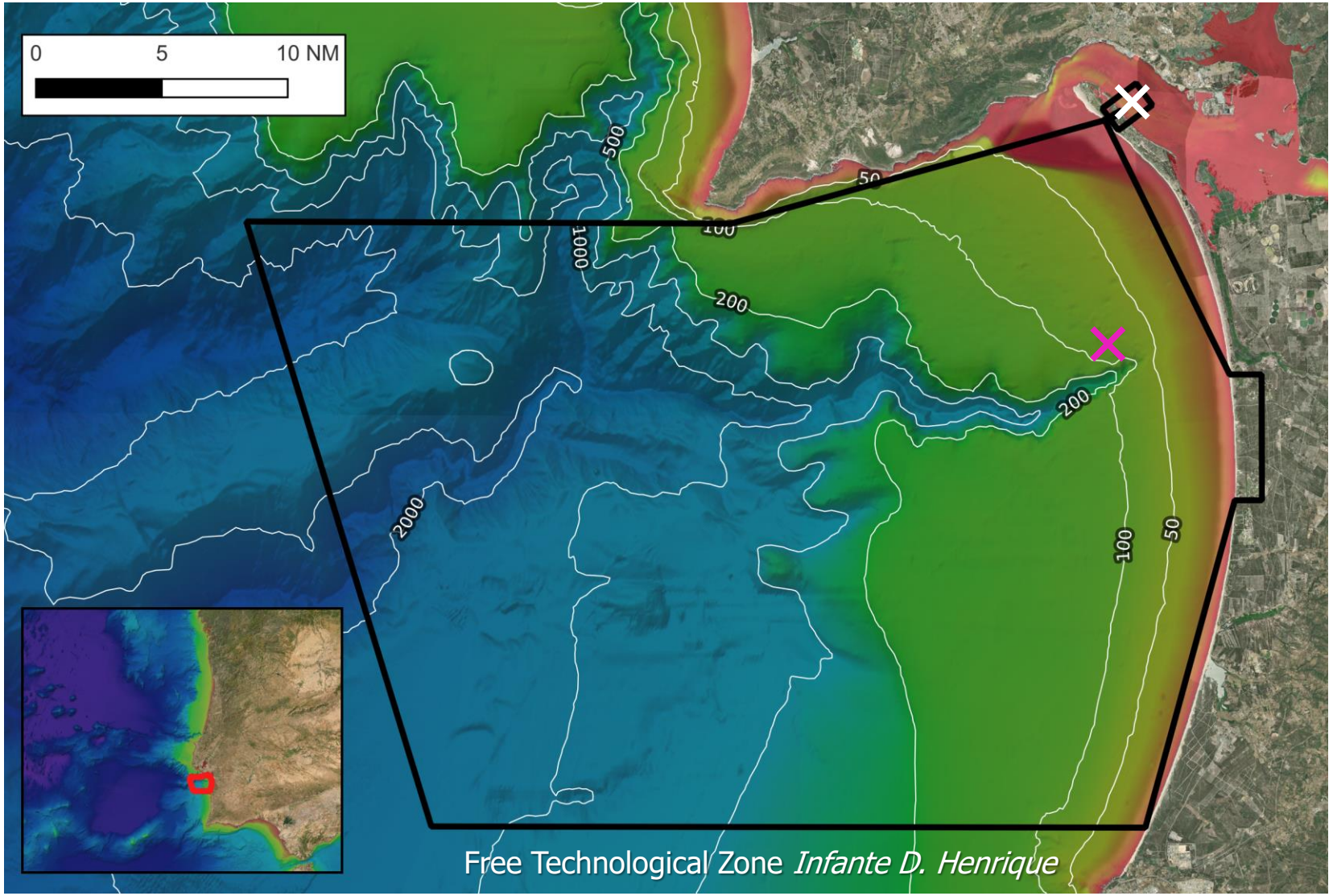
Demonstrate operational MUS capabilities

+2000 pax

September

Setúbal, Portugal

LOCATION



Experimentation Center

PARTICIPANTS

Co-Organizers

U.PORTO FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

NATO OTAN S&T organization CMRE

NATO OTAN Joint Capability Group Maritime Unmanned Systems (JCGMUS) Brussels | Belgium

EUROPEAN DEFENCE AGENCY

Marinha

Nations
23 Participating | 7 Observing

Institutions and Agencies

NATO OTAN S&T organization CMRE

NATO OTAN Joint Capability Group Maritime Unmanned Systems (JCGMUS) Brussels | Belgium

EUROPEAN DEFENCE AGENCY

siresp

ANACOM AUTORIDADE NACIONAL DE COMUNICAÇÕES

SatCen European Union Satellite Centre

FRONTEX EUROPEAN BORDER AND COAST GUARD AGENCY

EMSA European Maritime Safety Agency

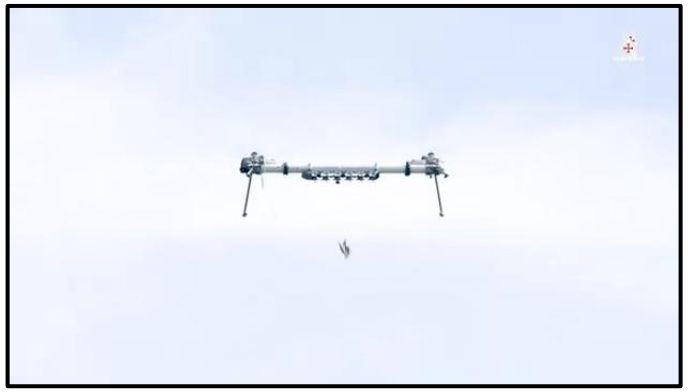
Industry & Academia
> 130 Participants

SDT · ECA GROUP · QINETIQ · CONNECT ROBOTICS · OceanScan Marine Systems & Technology · iqua robotics · SHIELD AI · uavision · RTsys Underwater Acoustics & Drones · THALES · ORACLE · blue oasis ocean sustainable solutions · marine instruments · U.PORTO FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO · vodafone · IAI ELTA · AV AeroVironment · Swatter · ALSEAMAR ALCEN · TEKEVER · gmv · INESCTEC · ATLAS ELEKTRONIK · KRAKEN · AIRBUS · CAE · instituto de telecomunicações · FINCANTIERI MARINE GROUP · thinklogical · KONGSBERG · Telefónica · K2D · EDISOFT · SCHIEBEL · TELEDYNE TECHNOLOGIES Everywhereyoulook

WORKING GROUPS

Maritime Safety and Security

Above Water Warfare

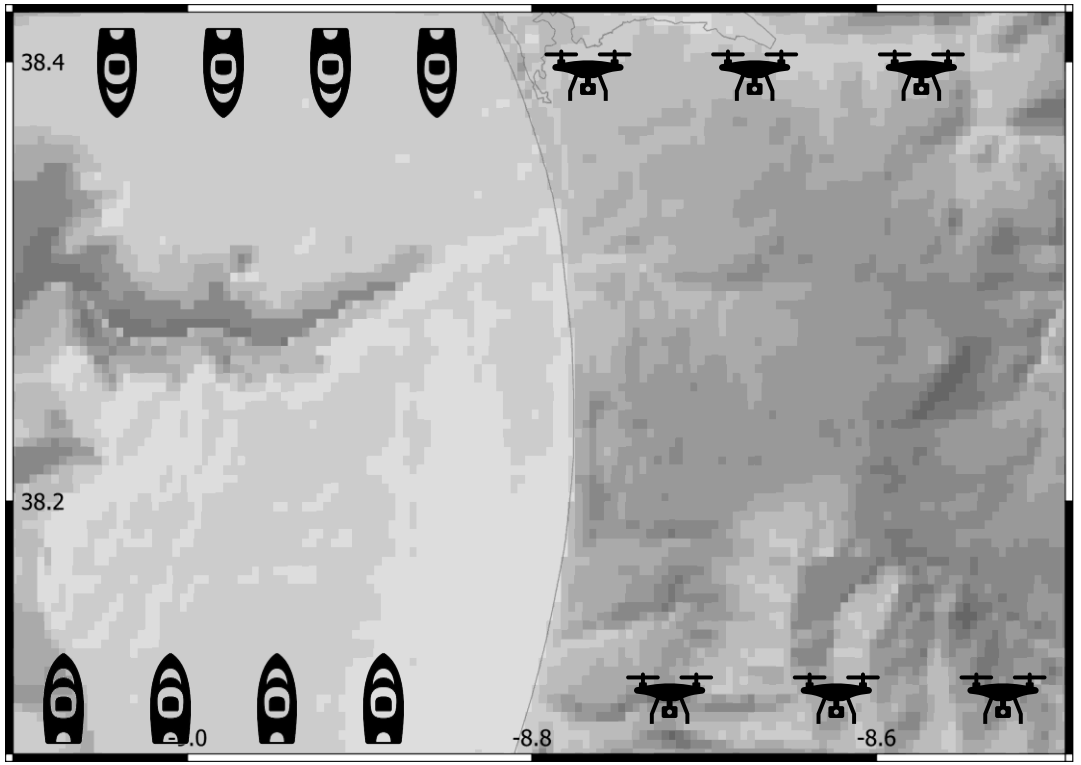


Naval Mine Warfare

Underwater Warfare

Rapid Environmental Assessment

Rapid Environmental Assessment (REA) is a systematic process aimed at **quickly gathering and processing** environmental data (GeoMETOC) to **support operations** and enhance situational awareness.



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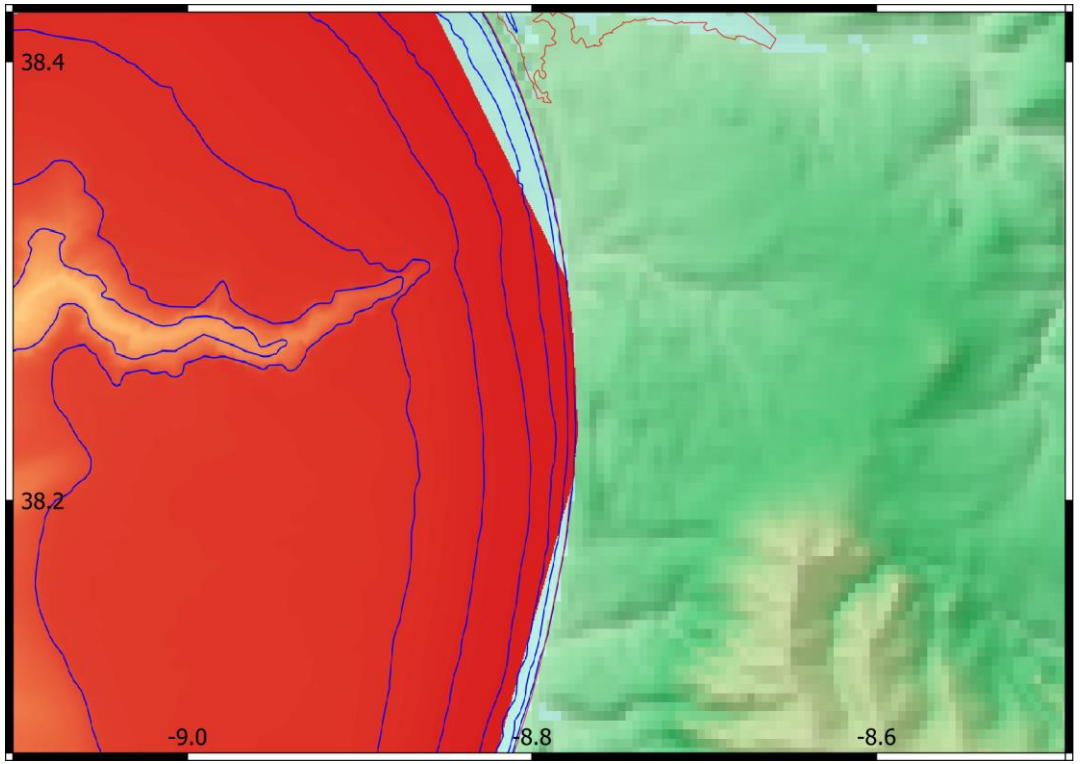

High-Resolution Bathymetry/Topography

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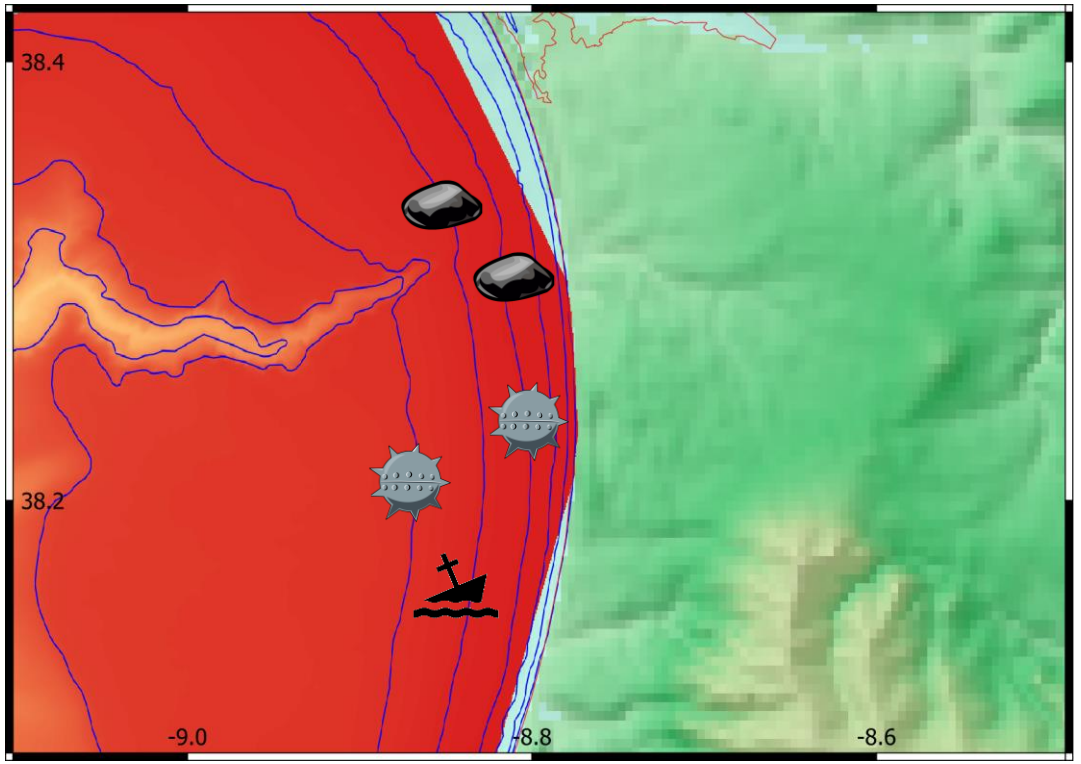

Navigation Hazards

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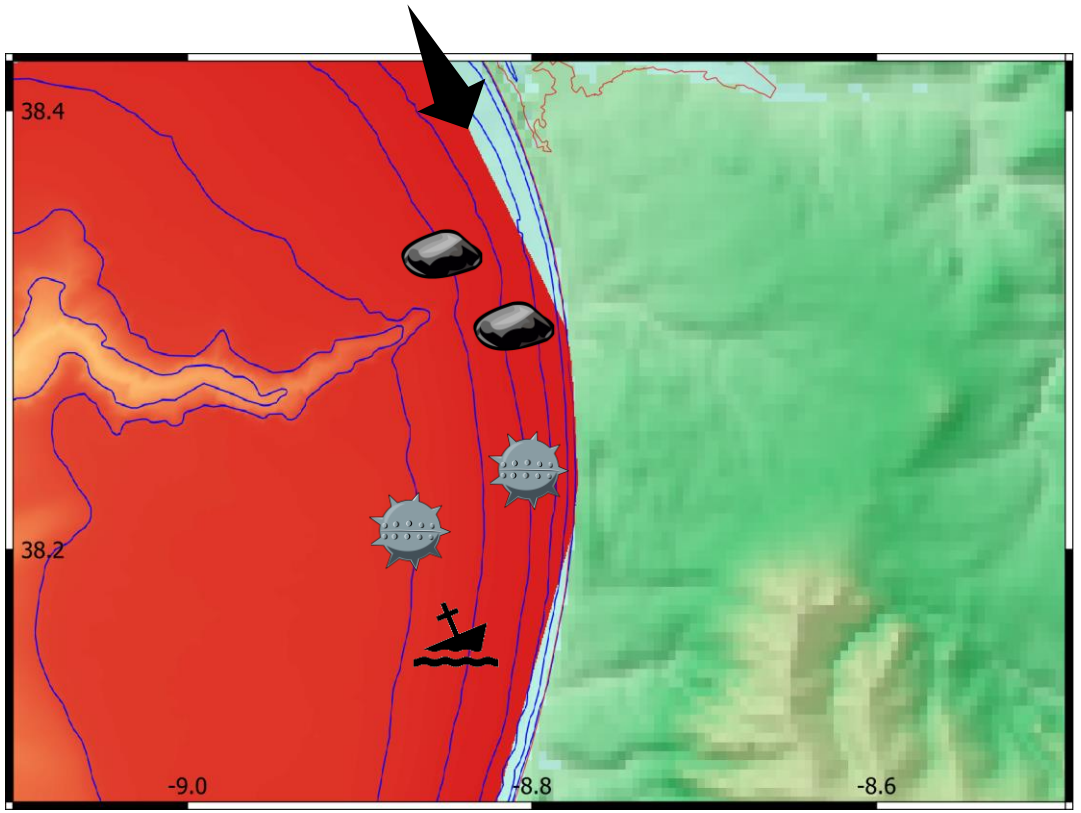

Littoral Drift Currents

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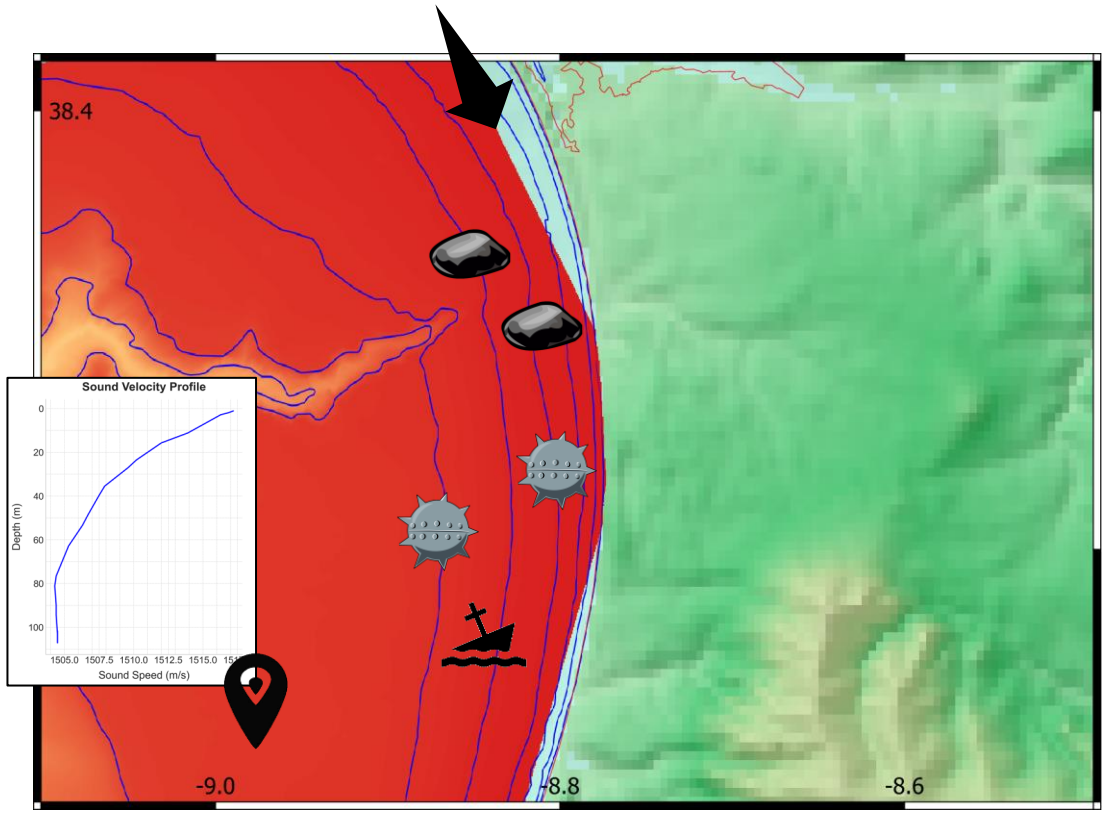

Water Column Properties

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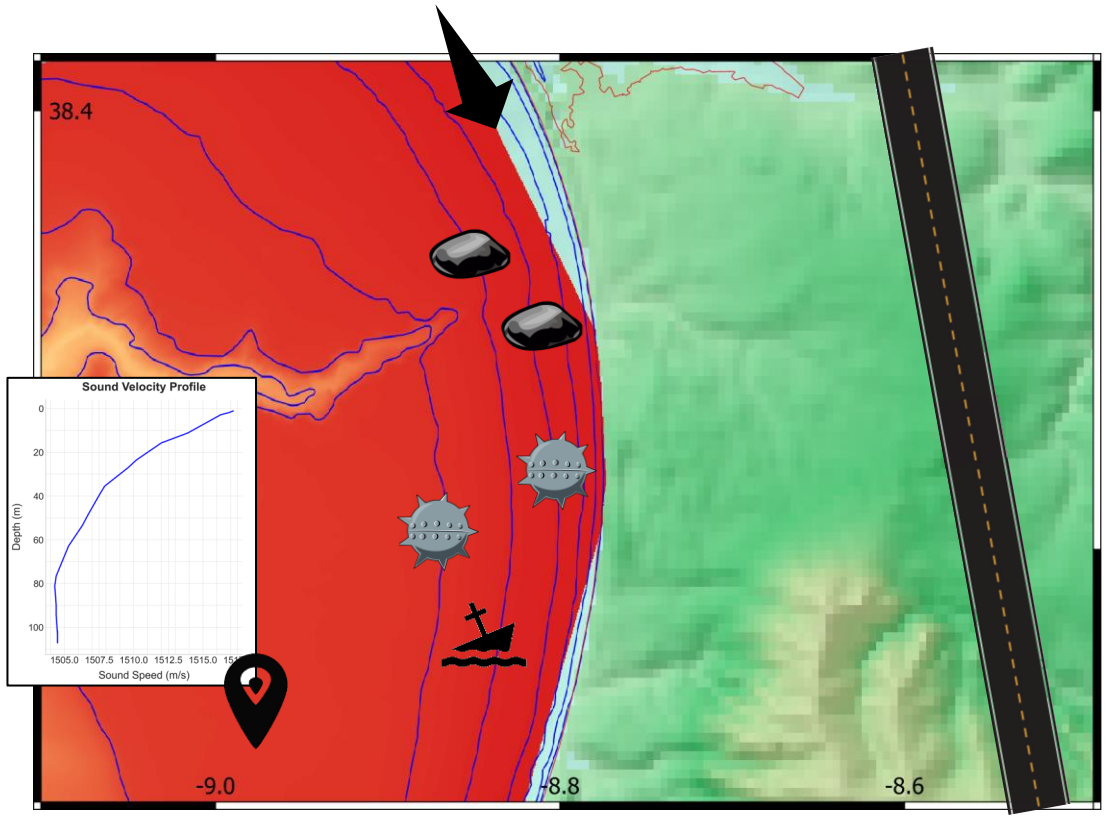

Roads for Further Progression

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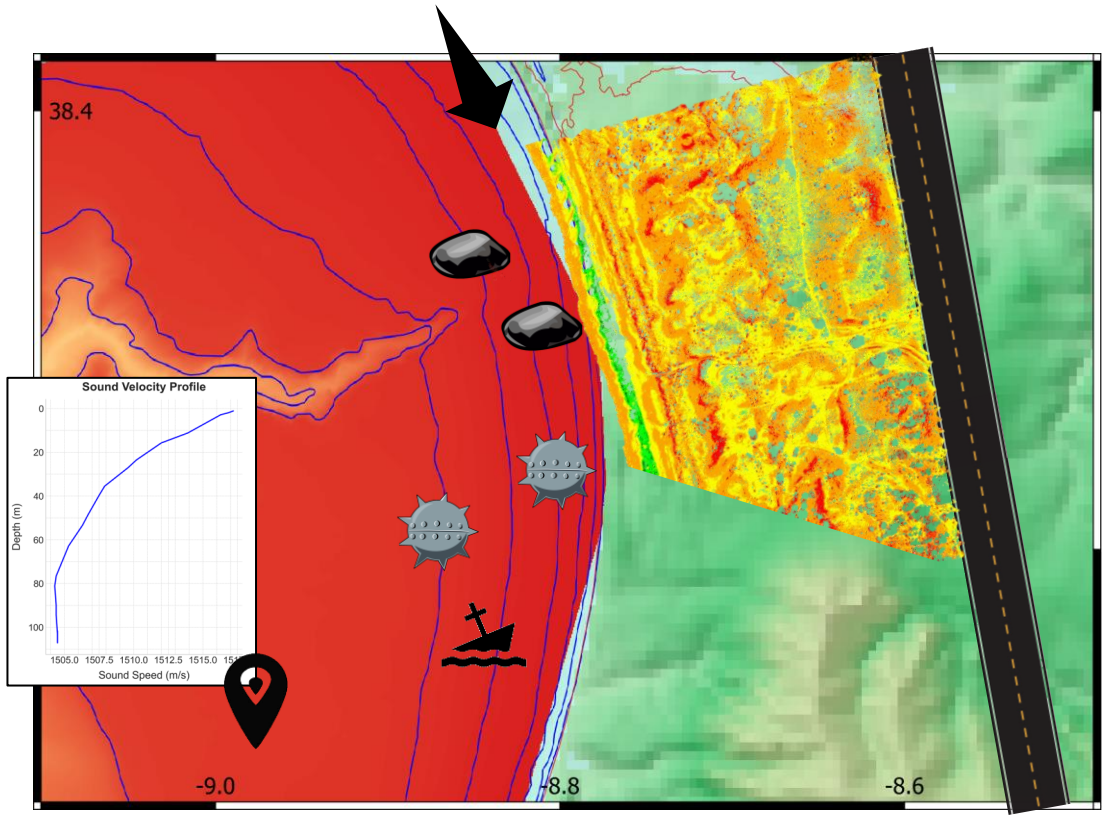
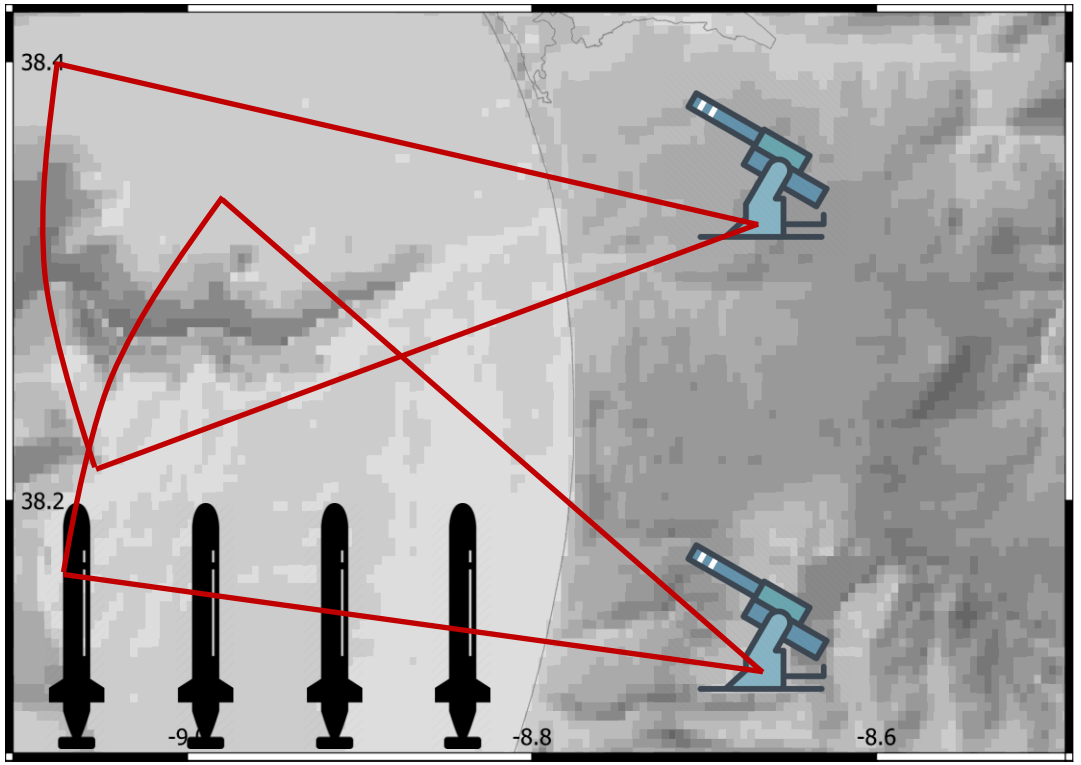


Trafficability

Rapid Environmental Assessment (REA) is a systematic process aimed at **quickly gathering and processing** environmental data (GeoMETOC) to **support NATO operations** and enhance situational awareness.



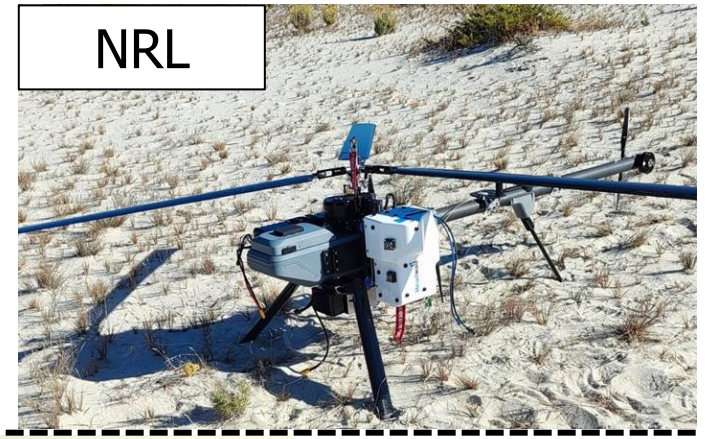
ASSETS

UAV

S-100

X8

NRL



USV

DriX

Mariner

UUV

Sea Explorer

Slocum

SENSORS

MBES

DriX

Mariner

EM712USV

EM2040

Optimized for USVs

Shallow Water Suitability

LiDAR

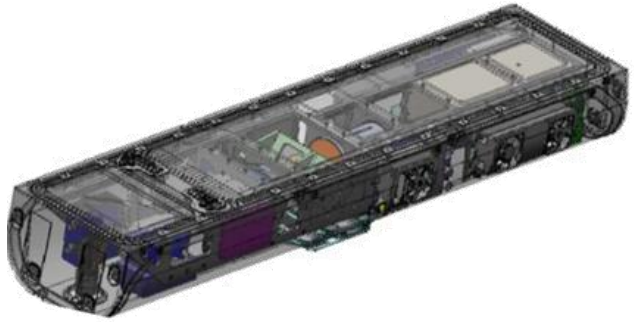
X8

S-100

YellowScan Navigator

Compact and Lightweight
Shallow Depth Limitations

ARETÉ PILLS



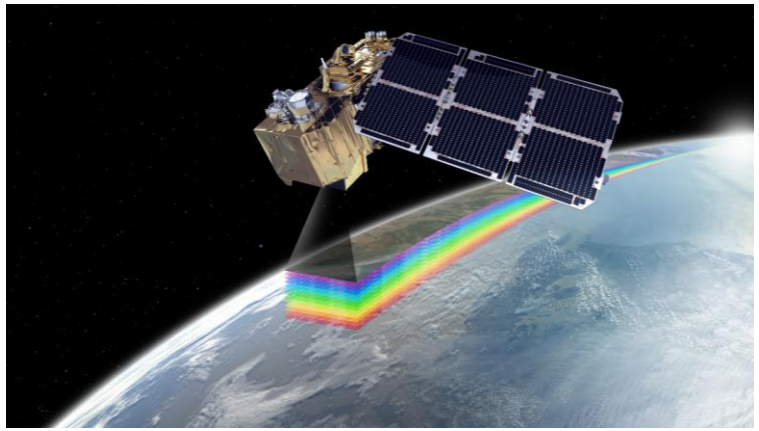
Depths up to 30 m
Moderate-Resolution

RIEGL VQ-860-G

Submerged target detection
Requires large airborne platform

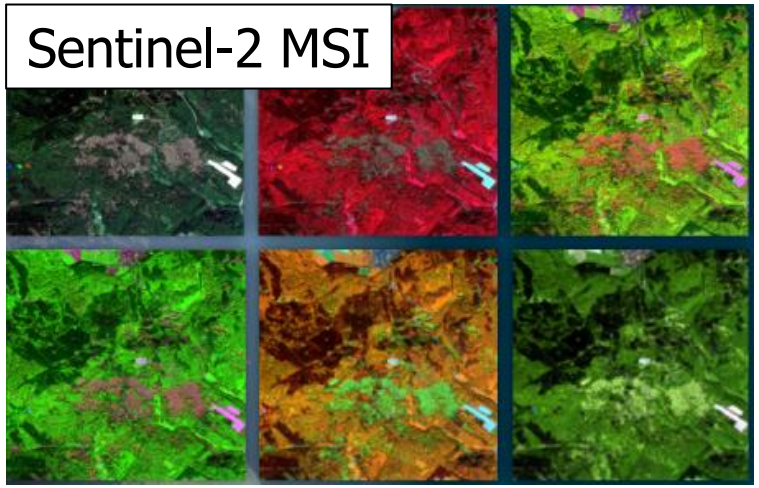
SENSORS

Spectral



NRL

Sentinel-2 MSI



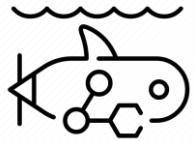
Headwall HSI

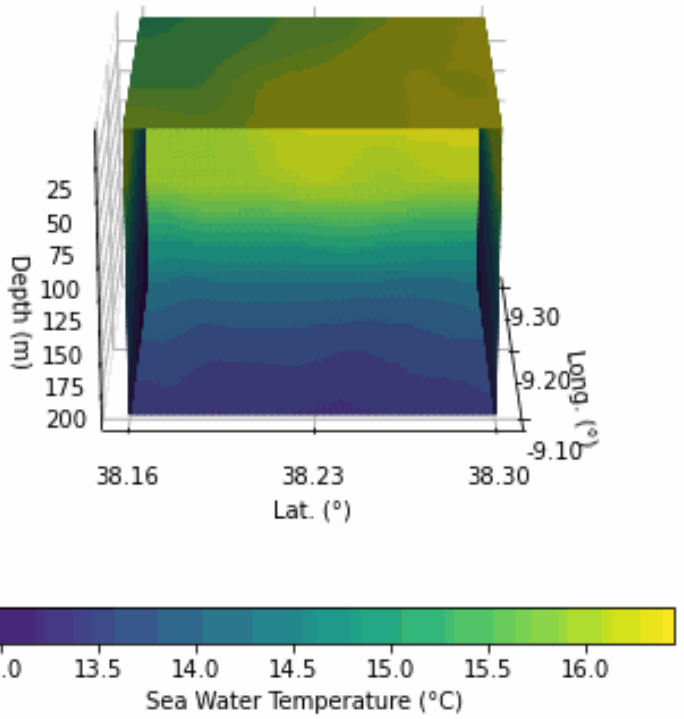
Large-scale, regional monitoring
Low Resolution

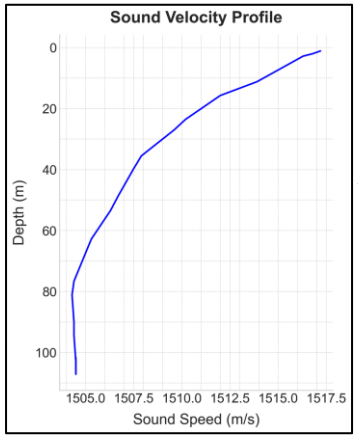
High-detail, targeted area studies
Higher cost

PRODUCTS

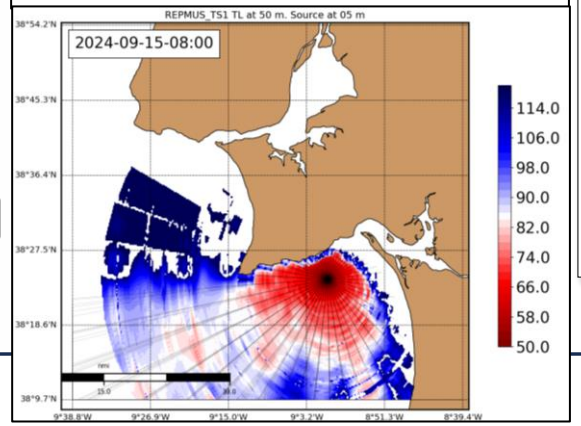
Oceanographic 3D Volume



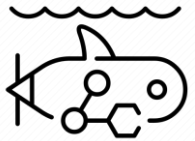


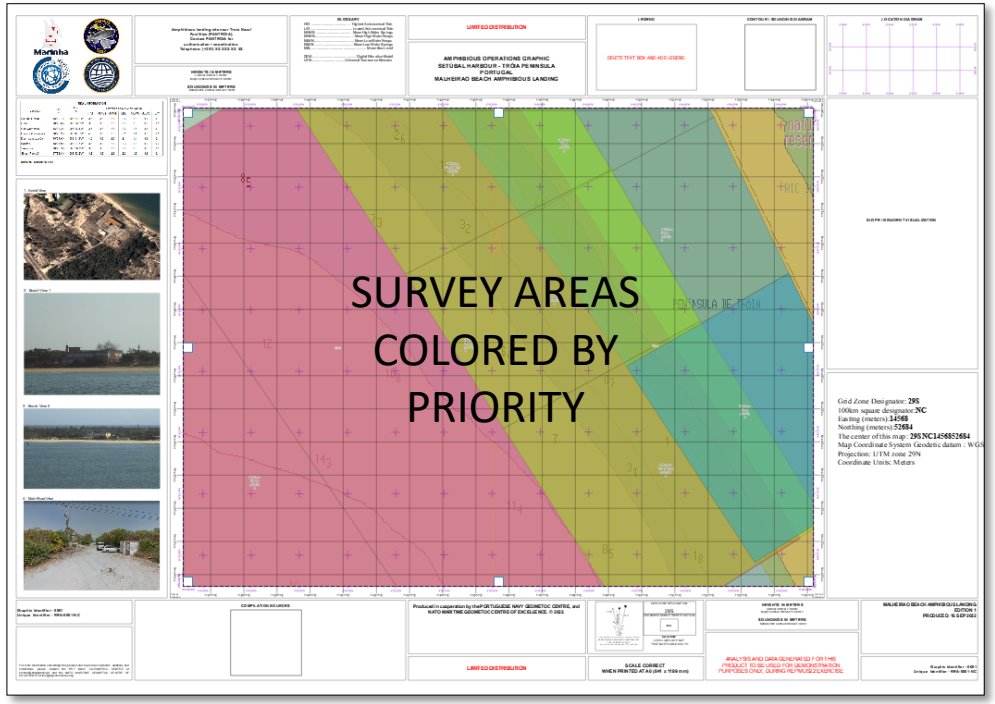


Transmission Loss Maps



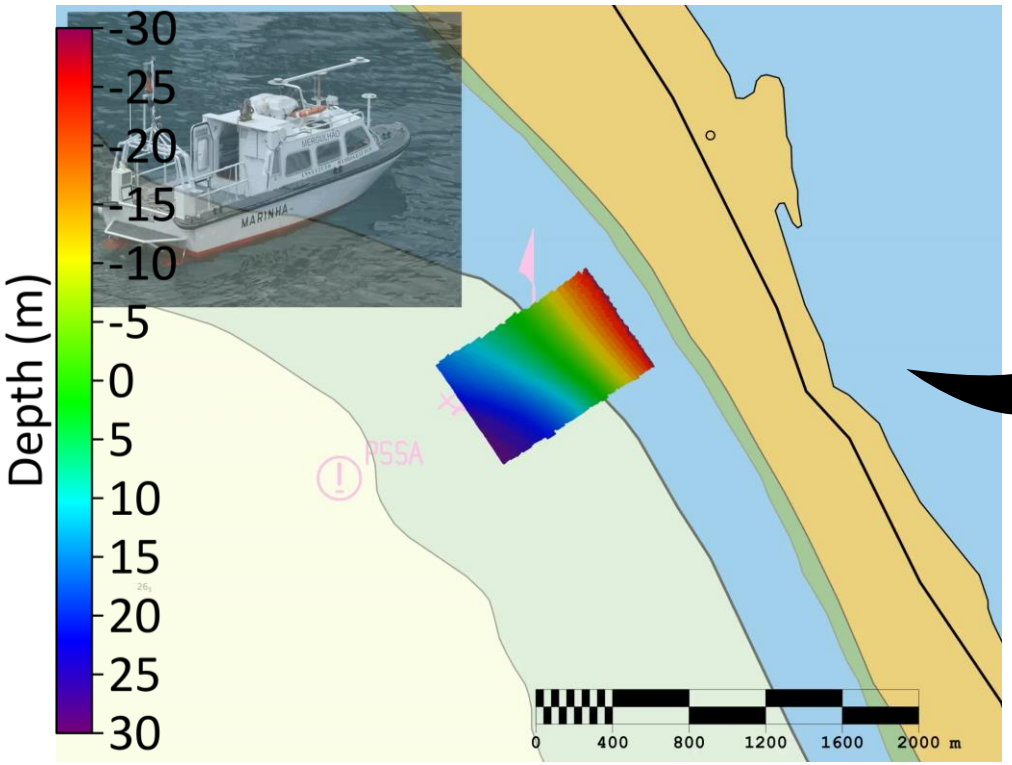
Amphibious Operations Graphic

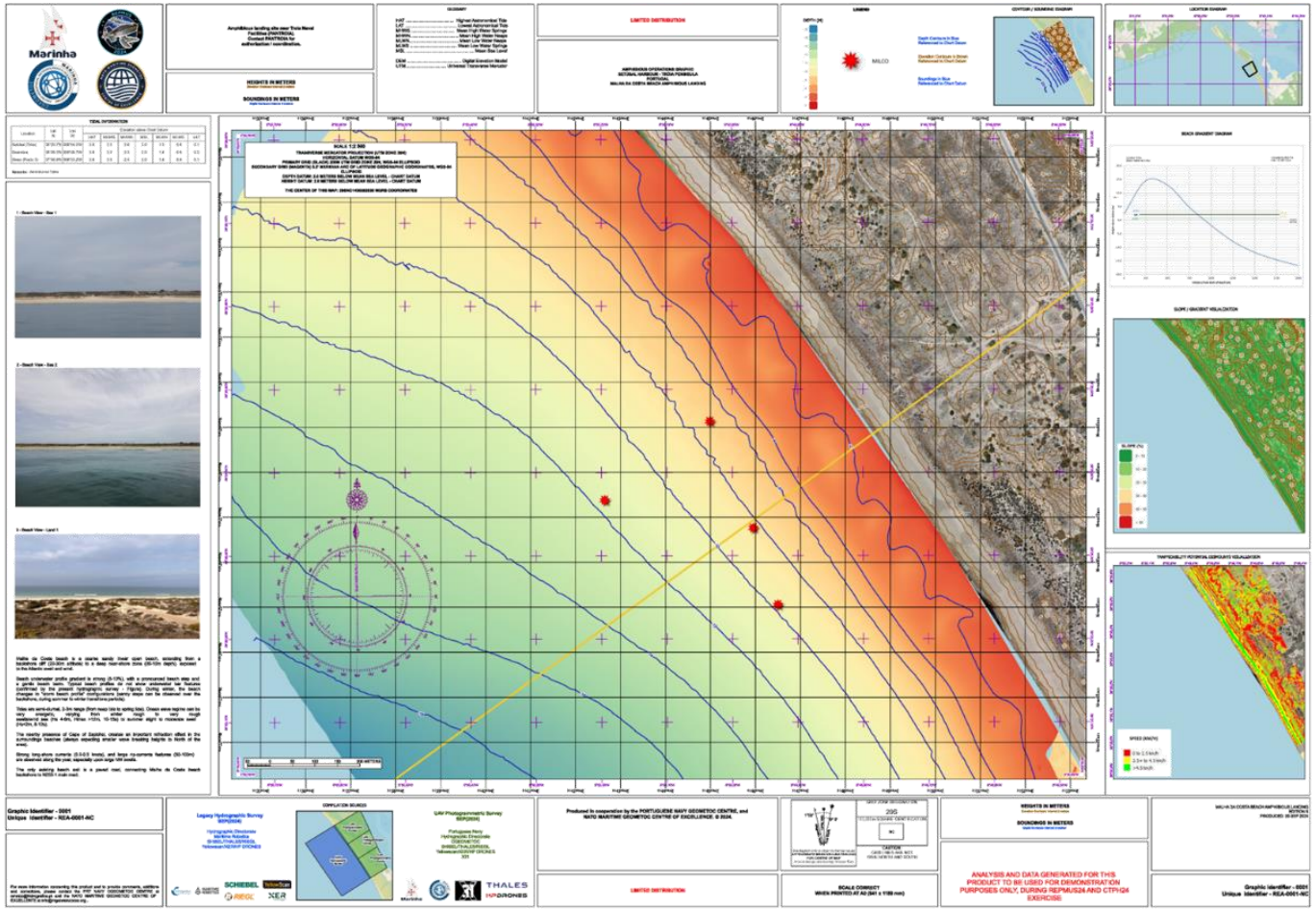




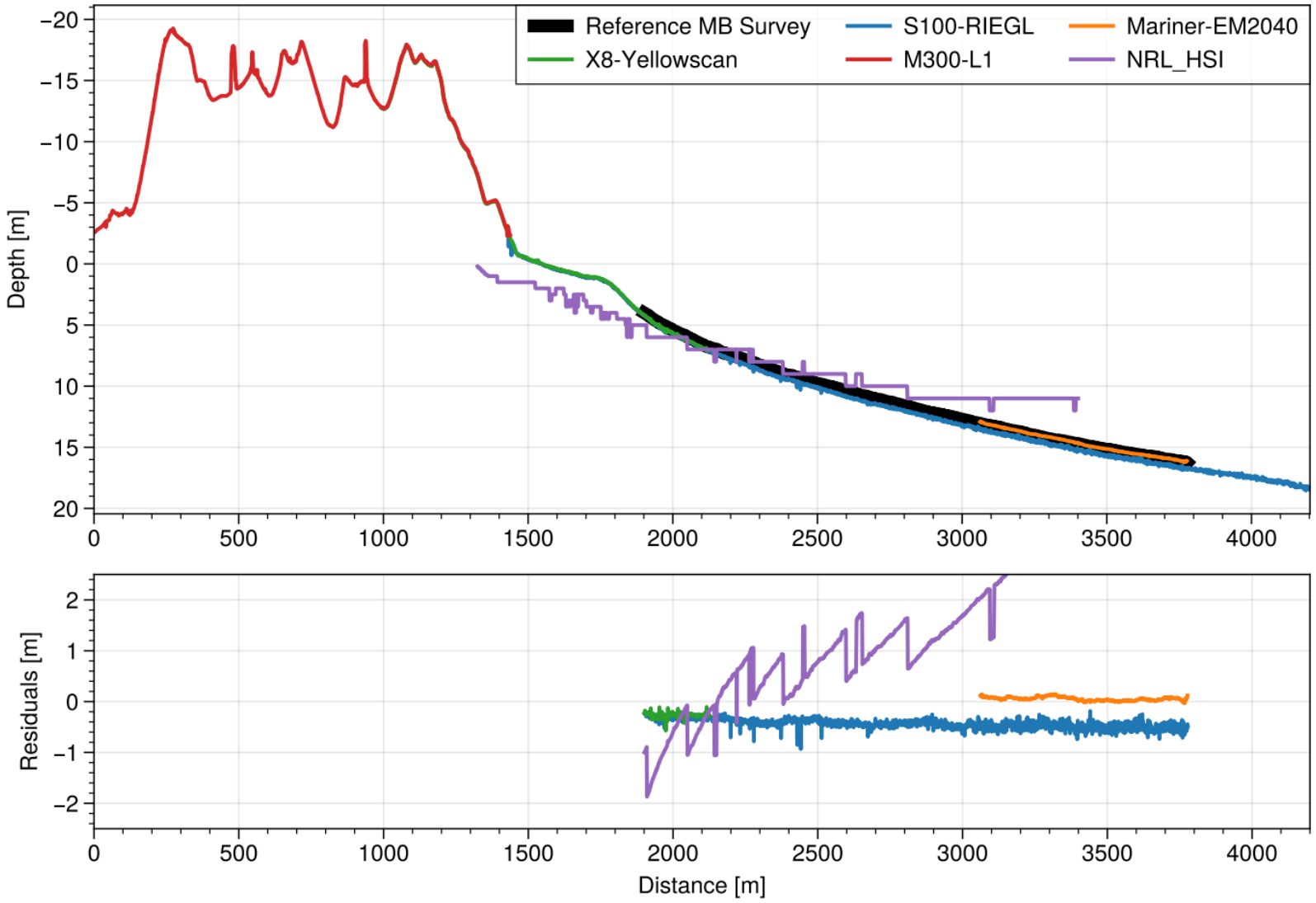
11 gliders contributing for this!

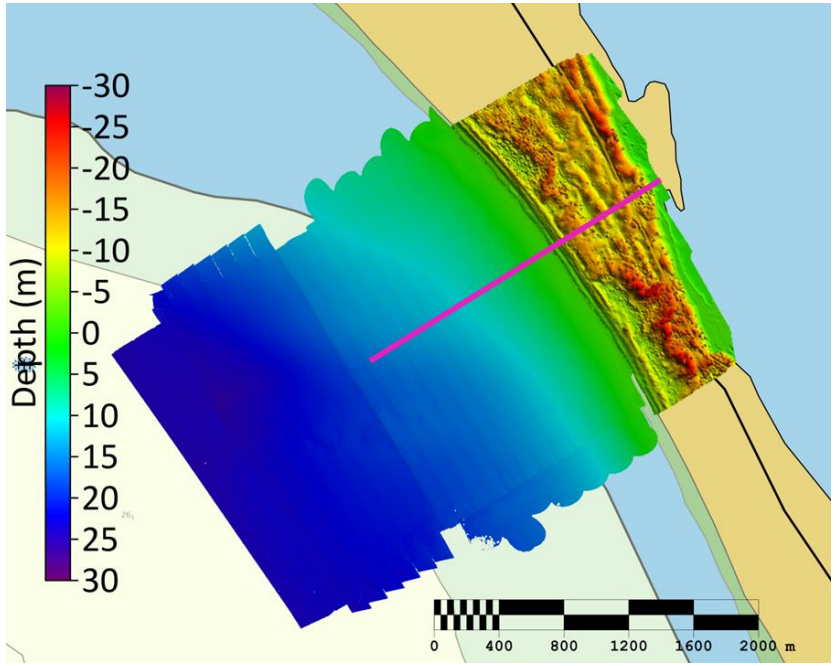
Amphibious Operations Graphic





PRODUCTS

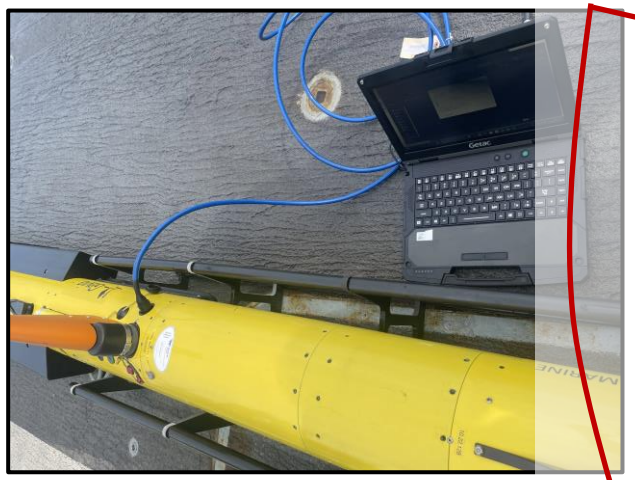




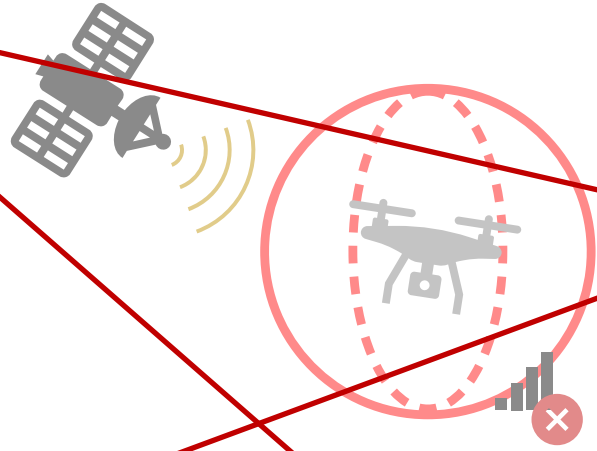
? What is good data in an operational context?!

CHALLENGES

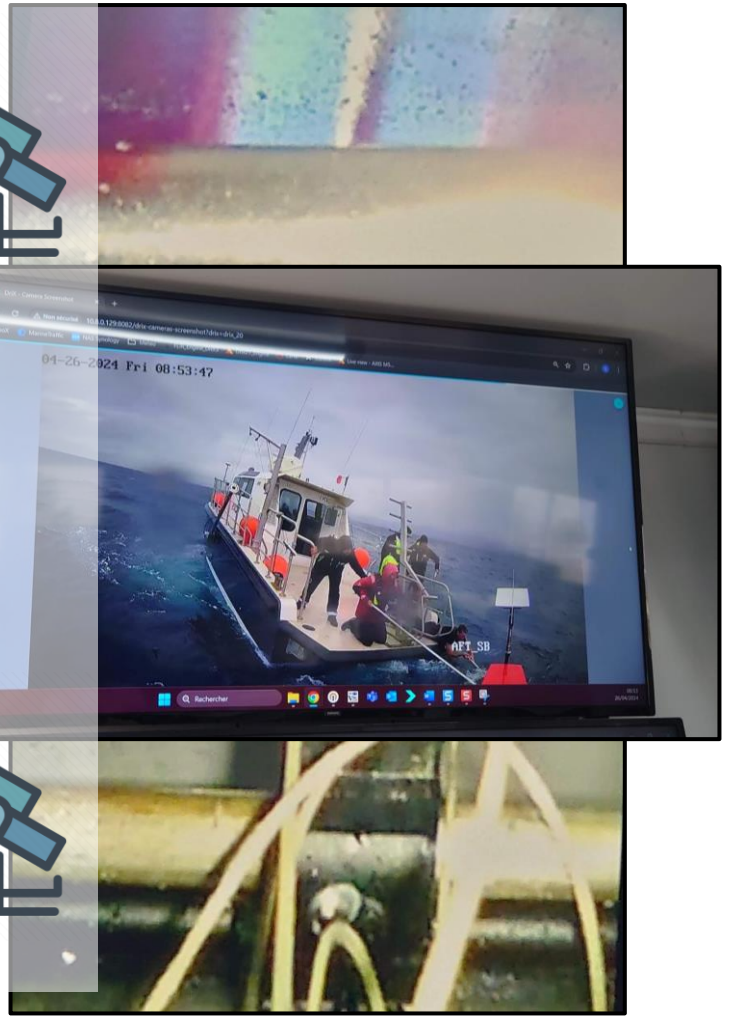
Data retrieval



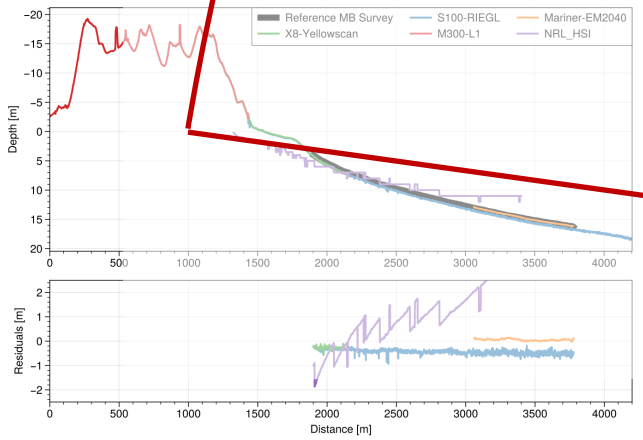
GNSS denied environments

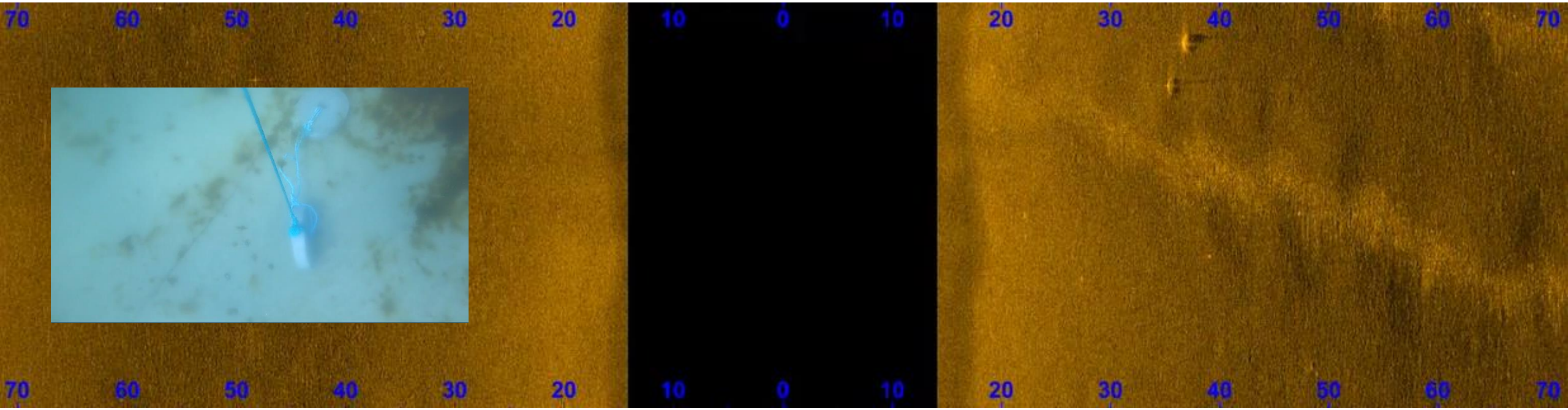


Sound Speed Profilers



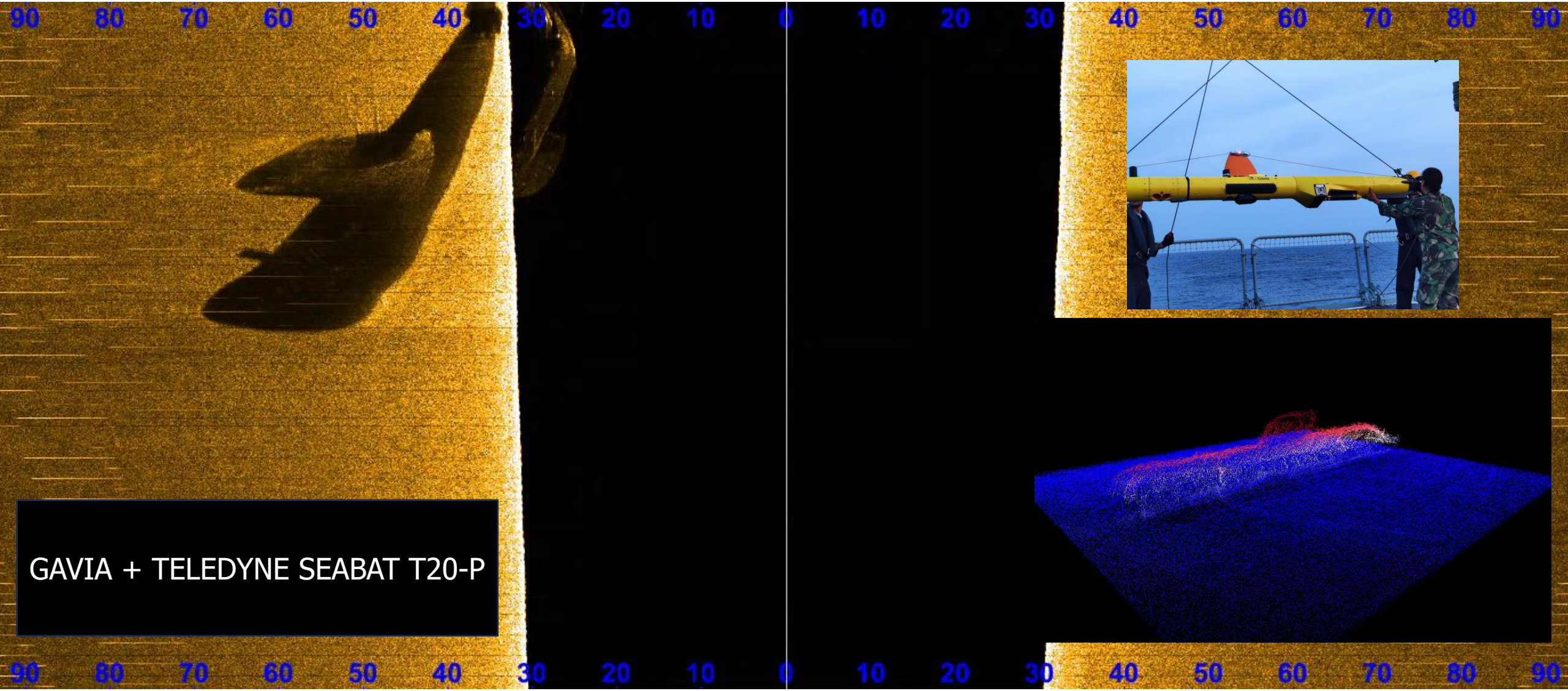
Data Quality Assessment



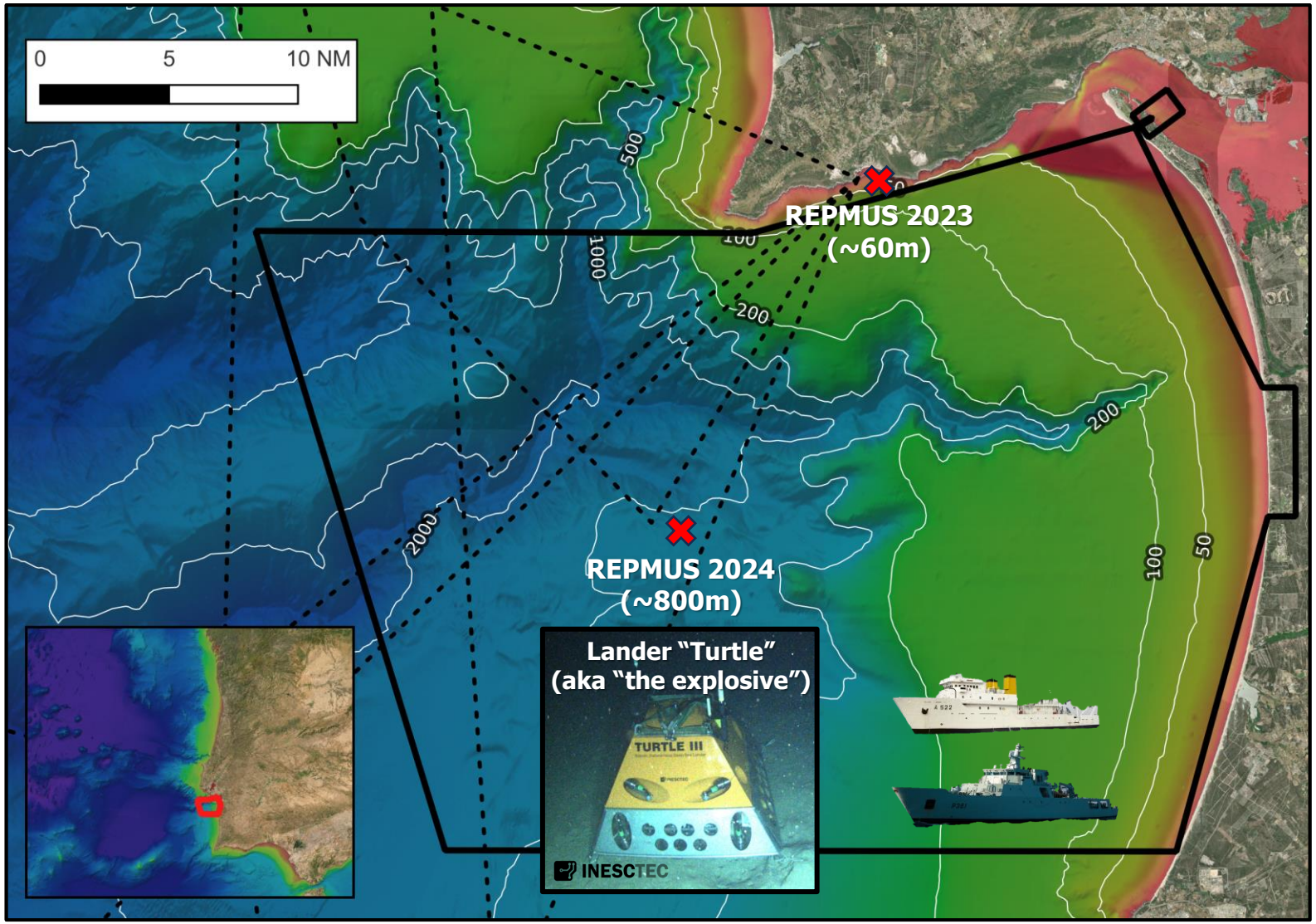


GAVIA + KRAKEN MINSAS 60

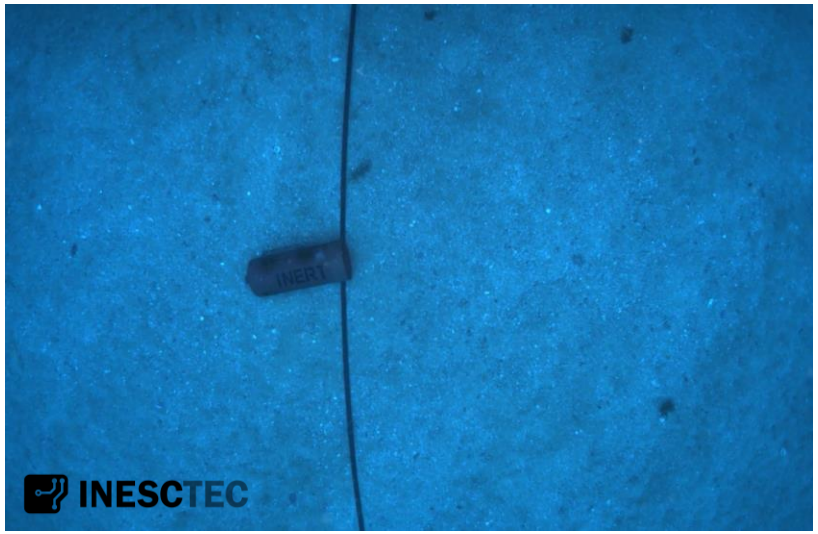
Submarine Escape and Rescue



Critical Underwater Infrastructures



REPMUS23

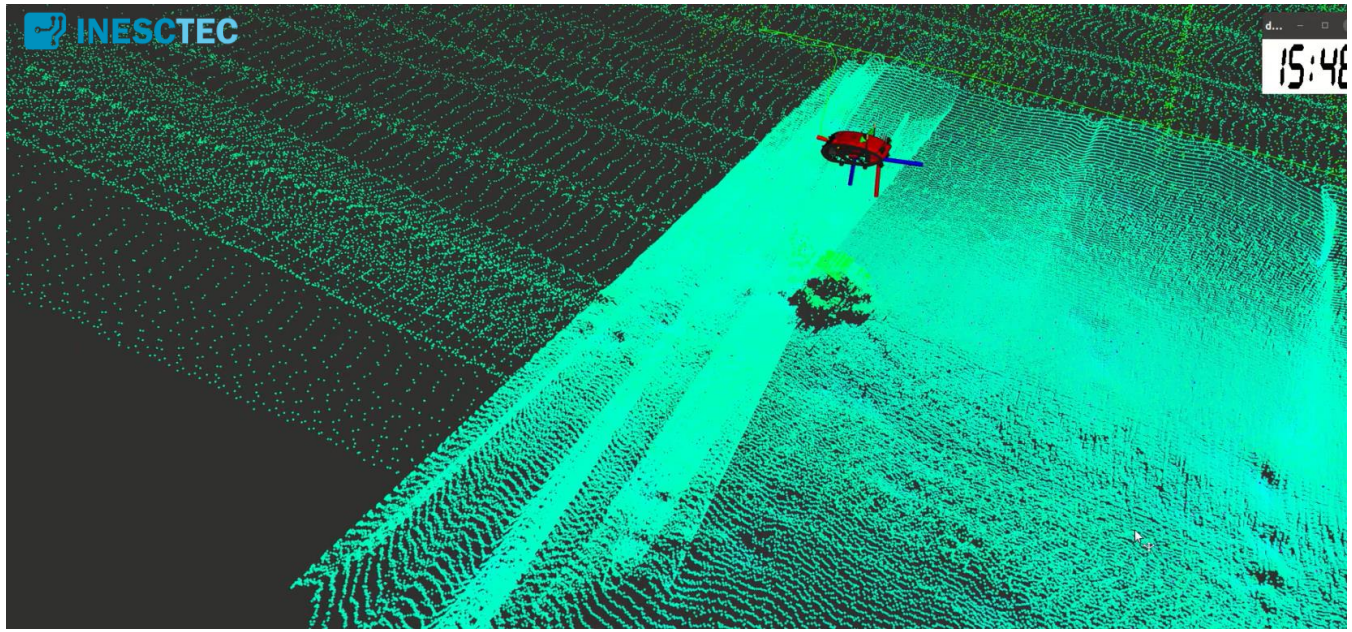


REPMUS24

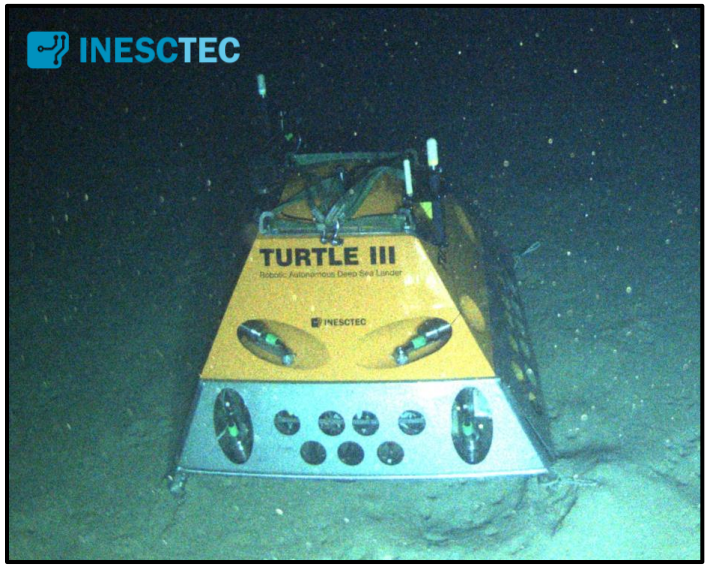
- Deploy a decoy cable @ 800m
- "Attack" the cable ("explosives")
- "Defend" the cable

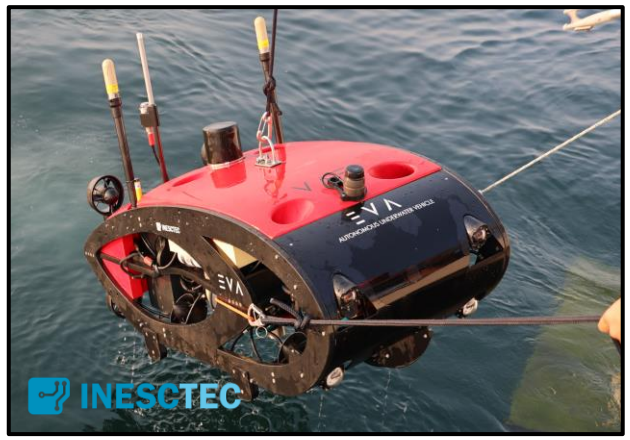
⚠ Several naval assets were deployed for a few days to support this operation!

Critical Underwater Infrastructures



...Turtle (aka "the explosive")





EVA (INESCTEC)

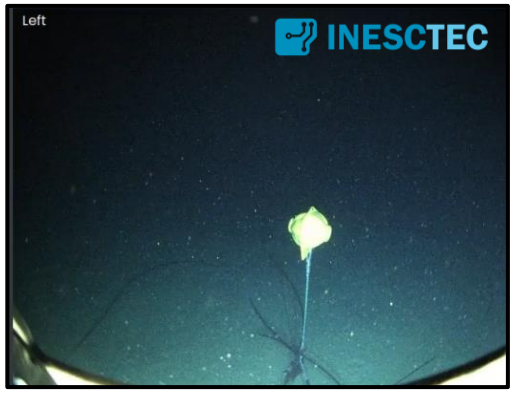
AUV / ROV

Made in Portugal

Payload

- **Norbit WBMS**
- Coda Octopus
- Kongsberg M3
- Cameras & Laser Scanners

...the decoy cable



HYDRO MUS: OTHER USE CASES

Critical Underwater Infrastructures

HUGIN 3000 (FFI)

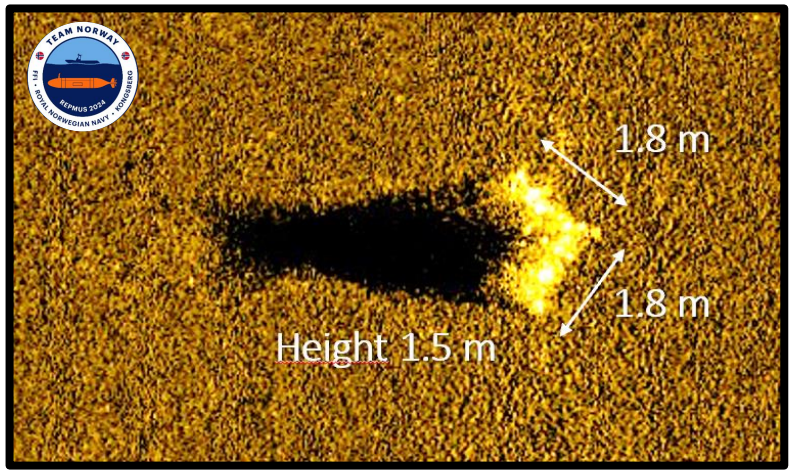
& FRIGG USV

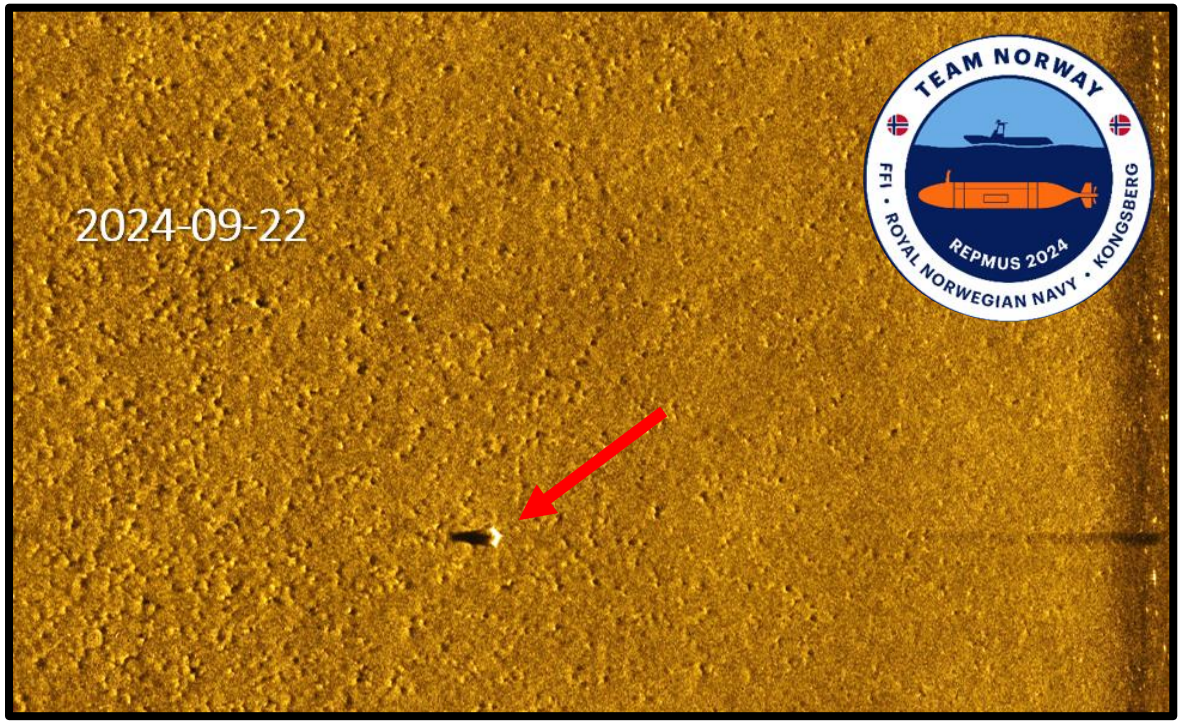
AUV

Launched from FRIGG USV (AUV taxi!)

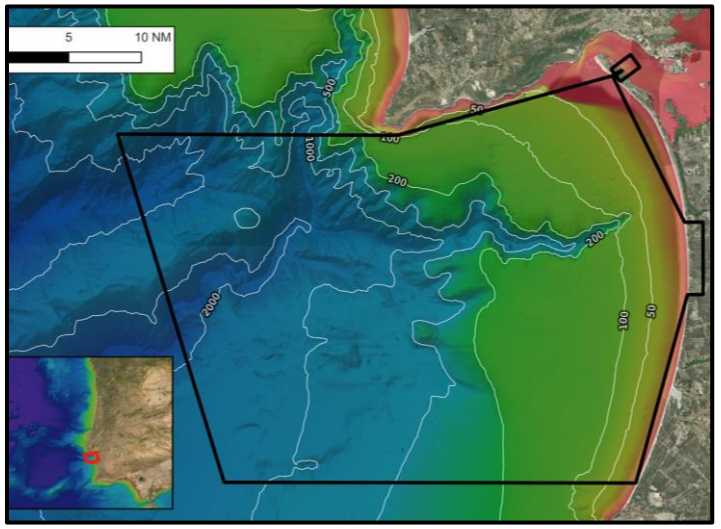
Payload

- **<u>Kongsberg HISAS 1032</u>**
- Kongsberg EM2040 MKII
- …



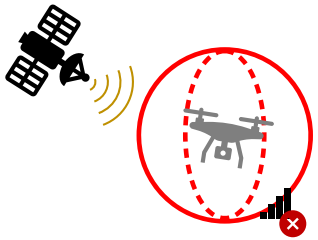


FREE TECH ZONE

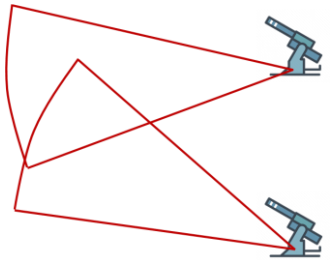


CHALLENGES

Deeper CUI?



GNSS denied REA?

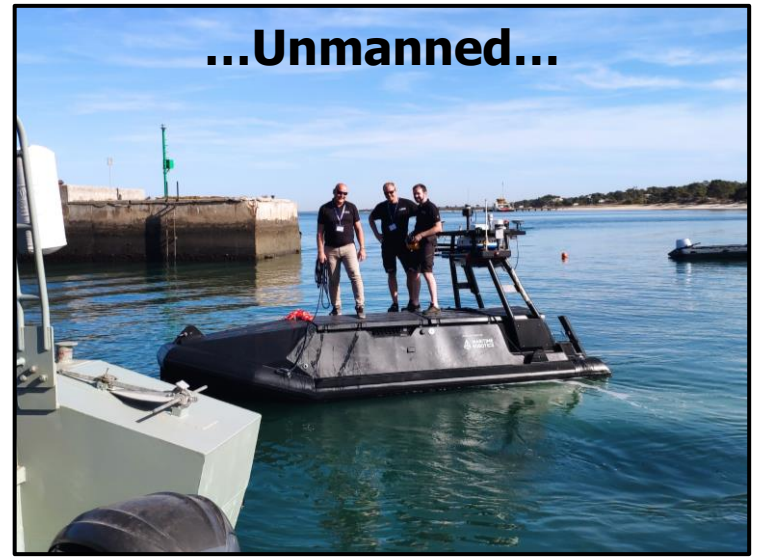


REA under hostile conditions?

HOW TO PARTICIPATE IN REPMUS?

REA WG Coordinator

HYDRO 2024
Hydrographic Conference



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