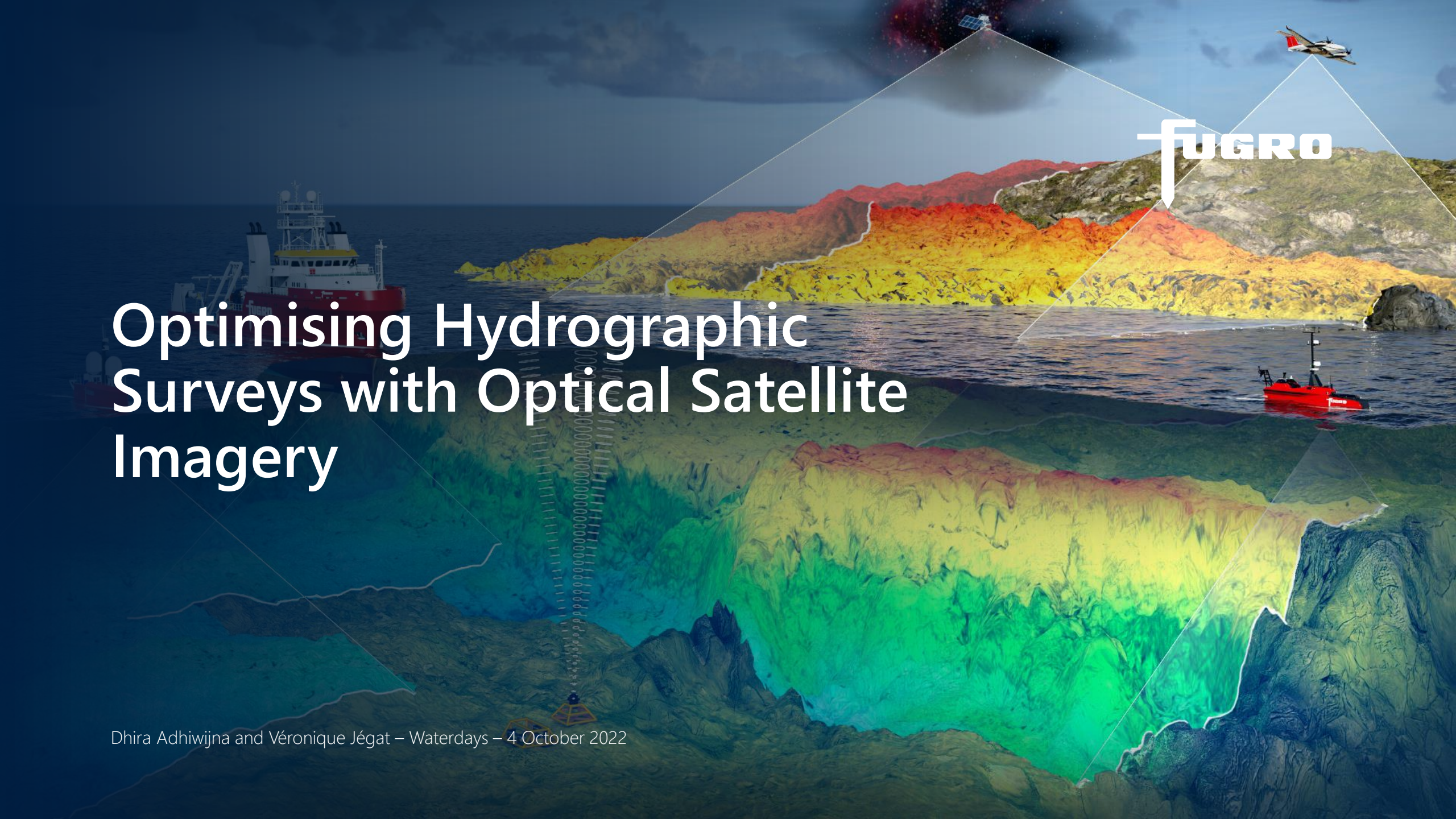


Optimising Hydrographic Surveys with Optical Satellite Imagery

Dhira Adhiwijna and Véronique Jégat – Waterdays – 4 October 2022

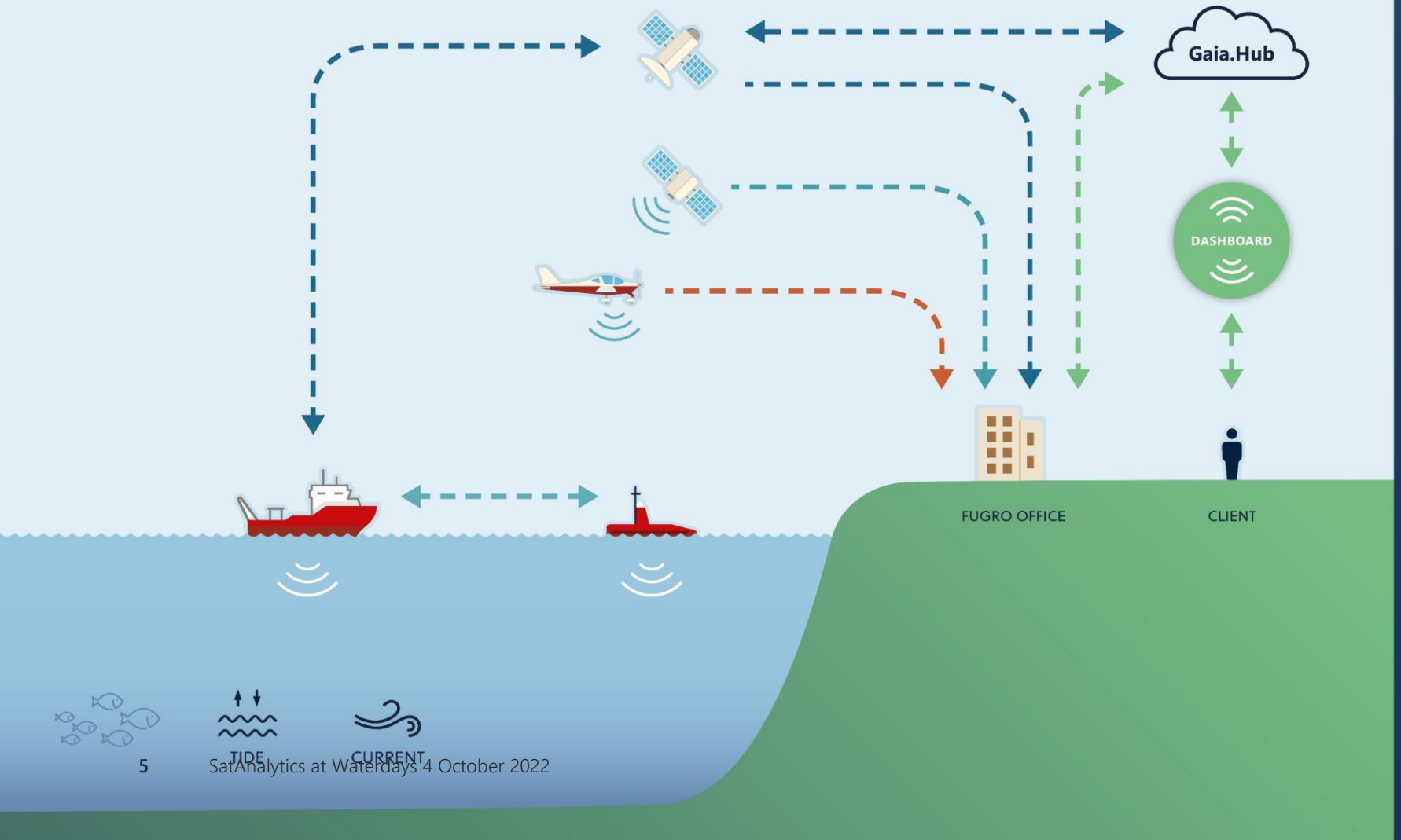
Unlocking insights from Geo-data

Using our ‘triple A’ approach, we support our clients in managing their project risks during construction and operation of their assets, both on land and at sea

Acquisition of Geo-data | **A**nalysis of Geo-data | **A**dvice based on expertise

Integrated Hydrographic Solutions

A range of seabed mapping services for fast and high-quality acquisition of hydrographic and bathymetric data.



BENEFITS

Satellite imagery analysis supports bathymetry and environmental mapping of nearshore environments

Airborne lidar bathymetry captures **fast and high-quality** shallow water bathymetry over large areas

Vessel based multi beam echo sounder acquires **accurate hydrographic data** reaching all ocean depths

Leverage core expertise in new growth markets

EO Market Value
(EUSPA, 2022)

	Global	
	2021	2031
	Value	Value
Data revenues (€ m)	536	797
Value-added service revenues (€ m)	2,236	4,662

SatAnalytics

Higher computation power

Improved sensors and algorithm

Increase in resolution

Increase in numbers of satellite

FUGRO

SatAnalytics

SatAnalytics is combining optical satellite imagery with data analytics, machine learning and cloud computation to derive bathymetry, morphology, seafloor and water column properties for marine site characterisation in nearshore.

SatAnalytics unlocks Geo-data safely and rapidly in nearshore environment without stepping foot on site

Innovation – ‘4S‘ Satellite Seafloor Survey Suite

MEDIA CENTRE > NEWS >

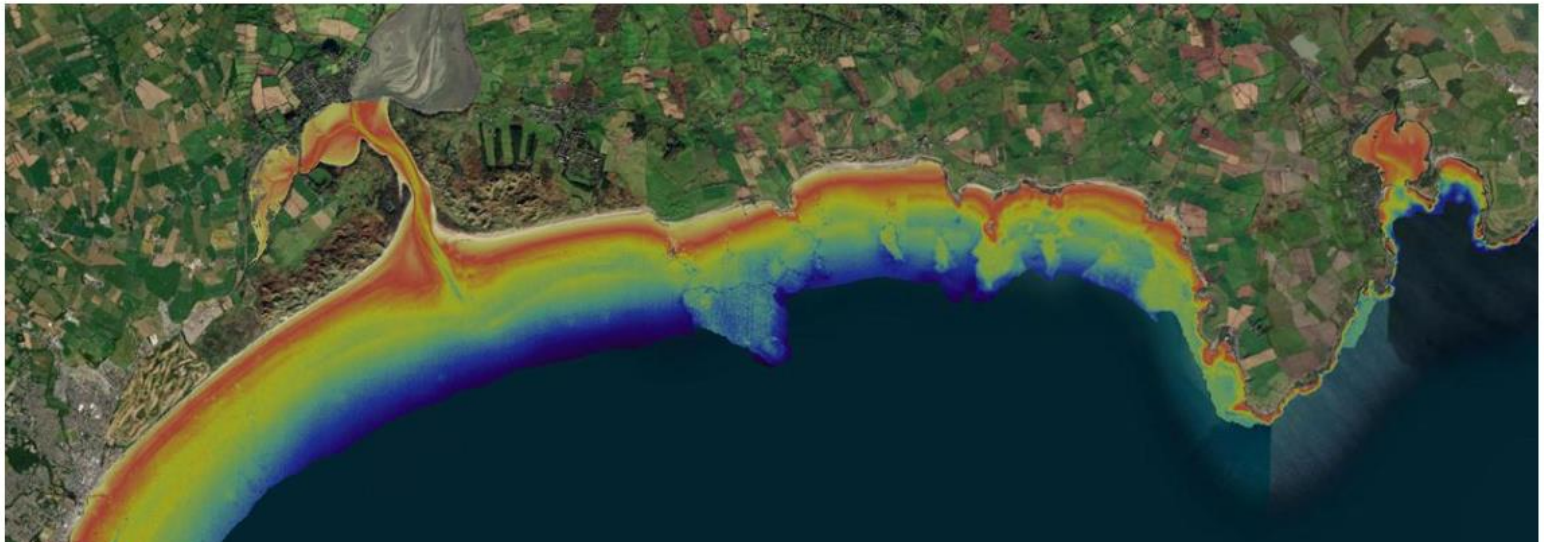
FUGRO PARTNERS ON ‘4S‘ GLOBAL SATELLITE OBSERVATION SEAFLOOR MAPPING INNOVATION

Fugro is participating in an EU co-funded research and innovation project to develop a remote solution for global satellite derived seafloor mapping.

11 Jan 2021

Bremen, Germany

Co-financed by the Connecting Europe Facility of the European Union



Innovation – ‘4S‘ Satellite Seafloor Survey Suite

MEDIA CENTRE > NEWS >

FUGRO PARTNERS ON ‘4S‘ GLOBAL SATELLITE OBSERVATION SEAFLOOR MAPPING INNOVATION

11 Jan 2021
Bremen, Germany

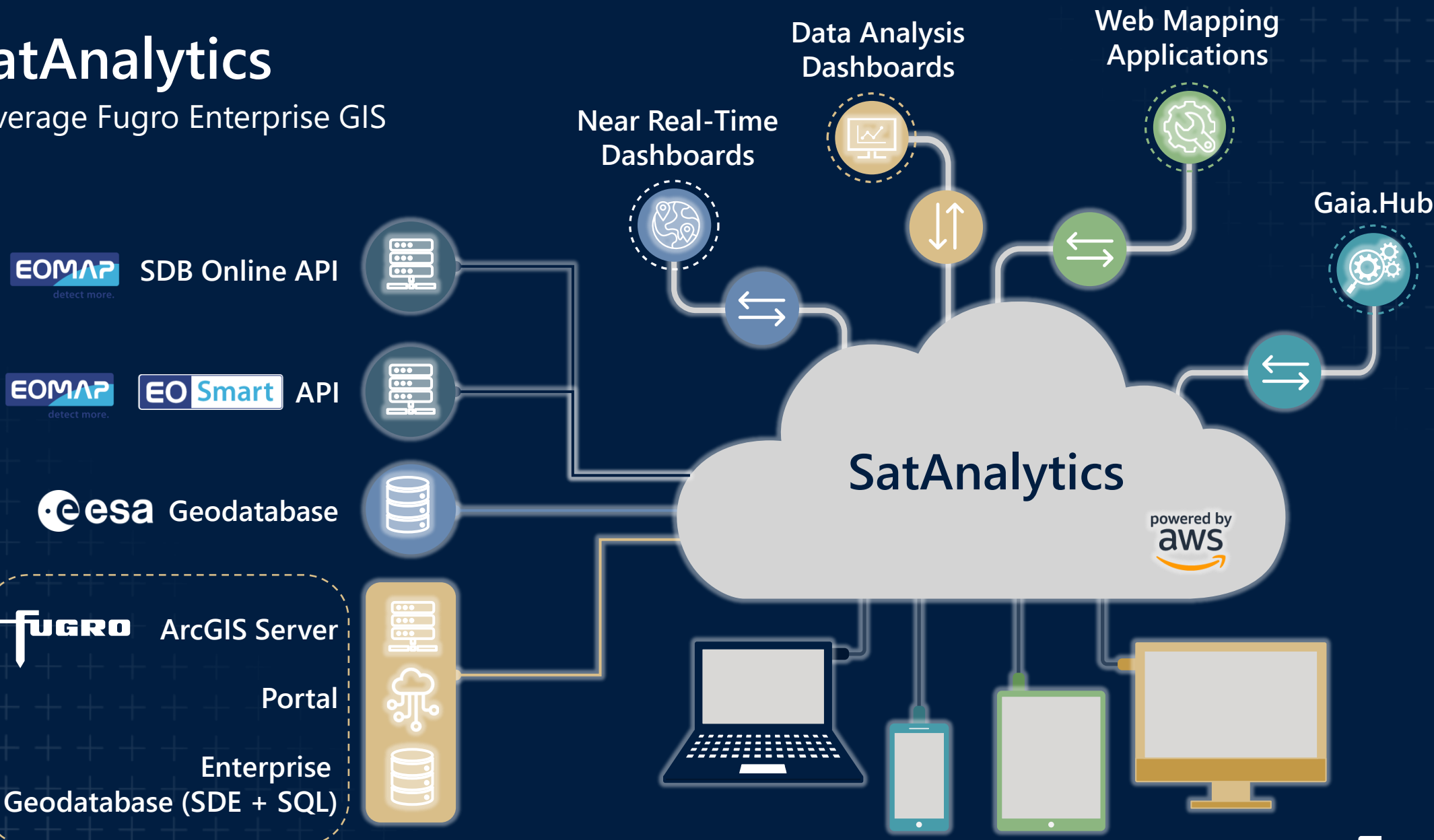
Co-financed by the Connecting Europe Facility of the European Union

Fugro‘s key contribution

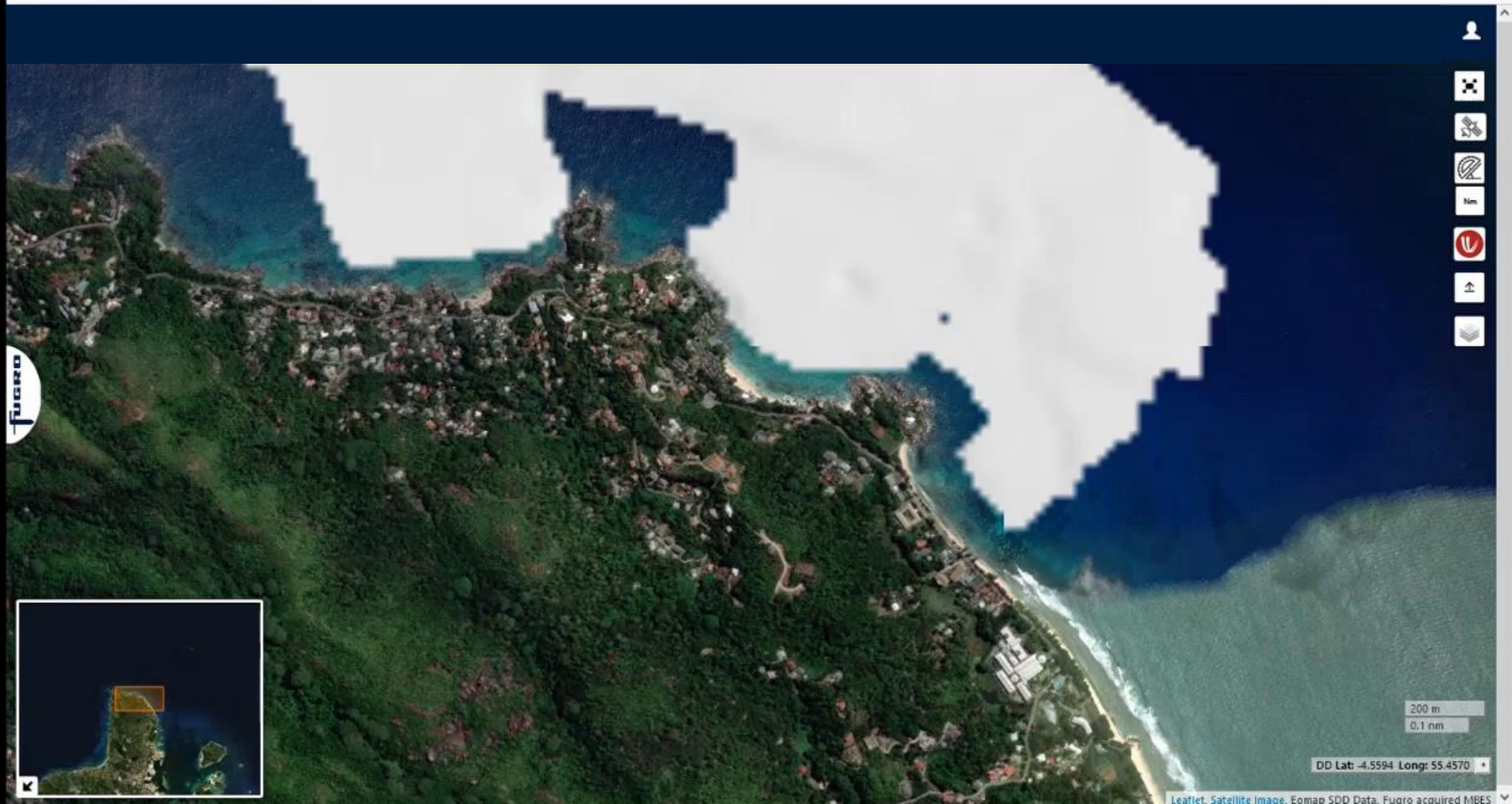
- Business Development
- Global Use Case Studies
- Software integration
- Capacity building and dissemination

SatAnalytics

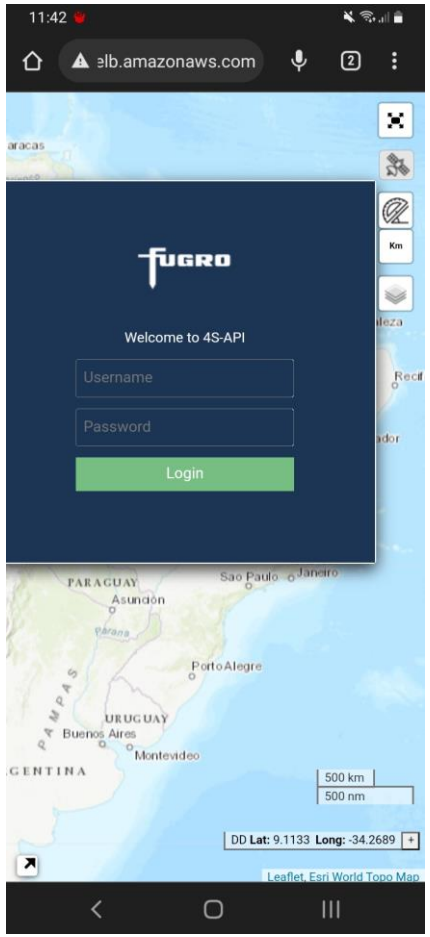
Leverage Fugro Enterprise GIS

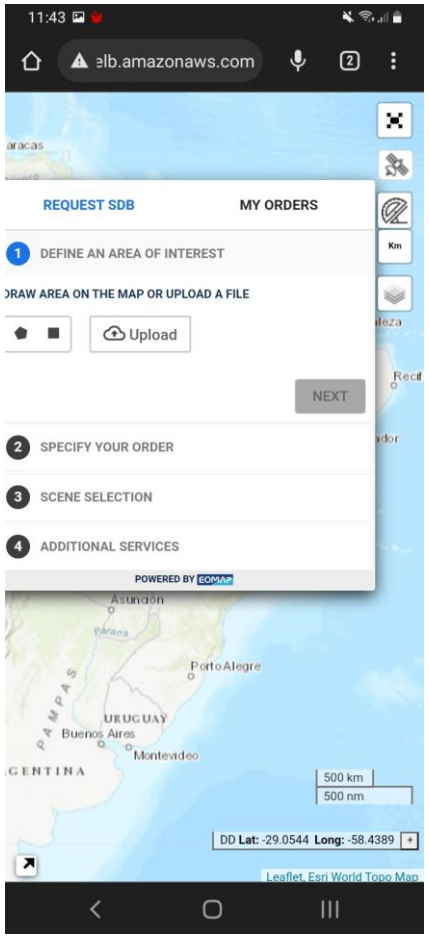


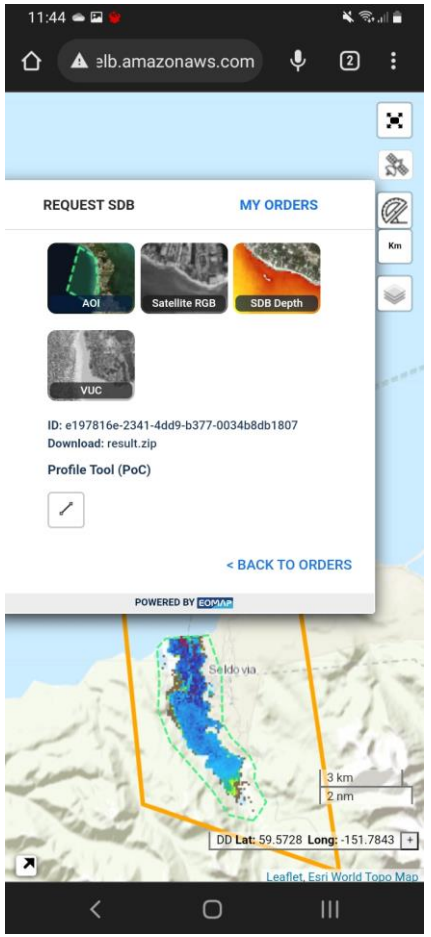
Differentiate by integrated digital solutions


Survey Status Dashboard
amazonaws.com/
FUGRO
Nm
200 m
0,1 nm
DD Lat: -4.5594 Long: 55.4570
Leaflet, Satellite Image, Eomap SDD Data, Fugro acquired MBES

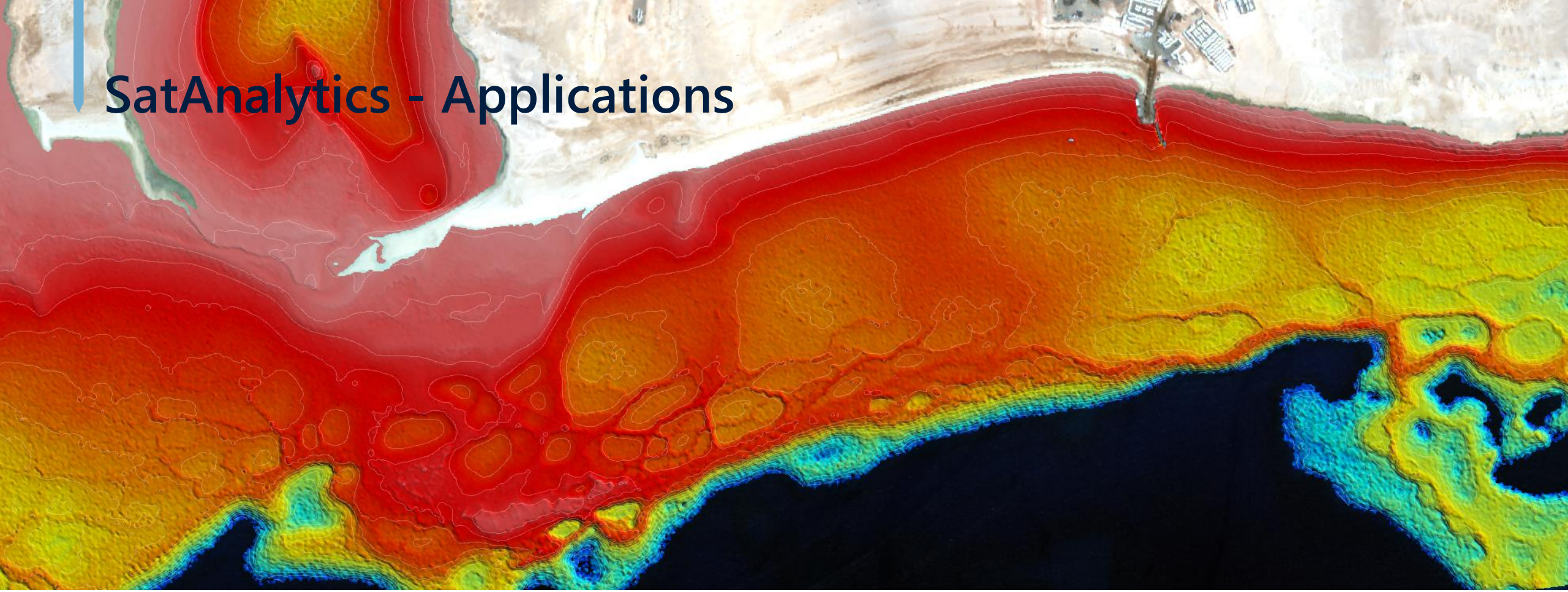
SatAnalytics on Mobile Web App







SatAnalytics - Applications



Planning

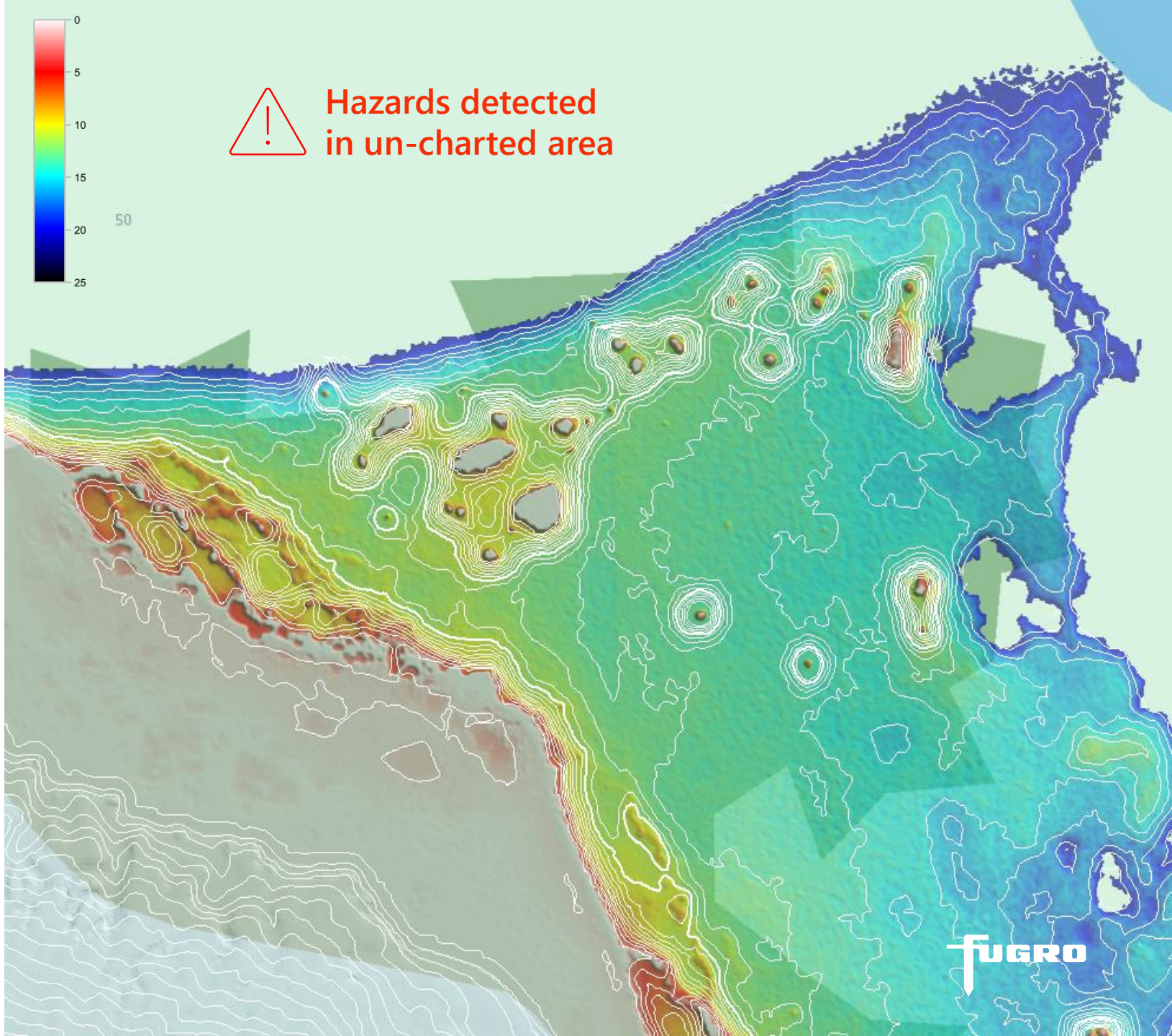
Mapping

Monitoring

Analysis

Reccee Data for Protecting Assets

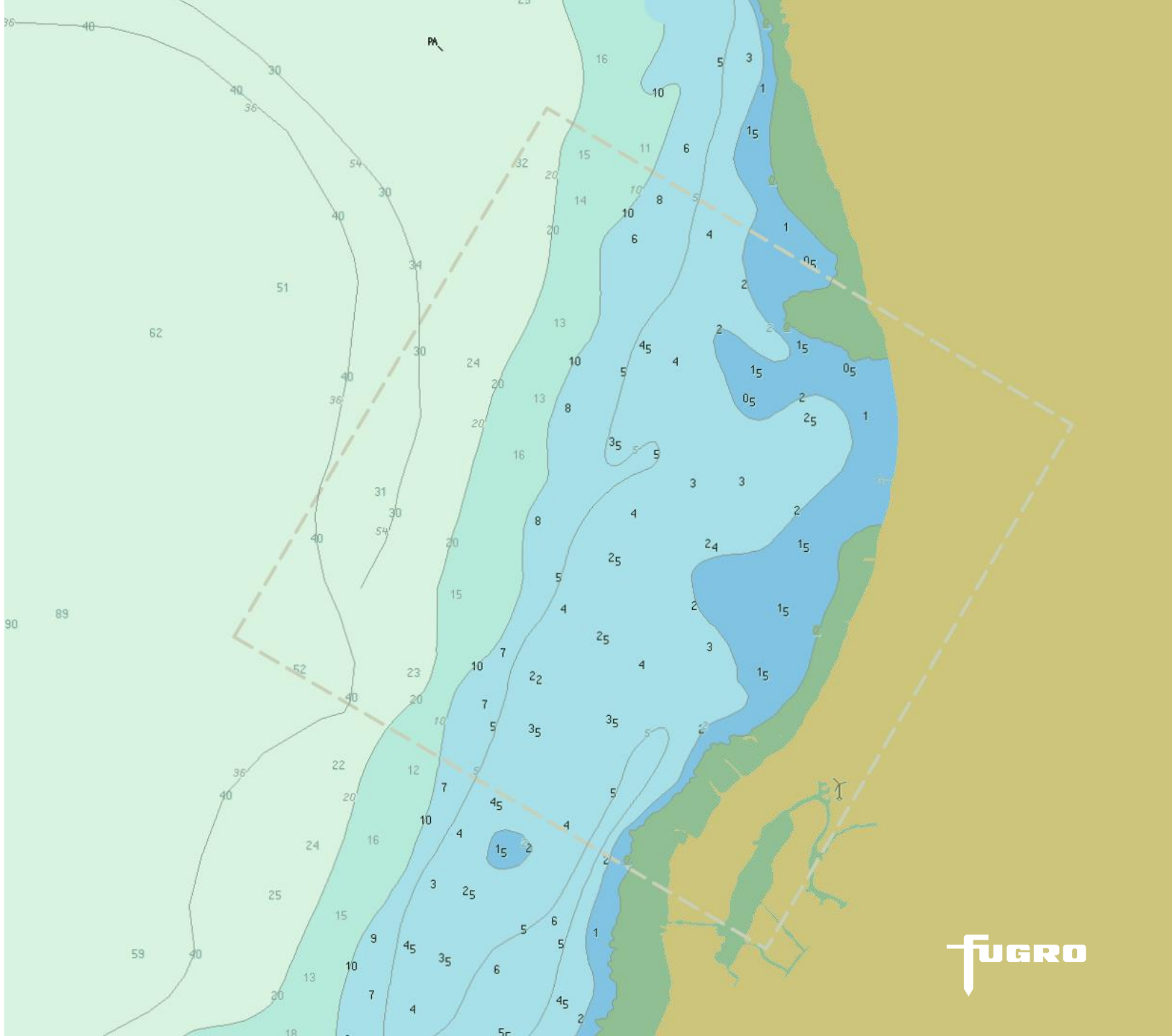
FUGRO BLUE SHADOW™



Reccee Data for Survey Planner

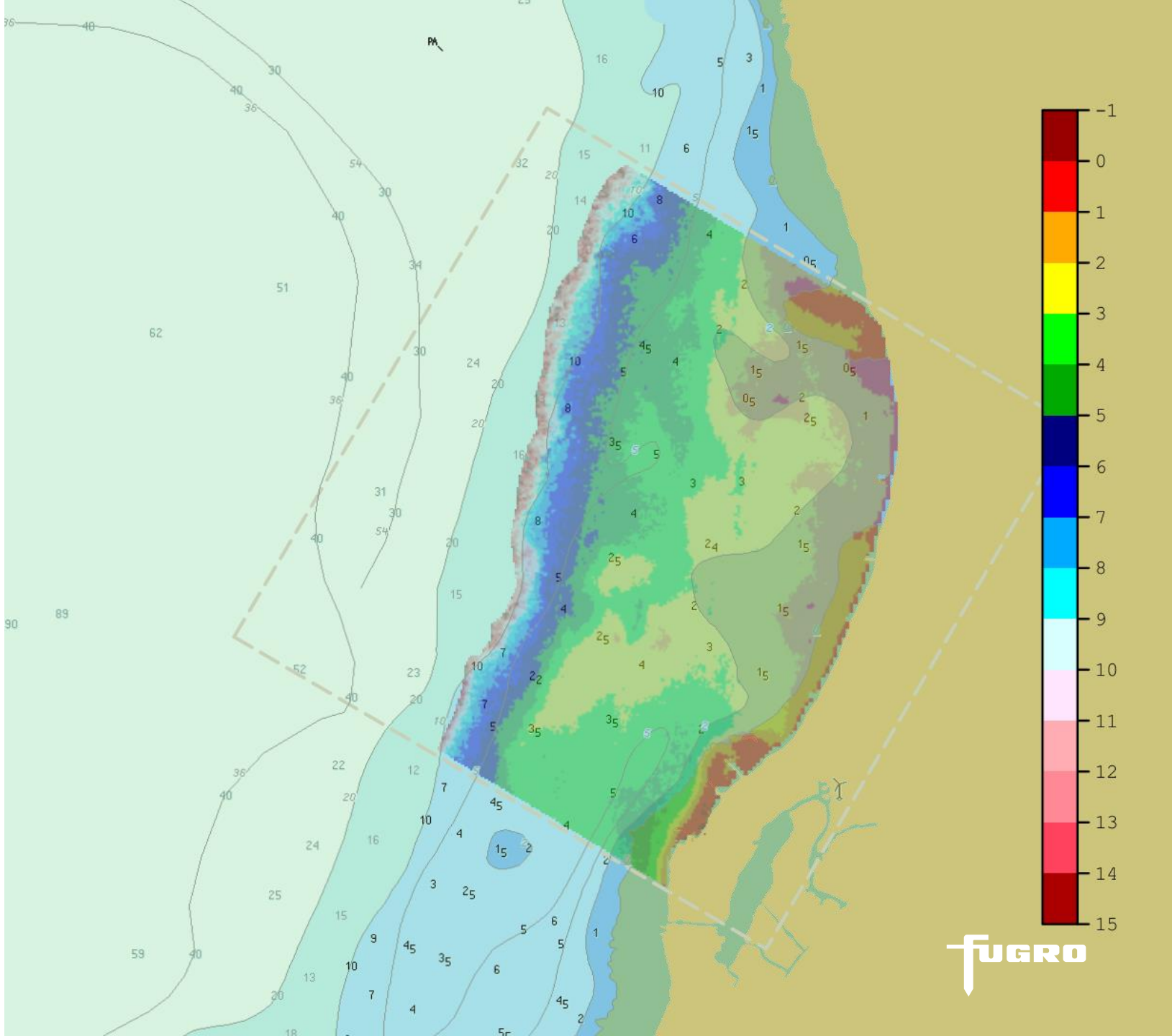
Inputs are:

1. **Pre-known depths**;
2. OPS hours;
3. Survey speed;
4. Transit speed;
5. Turn time between lines;
6. Overlap requirements;
7. Tie or cross lines;
8. Boat draft;
9. SVP time interval and type;
10. MBES technical specifications.



Reccee Data for Survey Planner

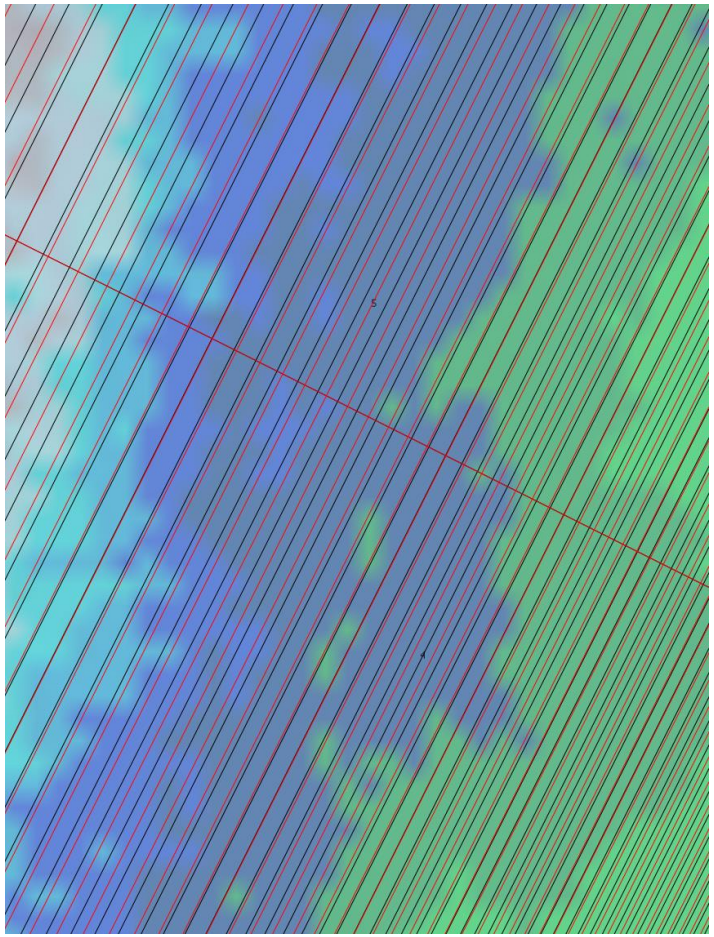
- ENC sounding depths provide low resolution depth input for Fugro Survey Planner
- SDB reccee depths shows differences compared to ENC contour depths



Survey lines estimation
ENC vs SDB

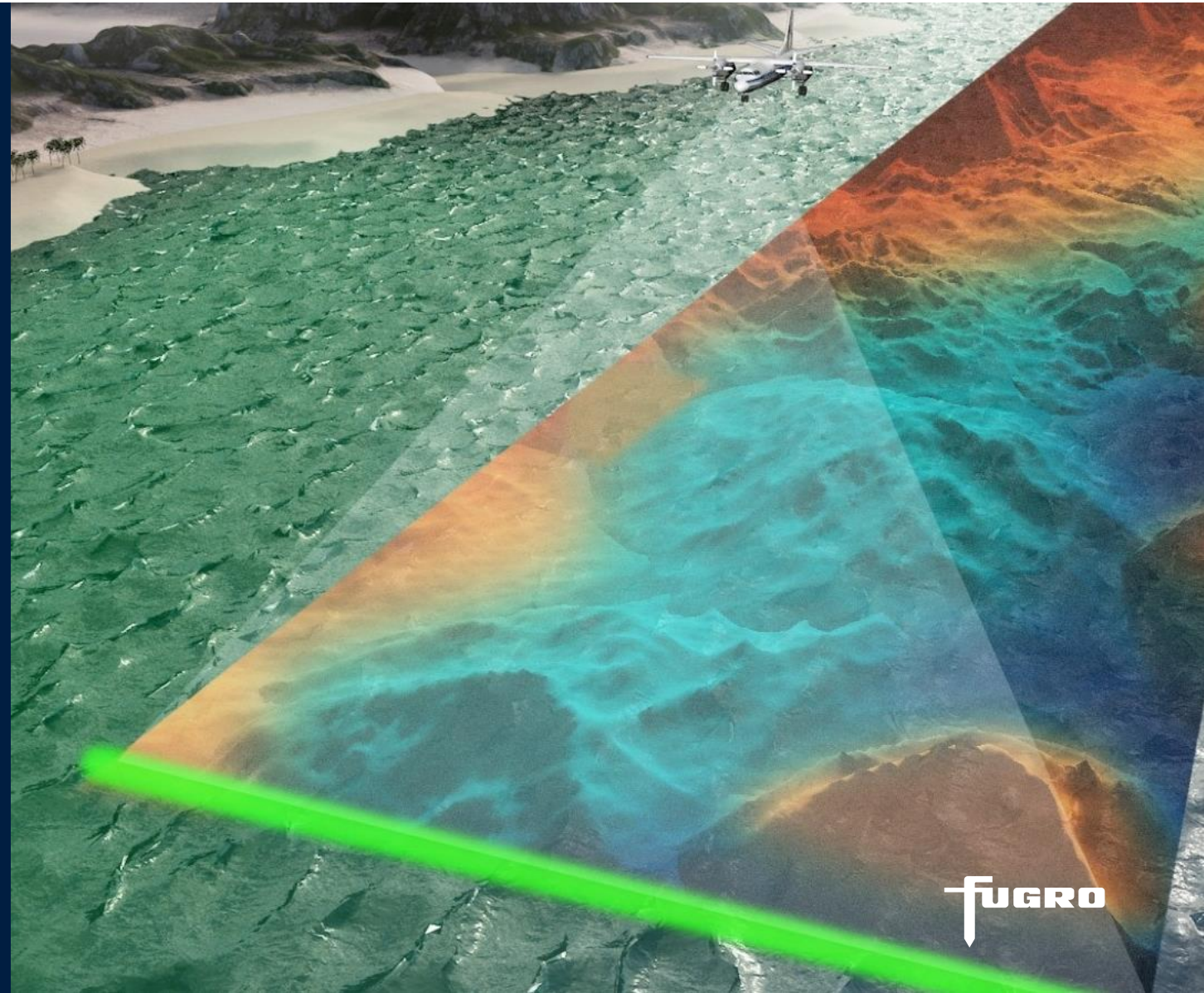
Depth Input	No. of lines	Survey Hours	OPS Days (12 hrs OPS)
ENC	102	107	9
SDB	619	148	12

- Low resolution depth input can provide under-estimation in operationals days
- Under-estimation can cause delays and leakage in project

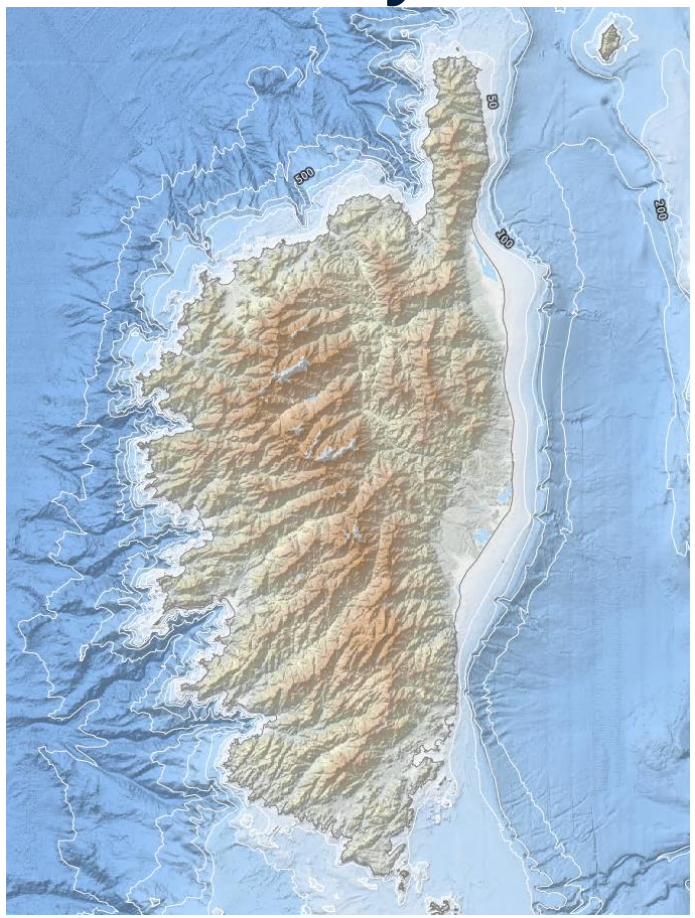


ALB Coverage Estimation for ALB Survey Planning

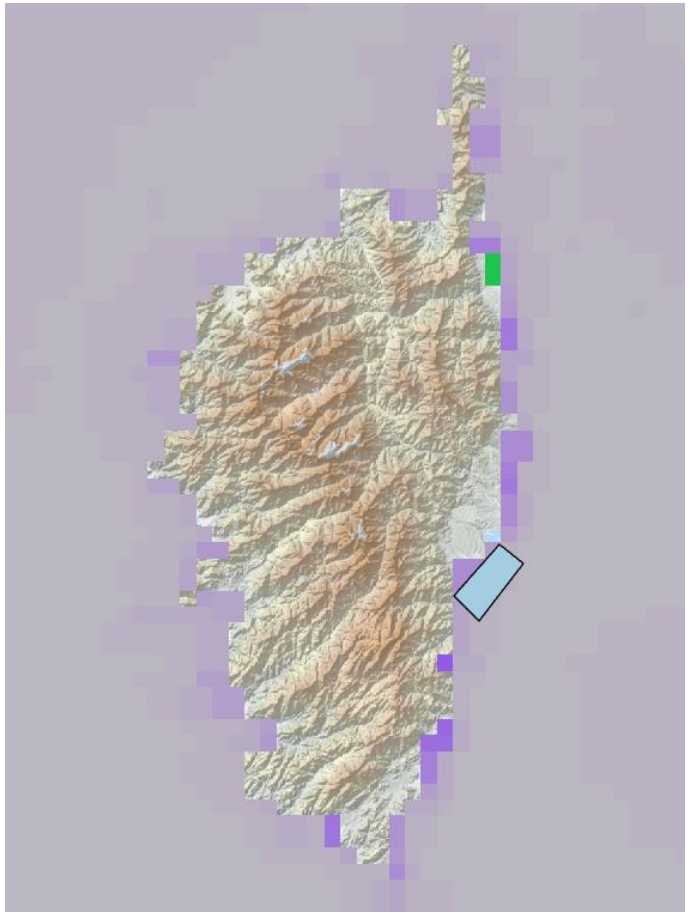
- Using passive ocean color satellite observations (e.g. MERIS, MODIS & VIIRS) to understand light attenuation at sea (Kd490);
- Kd490 obtained from ESA Ocean Colour Climate Change Initiative (OC-CCI);
- Kd490 is then processed to calculate ALB penetration depth estimation and compared with low resolution bathymetry (GEBCO / EMODnet)



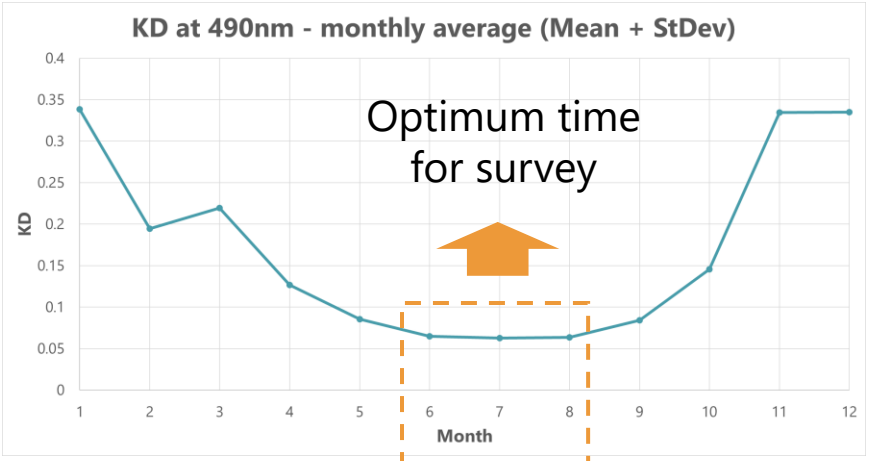
ALB Coverage Estimation for ALB Survey Planning Case Study Corsica

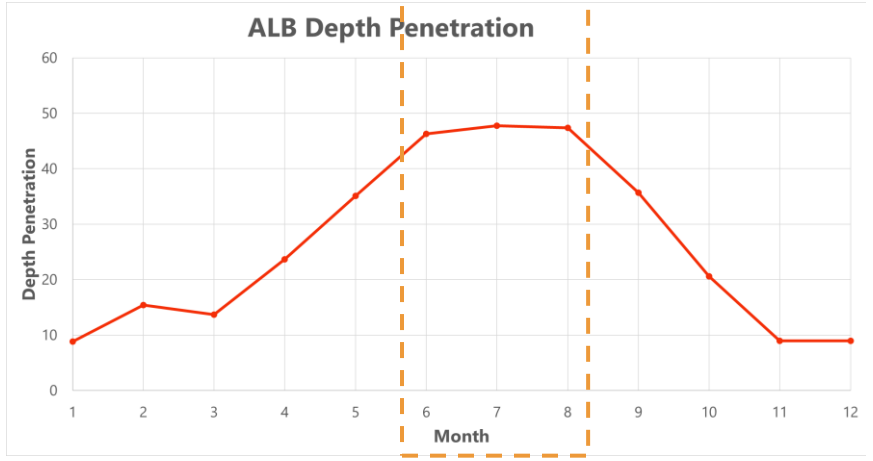


EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM)



Monthly 1997-2021, Ocean Colour Climate Change Initiative dataset, Version 5.0,European Space Agency, available online at http://www.esa-oceancolour-cci.org





ALB Coverage Estimation for ALB Survey Planning Case Study Corsica

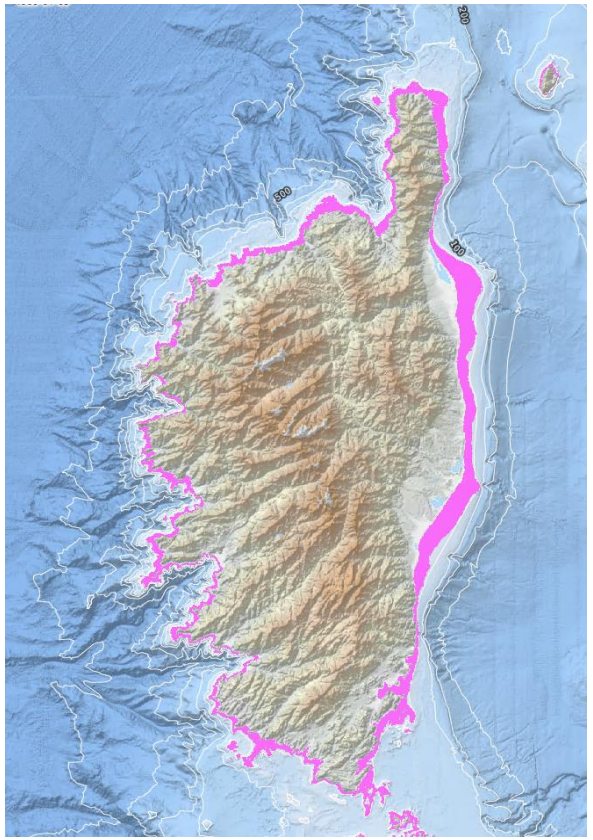
Excellent match between the estimate compared to ALB survey results (Shom, Partie maritime Litto3D® - Corse 2017-2018)

Data collection dates:

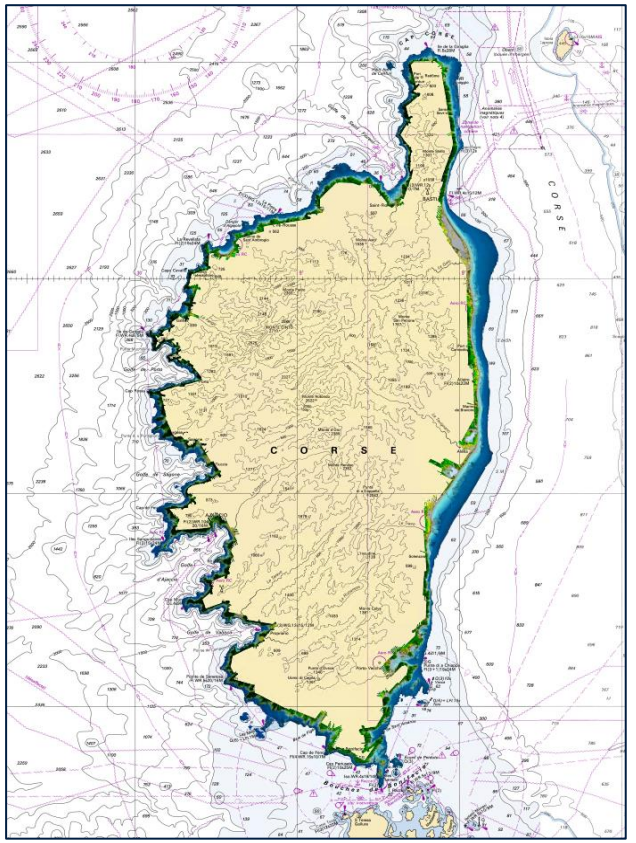
- 05 to 17 Oct. 2017
- 01 Feb. to 26 Mar. 2018
- 01 Sep. to 03 Oct. 2018

Notes:

- EMODnet model built from Shom data
- This location presents ideal water clarity for ALB survey.

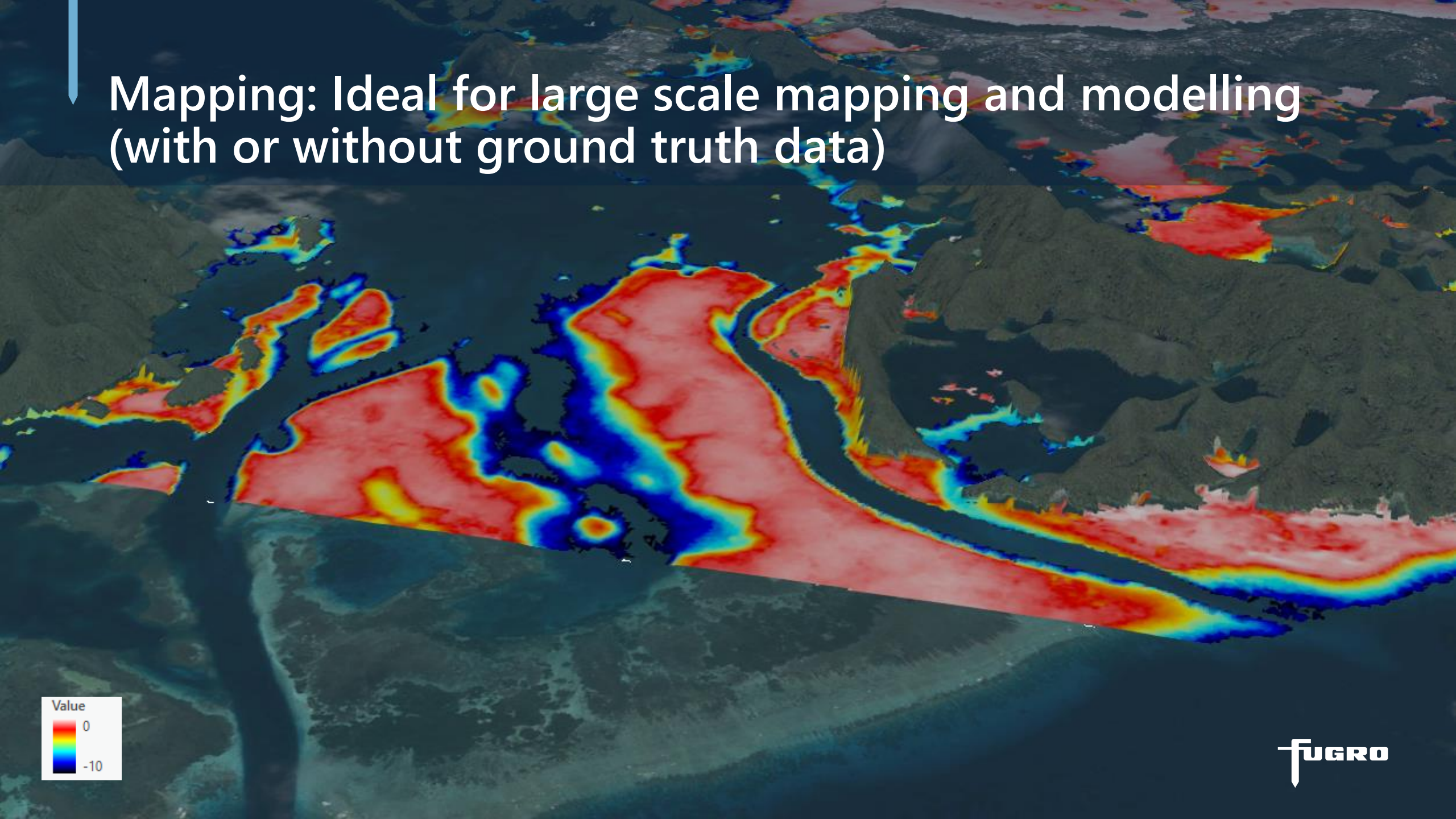


Coverage (pink) and EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM)

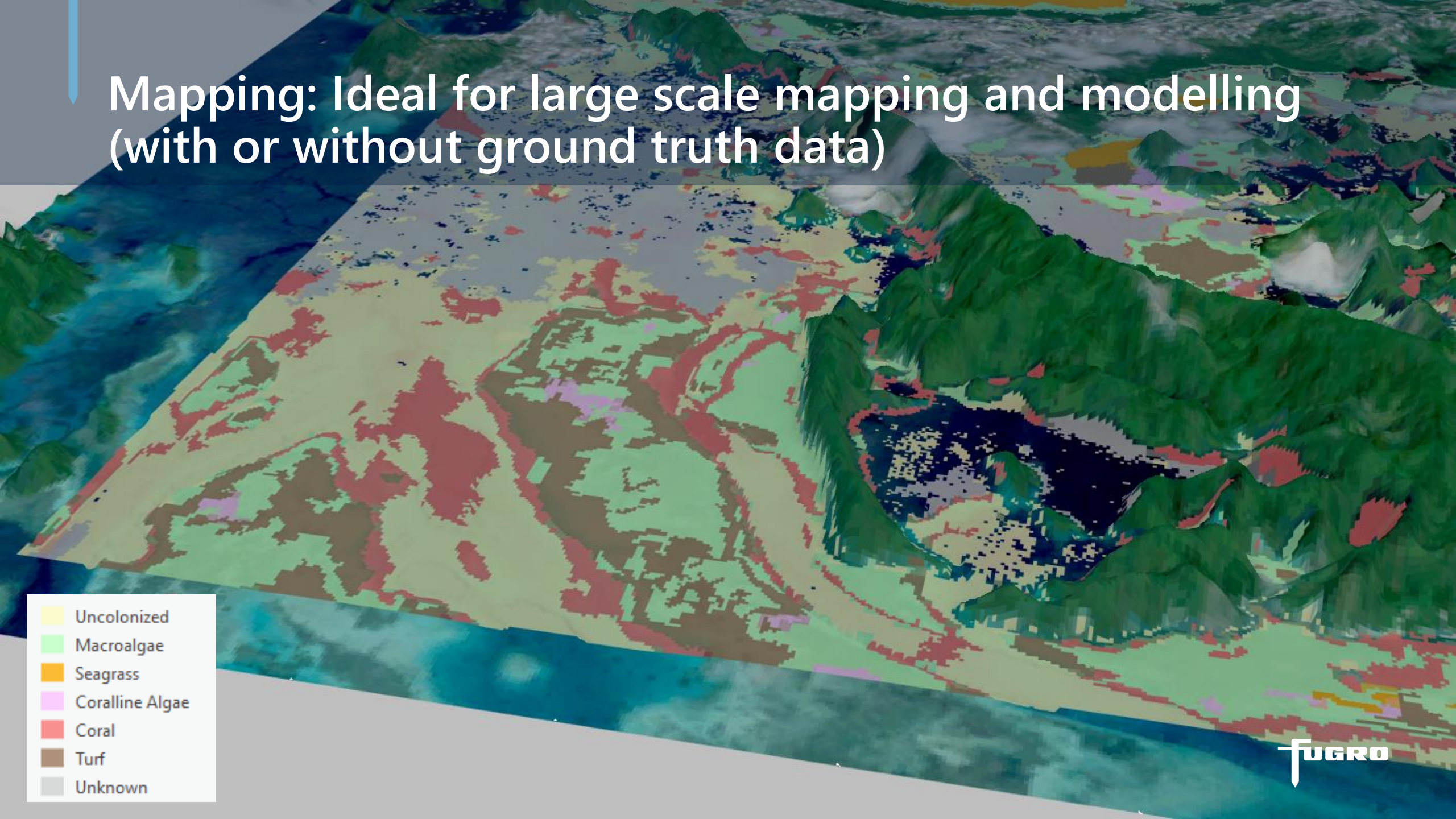


LiDAR 2017-2018
Shom - Collectivité de Corse - Dreal Corse, 2020.
https://dx.doi.org/10.17183/L3D_MAR_CORSE_2017_2018

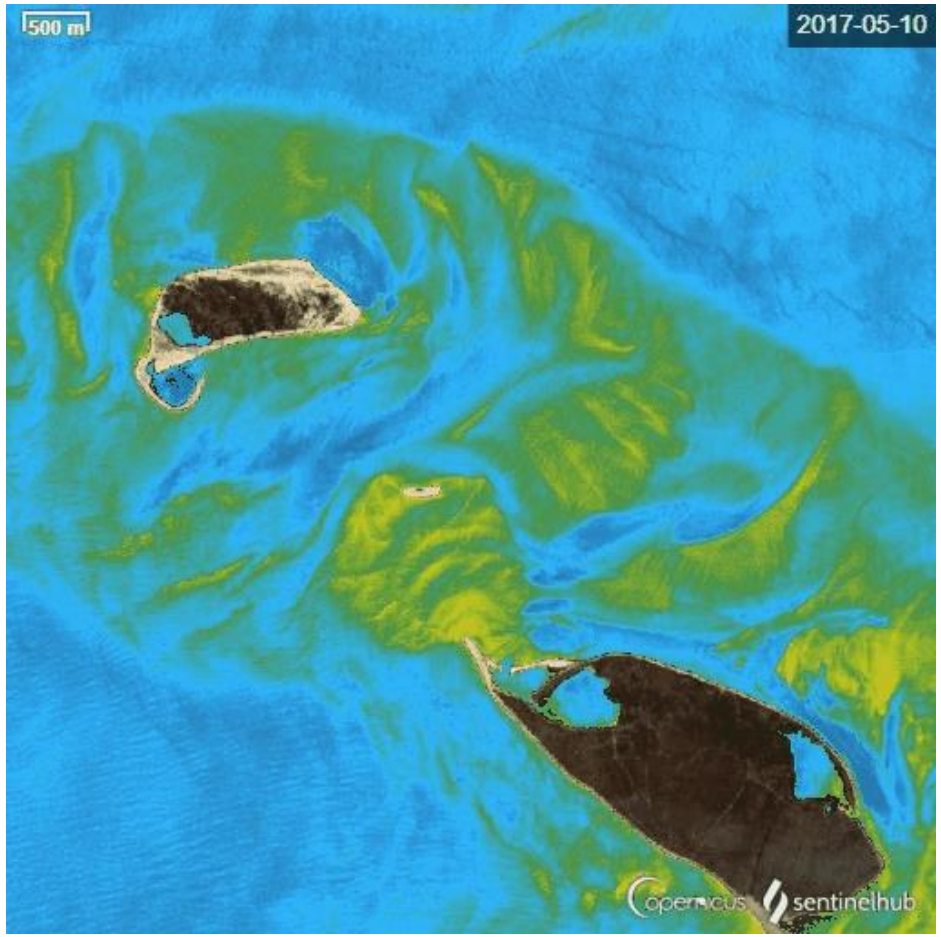
Mapping: Ideal for large scale mapping and modelling (with or without ground truth data)

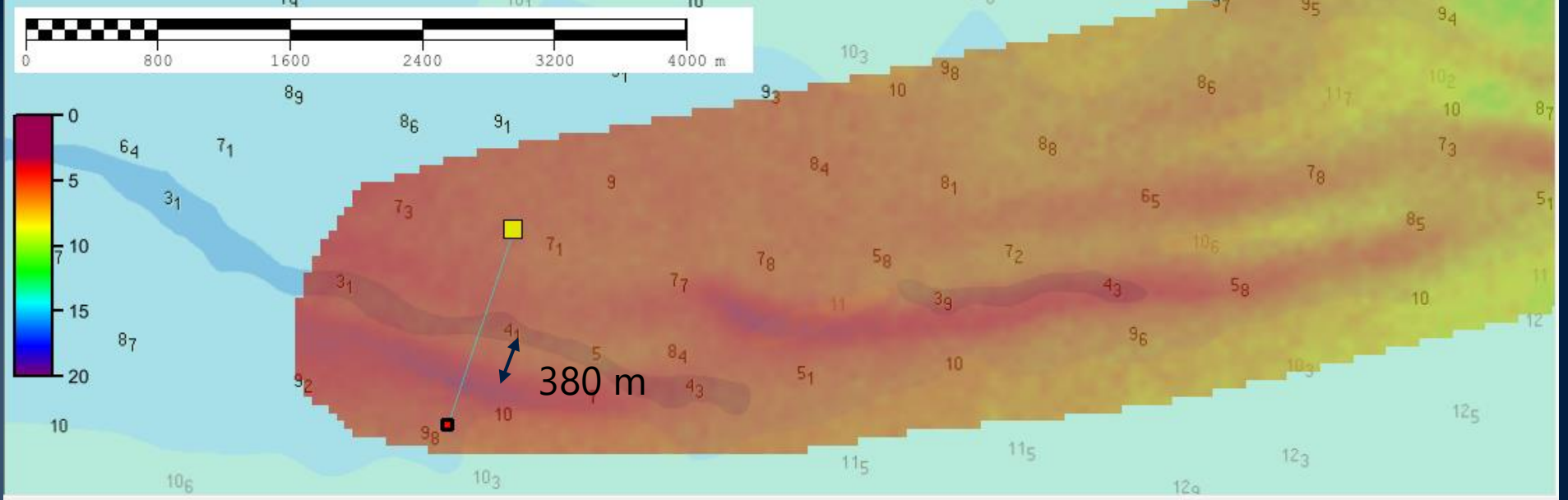


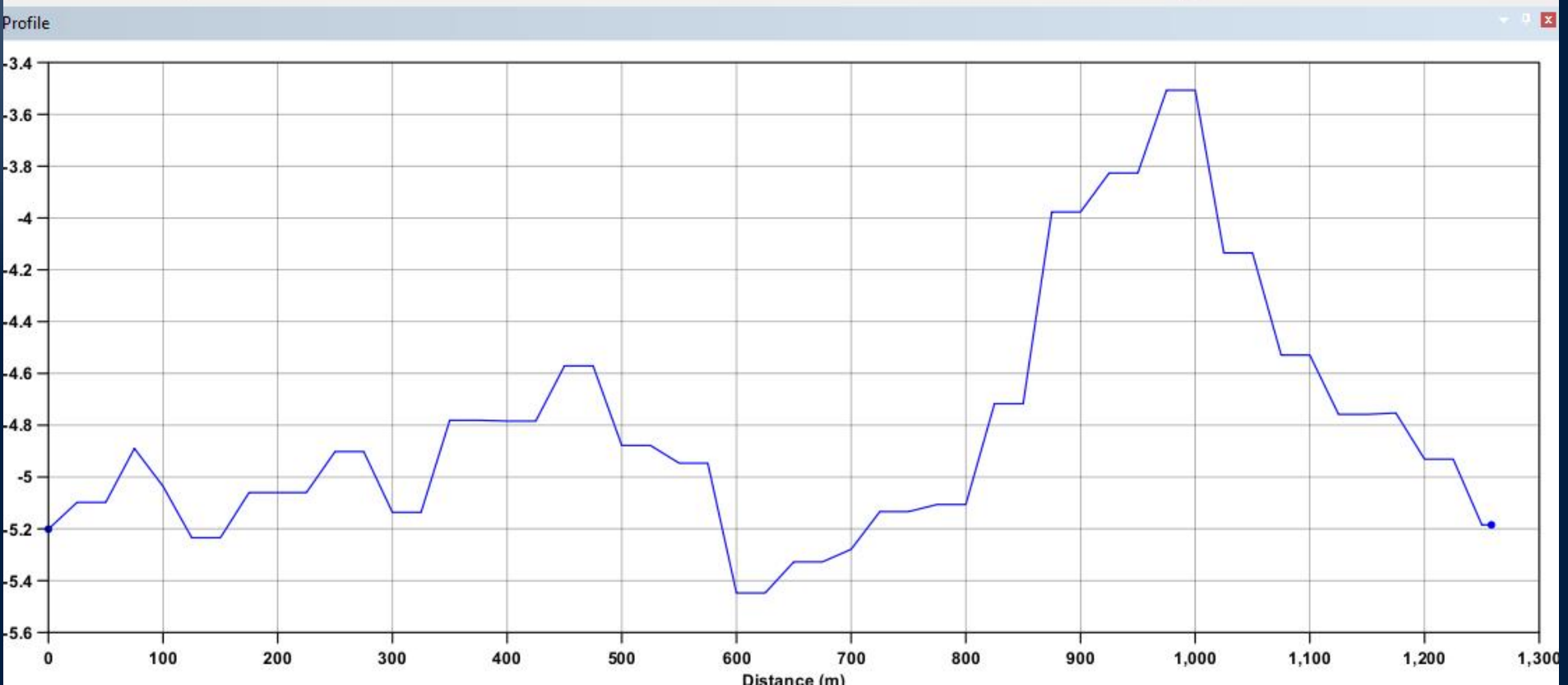
Mapping: Ideal for large scale mapping and modelling (with or without ground truth data)



Monitoring changes (Qualitative)







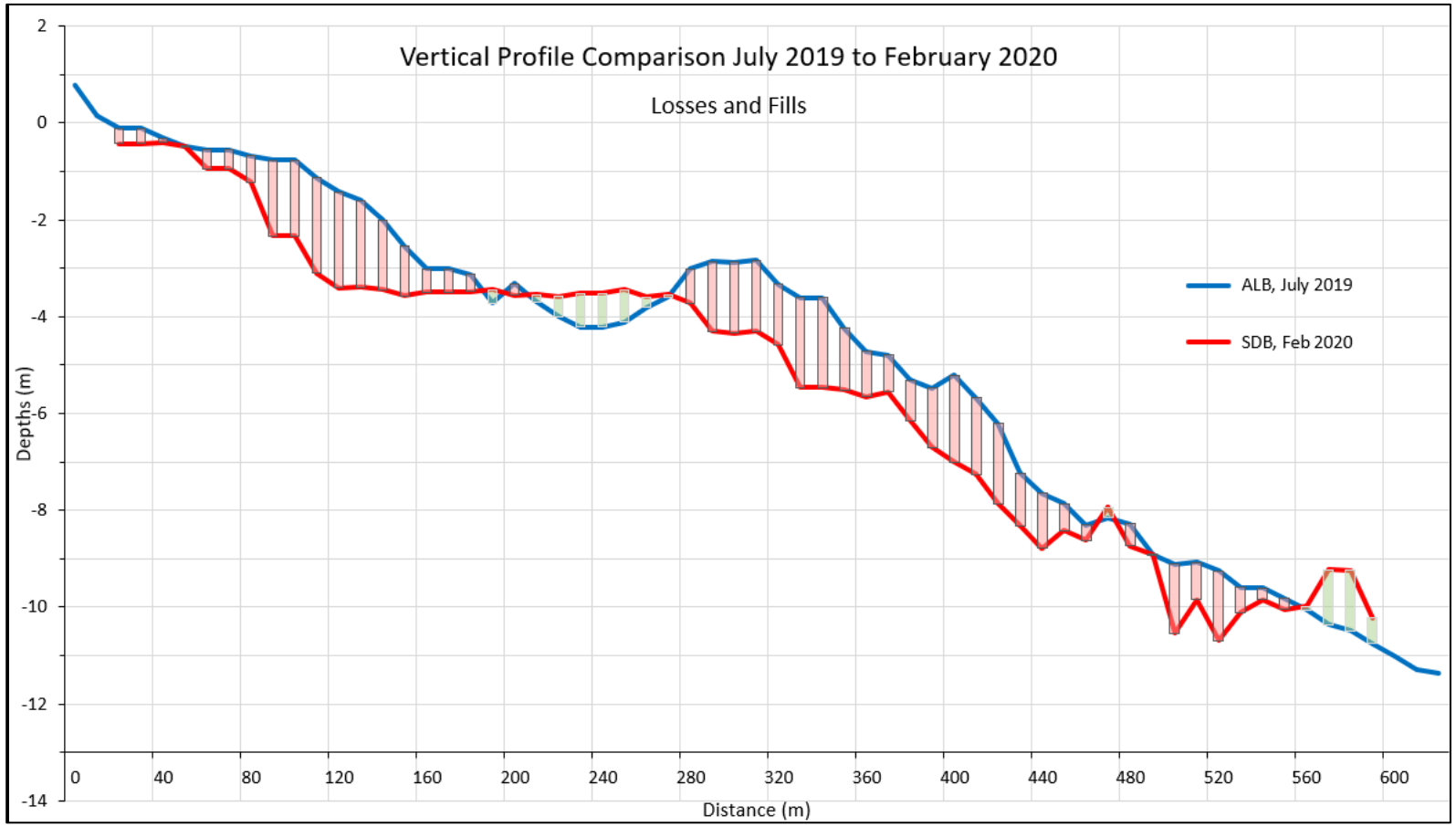
Monitoring Changes (Quantitative)

- ENC vs SDB
- Displacement of sandwave ca. 380 m

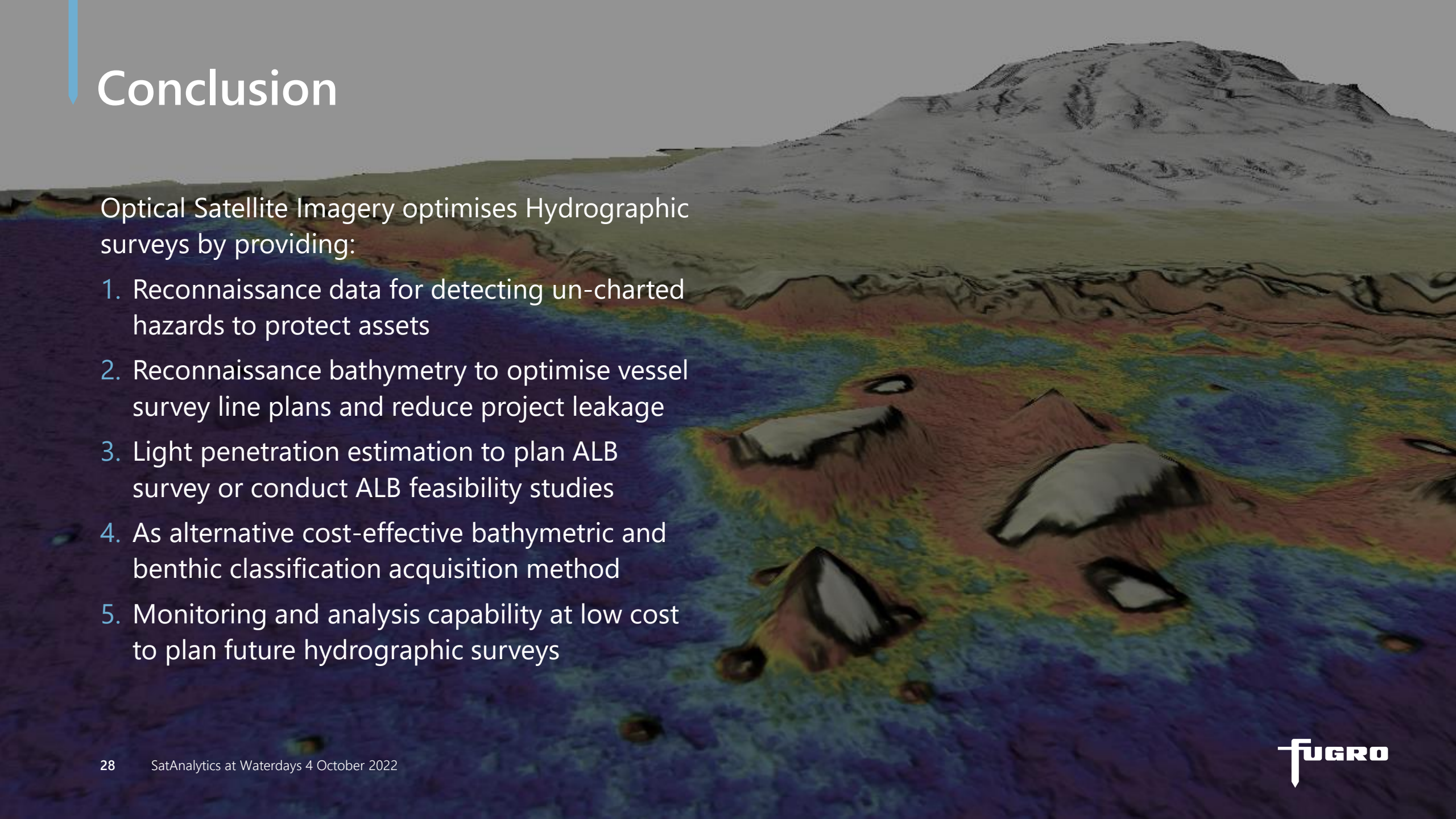
Analysing Seafloor Changes with Monthly SDB and using ALB as benchmark

Comparing dedicated profiles over several months for trends in changes

Profile section shows accumulated losses and fills between survey of July (blue) and survey of February (red).



Conclusion



Optical Satellite Imagery optimises Hydrographic surveys by providing:

1. Reconnaissance data for detecting un-charted hazards to protect assets
2. Reconnaissance bathymetry to optimise vessel survey line plans and reduce project leakage
3. Light penetration estimation to plan ALB survey or conduct ALB feasibility studies
4. As alternative cost-effective bathymetric and benthic classification acquisition method
5. Monitoring and analysis capability at low cost to plan future hydrographic surveys

FUGRO

Unlocking **Insights**
from **Geo-data**