



# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



# Welcome & Introduction

Simon Powell, Operations Director

# MSE International

- Not-for-profit marine cluster based in the Solent
- Strong track record delivering large collaborative projects
- Expertise in:
  - Project management
  - Technology transfer
  - Supply chain mapping
  - Funding applications
  - Event management & training
- Active in the global Blue Tech Cluster Alliance
- Focus areas: maritime logistics, marine energy, maritime surveillance, ocean resource management



# Introducing the EO4MI Project

*(Earth Observation for Maritime Innovation)*



- ESA-funded initiative
- Enhancing marine information services through Earth Observation
- Supporting operational users across the Blue Economy
- Building pathways from EO capability to real-world delivery



# Today's Speakers

- Dr Jonathan Williams — MSE International
- Prof Roberto Pierdicca — Università Politecnica delle Marche
- Dr Paul Bell — NOC
- Dr Barbara Hofmann — HR Wallingford
- Dan Smith — Fugro
- James Cowles — ACUA Ocean
- André Cocuccio — MSE International
- *Dr Stefano Ferretti – ESA – by phone – perhaps!*



# Who's With Us Today?

- **Over 60 Delegates from:**
- UK, Canada, India, Netherlands, Italy, France, Luxembourg, Namibia, Nigeria, Japan, USA, Singapore, Mauritius, Ireland, Norway
- **Organisations include:**
- Marine science & research institutions
- Government agencies & regulators
- Technology developers & engineering firms
- Environmental NGOs
- Ports, energy & infrastructure organisations
- Start-ups & SMEs



# Agenda

Time	Session	Speaker / Notes
15:00–15:05	Introduction	Simon Powell, MSE International
15:05–15:20	Empowering the Blue Economy through advanced information services: the EO4MI Project	Dr Jonathan Williams, MSE International
15:20–15:30	AI4COPSEC - Integrating AI solutions with EO data to support oil spill response.	Prof. Roberto Pierdicca, Università Politecnica delle Marche
15:30–15:40	Oceans of Data – Joining the Dots...	Dr Paul Bell, NOC
15:40–15:50	Satellite driven enhancements for metocean services	Dr Barbara Hofmann, HR Wallingford
15:50–16:00	Fully Remote Subsea Environmental Monitoring	Dan Smith, Fugro
16:00–16:10	Bridging the gap in EO marine data	James Cowles, ACUA Ocean
16:10–16:20	The EO4MI Roadmap: Looking ahead	André Cocuccio, MSE International
16:20–16:50	Panel discussion and Q&A Drawing together operational needs, EO capability and delivery pathways.	Chair: Dr Jonathan Williams
16:50–17:00	Round-up & Close	Dr Jonathan Williams





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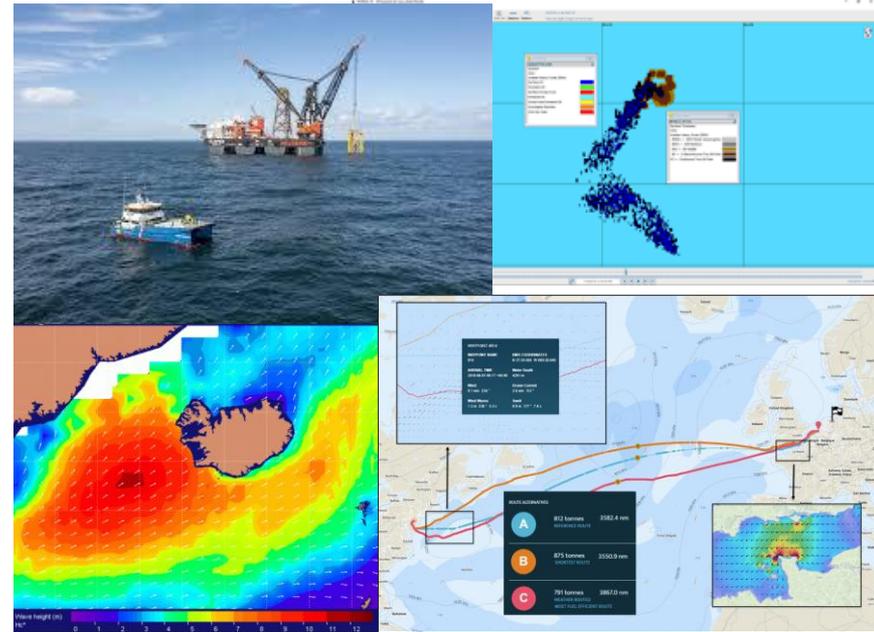


# EO4MI Project Overview

Dr Jonathan Williams, CEO

# Blue Economy Challenges: Marine Operations

- Many sectors of the Blue Economy depend on accurate and detailed information about metocean conditions:
  - Vessel mobilisation for offshore wind
  - Modelling of spills and erosion
  - Shipping route optimisation
  - Search & rescue
- But existing metocean data services generally suffer shortcomings:
  - Limited accuracy
  - Limited spatial resolution
  - Limited temporal resolution
- How can we address these shortcomings?



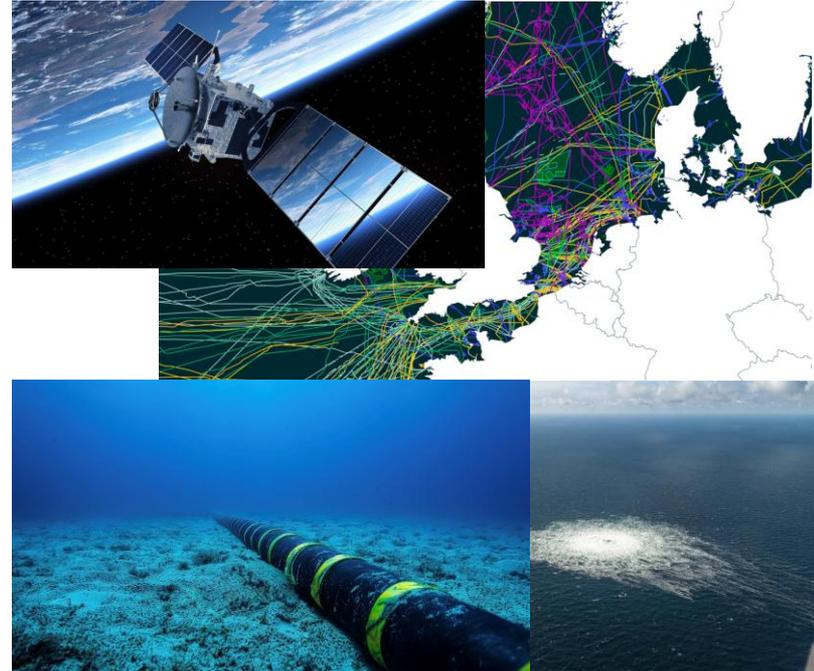
# Blue Economy Challenges: Managing Ecosystems & Decarbonisation

- The economic and ecological value of ecosystem services is becoming more & more important:
  - Seagrass meadows for offsetting hard-to-abate carbon emissions
  - Shoreline habitats for coastal protection
  - Ecosystems to support increased fish populations and water clean-up
- Managing Marine Protected Areas is challenging:
  - Monitoring seabed habitats & biodiversity cost-effectively
  - Enforcement by identifying illegal vessels
  - MPAs further offshore (BBNJ Treaty) and growing in area
- How can we manage ocean natural capital more cost-effectively?



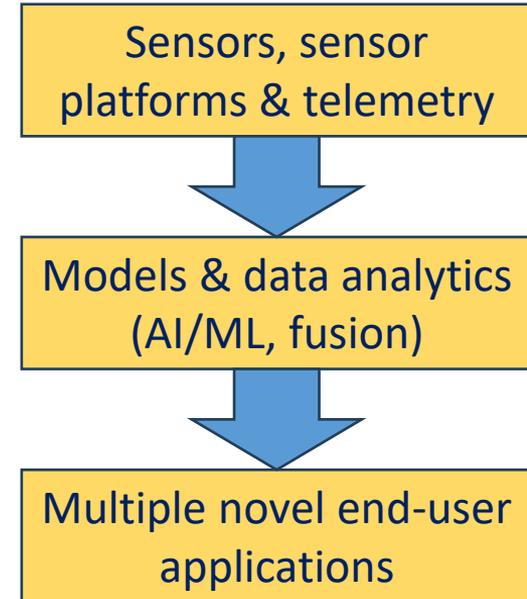
# Blue Economy Challenges: Securing Critical Infrastructure

- Critical infrastructure on the seabed is vulnerable
  - Damage to communication cables by anchor-dragging
  - Pipeline sabotage
  - Offshore wind array cables
- Managing risk involves seabed monitoring & vessel identification
  - Identifying hostile objects on seabed
  - Identifying suspicious vessels



# Focus on Capability Gaps

- All these challenges can be addressed by filling some critical capability gaps:
  - Seabed monitoring using autonomous vessels
    - Lower cost than traditional survey vessels
  - Seabed characterisation & feature detection
    - Eg by AI/ML from multibeam data
  - Fusion of disparate data resources and models
    - Eg periodic wide area EO data with continuous in-situ data
  - Vessel identification (with AIS off or spoofed)
    - Eg by detecting RF or acoustic emission signatures



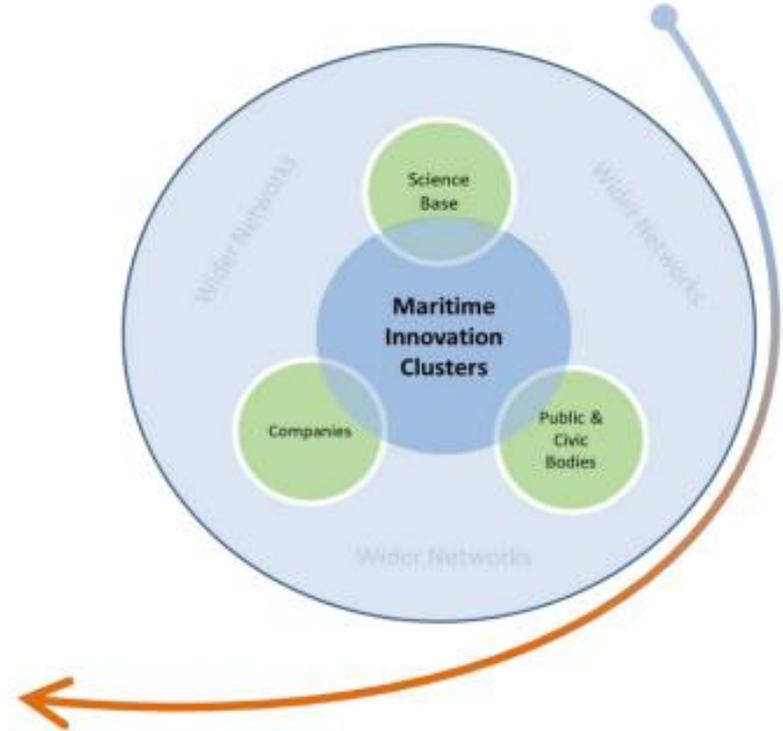
# ...Also Focus on Emerging Capabilities

- VHR optical imagery
  - Pléiades Neo – 30cm resolution, 12 hr revisit
- VHR SAR topography
  - SWOT - monitors swell wave fronts and Hs, 21 day revisit
- Autonomous marine vehicles
  - Low-cost imaging, edge processing & telemetry
- AI/ML image classification
  - Cross-sector image classification advances to improve computer vision
  - Habitat classification using CNN, ViT etc



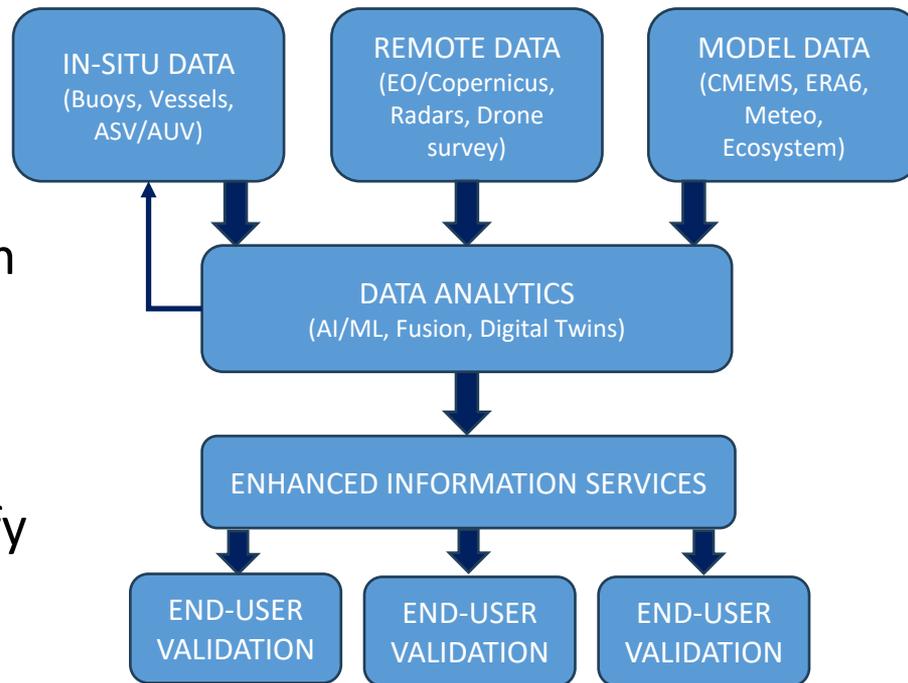
# Enabling Role of Innovation Clusters

- Blue Economy challenges need solutions that:
  - Meet global requirements
  - Draw on global expertise
- Innovation clusters can build collaborations across national and sectoral boundaries
  - Eg this webinar includes attendees from 18 countries, 4 continents
  - Companies, research centres, public bodies with ocean governance roles
- Solutions deployed by international user-base
  - Stronger business case to develop the solution



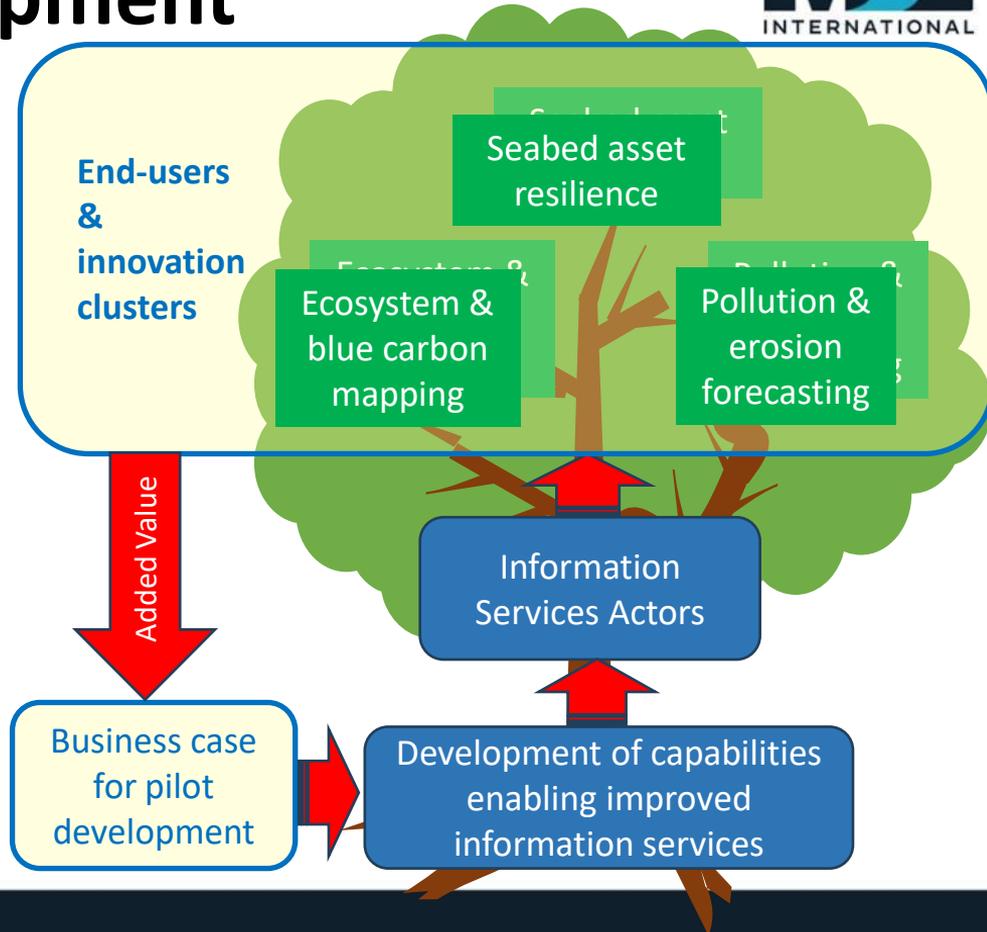
# Two Pilot Projects to Demonstrate

- Enhanced metocean forecasting
  - Enhanced resolution
  - Error mapping
- Seabed mapping & characterisation at low cost
  - Ecosystem/habitat mapping
  - Seabed asset resilience
- Technology roadmapping to identify capability gaps



# Pilot Projects Development

- Value Tree Methodology
- Consortia stakeholders
  - End-users & service providers
  - EO data specialists
  - In-situ platform and sensor developers/operators
  - Modellers, AI & assimilation experts
- Building consortia now
  - Value proposition to ESA & other stakeholders





# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



Security enhancement through heterogeneous data fusion and improved  
AI/ML-powered Copernicus maritime and border surveillance services

# Advancing the Blue Economy with Earth Observation Webinar

26 February 2026, Ancona

Prof. Roberto Pierdicca  
Università Politecnica delle Marche - DICEA Department  
On behalf of project partners



Funded by  
the European Union

PROJECT 101190021\_AI4COPSEC

# Project overview

AI4COPSEC is an innovative Horizon Europe research project focused on enhancing maritime and border surveillance through advanced artificial intelligence technologies.

The project aims to demonstrate the potential of machine learning and GeoAI models to improve existing **Copernicus services**.

**AI4COPSEC integrates state-of-the-art AI solutions with Copernicus satellite data to address urgent environmental and security challenges.** With a focus on self-supervised deep learning models, geomatics, and social media data, AI4COPSEC seeks to revolutionize maritime surveillance and environmental crisis response through cutting-edge technological innovations.



**36** months



**10** partners



**4** million €

# Consortium

AI4COPSEC is coordinated by **Simula Research Laboratory** and **eOdyn** (technical coordinator) and supported by an interdisciplinary consortium of **ten partners** from seven European countries.

Each partner brings specific expertise in the field of maritime surveillance, intelligence and artificial intelligence technologies.

**simula**

**eOdyn**

**HOZINT**  
HORIZON INTELLIGENCE

**itml**  
innovation applied

**AISTECH**  
access to intelligent space technologies



UNIVERSITÀ  
POLITECNICA  
DELLE MARCHE

**magellan  
circle**



**IMT Atlantique**  
Bretagne-Pays de la Loire  
École Mines-Télécom

**SATCEN**  
EUROPEAN UNION SATELLITE CENTRE



An aerial photograph of a large cargo ship sailing on a deep blue ocean. The ship is viewed from a high angle, showing its deck, superstructure, and the wake it leaves behind. The entire image is overlaid with a semi-transparent teal network of interconnected nodes and lines, suggesting a digital or data-driven theme. The ship is positioned diagonally across the frame, from the bottom left towards the top right.

# AI4COPSEC

Promotes synergies between space data, non-space data (IoT, in situ, OSINT) and AI to enhance CSS.



## Search and Rescue

Supporting Search and Rescue (SaR) entities and operations, by developing a rapid alert system, optimised drift modelling, and advanced ship detection/identification.



## Oil Spill

Addressing the challenges posed by oil spills at EU level, by developing a rapid alert and response system, optimised oil spill drift modelling, and advanced pollution detection.



## Irregular Migration

Supporting border and maritime authorities, by developing a rapid alert and detection system for pre-defined suspicious activities at sea, along with accurate predictions of the most likely maritime routes followed by migrants' vessels.



## Illegal Fishing

Addressing the challenges posed by Illegal, Unreported, and Unregulated (IUU) fishing at EU level, by developing a rapid detection system for small-scale fishing in restricted zones, advanced AIS shutdown detection, and rapid ship & event alerts

# Technological Bricks (TBs)



REA

## Near Realtime Oceans Conditions

Enable real-time ocean observation  
– Melodi IoT drifters' already provide in-situ measurements.

Currents, AIS, Omni-Situ to acquire wave patterns.

Merge coastal and satellite AIS into a



DAN

## Drift Analysis

Fuse AIS-derived currents and Copernicus data using 4dvarnet. Train models from ground-truth drifter data.



TRP

## Trajectory Prediction

Use historical data of AIS and Environmental data to forecast, backcast and interpolate trajectories.



SHI

## Ship Identification

Use nearby tracks, historical AIS and trajectory interpolation to identify ship that do not send AIS messages



SHO

## Ship and Oil Spill Detection

Image segmentation, complex image analysis, ship identification. Using CNNs, GANs and transformers.

Use HR-Images for vessel identification, AIS tampering. Combine AIS with SAR, optical and thermal imagery.



AAD

## AIS Anomaly Detection

Analyse AIS data and train model to correlate ship behaviour including speed and course variations, with encountered sea conditions derived for the fusion of near real-times Copernicus products.

Identify navigational or security risks.



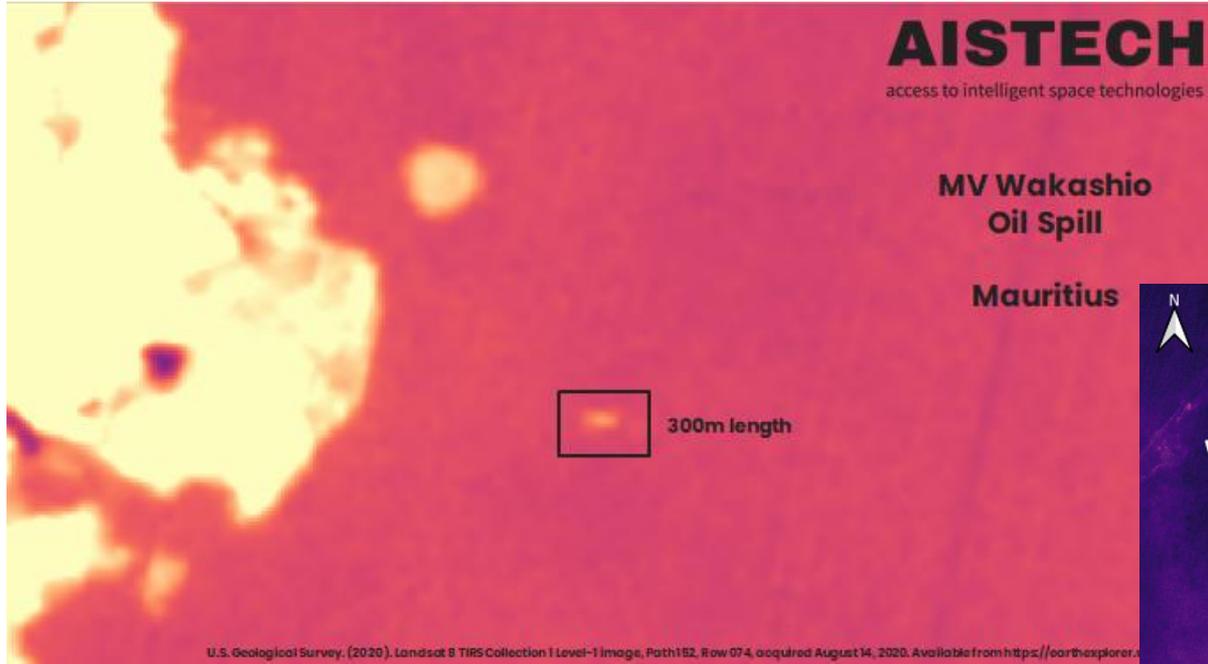
EVD

## Event Detection

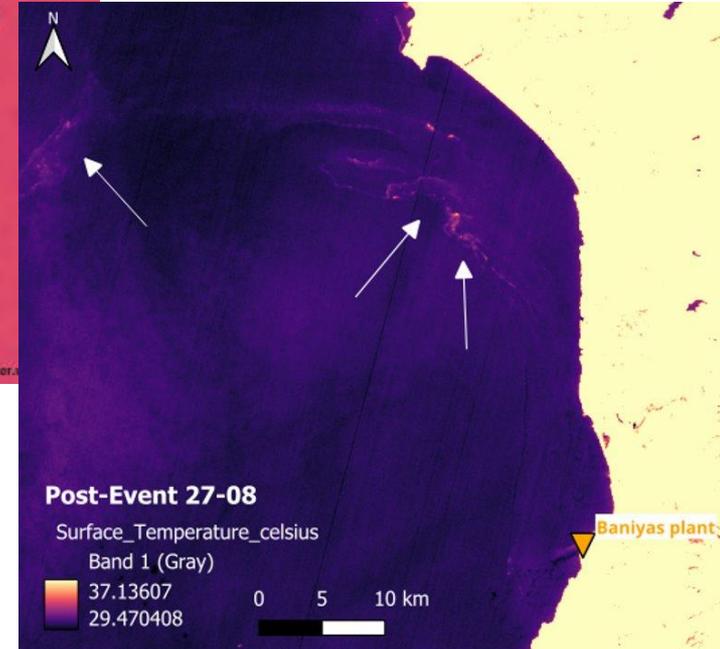
Build upon open-source intelligence data for real-time risk reporting.

Combine AIS data tracks with NLP techniques to retrieve coordinates and timing information of events.

# Space data and contributive missions (Thermal imagery)

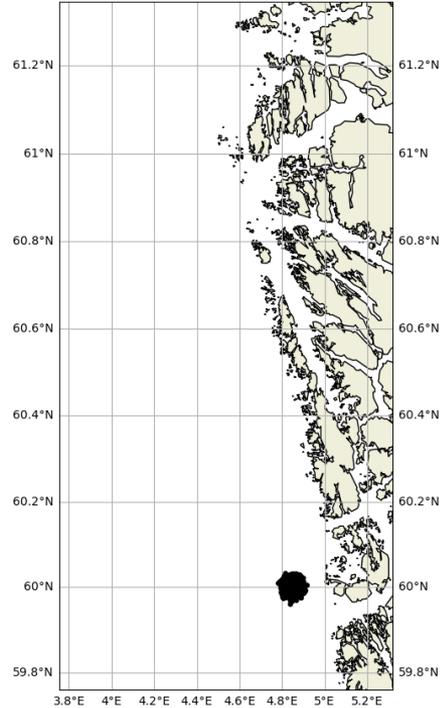


*Landsat 8 acquisition, courtesy of the U.S. Geological Survey (USGS), Processed by Aistech.*



# T6.5 Oil spill detection and drift prediction models

OpenDrift - OceanDrift  
2025-10-03T14:11:04 UTC



## Strategy

- use OpenDrift for modeling the trajectories of drifting objects (search-and-rescue) or substances (oil)
- use maps from ocean current and wind as input for the Lagrangian simulations
  - high-res current maps from our Omni-Situ technology will allow higher-precision simulations.

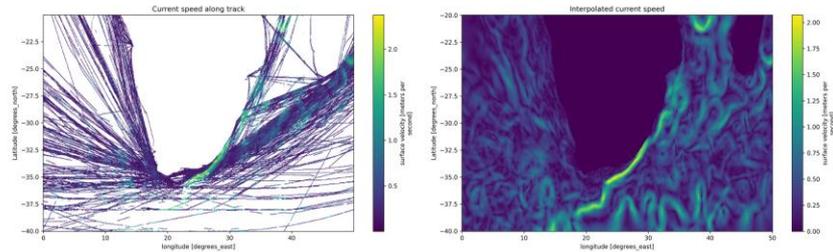
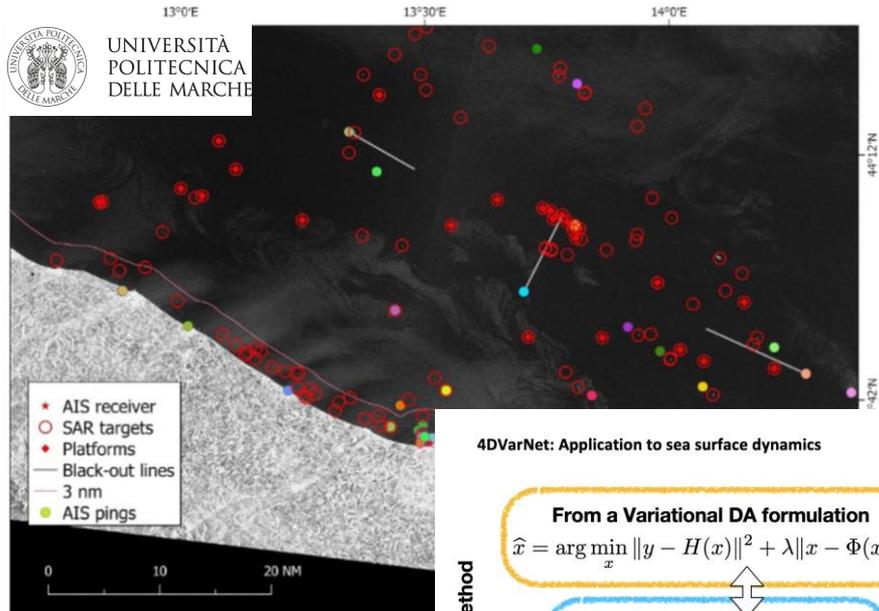
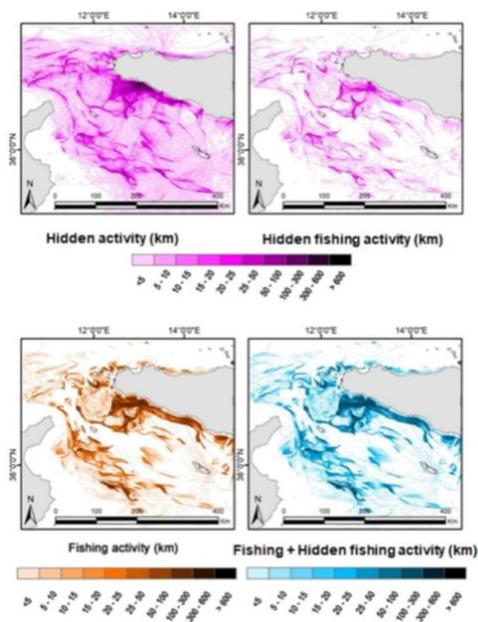
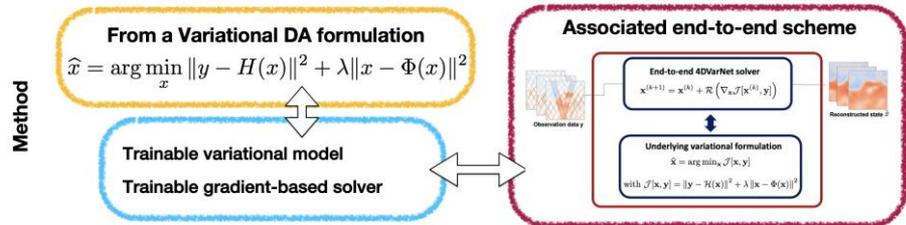


Figure 1: Current maps estimation by eOdyn. Left: current speed estimated along vessel tracks around South Africa on 05.01.2020 (L3). Right: Assimilated current maps (L4).

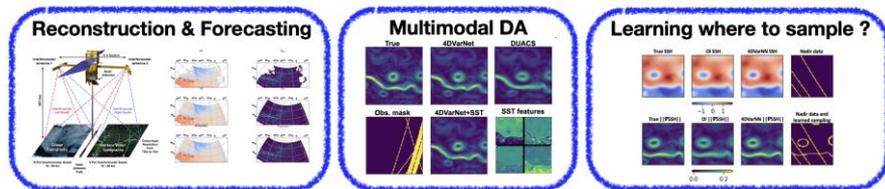
# Space data and data fusion (illegal fishing)



4DVarNet: Application to sea surface dynamics



Applications

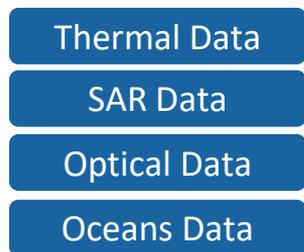


# GeoAI model training inputs

## Complementary use of remote sensing data sources

Individual detection constraints for each source, due to:

- cloud coverage
- resolution (optical or resolution)
- (open) data access
- availability (time and space)



Data Fusion (WP5)

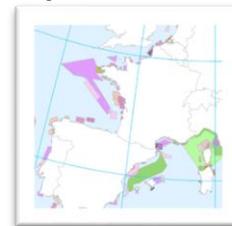


Feature Selection

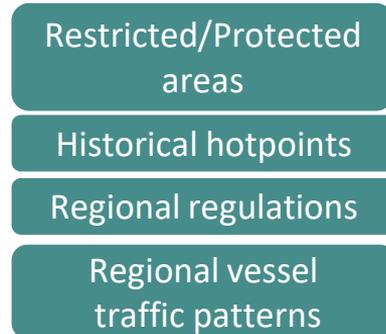
GeoAI models (WIP)

Detection models for illegal fishing and irregular migration

## Geographic metadata incorporation

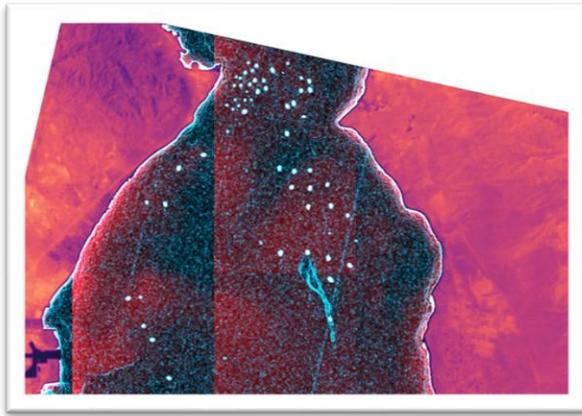


Context information:



# Dataset creation

Fusion of image data, regional restrictions, incident reports and AIS



Ex: Processed thermal data



Maritime Protected Areas

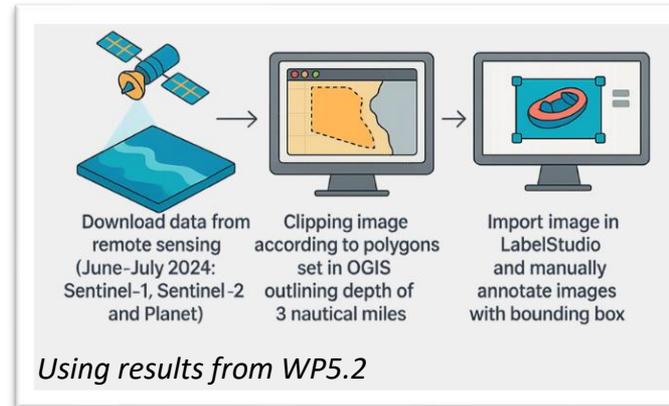
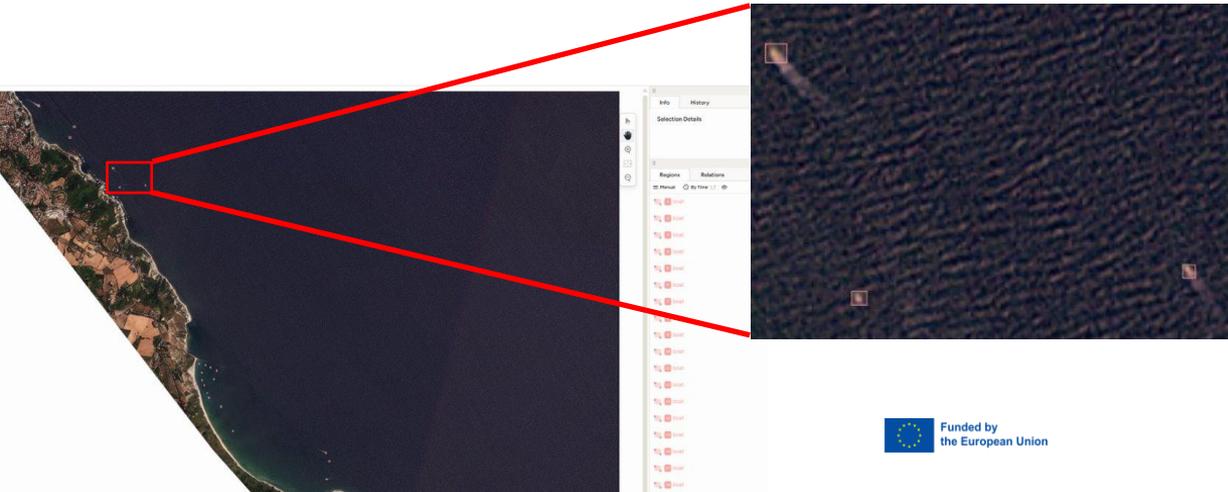


- Reported past incidents
- AIS data

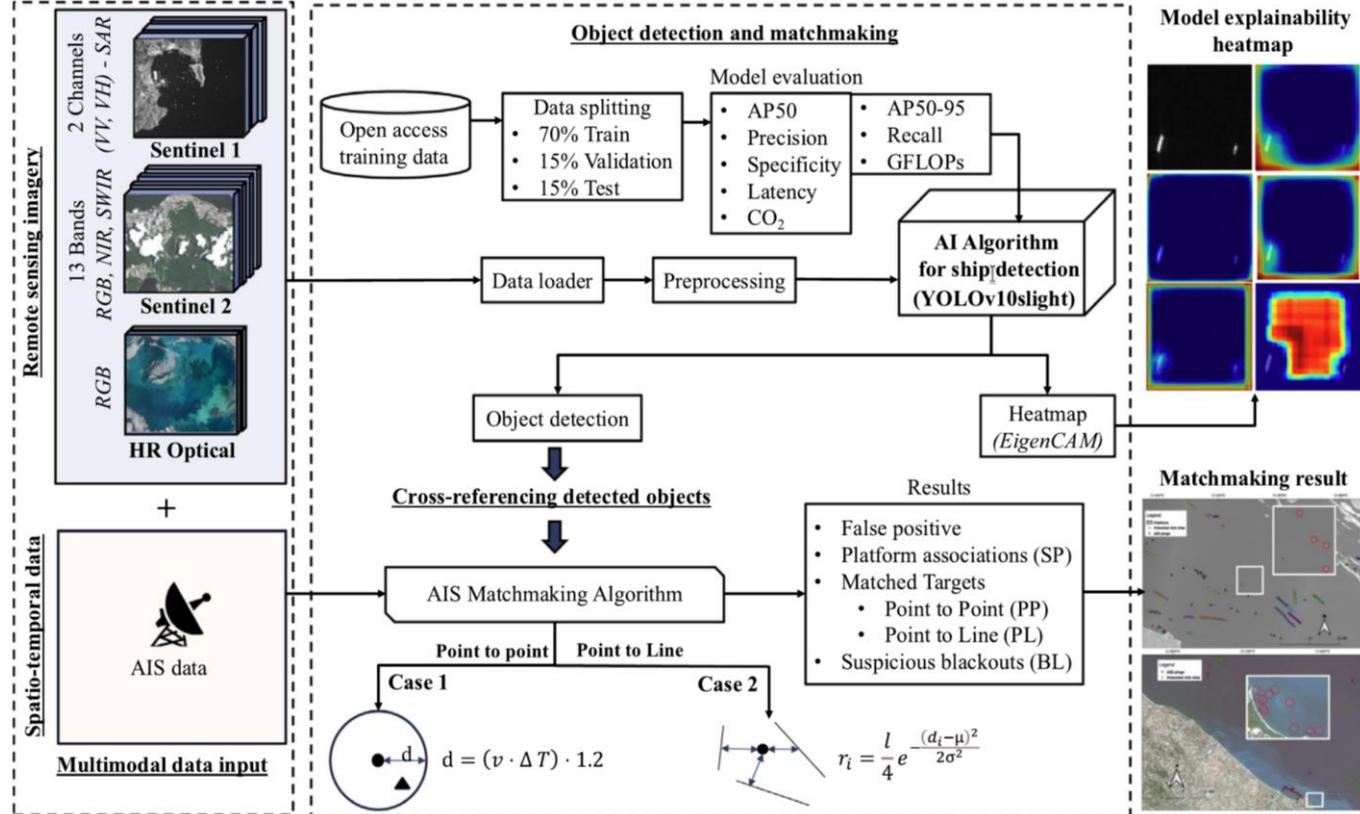
Labelling of irregular activities

# T6.3 Voluntary AIS shutdown detection with advanced DL models

- advancing AIS voluntary-shutdown detection
  - using multi-source data:
    - AIS, OSINT, environmental data (ocean currents, weather conditions) and satellite imagery
  - comparison of different DL model architectures
  - validation with real-world test datasets using PlanetScope imagery



# Identification of Suspicious Blackouts



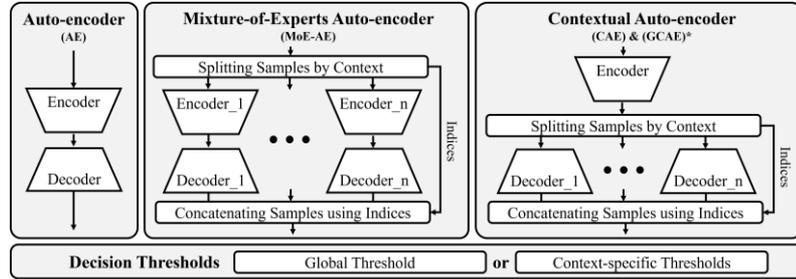
Galdelli et al., 2025, Multimodal AI-enhanced ship detection for mapping fishing vessels and informing on suspicious activities, Pattern Recognition Letter, Vol 191, pp 15-22 ([see](#))

# Open source data - Intelligence

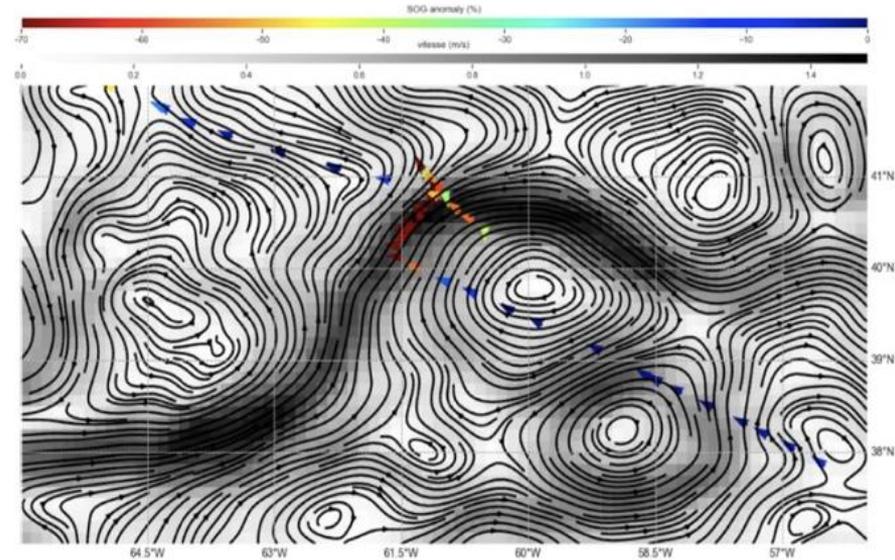
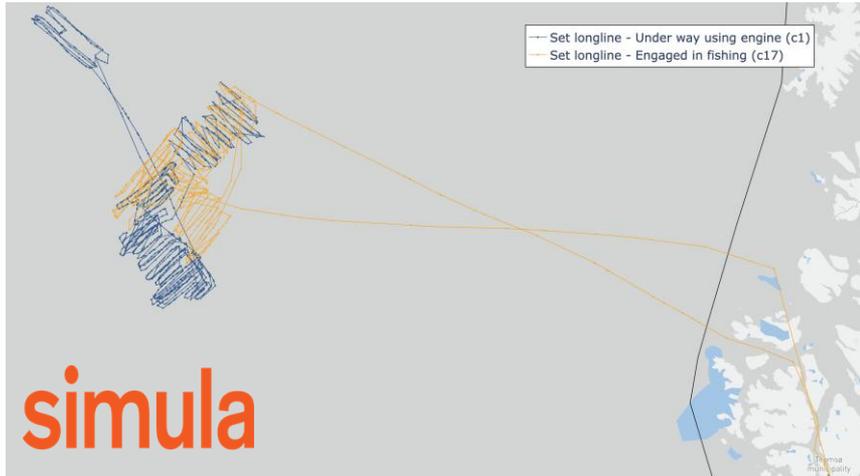
The screenshot shows the HOZINT interface with a map of Europe. The left sidebar contains filters for 'Europe / CIS', 'Oil & gas', 'Workplace disaster', and 'Last 90 days'. The map displays several incident markers with pop-up cards. One card for 'Germany | Oil leak from sunken ship in Flensburg - again deployment for fire brigade and THW' is highlighted. Other cards include 'United Kingdom | Jet fuel tanker in flames after crash off England's northeast coast' and 'Portugal | Beach closed due to oil spill'.

This screenshot shows a detailed view of an incident in Ceuta, Spain. The top right corner indicates it was published on Thursday 13 March 2025 16:46. The main heading is 'Spain | 12 detainees: they passed immigrants from Ceuta to Algeciras on stolen vessels'. The location is 'Calle Sgto. Mena, 8, 51001 Ceuta, Spain'. The event date is 'Thursday 13, March 2025'. The category is 'MIGRATION', the report is an 'Incident', and the impact is 'LOW'. A satellite map of Ceuta is shown on the left. The text summary states: 'The Central Unit for Illegal Immigration Networks and Documentary Falses (Ucifr) of the Algeciras Local Police (Cádiz) has carried out the detention of a total of 12 persons for their alleged membership in a criminal organization dedicated to the illegal introduction of Moroccan migrants from Ceuta to the coast of [...] La entrada 12 detainees: they passed immigrants from Ceuta to Algeciras on stolen boats aparece primero en El Faro de Ceuta.' The source is listed as 'https://elfarodeceuta.e...'. The interface includes filters for 'Europe / CIS' and 'Migration', and buttons for 'UPDATE FOCUS' and 'SAVE FOCUS'.

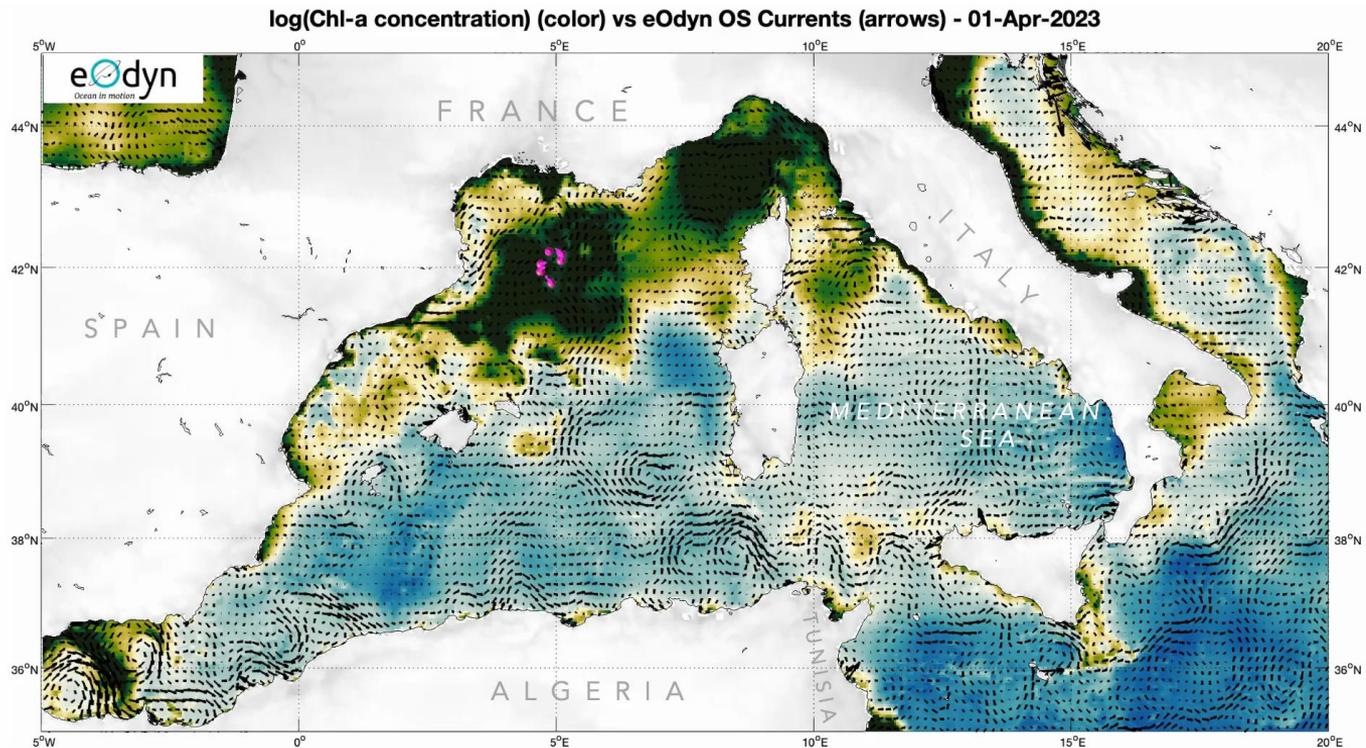
# Anomaly detection and context awareness using AI



Context-Aware AutoEncoders (A form of Self-Supervised DL) overcome traditional AE for anomaly detection in maritime traffic surveillance



# IoT and in situ data



# AI4COPSEC impact...



## Environment/Social

- Marine pollutions
- Illegal fishing
- Search and Rescue / migrations



## Operations

- Enhanced efficiency
- Costs savings



...maximized



Guardia  
Civil



EUROPEAN UNION  
SATELLITE CENTRE

*Analysis for decision making*





Security enhancement through heterogeneous data fusion and improved  
AI/ML-powered Copernicus maritime and border surveillance services

# Thanks!

## Do you have any questions?

[www.ai4copsec.eu](http://www.ai4copsec.eu)



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The information presented in this document are confidential.

@AI4COPSEC





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# Oceans of Data : Joining the Dots...

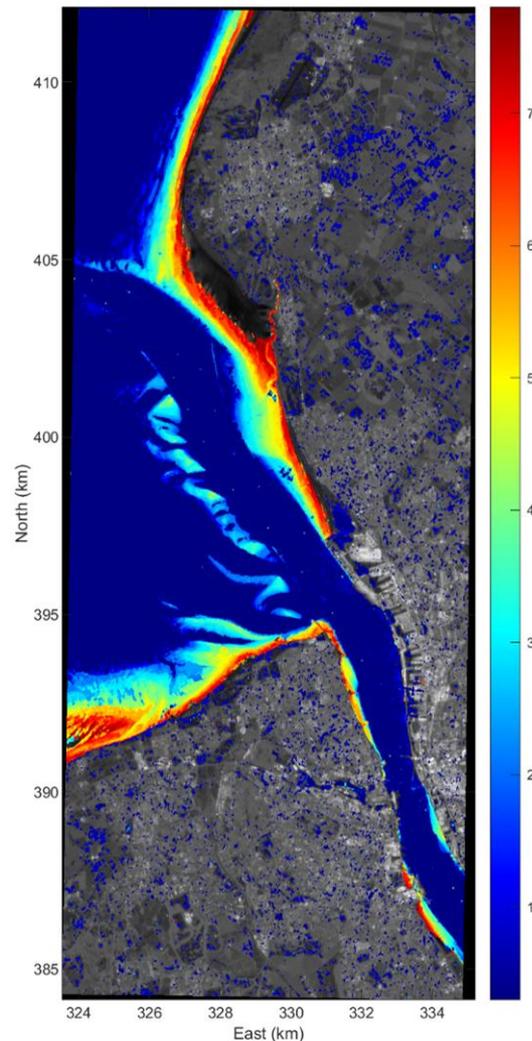
Paul S Bell

Principal Research Scientist

@ UK National Oceanography Centre, Liverpool

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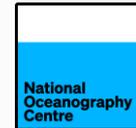
David McCann, Clive Neil, Christine Sams, Christine Gommenginger,  
Dougal Lichtman, Simon Williams, Andy Matthews (NOC)  
Cai Bird & Alex Sinclair (CoastSense Ltd)





Wholly-owned trading subsidiary  
 Commercial relationships, with access  
 to NOC expertise and facilities  
 Profits recycled into the NOC charity

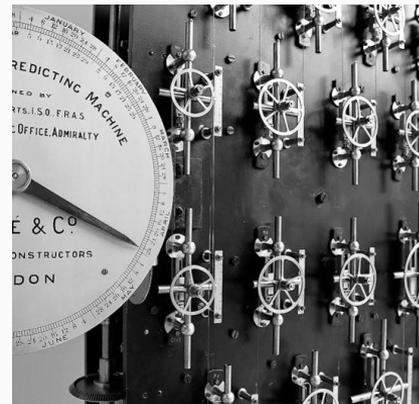
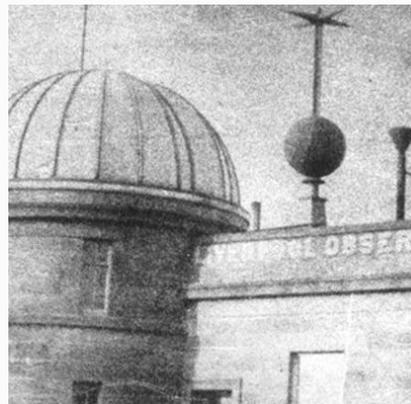
Independent since 2019 (ex-government)  
 Charity limited by guarantee (CLG)  
 Collaborations on research and development,  
 compatible with charitable goals



The National Oceanography Centre (NOC)  
 has been in operation for over six decades and  
 has a team of around 700 people leading  
 research, technology and innovation that  
 benefits the whole world.

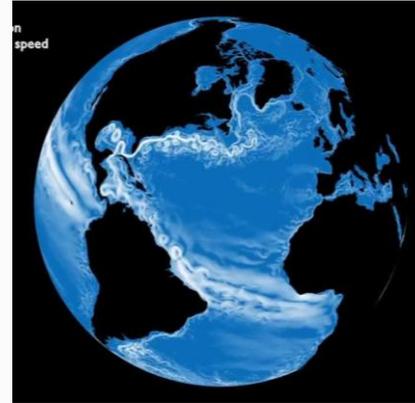
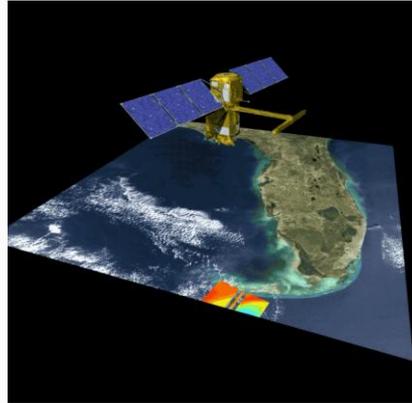
It has sites in Liverpool and Southampton. In 1929, the Liverpool Observatory  
 and Tidal Institute was formed to develop new methods for analysing and  
 predicting tides, gaining renowned worldwide reputation. The Liverpool Tidal  
 Institute was the pre-cursor to National Oceanography Centre in Liverpool.

The NOC in Southampton can trace its roots back to the original Discovery  
 Investigations in the 1920s, the influential Group W during World War II and  
 the founding of the National Institute of Oceanography (NIO) in 1949.



# NOC EXPERTISE, EQUIPMENT AND FACILITIES

- World Class Research Vessels
- National Marine Equipment Pool and Seagoing Technical Support
- Marine Robotics and Autonomous Systems Facility
- British Ocean Sediment Core Research Facility (BOSCORF)
- British Oceanographic Data Centre (BODC)
- Permanent Service for Mean Sea (PSMSL)
- National Oceanographic Library
- National Tidal and Sea-Level Facility

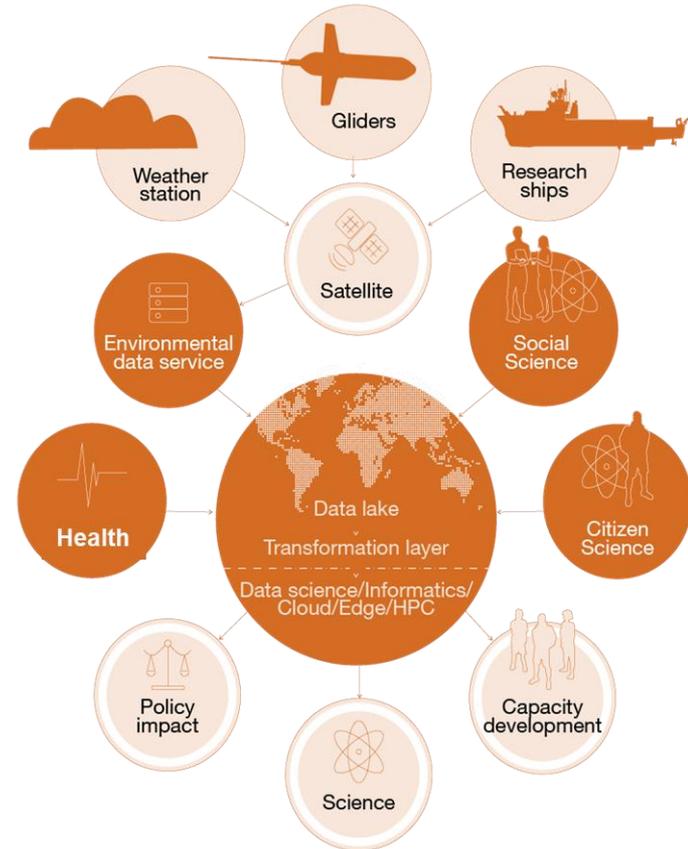


# Satellites Allow us to 'Join the Dots' with in-situ Data

"Satellites are delivering data products that we can use"

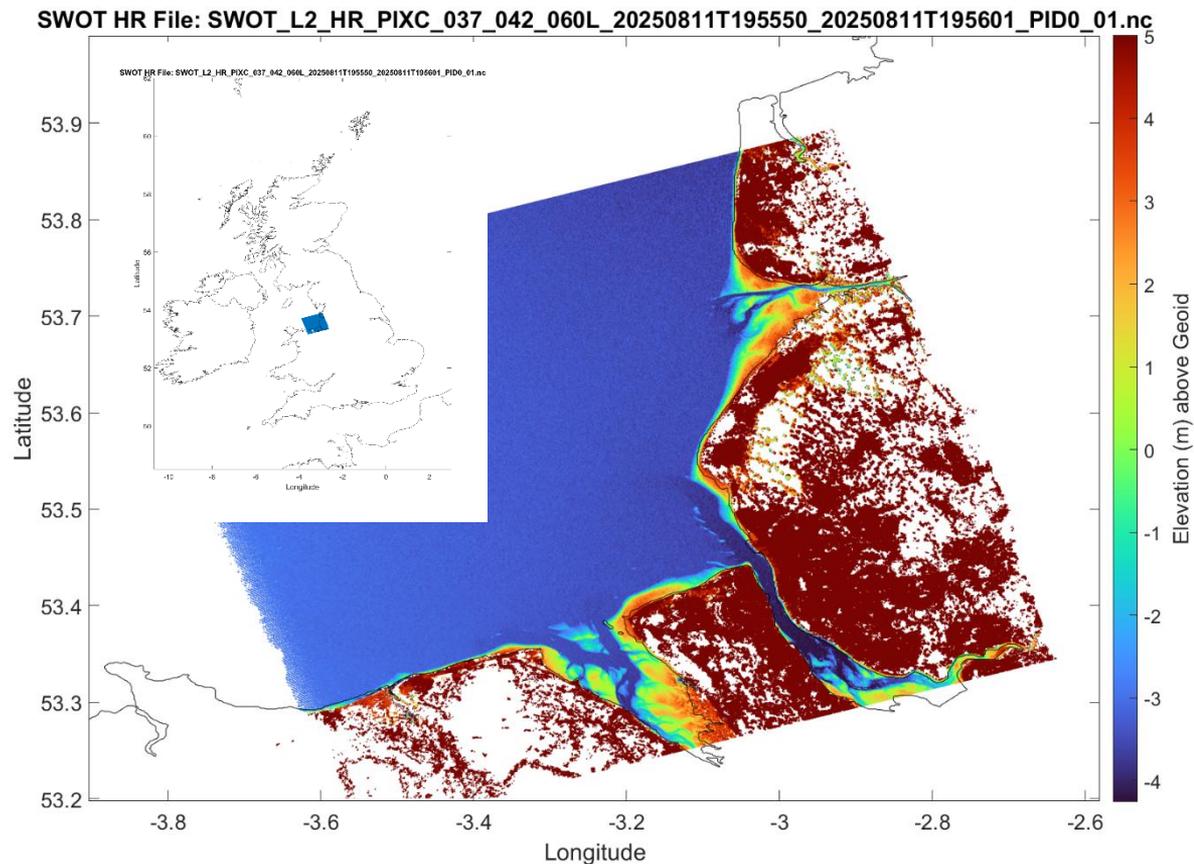
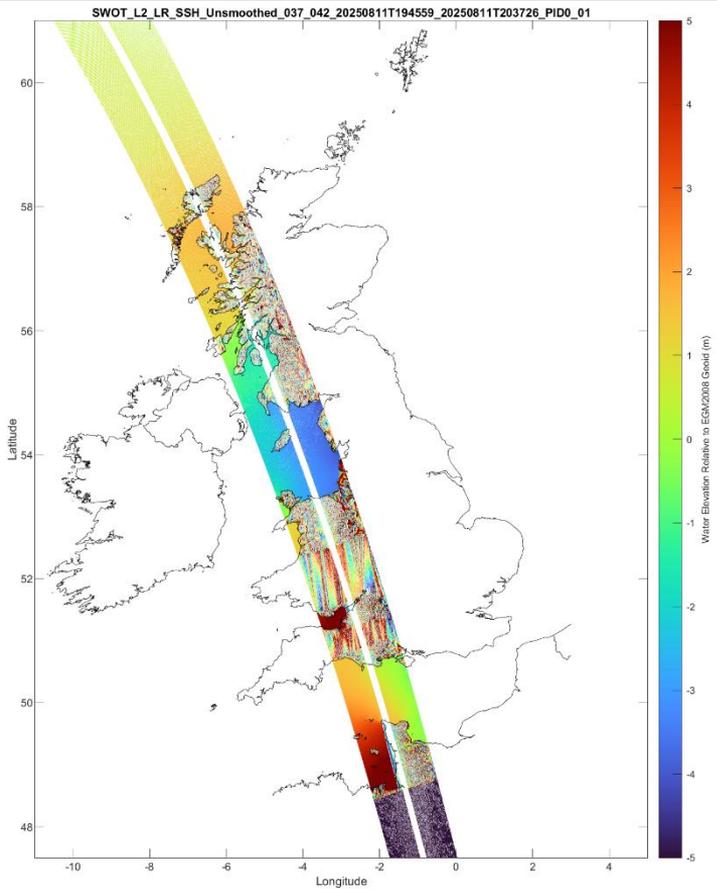


- **Intertidal Mapping** : Sentinels 1&2 + SWOT-enabled tidal water levels
- **Water Levels** : SWOT + tide gauges + TideMorph algorithm = tides at arbitrary locations; GNSS-IR from the ground
- **Water Levels & Waves** : GNSS-Interferometric Reflectometry
- **Currents & Winds** : Sentinel 1 (radial currents); SeaStar Aerial Demonstrator (OSCAR) 2D vectors,
- **Waves** : Sentinels 1, 2 & 3, SWOT, GNSS-IR and more...



# Surface Water & Ocean Topography (SWOT) Satellite (launched 2022)

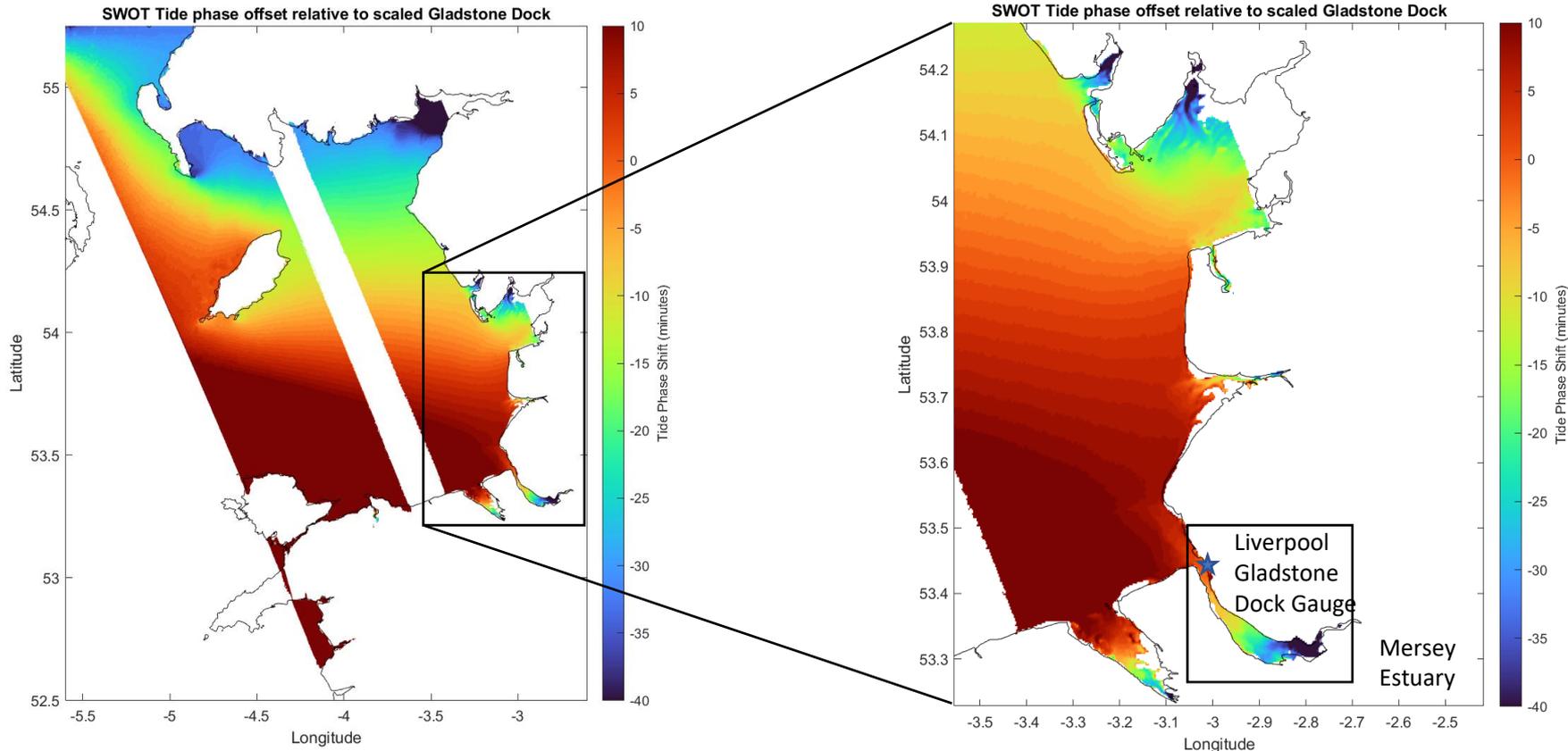
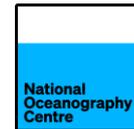
Left: LR 250m Unsmoothed Product      Right: HR PIXC Point Cloud



# METHOD 1: Cross Correlation of SWOT with Tide Gauge Data

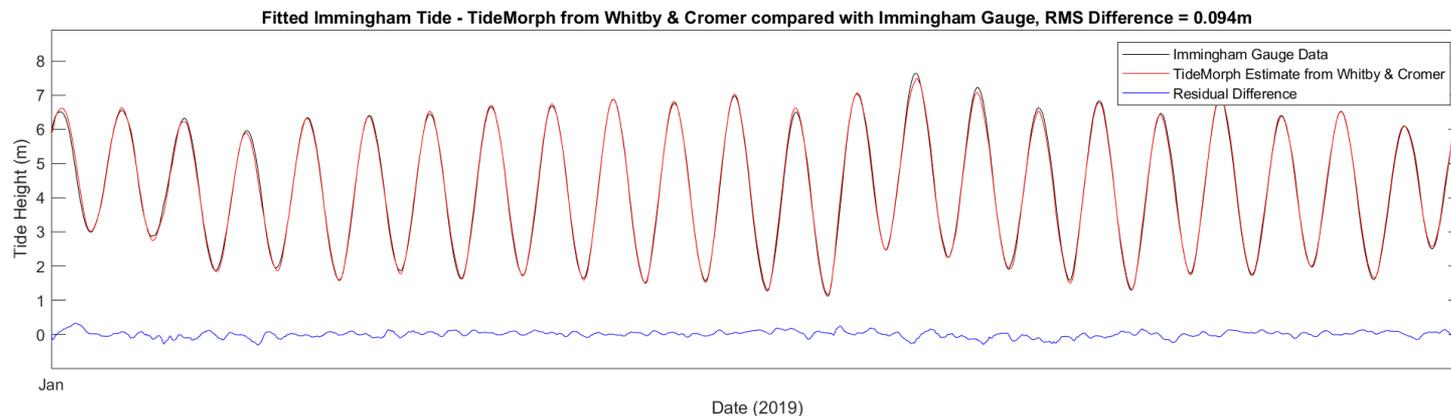
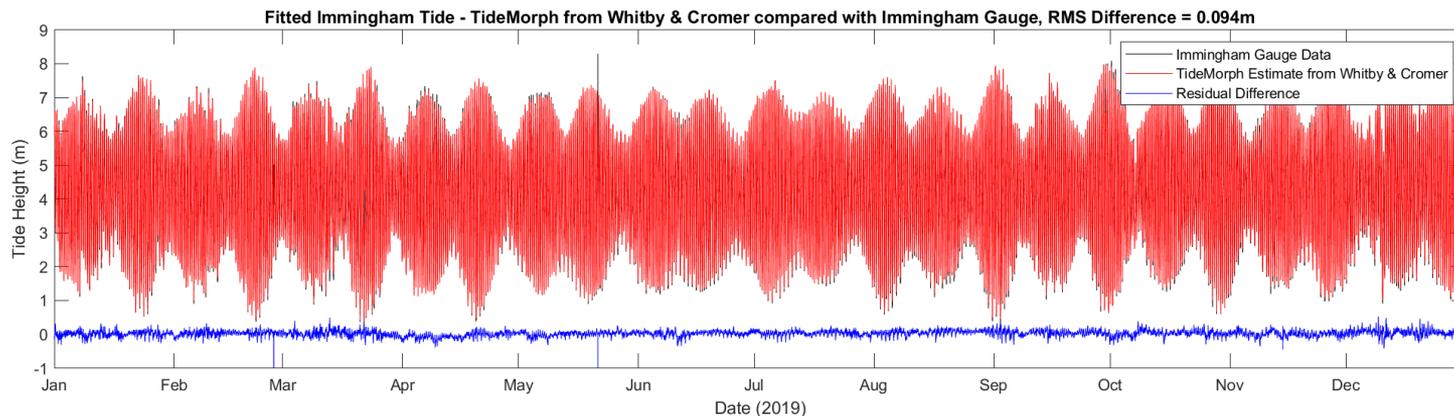
## SWOT-Derived Tide Delays – Liverpool Bay

(Minimising the difference between tide gauge data and SWOT LR Unsmoothed Data)

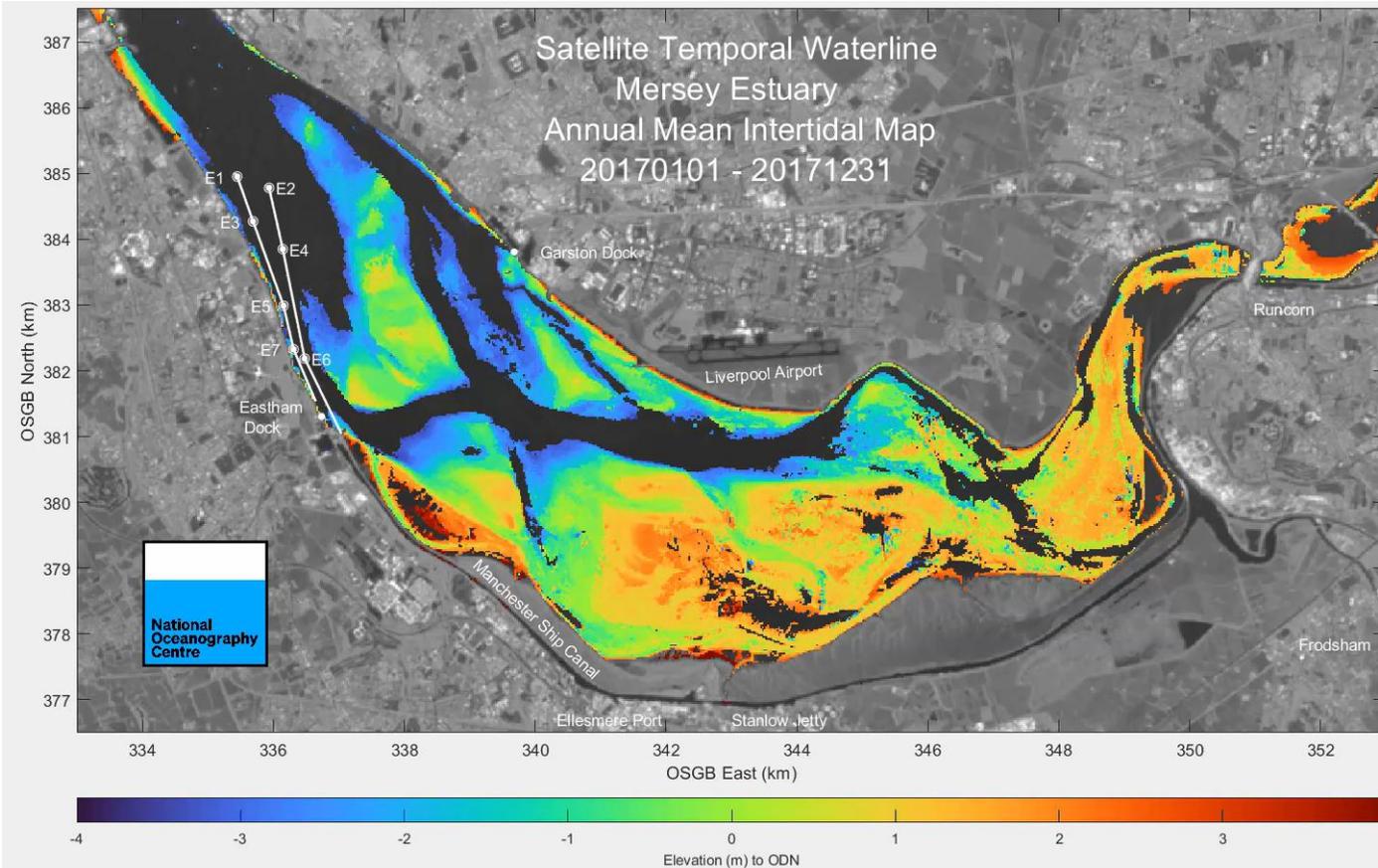
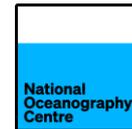


# TideMorph from one tide gauge to another – useful for QC & gap-filling

## Estimating Immingham Tide Gauge using TideMorph from Whitby and Cromer Gauges

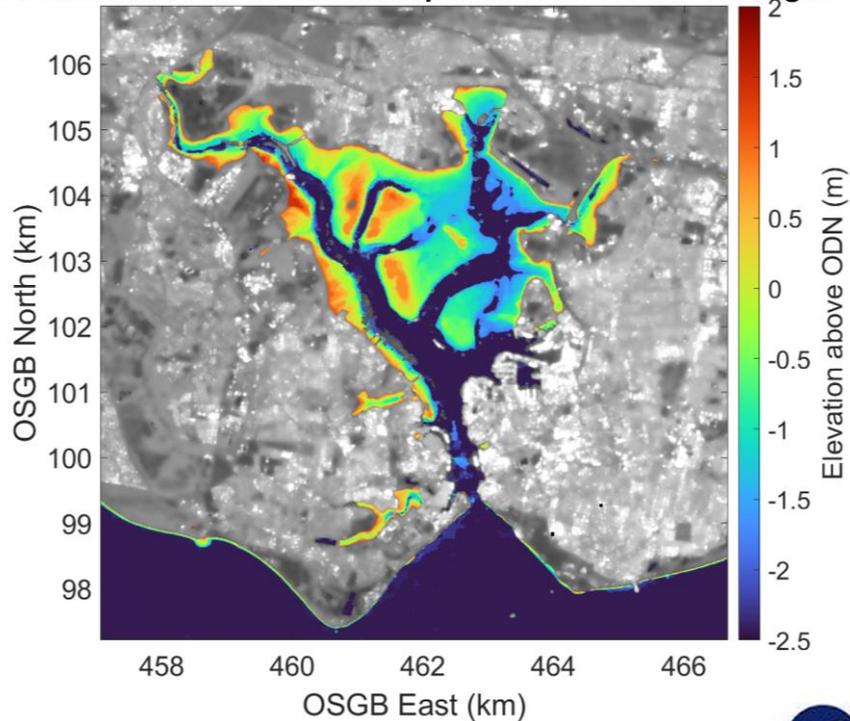


# Why did the Eastham Channel switch from minimal dredging to £Ms dredging? Tidal data still not quite good enough in upper-estuary... curve shape and amplitude changes

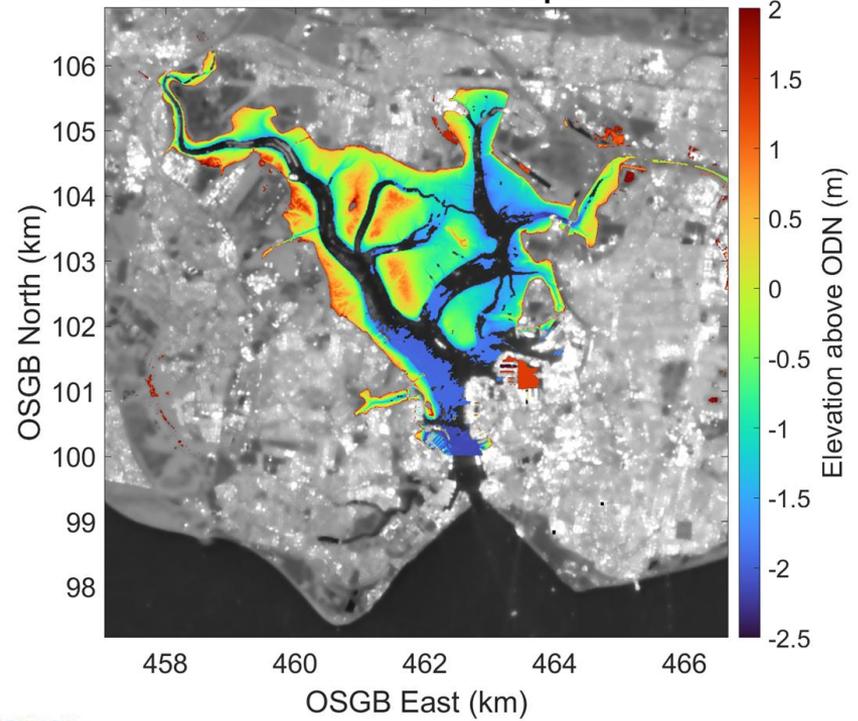


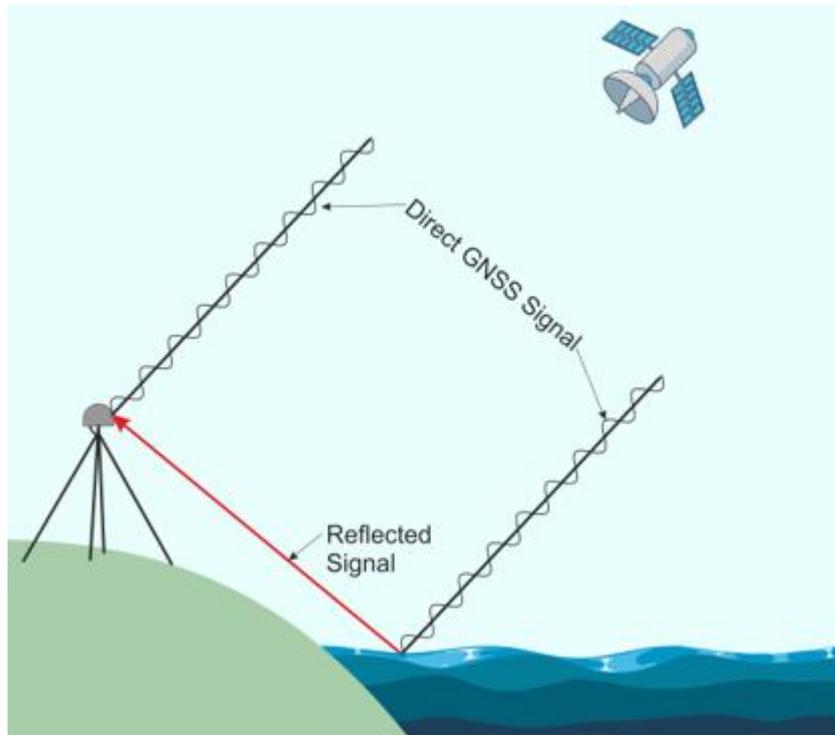
# Intertidal Mapping from EU Sentinel 1 & 2 Satellites (free to use imagery)

Portsmouth 2020 Intertidal map from Sentinel 1 & 2 images



Portsmouth 2020 Intertidal map from Lidar





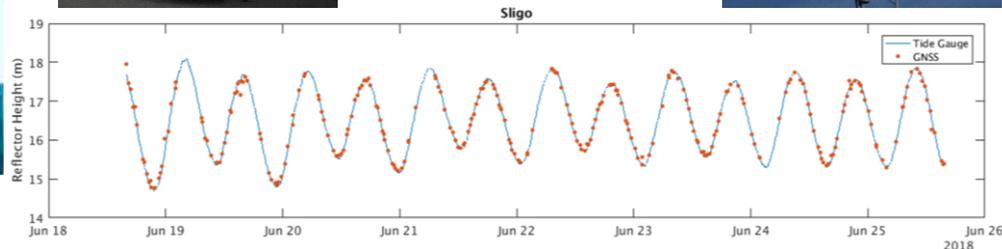
Multipath caused by GNSS signals reflecting off a body of water. Image: Simon Williams



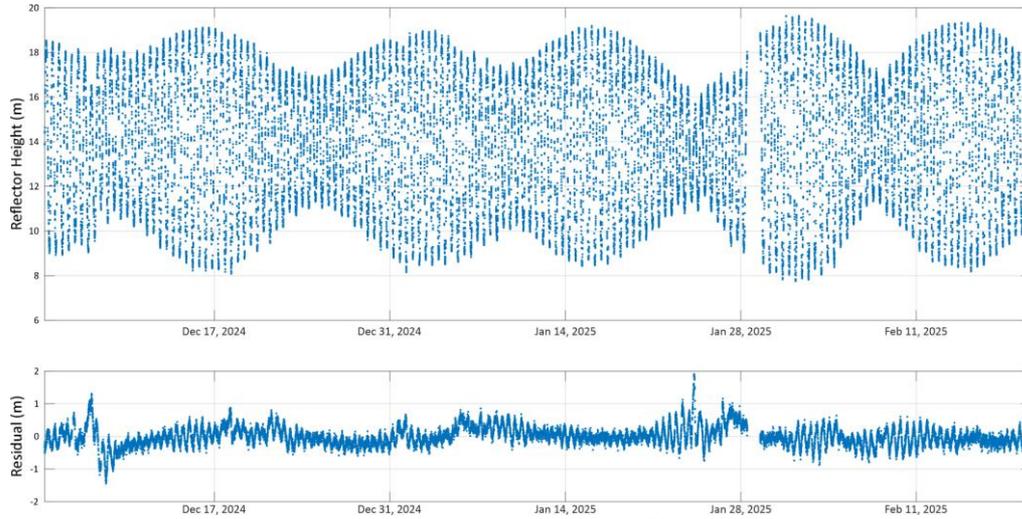
Early trials at Sligo Bay RNLI, Ireland

GPS constellation alone

*Accuracy so good that we discovered the in-situ gauge was calibrated for fresh water rather than saline*



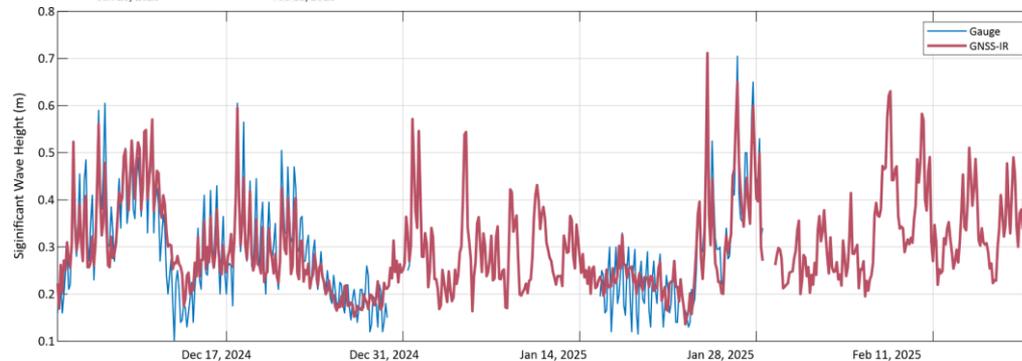
# Penarth Pier Test Site – pressure gauge available for comparison



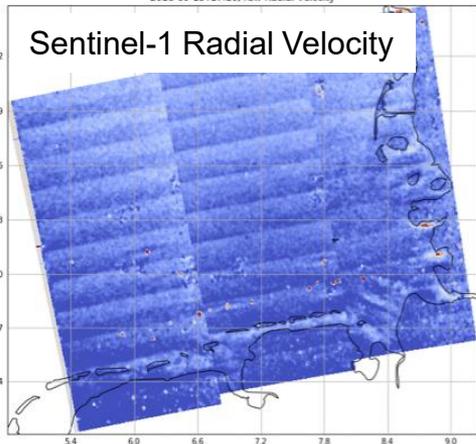
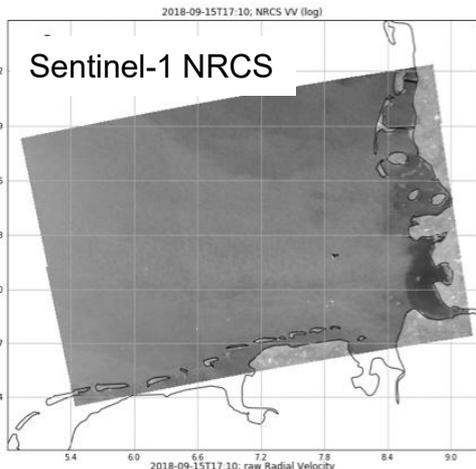
- Low-cost GNSS-IR systems coupled with NOC's state of the art processing
- Rapid deployment (<1 day) at suitable sites
- On site power and comms simplifies installation
- Unobstrusive sensor antenna, robust, stable.



Williams, Simon D. P. ; Bell, Paul S. ; McCann, David L. ; Cooke, Richard ; Sams, Christine. 2020 Demonstrating the potential of low-cost GPS units for the remote measurement of tides and water levels using interferometric reflectometry. *Journal of Atmospheric and Oceanic Technology*, 37 (10). 1925-1935. <https://doi.org/10.1175/JTECH-D-20-0063.1>



# INNOVATION WITH SAR DATA: RADIAL SURFACE CURRENTS



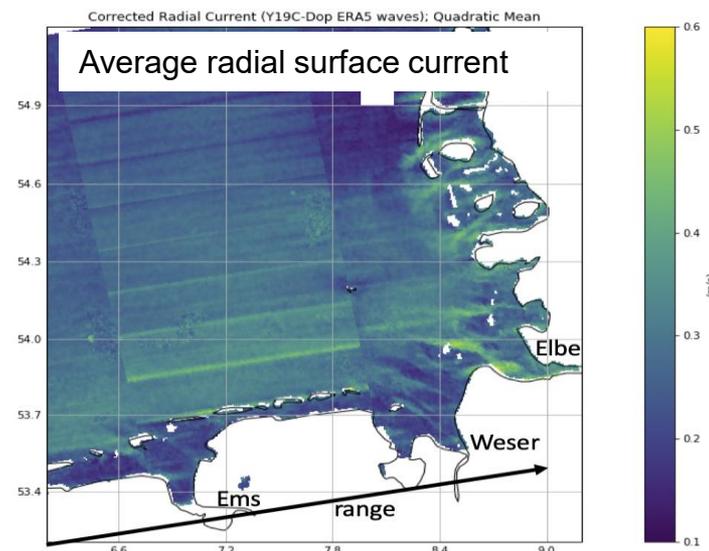
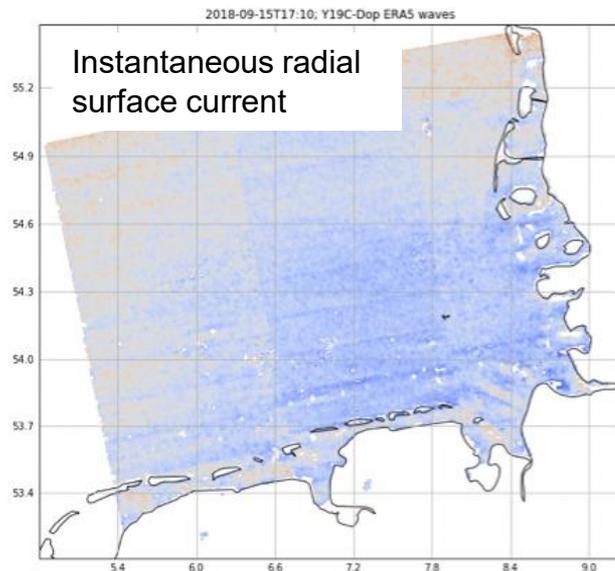
First multi-year assessment of Sentinel-1 radial velocity products using HF radar currents in a coastal environment

Adrien C.H. Martin<sup>a,\*</sup>, Christine P. Gommenginger<sup>a</sup>, Benjamin Jacob<sup>b</sup>, Joanna Staneva<sup>b</sup>

<sup>a</sup> National Oceanography Centre, European Way, Southampton SO14 3ZH, United Kingdom

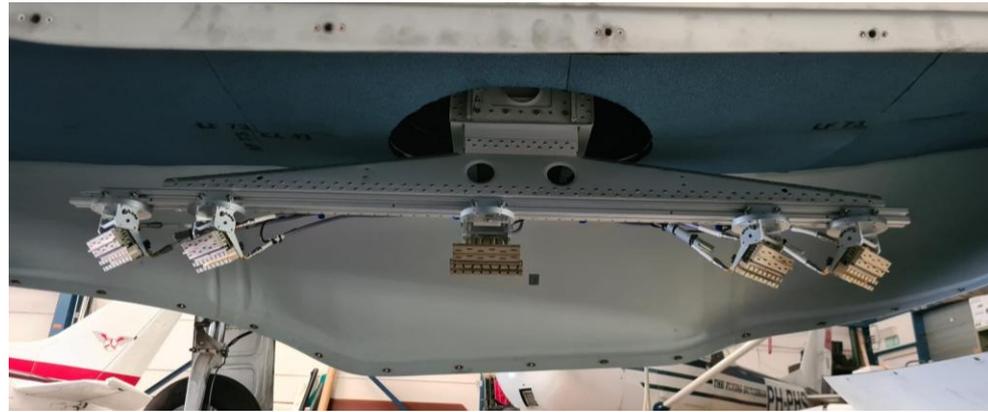
<sup>b</sup> Helmholtz-Zentrum hereon GmbH, Max-Planck-Straße 1, 21502 Geesthacht, Germany

RSE, 2022

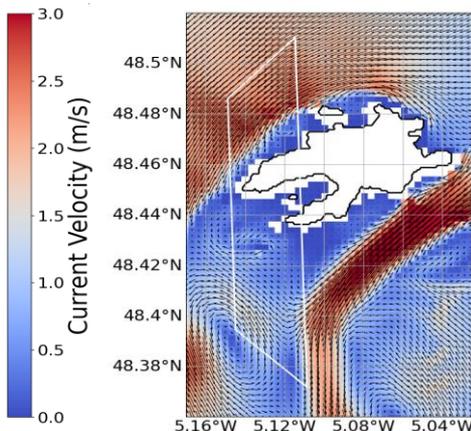
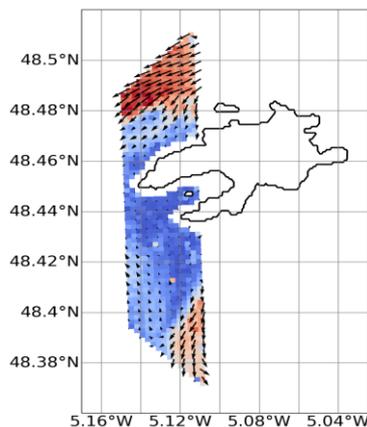


# SEASTAR AIRBORNE DEMONSTRATOR: OCEAN SURFACE CURRENT AIRBORNE RADAR (OSCAR)

- OSCAR: Ocean Surface Current Airborne Radar
- Unique high-squint along-track interferometer
  - Ku-Band SAR, VV polarisation
  - Two ATI channels squinted 45° Fore & Aft
  - Zero-doppler broadside channel
- 8 m resolution, 5 km swath
- Simultaneous high-resolution imaging of total surface current and wind vectors

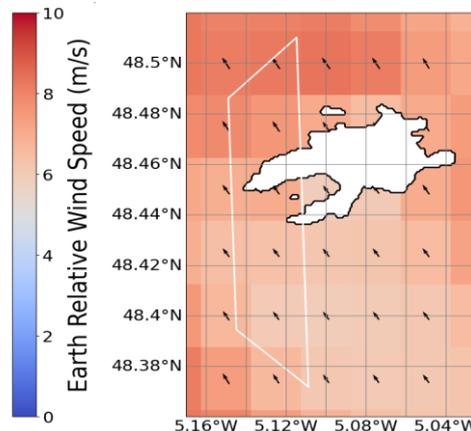
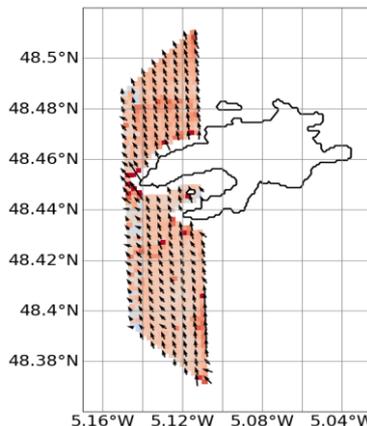


**OSCAR  
airborne  
surface  
current  
vectors**



**Model  
simulated  
surface  
current  
vectors**

**OSCAR  
measured  
wind  
vectors**



**Model  
simulated  
wind  
vectors**

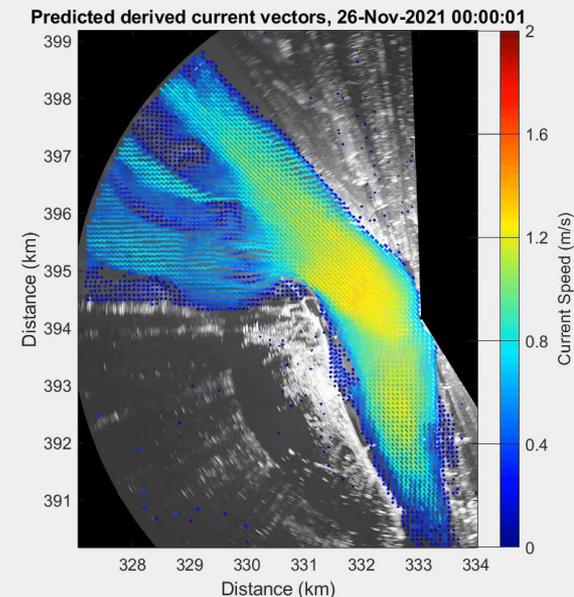
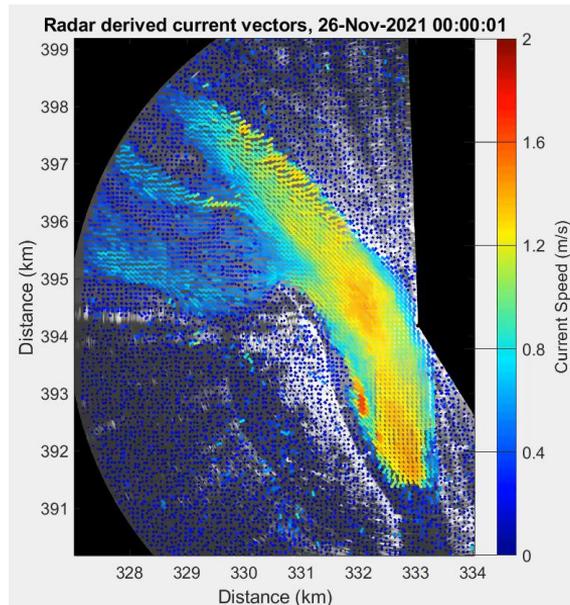
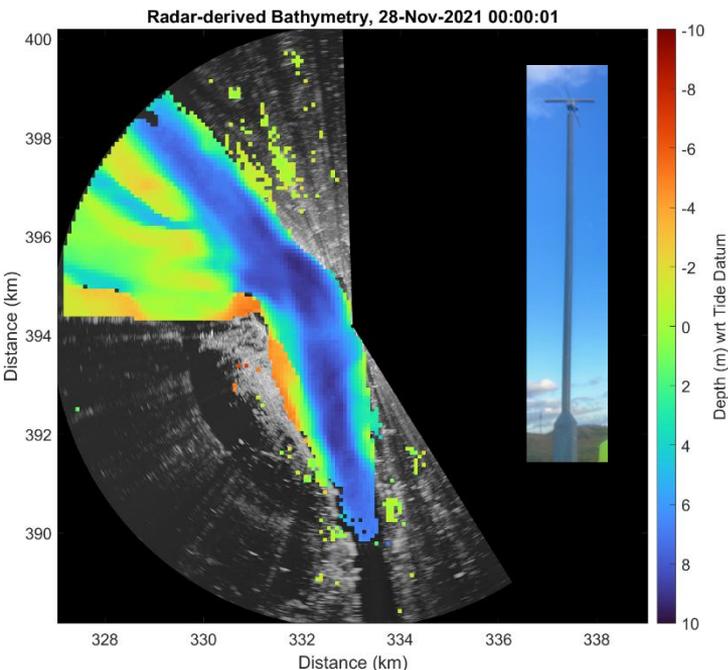
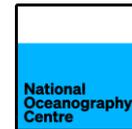
McCann, David L. et al. 2024 A new airborne system for simultaneous high-resolution ocean vector current and wind mapping: first demonstration of the SeaSTAR mission concept in the macrotidal Iroise Sea. *Ocean Science*, 20 (5). 1109-1122. <https://doi.org/10.5194/os-20-1109-2024>

# Using TideMorph to Estimate Tidal Currents from Remotely Sensed Training Data

## Wave Inversion Water Depths and Currents from Radar

(Inferred from the way waves interact with the seabed and currents)

(Tech Transfer supported by Radar Research, Results & Data to Decisions - R3D2, NERC Grant NE/W007347/1)



**Bell, Paul S.** 1999 Shallow water bathymetry derived from an analysis of X-band marine radar images of waves. *Coastal Engineering*, 37 (3-4). 513-527. [https://doi.org/10.1016/S0378-3839\(99\)00041-1](https://doi.org/10.1016/S0378-3839(99)00041-1)

**Bell, Paul; Osler, John.** 2011 Mapping bathymetry using X-band marine radar data recorded from a moving vessel. *Ocean Dynamics*, 61 (12). 2141-2156. <https://doi.org/10.1007/s10236-011-0478-4>

**Bell, Paul; Lawrence, John; Norris, Jennifer.** 2012 Determining currents from marine radar data in an extreme current environment at a tidal energy test site. In: *Proceedings of the IEEE International Geoscience and Remote Sensing Symposium 2012*. Piscataway, NJ, USA, IEEE, 7647-7650.

**Bell, Paul S.; McCann, David L; Crammond, Sarah; McIlvenny, Jason; Dufaur, Juvenal; Archer, Philip.** 2014 Marine radar derived current vector mapping at a planned commercial tidal stream turbine array in the Pentland Firth. In: *Proceedings of the 2n (EIMR20d International Conference on Environmental Interactions of Marine Renewable Energy Technologies 14)*, 28 April – 02 May 2014,

**Summary:** Satellite and other remotely sensed data provide a consistent framework of observations that can be linked/fused with in-situ data to generate new types of data products  
New remote sensing capabilities are fuelling a revolution in ocean observations



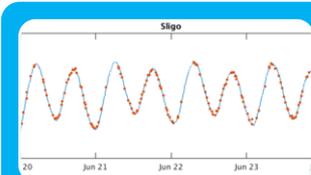
## Satellite Intertidal Mapping

- Uses Sentinel 1 SAR and Sentinel 2 Optical + tidal data
- Can also use 50-years of Landsat archives
- Elevations estimated at pixel resolution



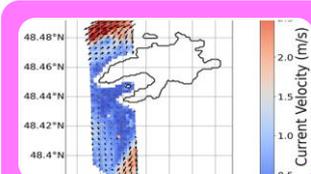
## SWOT Water Levels

- A breakthrough for spaceborne ocean sensing of water levels
- New discoveries and applications e.g. internal waves, sea ice, estuaries
- New knowledge about ocean variability at km and hourly scales



## GNSS-IR Water Levels & Waves

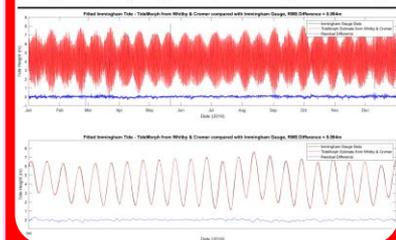
- Water levels and wave height from low-cost ground-based receivers
- Satellite GNSS-Reflectometry for NRT winds and sea ice
- The ESA SCOUT HydroGNSS mission



## SeaSTAR SAR Currents

- Innovative mission concept for high-resolution high-accuracy mapping of total currents and winds
- Demonstrated capability with unique OSCAR airborne system
- Now seeking new opportunities to progress towards space launch

eMorph from one tide gauge to another – useful for QC & gap-filling  
Immingham Tide Gauge using TideMorph from Whitby and Cromer Gauges



## TideMorph

- Versatile new algorithm for the estimation of tidally-linked data from sparse training data coupled with a trusted tide gauge reference sensor.
- Multiple applications in digital twin architecture, data QC, gap filling etc.
- Can include surge



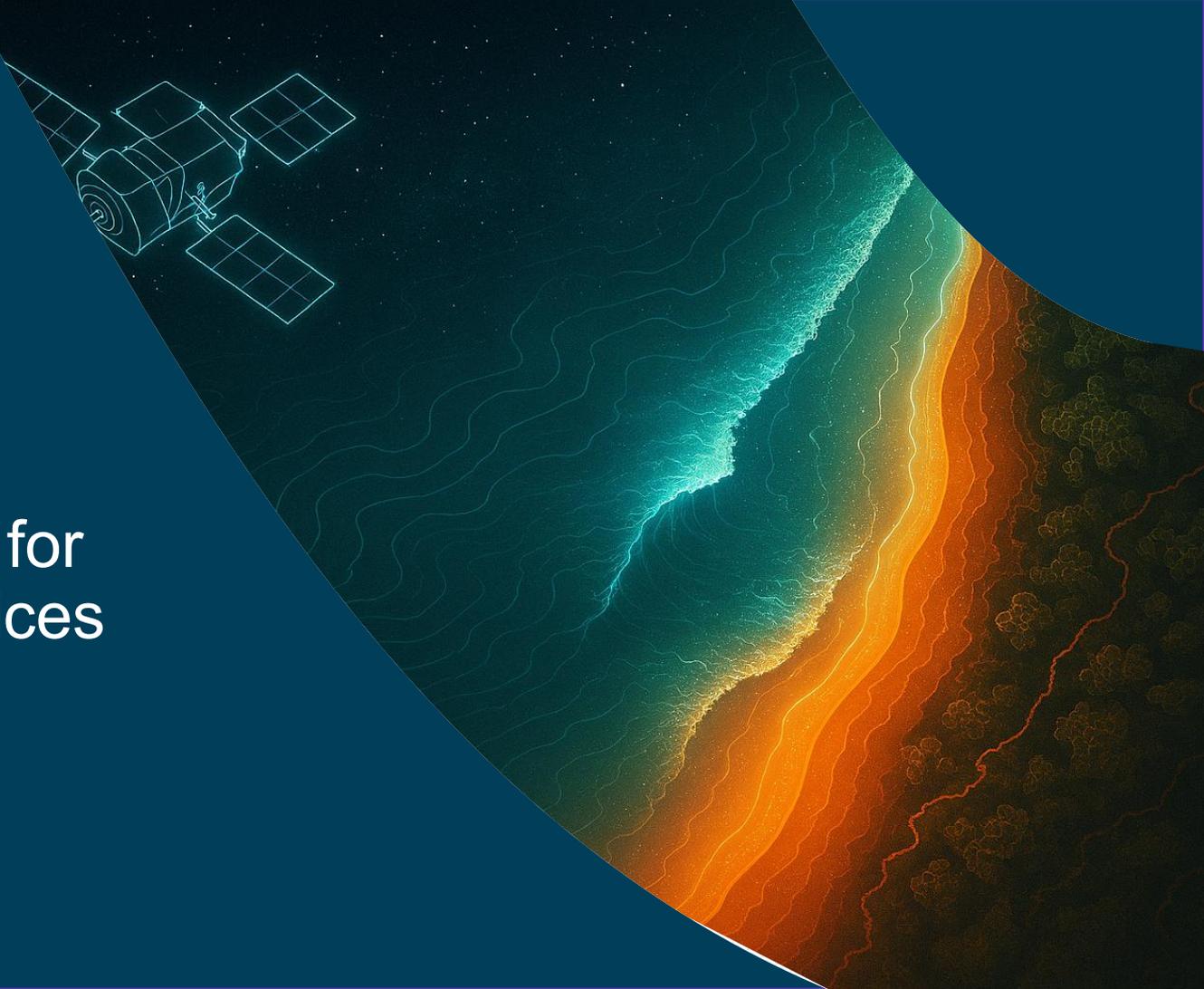
# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



# Satellite driven enhancements for metocean services

Barbara Hofmann  
26/02/2026



# HR Wallingford

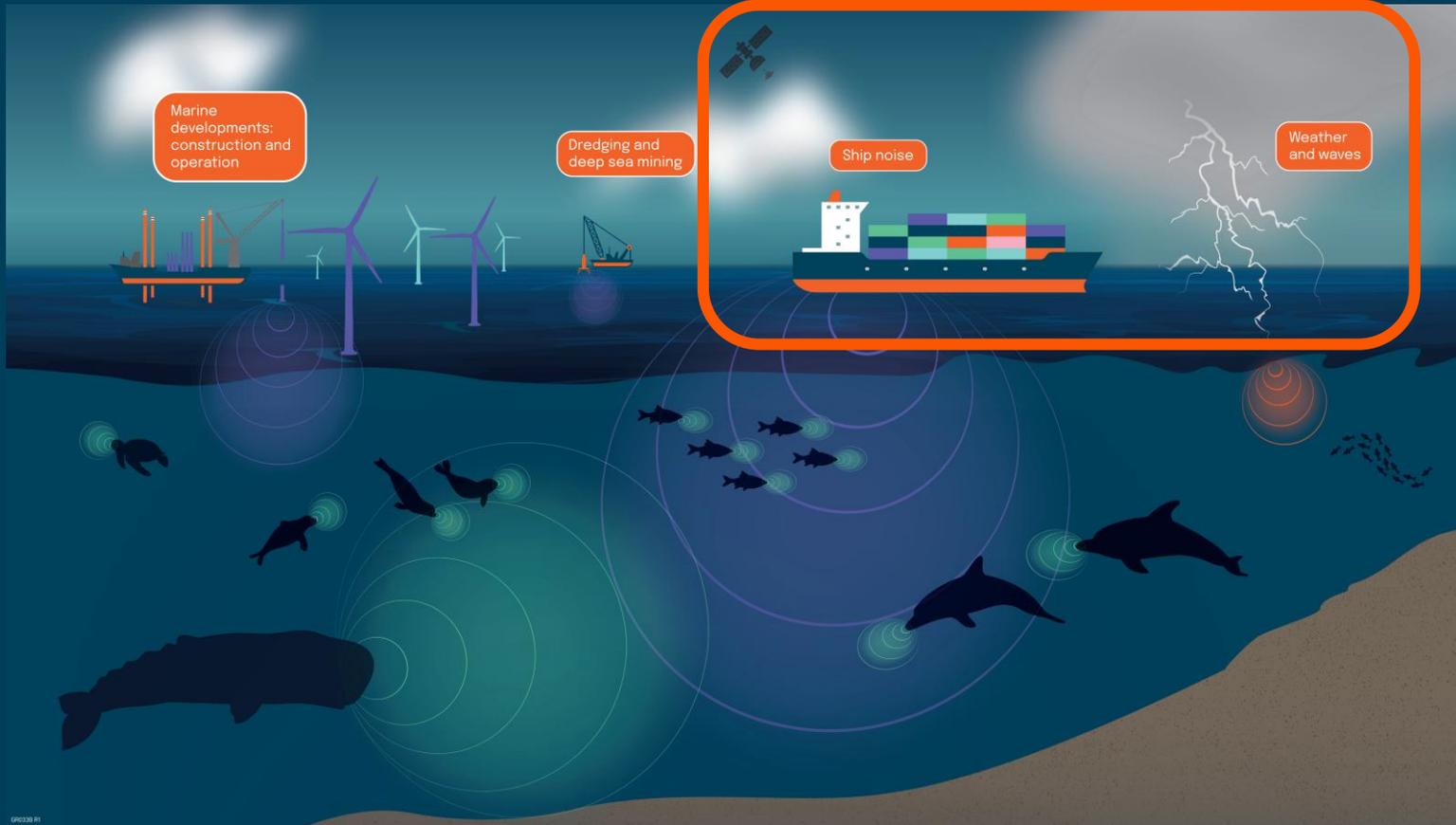
- Established for over 75 years
- Independent, not for profit
- 250+ technical specialists
  
- Experts in how water moves, behaves and influences the natural and built environment



How can satellite data  
enhance services?



# Underwater noise modelling

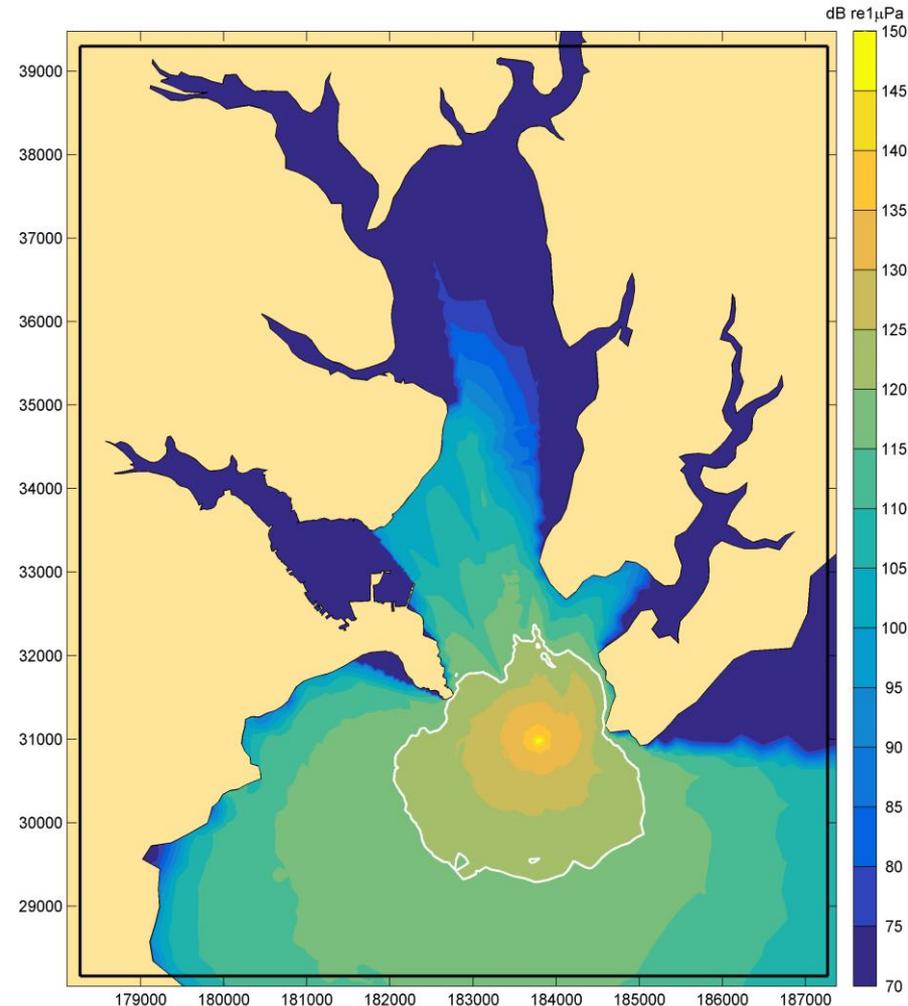


# SEUSS – Satellite Enhanced Underwater sound services

HR Wallingford routinely models underwater sound for environmental impact assessments (EIA)

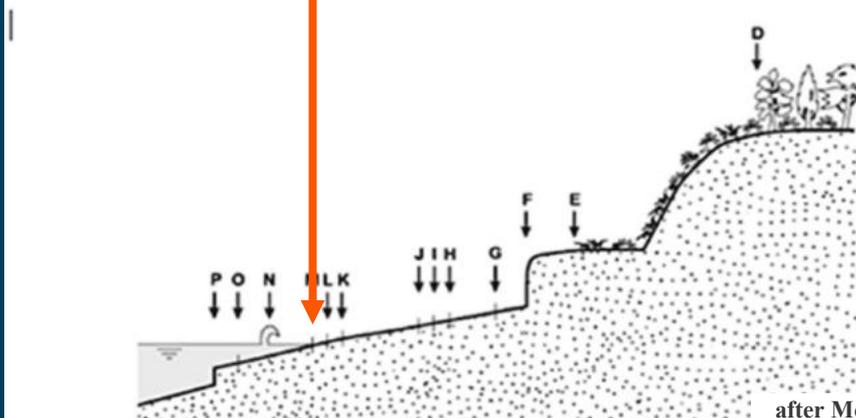
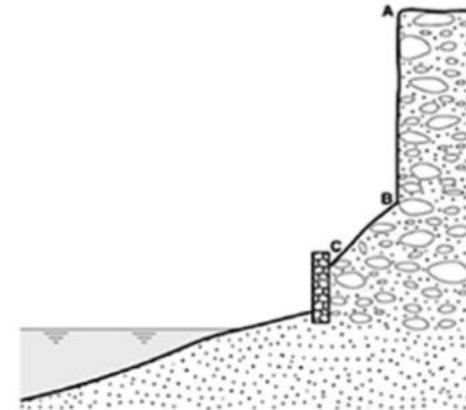
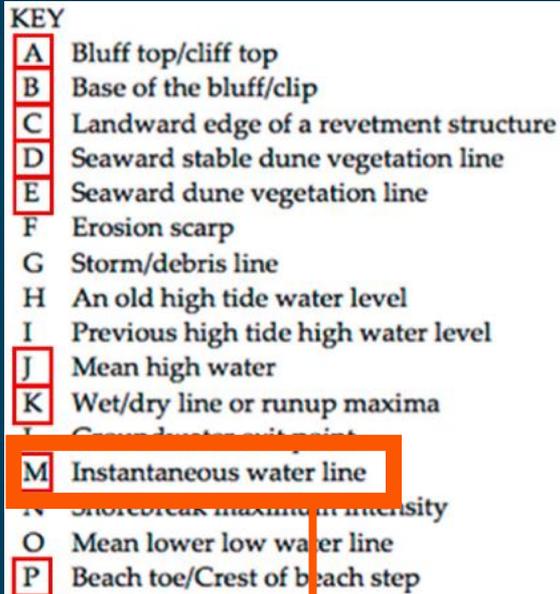
By including ship positions and ship types (AIS) as well as weather data we can now better model the background noise.

Isolate the sound of developments from background noise



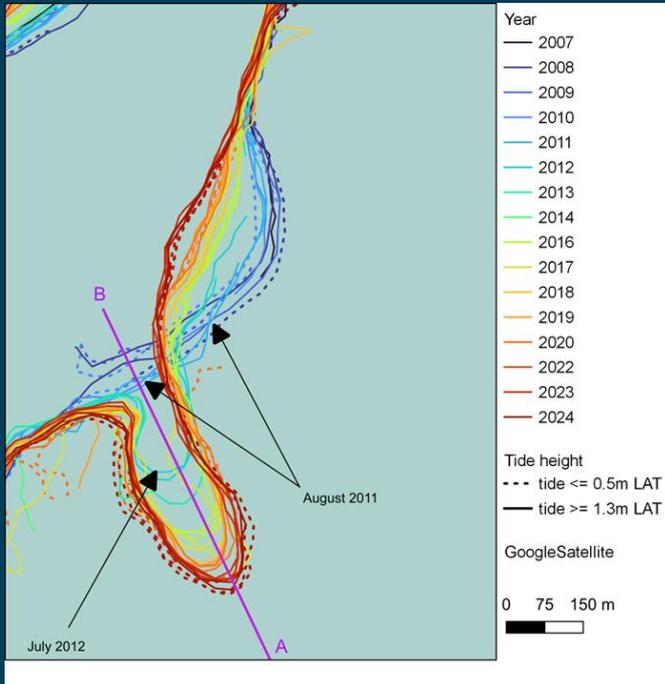
# Shoreline change

- Developed our own tool (SASHA) based on subpixel waterlines and tidal corrections
- Multispectral imagery (MSI) by far the most commonly used satellite data source



after McAllister et.al. 2022

# Use cases

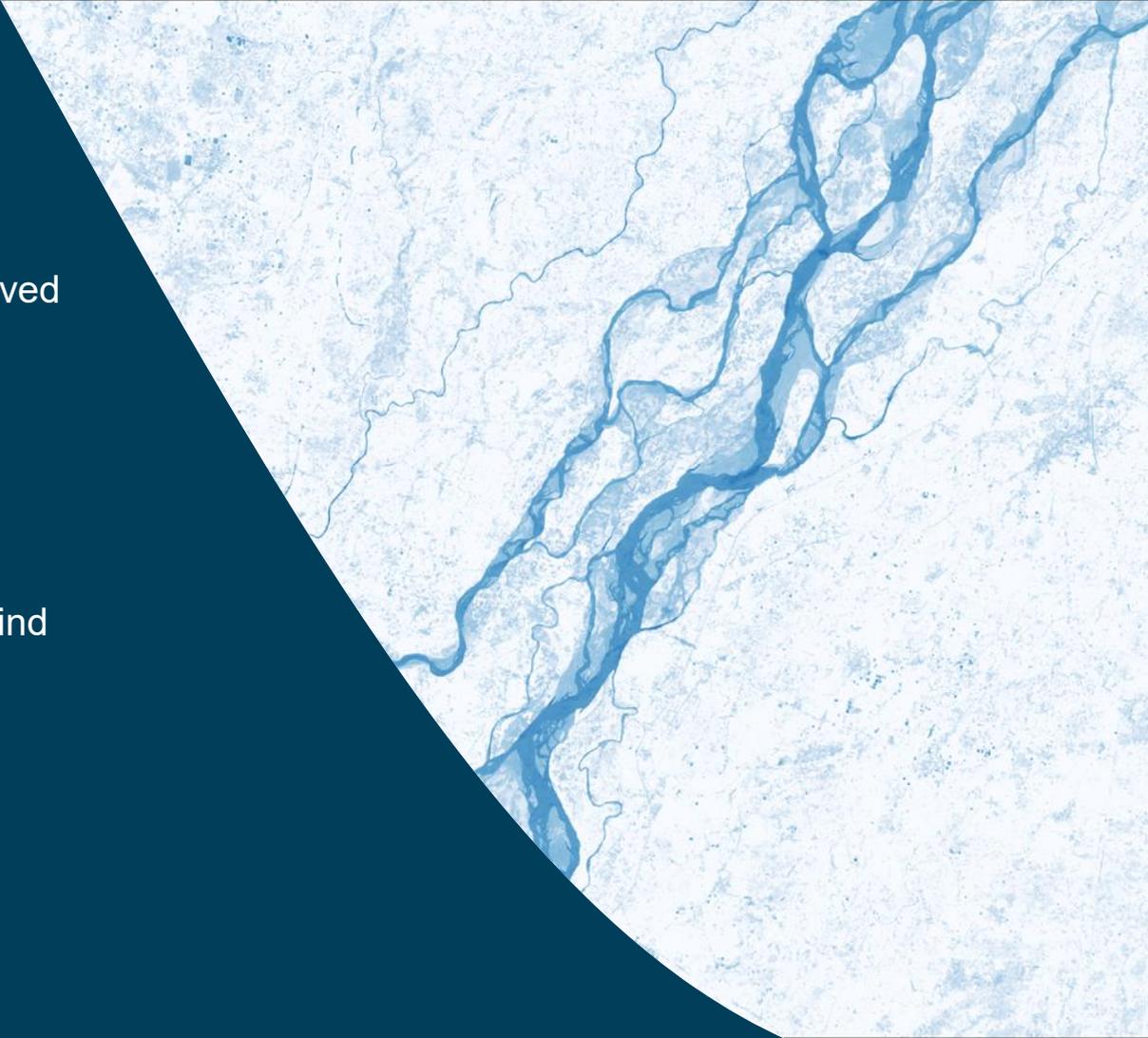


- Providing systematic data of past shoreline development and input climate change projections for small developing island nations
- Moving location to a more stable section of shoreline as part of part development
- Identifying areas which need protection as part of development strategy for metropolitan area
- Impact of dredging on sediment transport
- etc

Earth observation, satellite  
telecommunication or satellite derived  
meteorological variables

Novel approaches or familiar  
technologies

Enhancements happen when we find  
ways to link them with real world  
problems





**Thank you!**

[b.hofmann@hrwallingford.com](mailto:b.hofmann@hrwallingford.com)





# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



# Fully Remote Subsea Environmental Monitoring



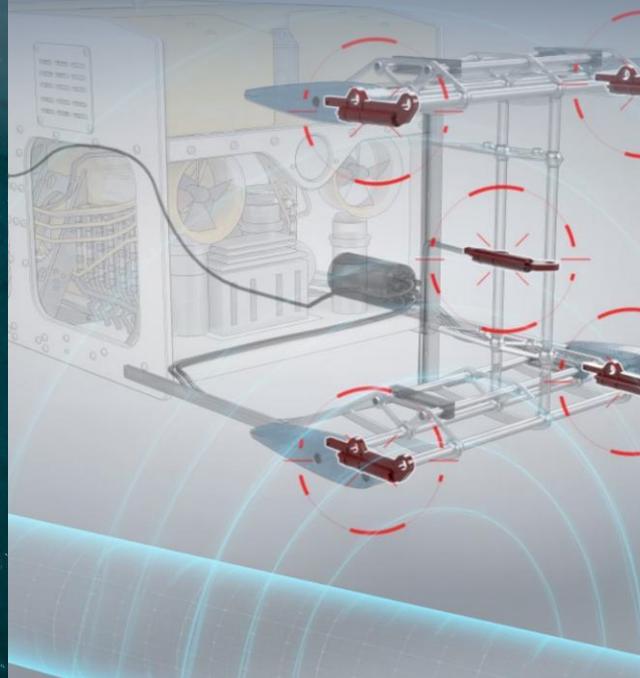
# BeWild has three developments

Survey

FUGRO



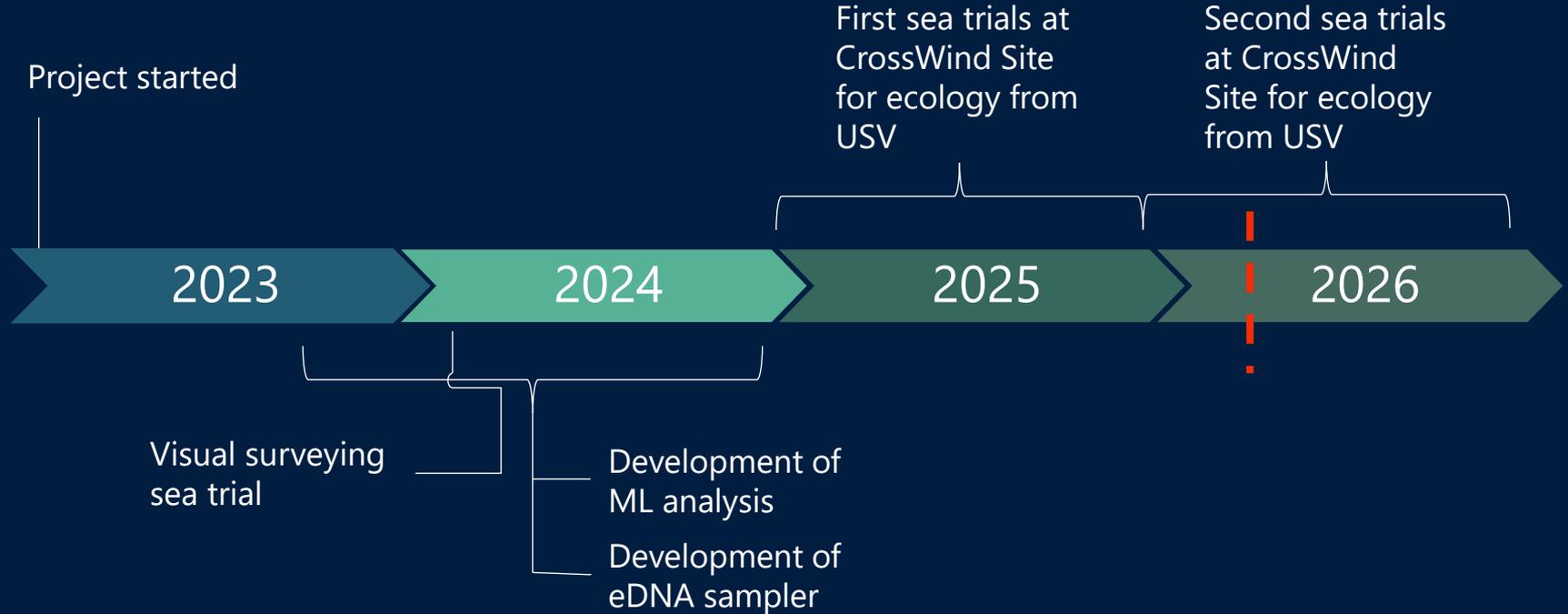
Cable monitoring  
seekable



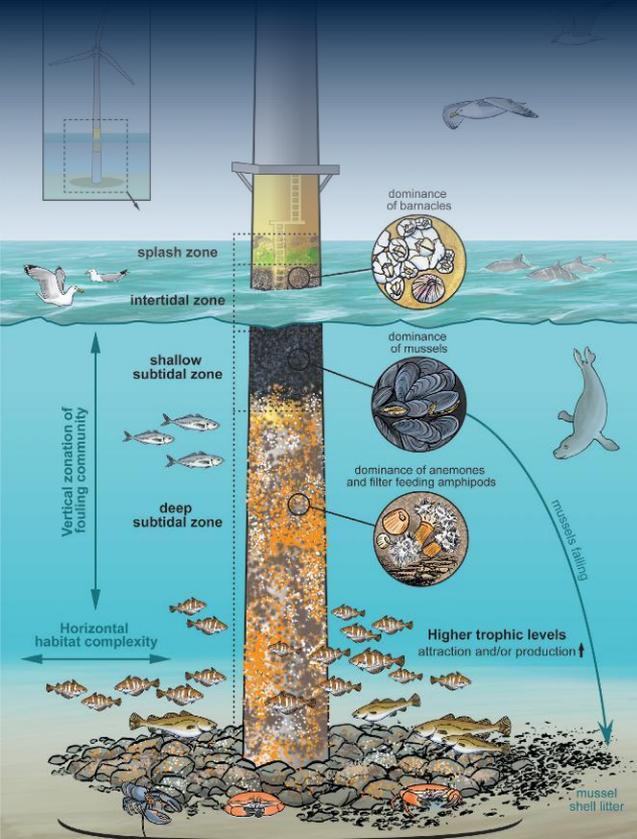
Biodiversity nodes



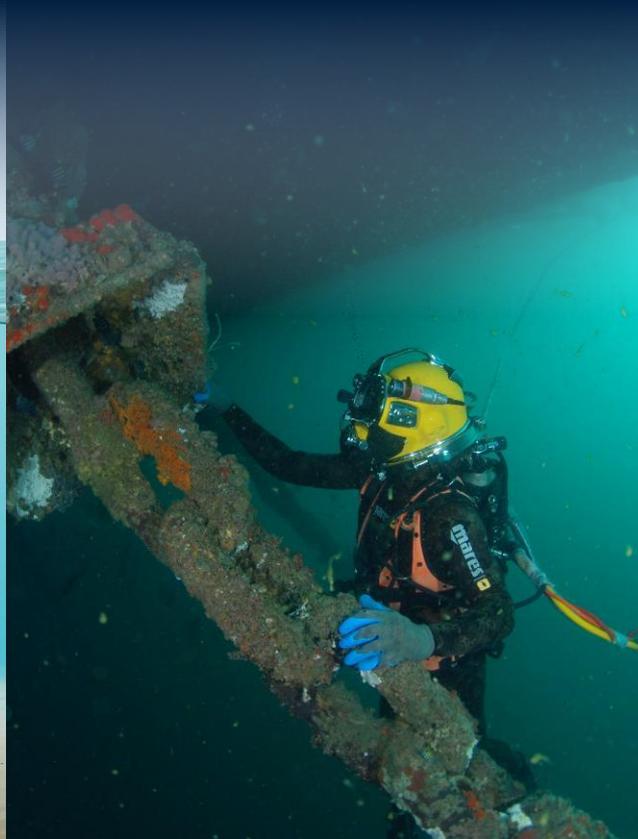
# BeWild Project Timeline



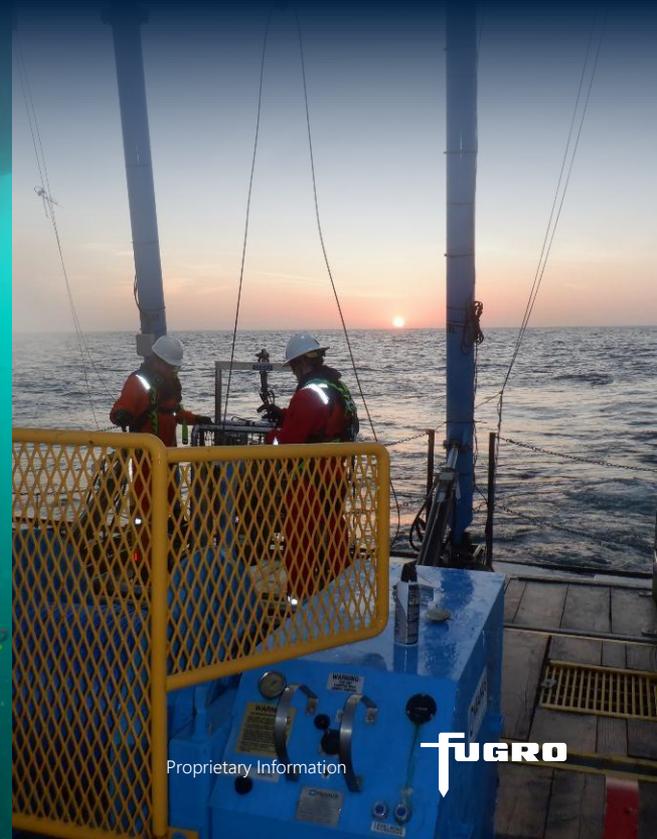
# How to prove this?



# Without divers?



# Or people on vessels?



Proprietary Information

FUGRO



Proprietary Information

 De  
Rijke  
Noordzee

 WAGENINGEN  
UNIVERSITY & RESEARCH

CROSSWIND

 FUGRO

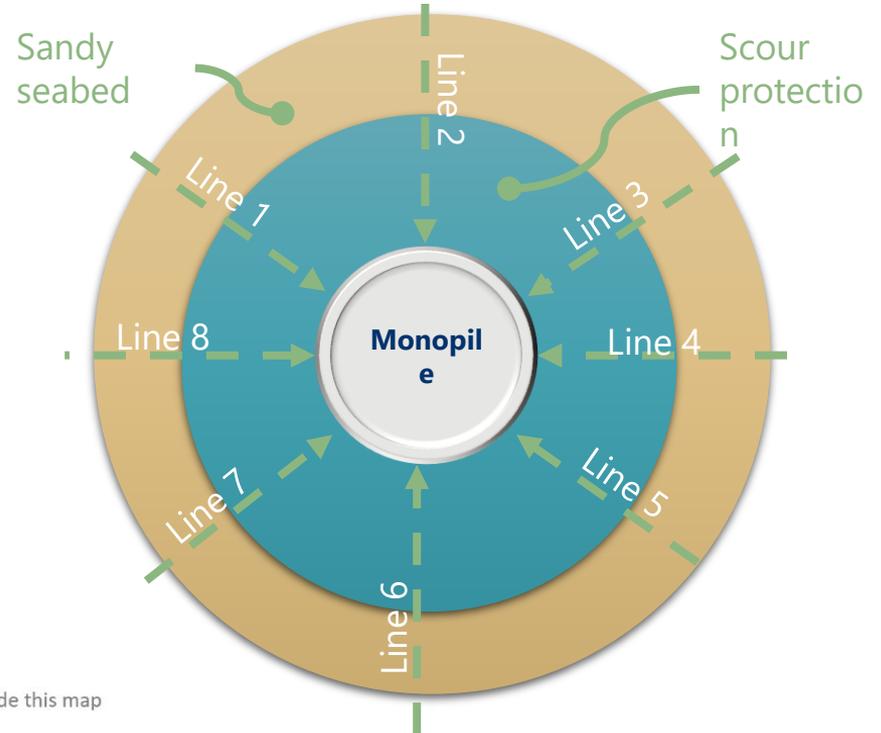
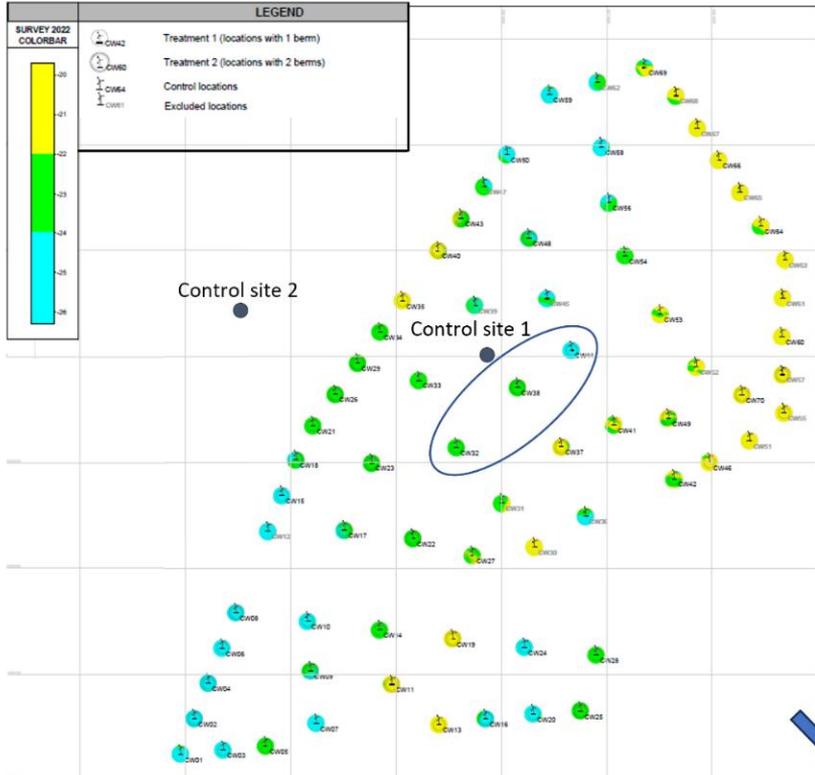


Proprietary Information



**FUGRO**

# Surveys at CrossWind Site



# Example orthomosaic from the cruciform survey



## Example orthomosaic from the cruciform survey



## Example orthomosaic from the cruciform survey



# Example orthomosaic from the cruciform survey



# Sandy seabed

eDNA species findings:

- 34 vertebrate
- 20 vertebrate found on both
- 14 unique vertebrate
- 32 invertebrates

Video findings:

- 7 found on sandy seabed
- 2 unique for sandy seabed
- Abundance much lower
- Spatial information
- Qualitative abiotic information



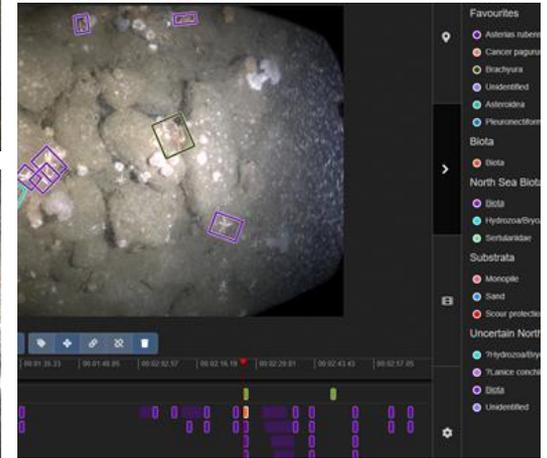
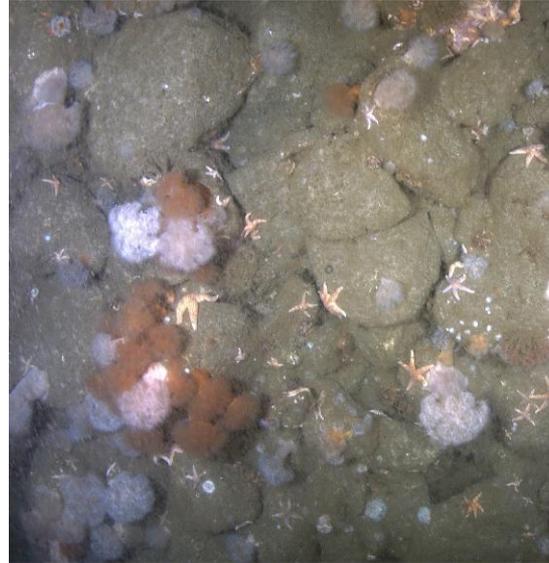
# Scour protection

eDNA species findings:

- 32 vertebrate
- 20 vertebrate found on both
- 12 vertebrate unique
- 35 invertebrates

Video findings:

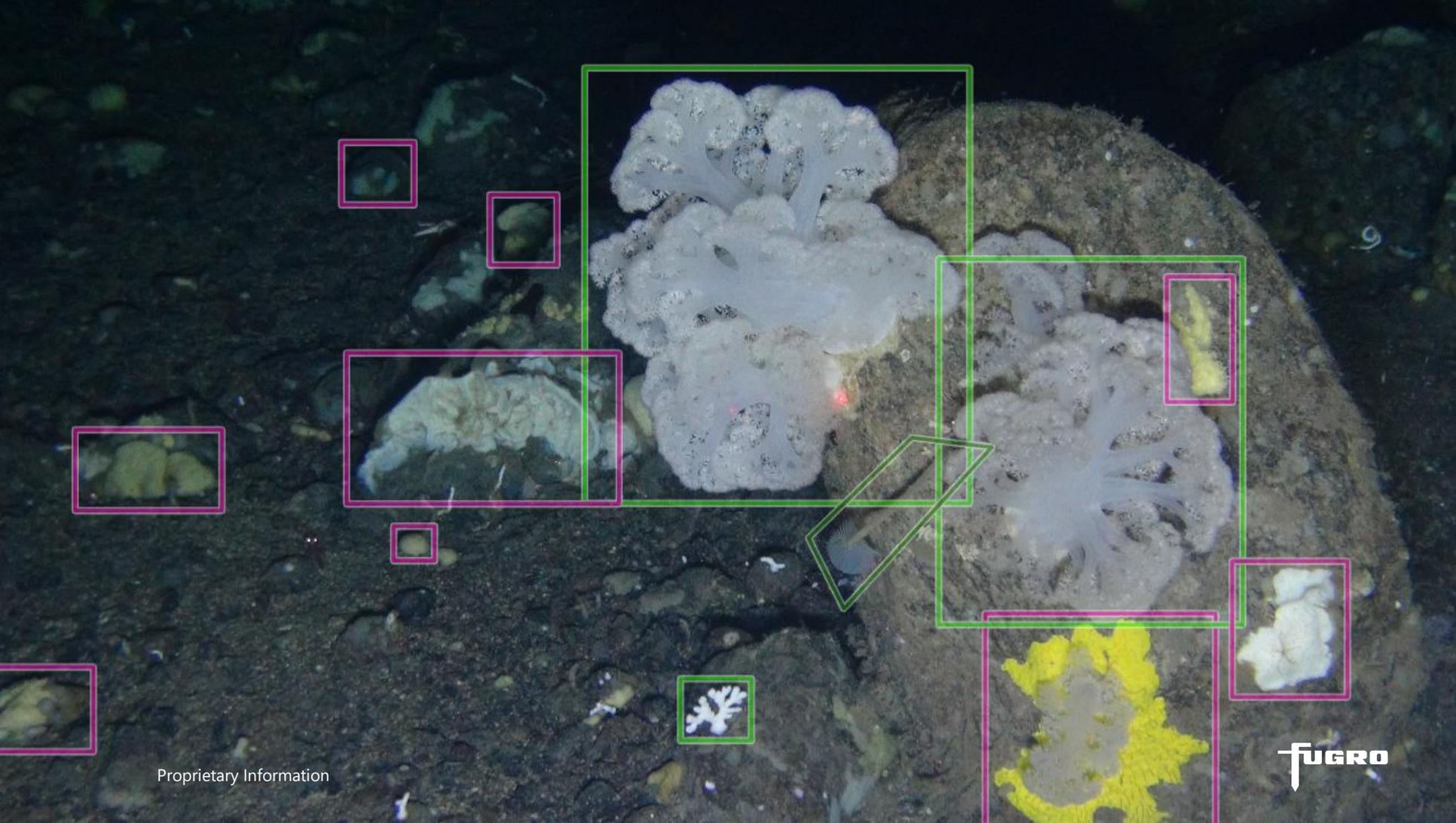
- 11 found on scour protection
- 5 unique for scour protection
- Abundance much higher
- Spatial information
- Qualitative abiotic information





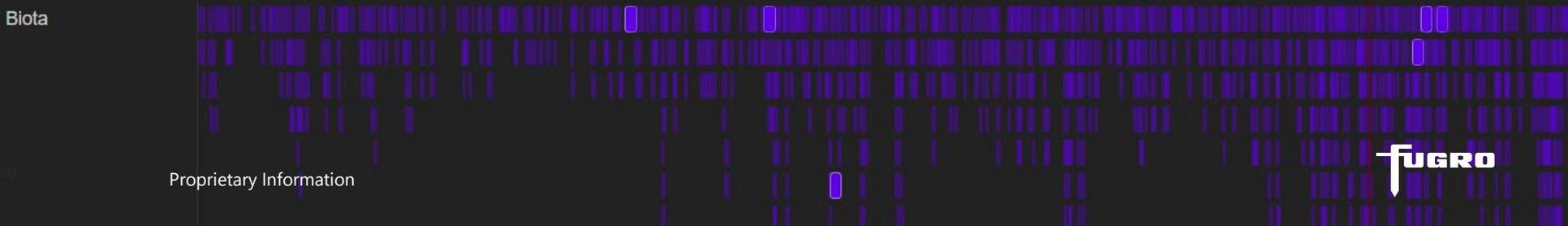
Proprietary Information

FUGRO

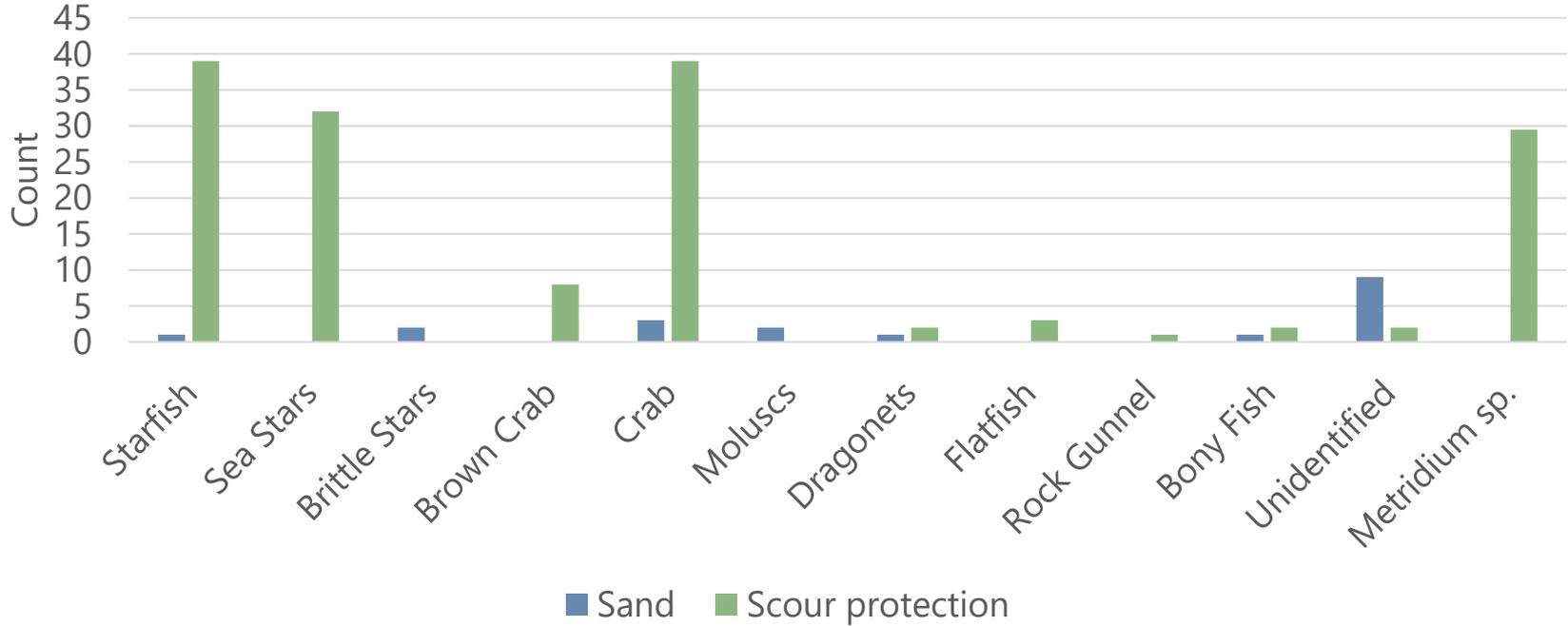


Proprietary Information

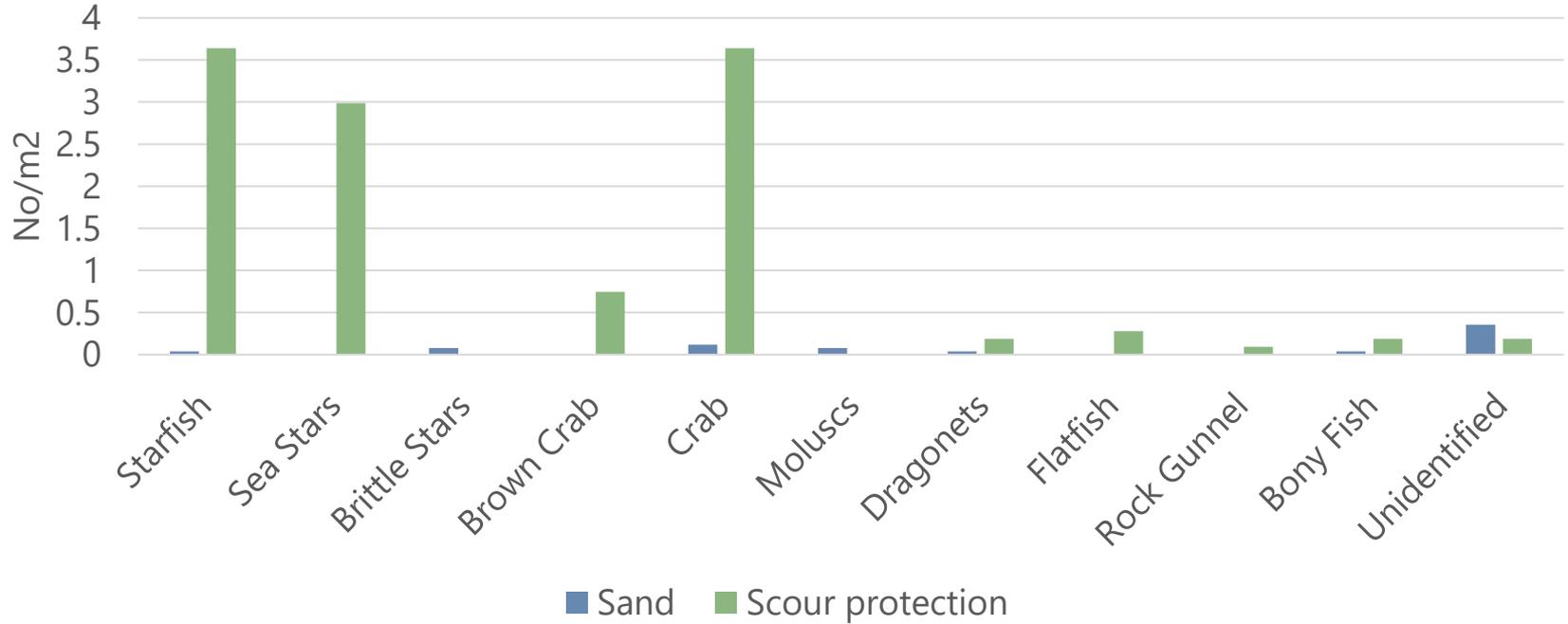
FUGRO



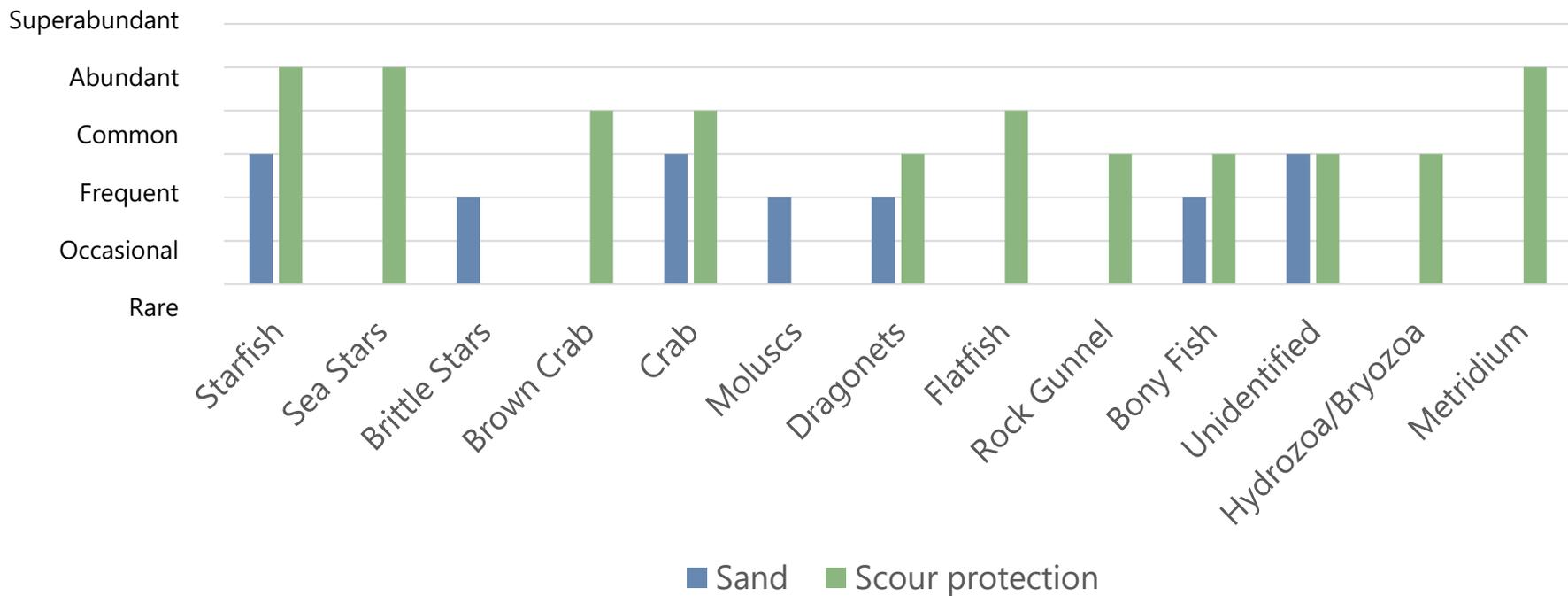
# Count on Sand vs Scour Protection



# Density on Sand vs Scour Protection



# Abundance on Sand vs Scour Protection (SACFOR)





### Imagery Demo Project

All Features

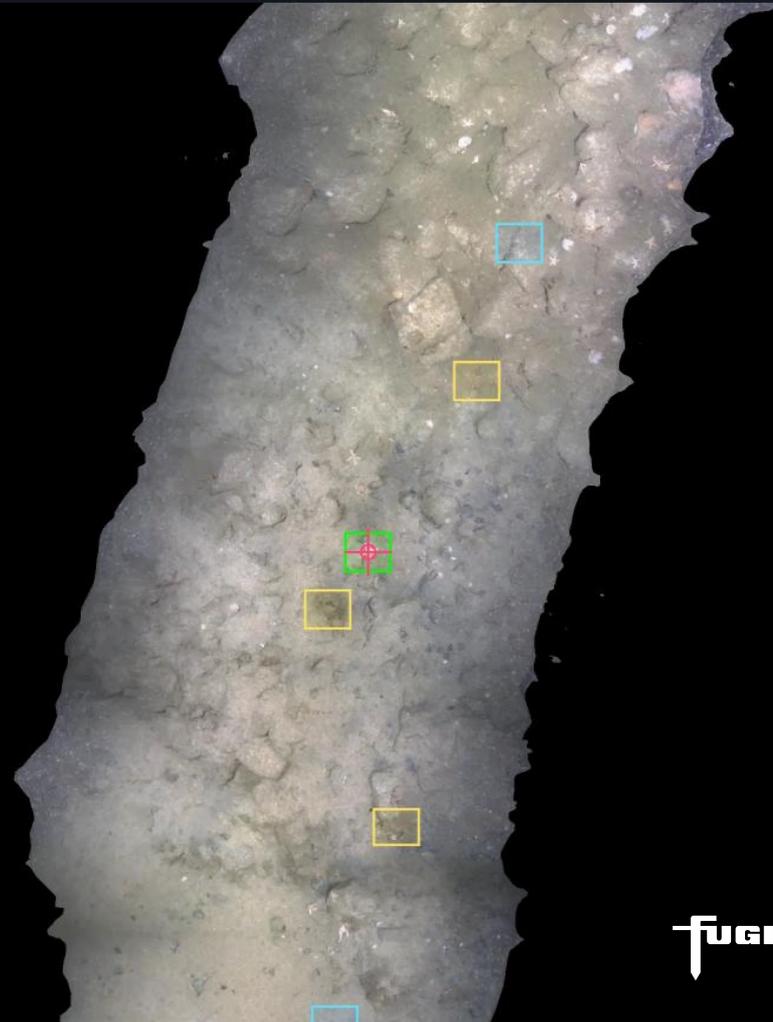
#### Common Starfish

2 of 16



Scientific name: *Asterias rubens*  
Common name: Common Starfish  
Confidence: 95.0%  
Location: 4.283304, 52.726660  
Status: Alive  
Evidence: Organism  
Life stage: Adult  
Sex: Cannot Be Determined

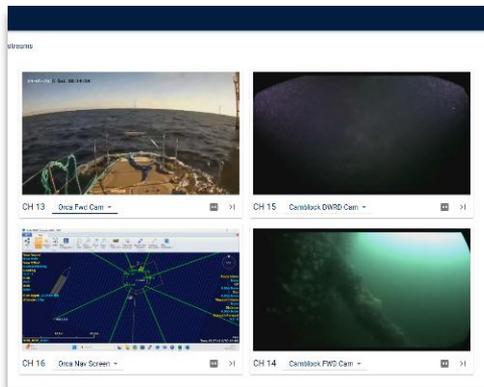
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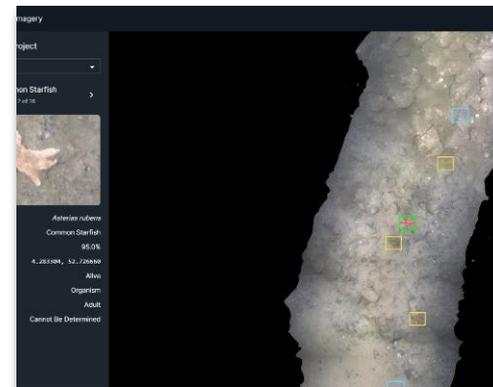
# Combined subsea asset and ecology service



Combined subsea asset and ecology inspection from one USV platform



Watch surveys live via Sense.Live



Review all engineering and ecology data in Sense.Insights

# Questions?

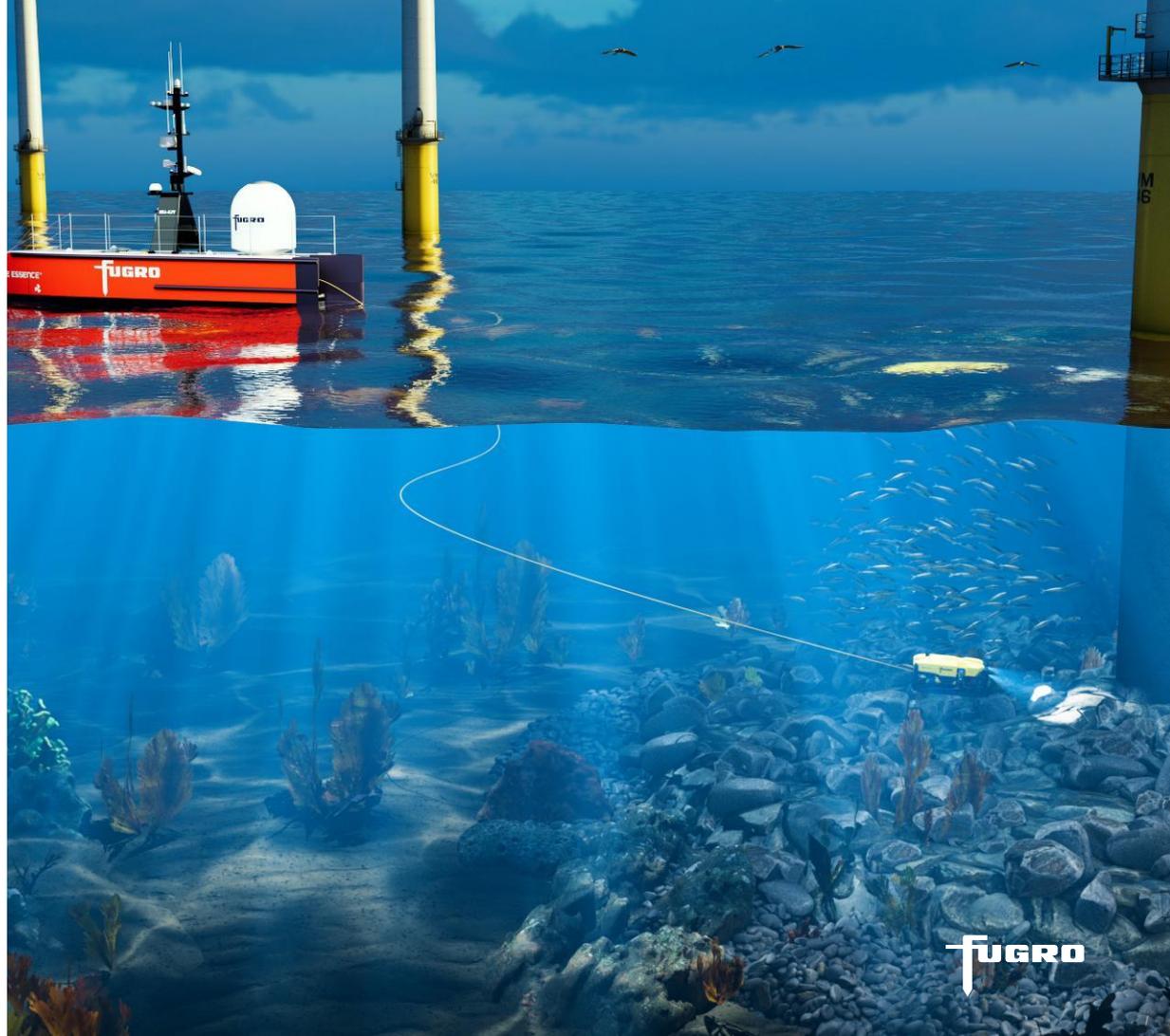
## Daniel Smith

Offshore Wind Biodiversity Solution Owner

BEng MPhil CEnv MISEP

[Daniel.smith@fugro.com](mailto:Daniel.smith@fugro.com)

Fugro, Edinburgh, UK





# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



ROBUST | RELIABLE | RECONFIGURABLE

ACUA  
O C E A N

# BRIDGING THE GAP WITH MARINE EO DATA



- Wide area coverage
- No risk to people
- Low cost per data point
  
- Measurement set fixed a launch
- Limited subsurface measurements



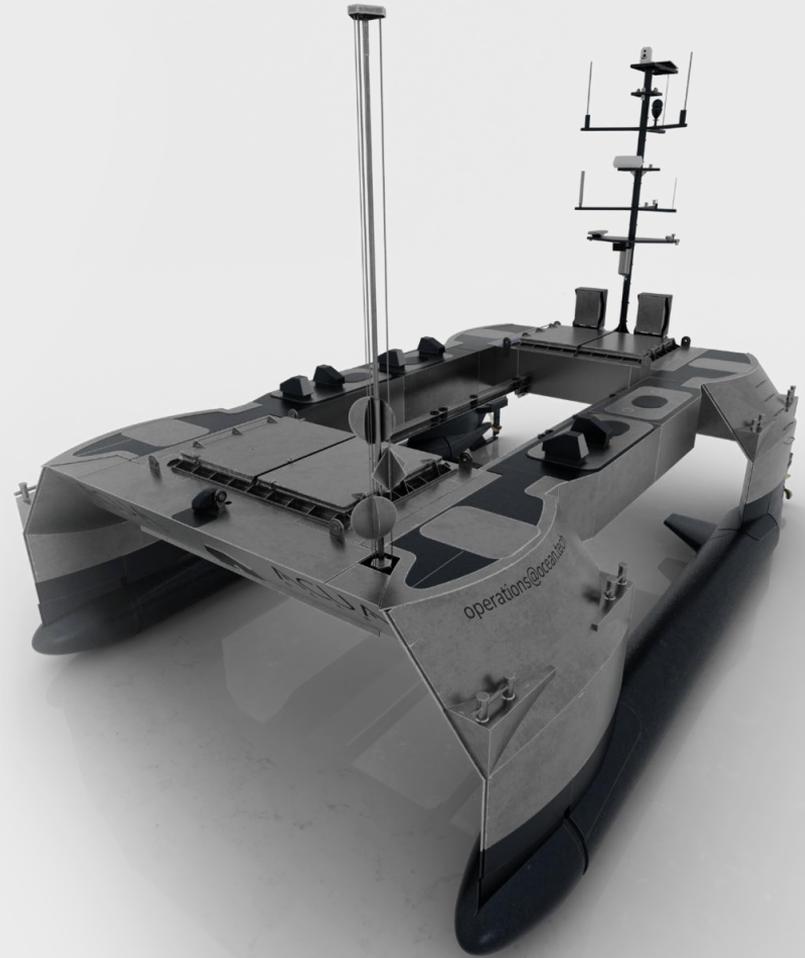
- Full-Depth and Subsurface Profiling
- Sensor flexibility
  
- High risk to people at sea
- High Cost – per data point
- Limited time at sea

# HOW TO ADDRESS THE GAP

## USV PIONEER

ACUA's full ocean vessel for payload deployment

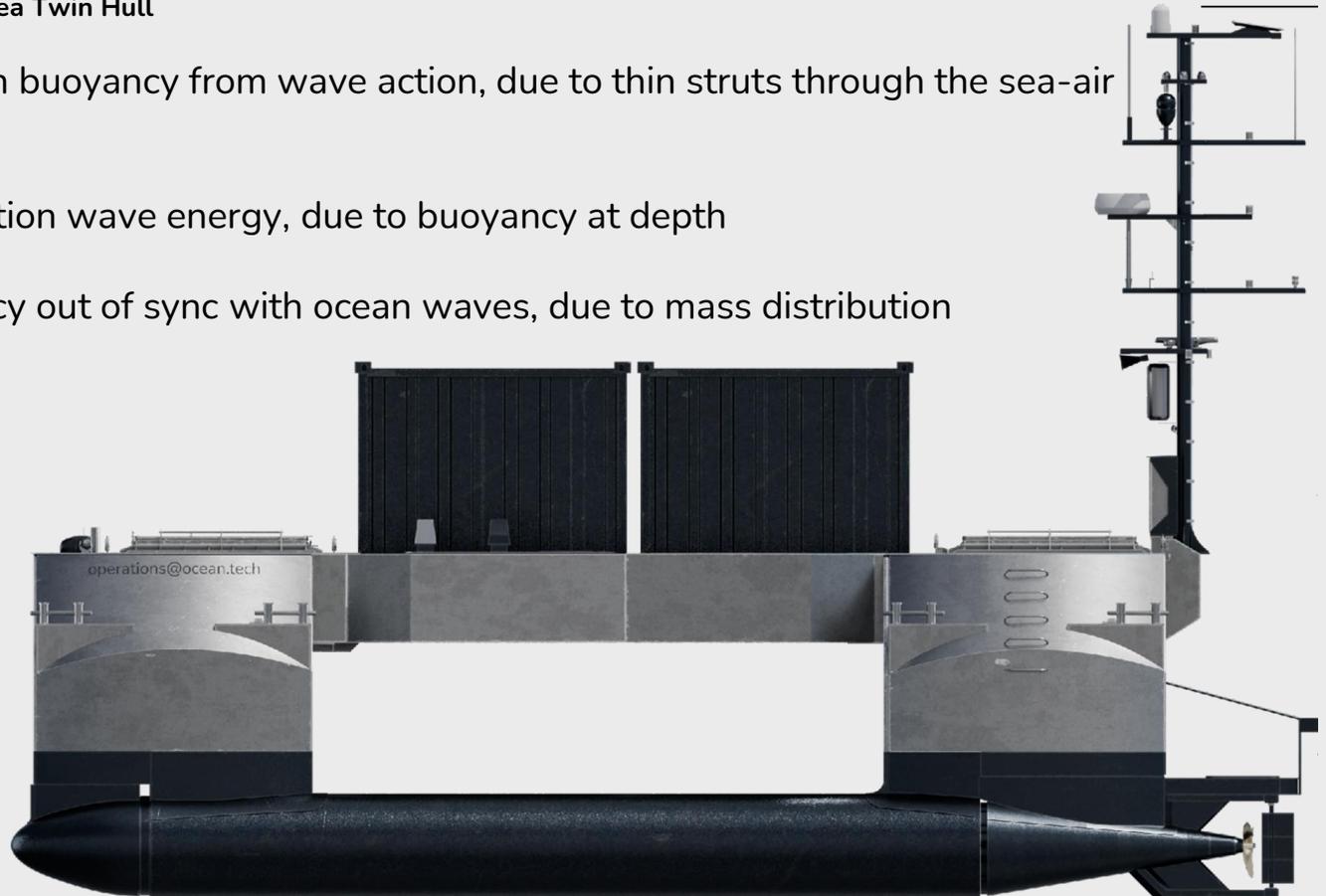
- **No People at sea**
- **Long Endurance** - 50-days @ 4kts
- **High Sea state capability** – Operations upto **5m Hs**
- **High Payload capacity** up to **7t** payload capacity
- **Reconfigurable** – Standard 20ft ISO container fittings in moonpool, High bandwidth Comms and power upto **50kw**
- **Low cost** – > 60% reduction operational cost



# WHY SWATH?

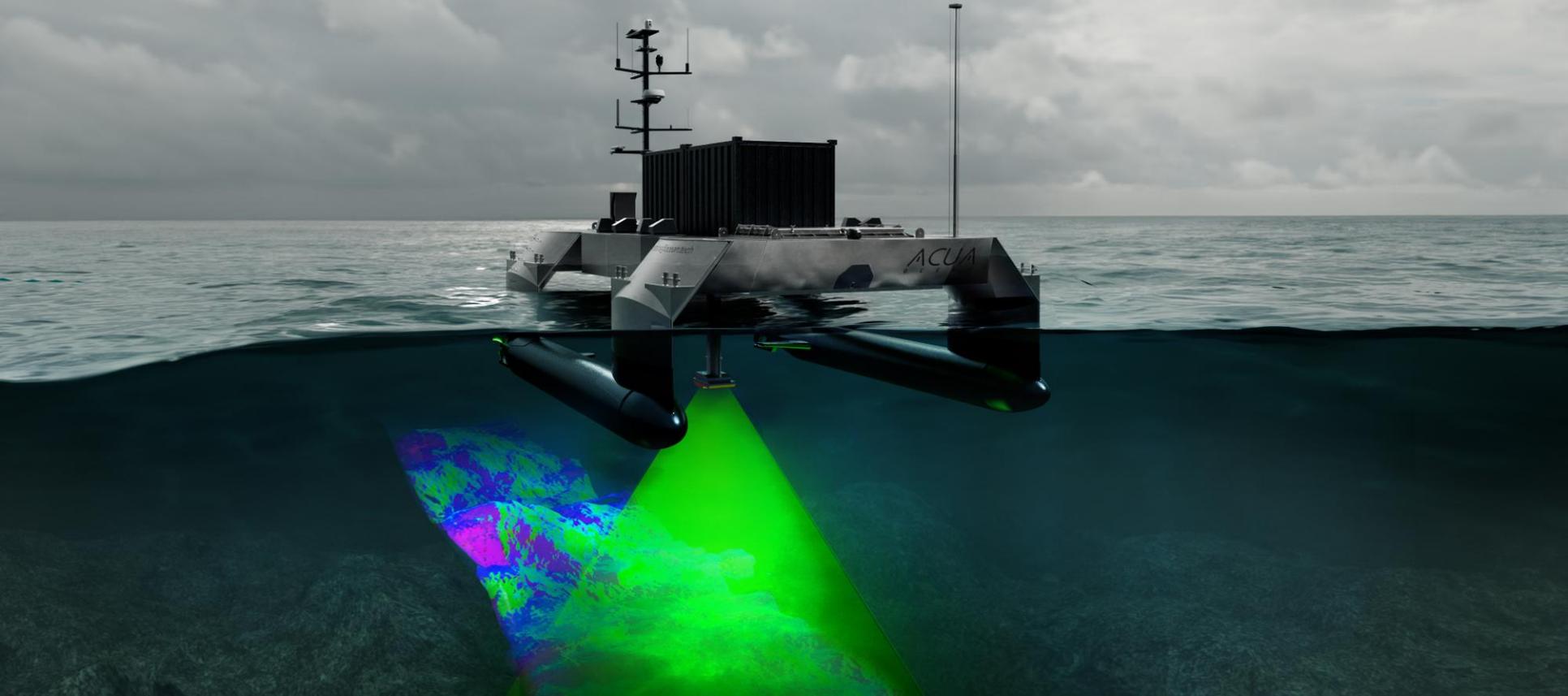
## SWATH: Small Waterplane Area Twin Hull

- Reduced change in buoyancy from wave action, due to thin struts through the sea-air interface
- Exponential reduction wave energy, due to buoyancy at depth
- Resonant frequency out of sync with ocean waves, due to mass distribution

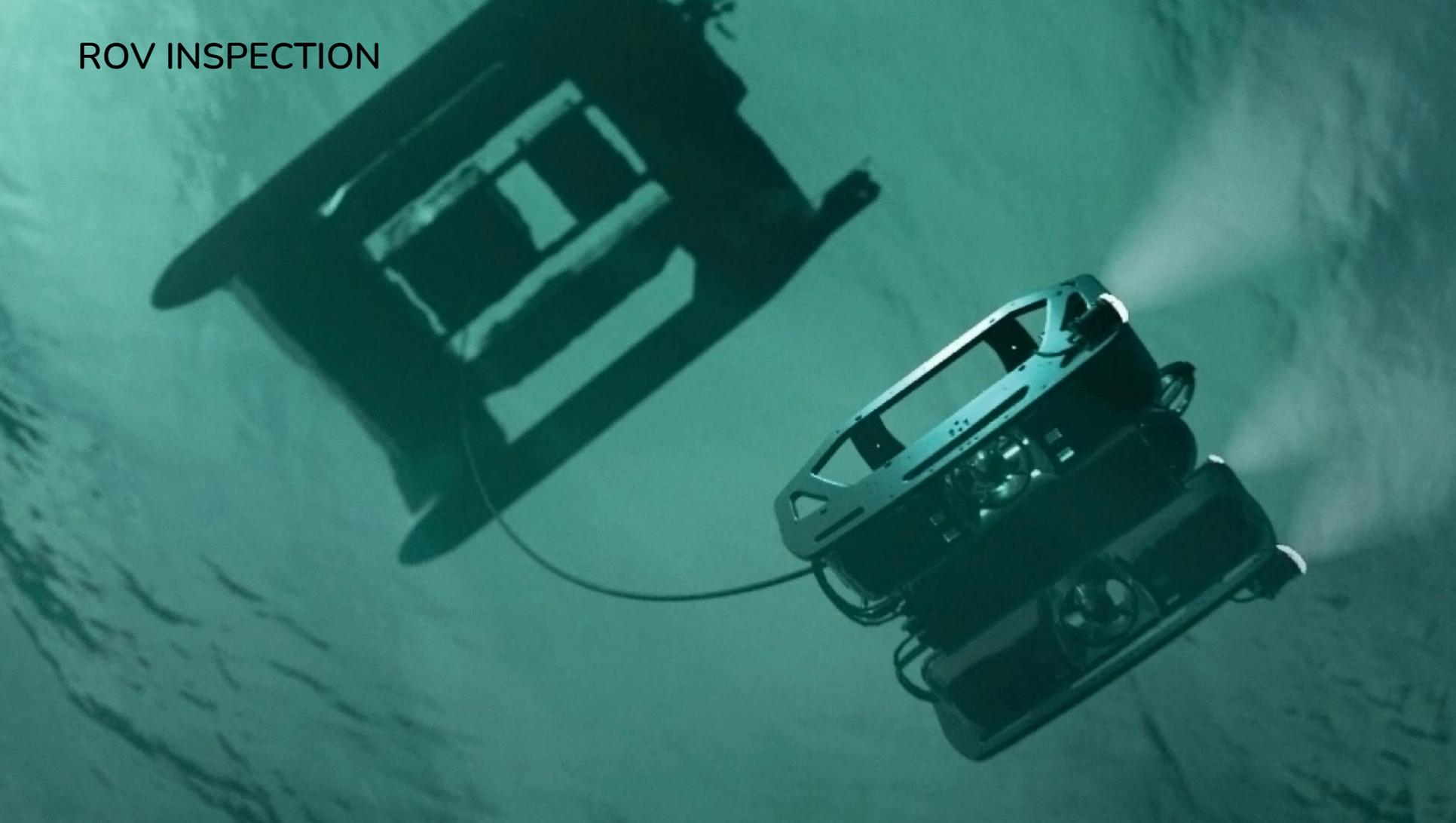


## GEOPHYSICAL SURVEY

PIONEER's stability from its SWATH form provides enhanced data quality from survey payloads and expands normal operating windows, reducing weather downtime and resurvey requirements.



# ROV INSPECTION



# NESTED ROBOTICS: AUV AND UAS OPERATIONS



# DUAL-USE

Multiple Capabilities | Multiple Addressable Markets

## SUBSEA SERVICES

ROV or AUV LARS for Defence, Offshore Energy, Research



## OFFSHORE GEOPHYSICAL

MBES, ROTVs, for Offshore Energy and Defence



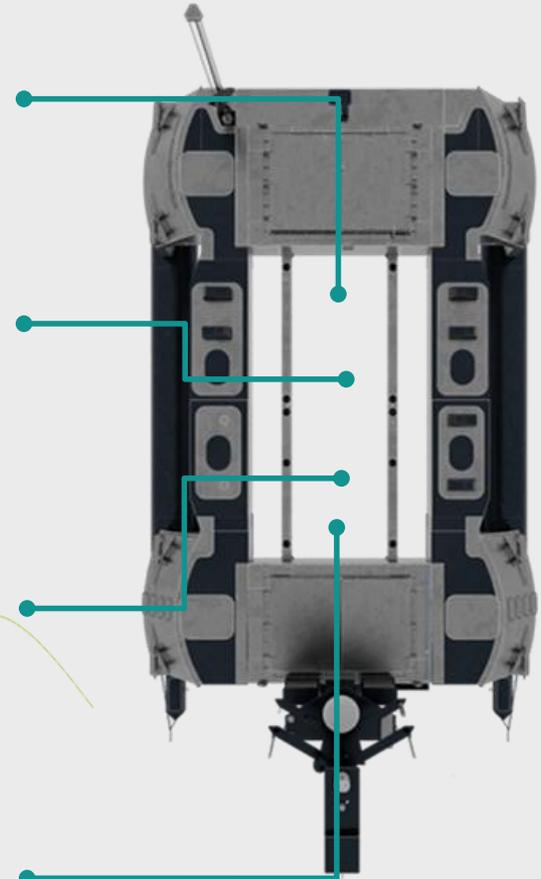
## MARITIME ISR & ASW

8m Mast for EO/IR Sensors, Deployment of Tethered and Untethered UAVs, Passive Acoustic Array for Subsurface Detection

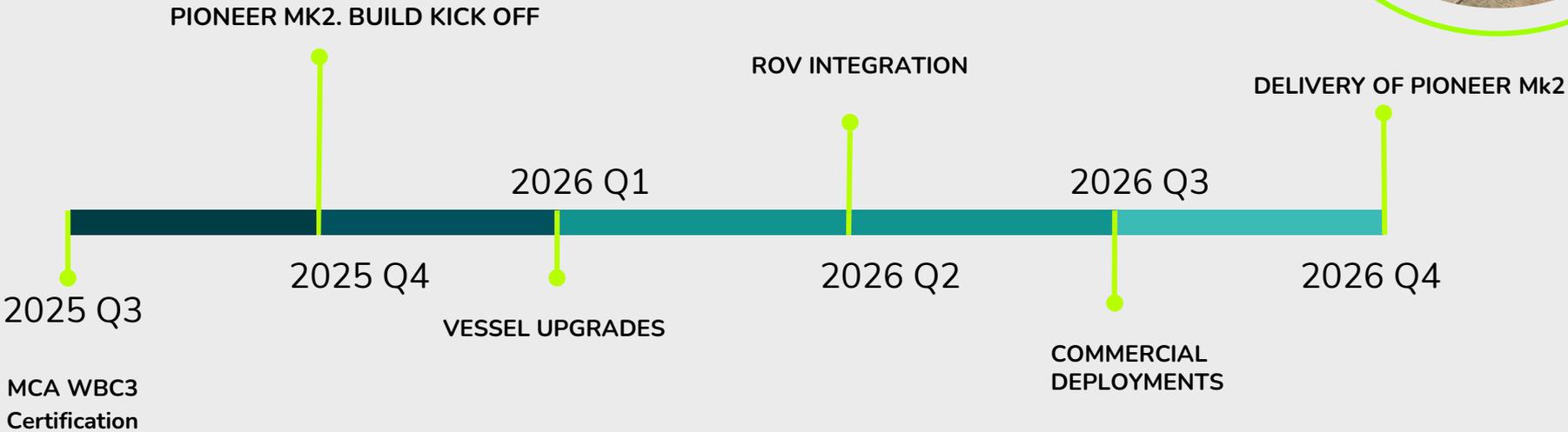


## OFFSHORE LOGISTICS

Delivery of Cargo to Offshore Industries



# OUR ROADMAP FOR THE NEXT 12 MONTHS





ACUA  
O C E A N

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# Advancing the Blue Economy with Earth Observation Webinar

26<sup>th</sup> February 2026



# The EO4MI Roadmap: Looking Ahead

André Cocuccio, Commercial Director

# Capability mapping to investable pilots

- To recap...
- EO4MI began by identifying where EO can genuinely improve maritime decision-making
- Our aim: develop a structured innovation pathway



- Identified 2 priority domains:
  - Enhanced Metocean Data Services
  - Dual use: Marine Monitoring & Asset Protection

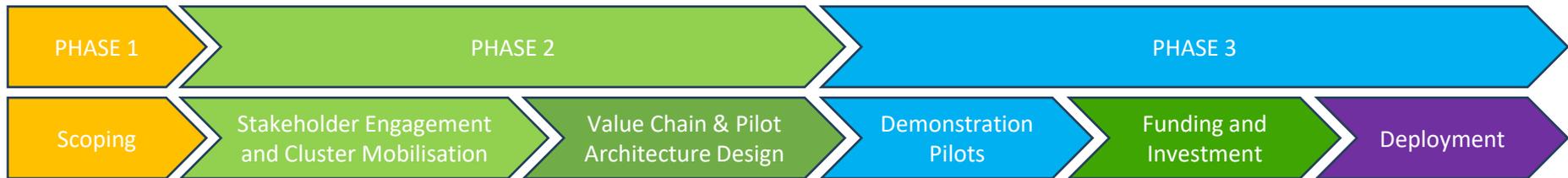
# What is the Roadmap?

- It's not about new satellites
- Dialogue with champions, construction of value chains, creation of business-aligned value propositions, population of interest networks, preparation of an investable roadmap
- It is about:
  1. Making EO useable
  2. Making it trusted – raising awareness and confidence in its application
  3. Making it investable
- **Positioning EO within operational (maritime) business processes.**



# How do we get from idea to infrastructure?

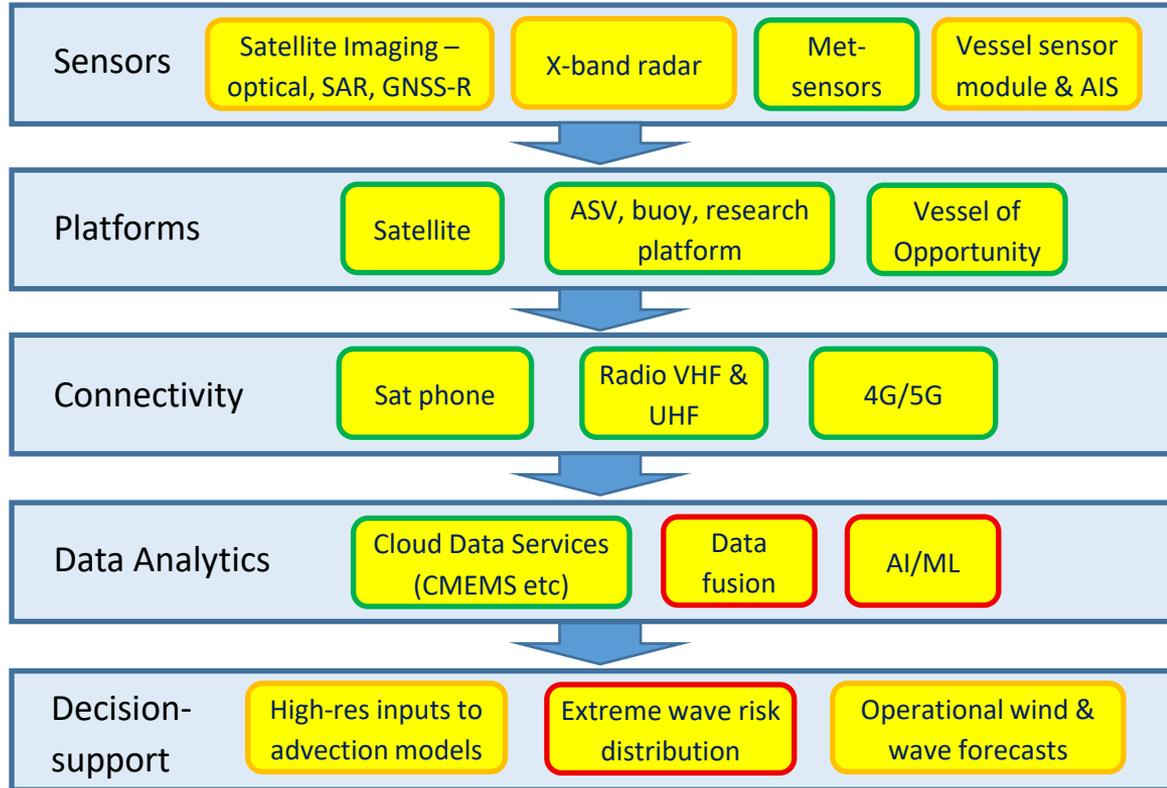
- Sequencing matters
- Phase 1 – Scoping: started
- Phase 2 – Engagement: started, but more to do!
- Phase 3 – Implementation: Next.
- Crucially we're not starting with technology
- We're starting with benefit and value and moving outward.



- Why?
- Overcome current limitations
- Improve operational benefit
- Innovation gaps: data assimilation, uncertainty, operational integration
- Innovation lies in:
  - Assimilating diverse in-situ inputs, using AI & ML for calibration, integrating data streams and expressing uncertainty in operational form.
- **The goal is not prettier forecasts, but improved risk intelligence.**



# Pilot 1: Value Chain – Where are the gaps?

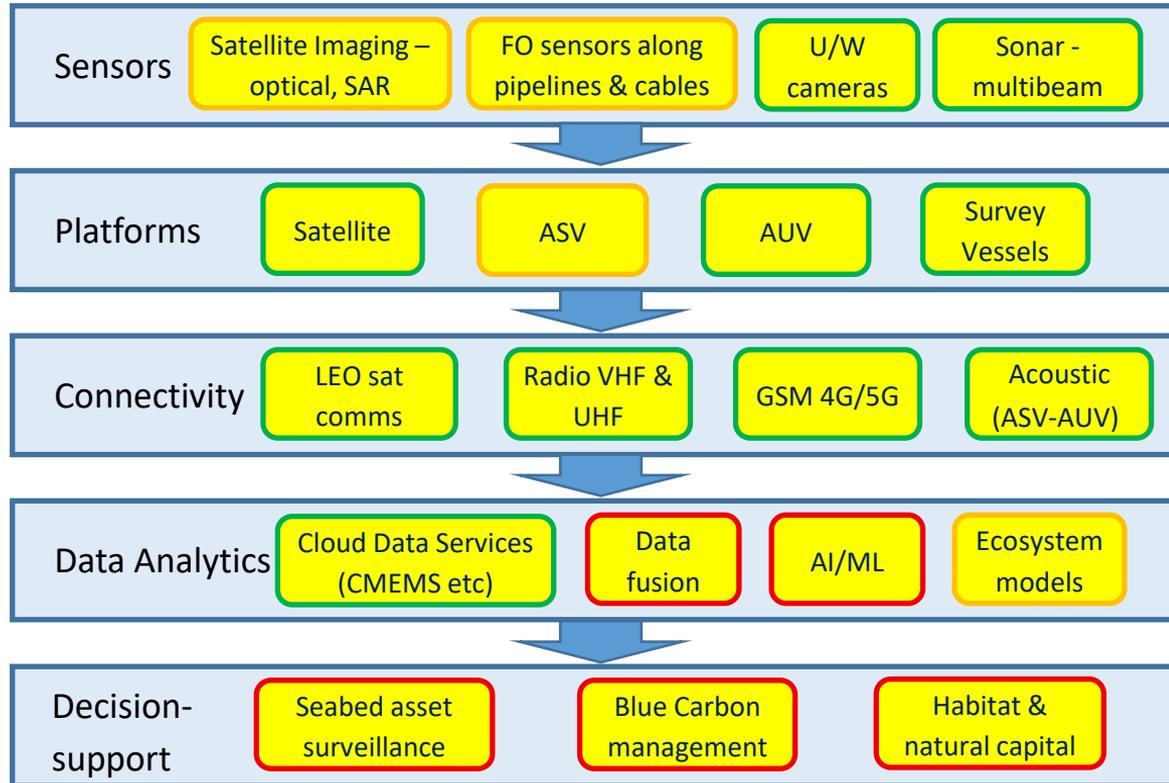


- Improved route optimisation for ships
- More accurate erosion forecasting
- Safer marine operations
- More rapid Search & Rescue
- Improved spill response
- Etc

# Pilot 2: Marine Monitoring & Asset Protection

- Why? Coastal habitats store carbon, they reduce erosion, they underpin fisheries and monitoring is expensive and periodic.
  - The roadmap broadens this to include a dual use capability: seabed asset surveillance. This is strategic.
  - By linking habitat monitoring, blue carbon valuation and seabed asset surveillance, we create a more investable value chain.
  - Natural capital alone can be policy-driven
  - But dual-use capability attracts infrastructure investment.
  - **BlueActionAA**: opportunity already exists. EO4MI has good traction already. Partners want to collaborate rather than compete.
- [www.blueactionaa.eu](http://www.blueactionaa.eu) – community led action call. Horizon Europe funded.

# Pilot 2: Value Chain – What needs to mature?



- Low-cost habitat mapping for MPA management
- Blue carbon verification
- Ecosystem services valuation
- Seabed pipeline & cable resilience
- Dark vessel identification
- Etc

- Common enablers: interoperable data sharing networks, value tree prioritisations, service providers as delivery layer, cluster modality as the scaling mechanism.
- Across both pilots, innovation is systemic.
- The EO4MI roadmap requires:
  - Clusters accelerate adoption
  - 3<sup>rd</sup> party providers acting as the operational gateway
  - Data interoperability as standard
- **This is ecosystem architecture, not isolated tools or portals.**



- 2 pilots – both aligned to external funding routes
- Our work so far has defined KPIs: end-user engagement, validated use cases, value-chain stakeholder commitments & cluster dissemination and reach
- We need to: define objectives, structure work packages, identify gaps and explore early funding pathways.
- **Aim to become pre-investment ready**
- **Want to contribute?**



# Looking ahead: What does success look like?

- EO-based services embedded in operational workflows
- Quantified uncertainty as standard practice
- Lower-cost marine monitoring
- 3<sup>rd</sup> party service providers integrating enriched datasets
- Atlantic clusters acting as multipliers
- Establish a methodology for turning EO capability into operational infrastructure.
- **The next phase isn't more mapping, its demonstration, validation and scale.**



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