



ALSEAMAR
ALCEN



OFFSHORE WIND ENERGY SURVEY & SAFETY

With Autonomous Underwater Glider



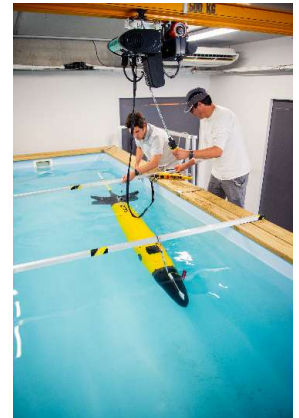


ALSEAMAR CORPORATE PROFILE

- Key figures
- Subsidiary of the ALCEN group
- Turnover 2024: 45 M €
- Staff: 220 employees
- Head office: Paris
- Operational offices: Aix-en-Provence, Toulon & Brest
- Activities: Underwater robotics systems / Buoyancy solutions (syntactic foam) / Radio communication systems / Modernization & Life-extension services



2



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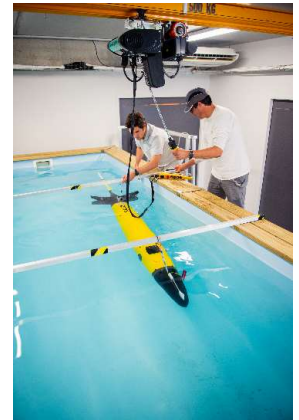


AGENDA

- Product specifications
- SeaExplorer services
 - Environmental monitoring
 - Critical infrastructure



3

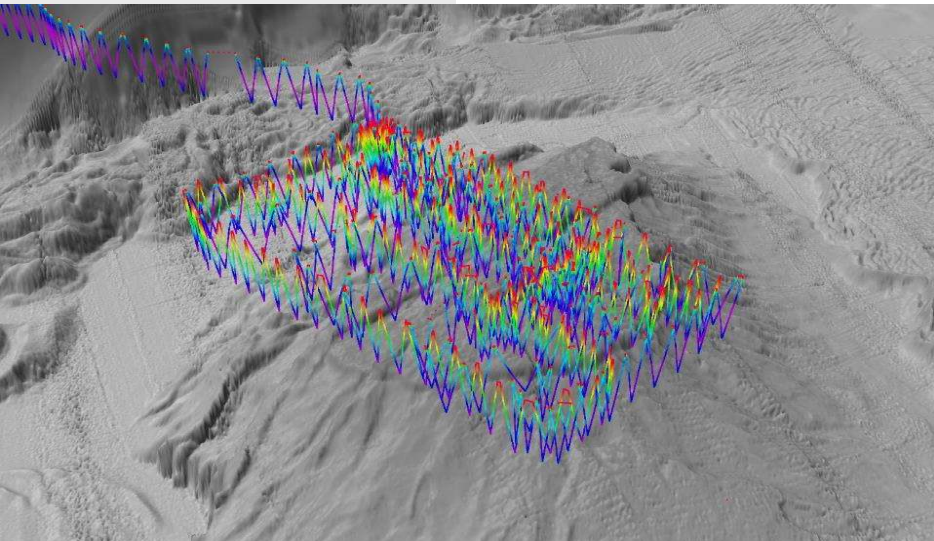


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SeaExplorer GENERAL PRINCIPLE

- The SEAEXPLORER is an autonomous underwater multi-sensor platform dedicated to collecting data profiles into the water column, up to 1,250 meters depth, with very large space & time coverage (weeks to months on one single battery charge and without supervising vessel).
 - Driven by changes in buoyancy, the vehicle silently glides following the path requested by the pilot to collect physical, chemical, biological and/or acoustic data, depending of sensor configuration to answer customer requirements.



- A user-friendly software suite allows constant supervision, data quality control and mission control from any place in the world. The SEAEXPLORER regularly surfaces to send ashore its GPS position, collected data and receive new mission commands via Iridium telemetry.
 - A very cost-effective solution for data collection: it requires no supervising boat at surface during its missions, reducing the need of vessel with expensive daily costs.



SeaExplorer SPECIFICATIONS

- **Body size: (D x L)**
 - Wingspan:
 - Weight:
 - Depth Rating:
 - Speed:
 - Battery:
 - Communications:
 - Navigation Mode:
 - Safety:
- **0.25 m x 2 m + 70 cm foldable antenna**
 - 56.5 cm Wingless design
 - 59 kg in air
 - 1,250 m
 - Nominal 0,5 knot / Maximum 1 knot
 - Rechargeable Li-ion
 - GPS / Satellite (Iridium) / Radio
 - Survey / Virtual mooring / Drifting / Bottoming
 - Autonomous drop-weight, Strobe light & Argos



Interchangeable payloads

Passive acoustic monitoring

Hydrocarbons

Oceanographic research



Zooplankton & suspended solids



Metal traces & micro nutrients

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Shallow SeaExplorer SPECIFICATIONS

The Shallow SeaExplorer is a hydride glider able to dive and ascend the water column and to navigate horizontally thanks to its propellers. A unique product enhancing navigation and endurance at sea. The ideal tool for monitoring and surveillance of critical infrastructure.

Data

consumption: 1.6 W to 26 W

Speed: 0.6 knots to 2 knots

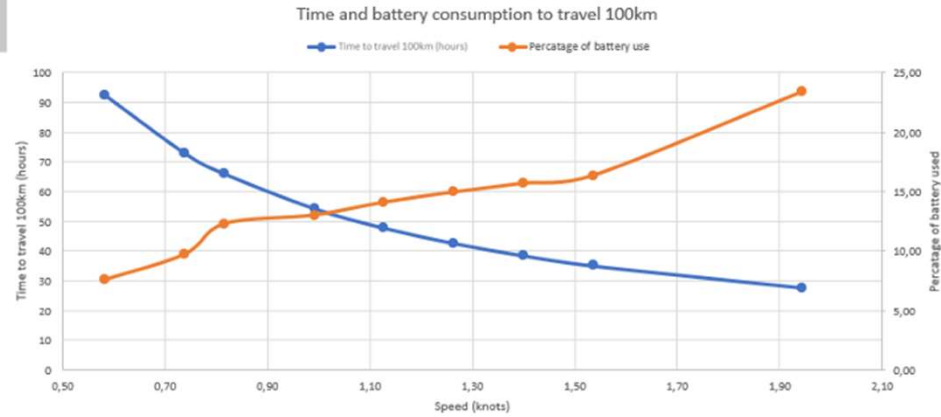
Use: yo pattern and horizontal flight

Horizontal flight

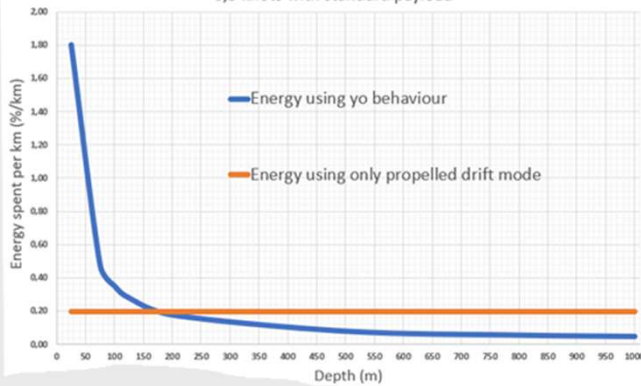
- Navigate against high velocity current
- Deployment in shallow water

Yo Propelled

- Navigate against high velocity current
- Penetrate fresh water lensing



Energy consumption in horizontal flight vs yos at different depths at 0,5 knots with standard payload

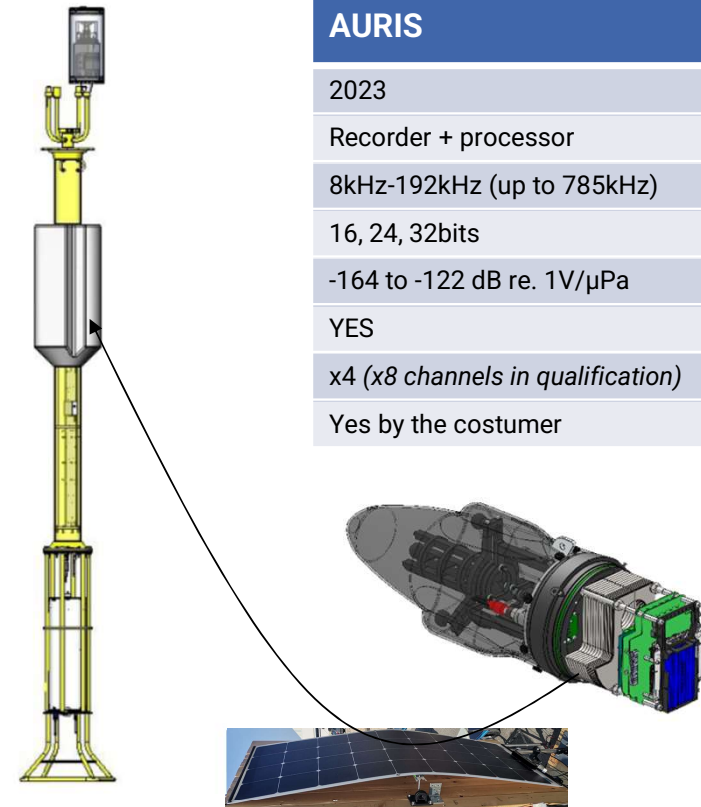




AURIS buoys specific development (confidential)

- In order to provide our customers with specific solutions for their industrial assets at sea, ALSEAMAR decided to propose its new acoustic system integrated within a buoy as described here. The aim is to offer a cost-effective solution with advanced technology.
- ALSEAMAR is a pioneer for acoustics detection, which is a historical field of the company. At the request of the French government, we were successful in helping to detect and localize black boxes following airplane crashes twice in Egypt (MS804 EgyptAIR 3000M depth) in the mediterranean & in the red sea and a third time in the black Sea (Sotchi).
- This tool can be coupled with other systems manufactured by our engineers and doctors. It will present the advantage to give early warnings for rapid intervention. The alerts will be sent straightly to operators or agents in charge of securing their infrastructures or areas; ie presence of unusual vessels, small boats, smugglers...

7

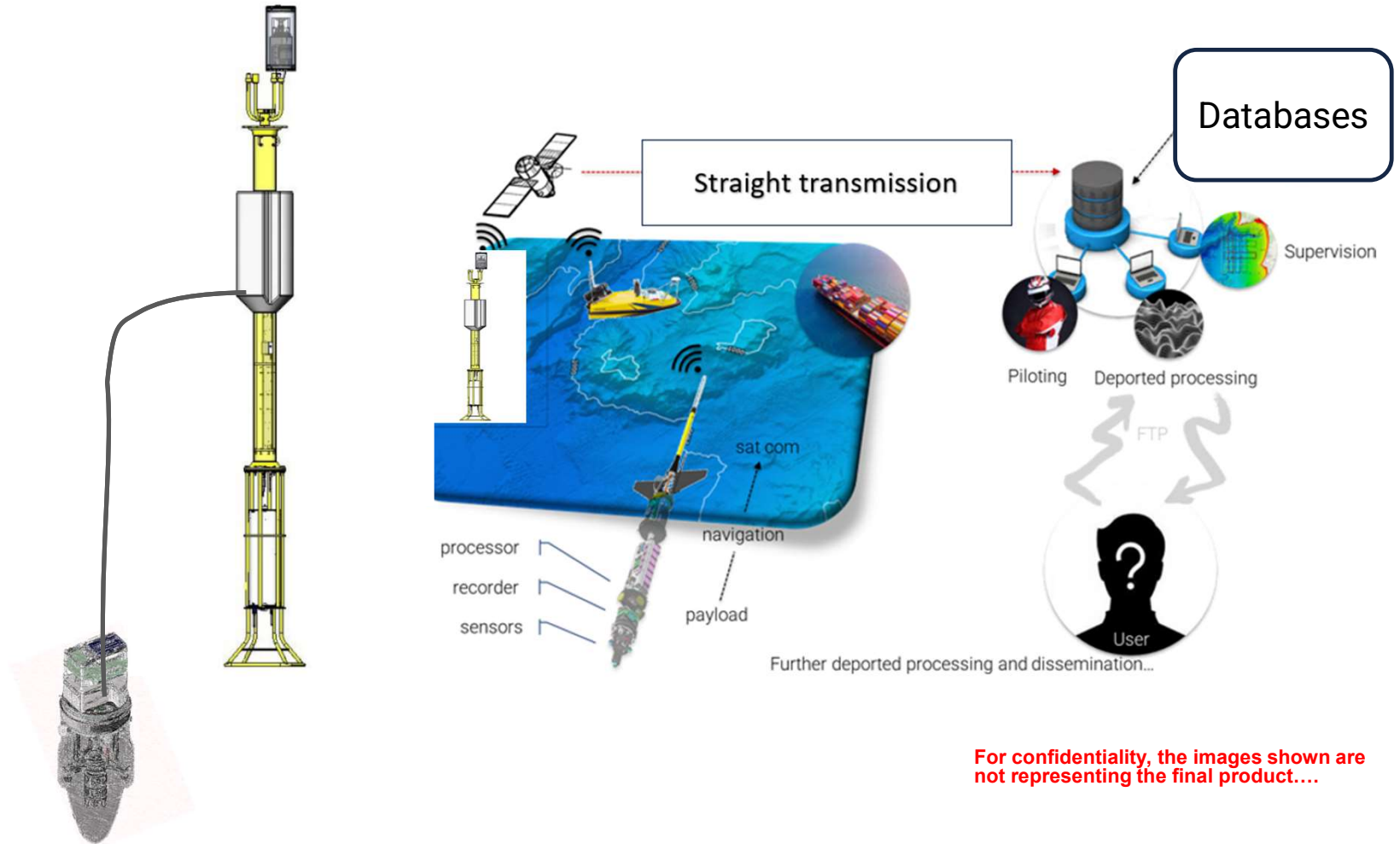


AURIS
2023
Recorder + processor
8kHz-192kHz (up to 785kHz)
16, 24, 32bits
-164 to -122 dB re. 1V/μPa
YES
x4 (x8 channels in qualification)
Yes by the costumer

For confidentiality, the images shown are not representing the final product....



AURIS buoys integration on Glimpse (confidential)

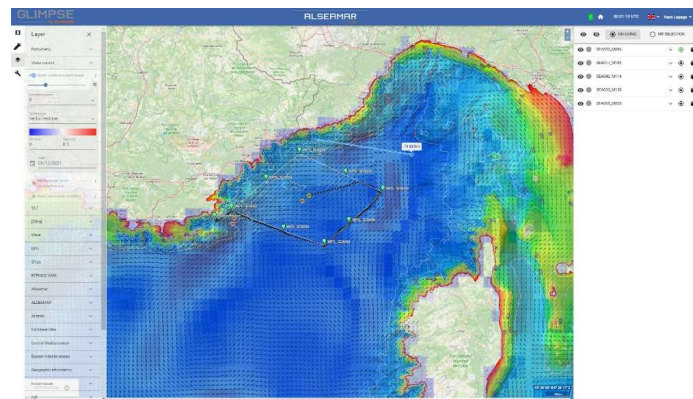
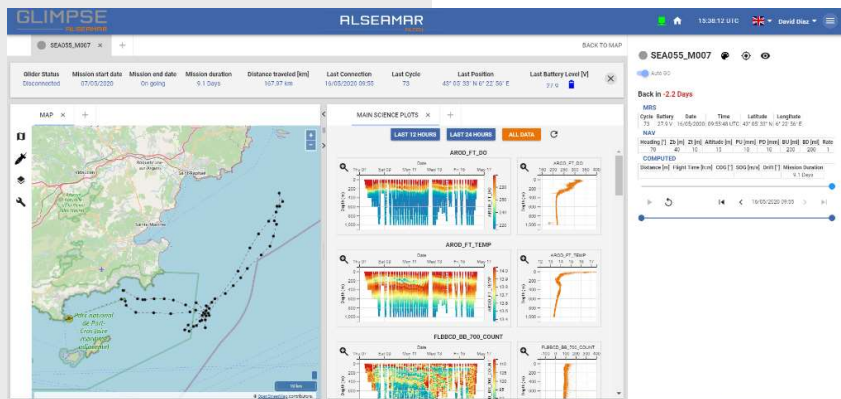


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EASY TOOL, EASY LOGISTICS, HIGH VALUE DATA

GLIMPSE is a web-based tool for the piloting, data analysis, mission planning and maintenance management of the SeaExplorer underwater glider:



Easy logistics

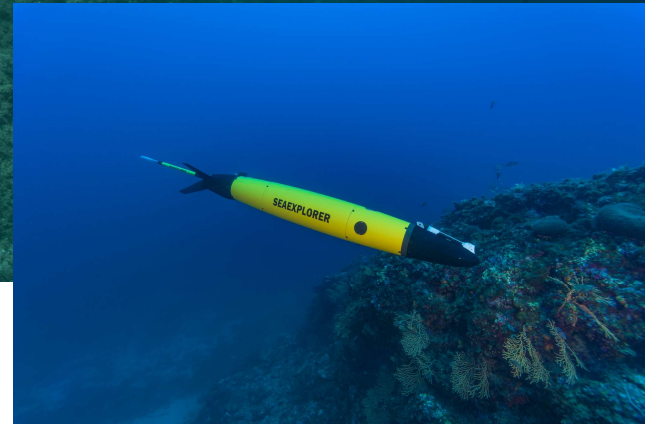


Easy deployment

- We monitor gliders in real time and make piloting decisions by sending new commands to them. We can use & superpose different useful layers for navigation forecasting (sea floor, currents, maritime traffic...).
- We can visualize the science data gathered by the gliders in real-time and use it for decision-making.
- We plan and **simulate** ahead future deployments and missions.



SEAEXPLORER SERVICES



Offshore wind industry

- Offshore wind industry is showing a strong and continuous development as the world leaders and individuals are willing to decarbonize their industry and to benefit from purified air and green energy.
- As societies are more conscious of their impacts on their environment, a global trend has appeared, and this trend is willing to look for a brighter future in accordance with the preservation of natural resources and habitats.



OFFSHORE WIND ENERGY IMPACTS ON ENVIRONMENT

- The wind industry has consequences on their direct environment, specifically on marine mammals, turtles, fish, ecosystems, water quality...those consequences can be temporary or permanent.
- Some of the consequences can be:
 - Disturbance of sensitive habitats of protected species
 - Modification of benthic populations
 - Disturbance of breeding areas & “Barrier” effect
 - Disturbance of marine fauna, (fields electromagnetics, cable heat, noise, vibrations, shadow projection)
 - Disruption of food chains

SeaExplorer monitoring through the whole stages of your project

Phase	Aspect concerned	Potential impacts	SeaExplorer Sensors for prevention & monitoring
Installation & dismantling	Marine mammals	Disturbances, injuries temporary or permanent. Seals and cetaceans (mainly porpoises).	AURIS
	Fish species	Disturbances, injuries temporary or permanent.	ECHOSONDER / FLBB CD / CTD / HYDROPTIC UVP6-LP
	Benthos	Localized destruction, 'suffocation' due to sediment resuspended by the work.	FLNTU / Accelerometer
	Littoral	Localized destruction of potentially sensitive species due to cable landing.	Not Applicable
Operation	Sediments	Scour phenomenon around the foundations and risk of cable exposure.	LISST / FLNTU / HYDROPTIC UVP6-LP
	Marine mammals	Disturbance due to vibrations, noise and electromagnetic waves (OEM) emitted by the cable, modification of behaviour (reproduction, feeding), movement to other areas.	AURIS
	Fish species	Modification of initial benthic communities.	ECHOSONDER / FLBB CD / CTD / HYDROPTIC UVP6-LP
	Benthos	Reef effect on foundations.	FLNTU / Accelerometer
	Seabirds	Injury by collision, modification of behaviour (reproduction, feeding) and flight habits, displacement.	Not Applicable

A Through the whole stages of your project

As per environmental project management, we have detailed the different stages that we can undertake for a smooth use and integration into client's projects and requirements.

EIA / EBS

We can do the baseline study with our autonomous AUV's and provide you with a complete report done by our specialized oceanographic team.

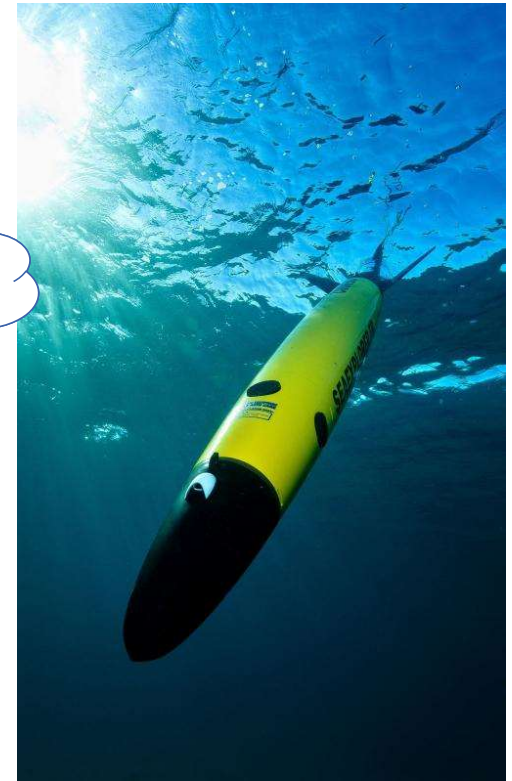
Once, the installation is done, we can then do a new monitoring to assess the impacts of the existing facility on its environment, fauna and flora.

Throughout, the operational life of your offshore wind project, we can also deliver a continuous monitoring to report any disturbance of natural habitats or mammals at sea in accordance with regulations for specific habitats or species.

Environmental reporting

The data that we will retrieve will help you to make the difference between natural conditions, ambient parameters, natural pollutants and changing parameters, provoked by pollution, erosion growth...

Environmental monitoring



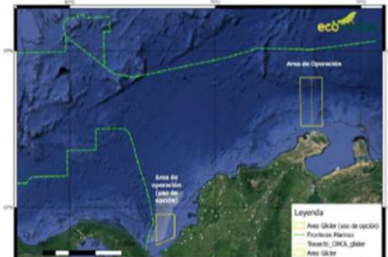
A Example of environmental use cases

Hydrocarbon & metocean study_Colombia_ECOPETROL

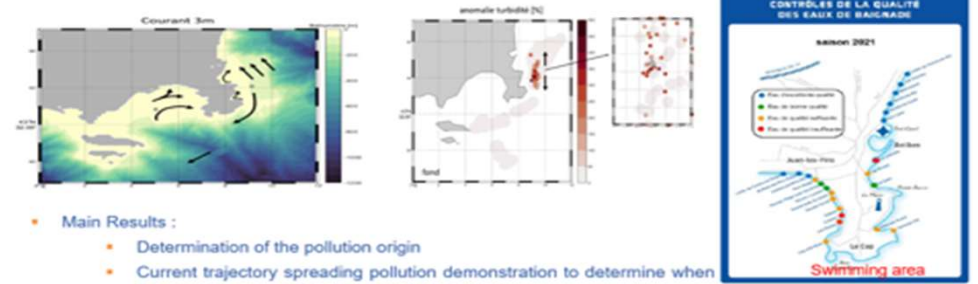


Metocean monitoring mission in Colombia

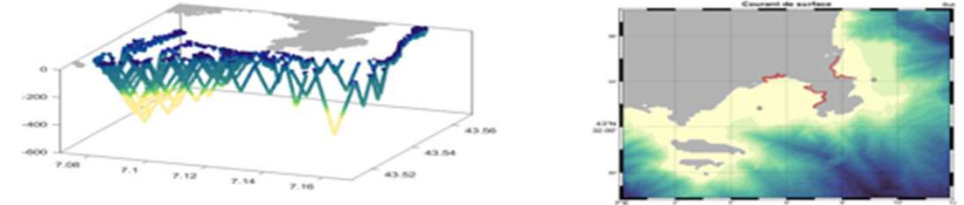
- 2 gliders SeaExplorer monitored during 6 months the Colombian Caribbean Sea (sept'19 – mar'20)
 - Glider 1 - Currents: CTD, DO, O₂, Chl-a, BBP, CDOM, ADCP
 - Glider 2 - Hydrocarbons: CTD, DO, O₂, Chl-a, BBP, CDOM, Methane, PAH
- ALSEAMAR organized and operated the entire mission:
 - Preparation of the gliders in France
 - Temporary importation in Colombia and local logistics
 - Deployment and recovery of the gliders at sea
 - 24/7 Piloting
 - Local maintenance of the gliders
 - Data processing, QC, data delivery & elaboration of the scientific report



Water quality study south east France_SUEZ

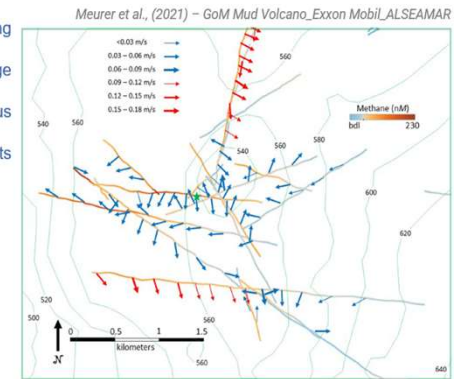
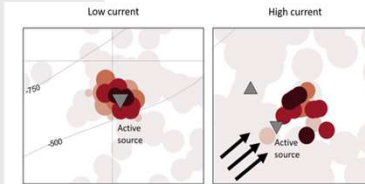


- Main Results :
 - Determination of the pollution origin
 - Current trajectory spreading pollution demonstration to determine when & how discharges impact the nearby beaches
 - Determination of the shore location presenting risks for human bathing.



Methane seeps study_Gulf of Mexico_EXXON MOBIL

- ALSEAMAR's expertise with excellent collection of environmental parameters allows to provide critical nrt data for water current such as direction & speed
- High quality data show direction & speed water current affecting methane seeps released along the water column
- Key factor to understand methane molecules journey on a large spatial area
- Study with Exxon Mobil confirm robust data for current versus local technology, achieving thorough understanding of methane displacement affected by venting and currents; eg: water-currents (dispersion / advection / dilution)



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Marseille & Fos port pollution survey Fos harbor mooring pattern

- Pollution survey of harbor approaches with buoys and gliders.
- The system is operating 24/7 including night on critical location.
- Real-time data transmission for buoys and near real-time data transmission for gliders.
- Devices complementary to navigation control system (Radars, AIS reports, AUV & Navy assets)



Fixed survey system:

- **Buoy field**

- Field location determined after currents & pollutants targets.
- Distance between buoys elaborated following pollutants identification.
- Inbound mooring area perimeter monitored by static buoys.



Mobile survey system:

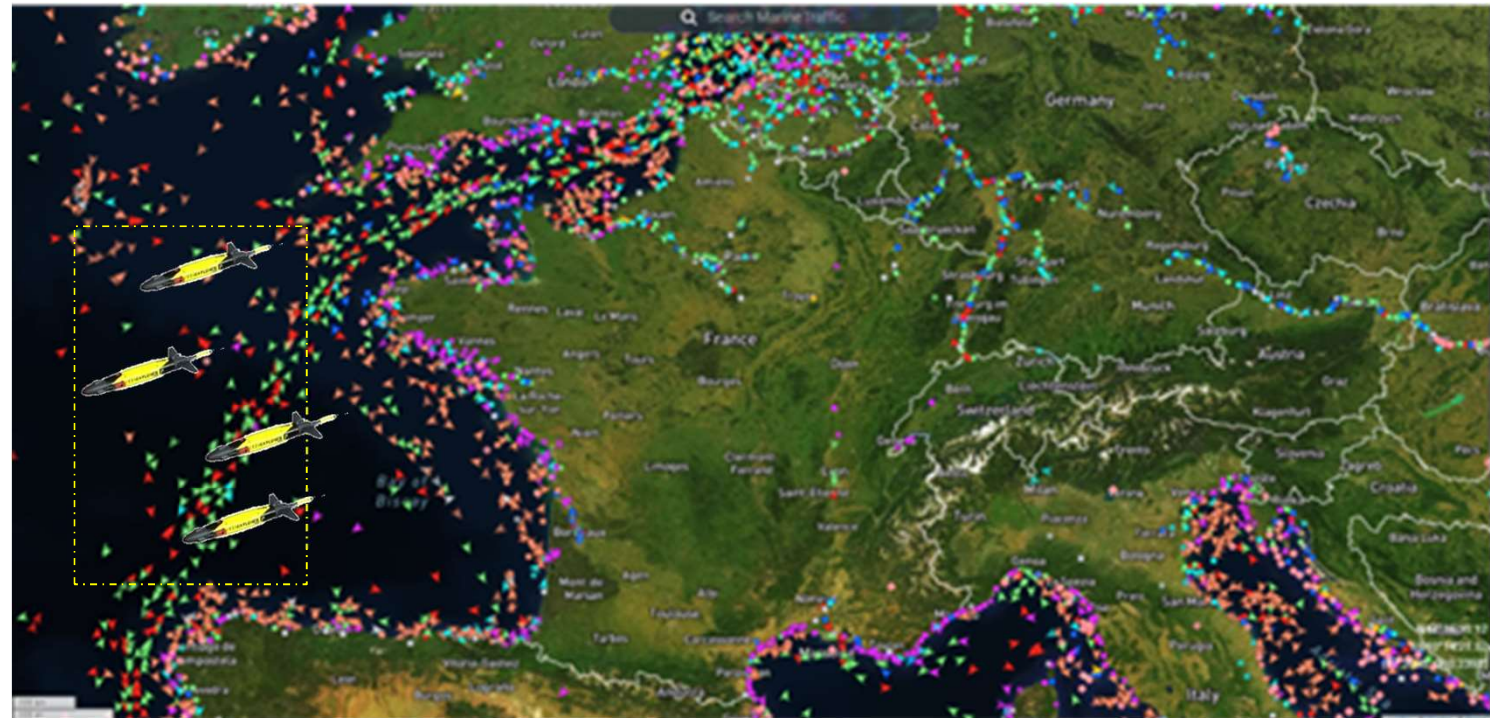
- **Glider fleet**

- On site real-time pollutant measurement.
- Outbound area perimeter patrolling.
- Real-time data processing.



Gascogne gulf – Pollution survey

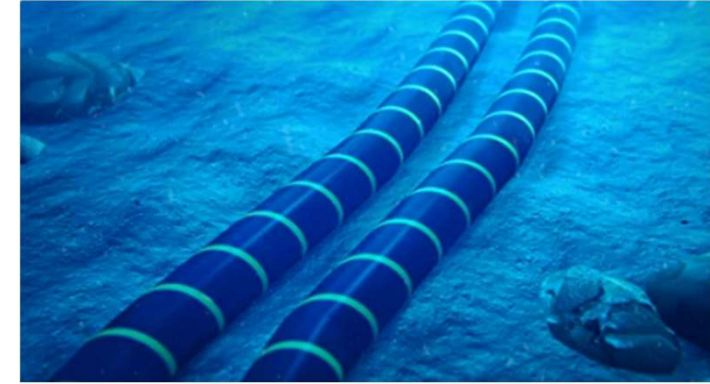
- Traffic lane survey with gliders.
- System is operating 24/7 on critical location with near real-time data transmission after pollution detection.
- Devices complementary to navigation control system (Radars, AIS reports, AUV and Navy assets)



A SEAEXPLORER SERVICES

Surveillance of critical infrastructure

- Offshore wind industry is showing a strong and continuous development, European countries embarked into an important program to benefit from clean and independent energy.
- In a constant changing environment with geopolitical uncertainty and potential conflicts, the need to offer a permanent control and surveillance of these assets is now a priority.
- The recent series of cable breaks in the Baltic Sea is a reminder of existing and underlying threats.



ALSEAMAR CUTTING EDGE TECHNOLOGY TO SECURE YOUR ASSETS

- Following growing demands, ALSEAMAR developed several technologies able to provide a reliable and continuous surveillance mode with minimal costs.
- Our proximity with the defence sector helped us into tailor a concrete and straight response plan.
- ALSEAMAR has been offering expertise and know-how for defence for more than ten years
- Our operational scenario is design to identify, analyse and alert the authorities.

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Panorama of critical assets in Europe

Global area


Distances:

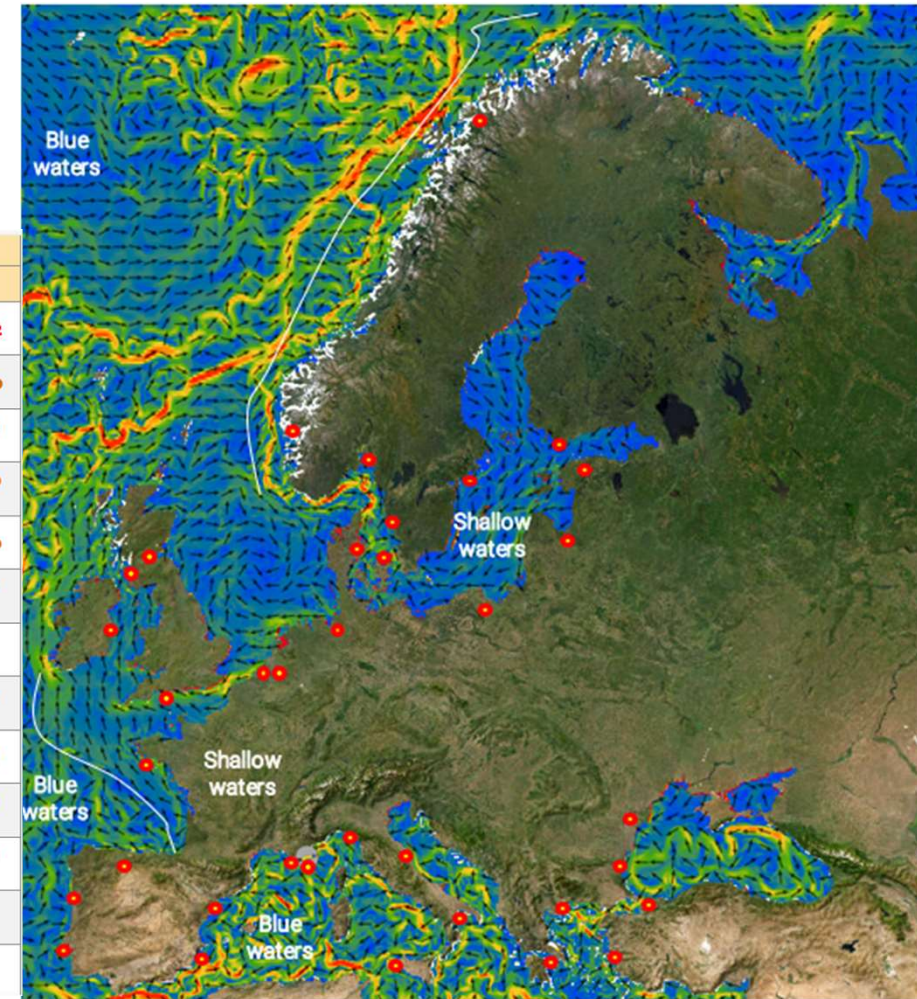
X / Y - 276 Nq

X / Y - 276 Nq

X / Y - 276 Nq

RANG	PORT (ÉTAT)	TRAFIC TOTAL ANNUEL (en Mt)			
		2005	2010	2015	2019
1	Port de Rotterdam (Pays-Bas)	377,000	429,926	466,363	469,402
2	Port d'Anvers (Belgique)	160,000	178,167	208,400	238,000
3	Port de Hambourg (Allemagne)	126,000	121,187	137,800	138,100 (2016)
4	Port de Novorossiysk (Russie)	71,000	81,603	128,400	128,400 (2015)
5	Port d'Amsterdam (Pays-Bas)	74,900	90,644	96,500	105,000
6	Port d'Oust-Louga (Russie)	-	-	87,900	98,700 (2018)
7	Port d'Algésiras - La Linea (Espagne)	64,000	65,531	98,178	98,178 (2015)
8	Port de Marseille (France)	97,000	85,997	81,700	81,000 (2018)
9	Port de Valence (Espagne)	-	63,741	69,600	81,000
10	Port de Botaş (Ceyhan) (Turquie)	-	-	78,000	78,000 (2015)
11	Port de Brême/Bremerhaven (Allemagne)	-	68,690	73,400	73,400 (2015)
12	Port du Havre (France)	75,000	70,469	68,200	72,710 (2017)
13	Port de Barcelone (Espagne)	-	42,878	45,900	67,756 (2018)

 Major ports



A European port's security

Ports

Many major ports and container hubs in the European region are considered key points in the global trade and supply chain. Securing supplying channels and goods transport is a major concern for European trade. To avoid disturbance of ports activities, we are proposing to assist our client with our technology and know-how.

One of the challenge that we will face is a high maritime traffic, making threat identification difficult. A thorough analysis will be needed to enable accurate target discrimination.



Rotterdam



Anvers

Fos harbour – Mooring pattern

- Securing harbor approaches with buoys and gliders.
- System is operating 24/7 including night on critical location.
- Real-time data transmission for buoys & near real-time data transmission for gliders.
- Devices complementary to navigation control system (Radars, AIS reports, AUV and Navy assets)



Fixed survey system:

▪ Buoy field

- Field location determined following ambient noise surveys
- Distance between buoys elaborated following threats identification.
- Inbound mooring area perimeter monitored by static buoys.

Mobile survey system:

▪ Glider fleet

- On site real-time ambient noise measurement.
- Outbound area perimeter patrolling.
- Real-time data processing.



Major ports – Wind farms and mooring patterns

- Securing harbor and wind farms approaches with buoys and gliders.
- System is operating 24/7 including night on critical location.
- Real-time data transmission for buoys & near real-time data transmission for gliders.
- Devices complementary to navigation control system (Radars, AIS reports, AUV and Navy assets)



Fixed survey system:

▪ Buoy field

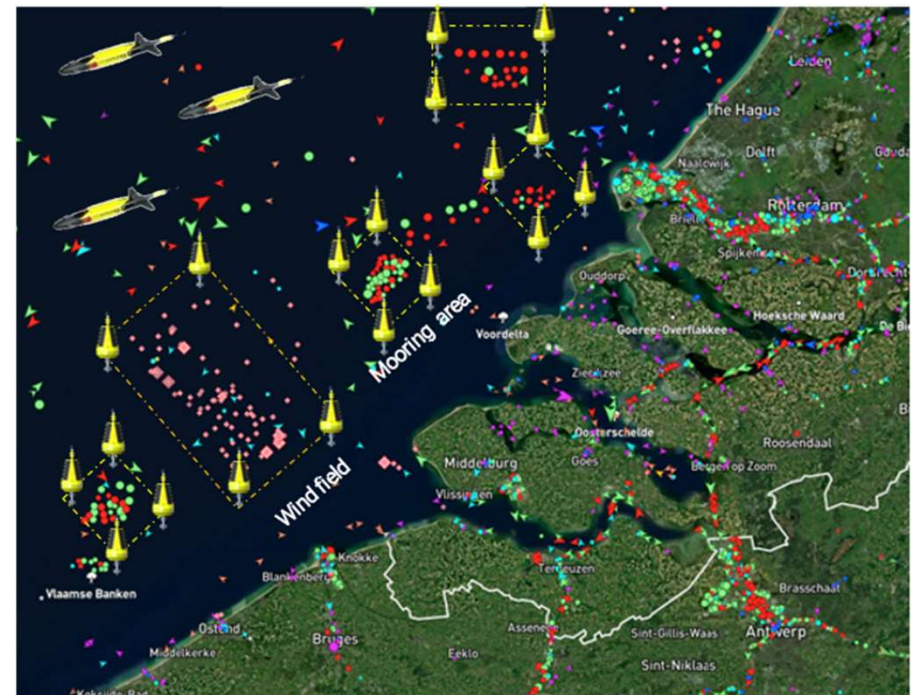
- Field location determined following ambient noise surveys
- Distance between buoys elaborated following threats identification.
- Inbound mooring area perimeter monitored by static buoys.
- Wind field survey



Mobile survey system:

▪ Glider fleet

- On site real-time ambient noise measurement.
- Outbound area perimeter patrolling.
- Real-time data processing.



A Wind farming security

Major energy interconnections – Wind farms

- Securing harbor and wind farms approaches with buoys and gliders.
- System is operating 24/7 including night on critical location.
- Real-time data transmission for buoys & near real-time data transmission for gliders.
- Devices complementary to navigation control system (Radars, AIS reports, AUV and Navy assets)



Combined fixed & mobile surveying systems allow to control energy infrastructure and to patrol from the shore all the way along transmission cables up to the installations at sea.

This way, we ensure a complete coverage of the asset



Belgian energy cluster "Princess Elizabeth island"



Source: Elia Group