ESA BUSINESS APPLICATIONS ATLANTIC FROM SPACE WORKSHOP

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➔ PURPOSE OF THE EUROPEAN SPACE AGENCY

"To provide and promote, for exclusively peaceful purposes, cooperation among European states in **space research** and **technology** and their **space applications.**"

Article 2 of ESA Convention

BUSINESS APPLICATIONS

Business Applications is a subset of the ARTES programme elements dedicated to funding and promoting the **development of space-based downstream applications, services and solutions** for the needs of European citizens and society at large.

institutions, users,
potential customers

service providers,
industry

FUEL FOR YOUR BUSINESS

- Space Weather
- Earth Observation
- Satellite Navigation
- Satellite Communication
- Human Spaceflight Technologies
- Financial
- Aviation
- Education
- Energy
- Media
- Agriculture
- Environment
- Transport
- Healthcare
- Maritime

★ application domain of interest for the Atlantic area

→ ...MORE TECHNOLOGIES

- 5G
- Crowdsourcing
- IoT
- Big Data analytics
- VR/AR
- Artificial Intelligence
- Megaconstellations

RELEVANT PROJECT AREAS FOR THE ATLANTIC

- **Maritime Safety and Surveillance**
- **Unmanned Maritime System**
- **Off Shore Energy**
- **Ports of the Future**
- **Kick Start Activity : Atlantic Area**

→ NEW TOPICS: UPCOMING KICKSTARTS

- **5G**
- **Decommissioning of energy assets**
- **Plastic-less society**
- **Biodiversity**
- **Environmental crime**
- **Mining**

MARITIME SAFETY AND SURVEILLANCE: NEW INSTRUMENTS FOR TACKLING NEW NEEDS

Tomorrow

Today

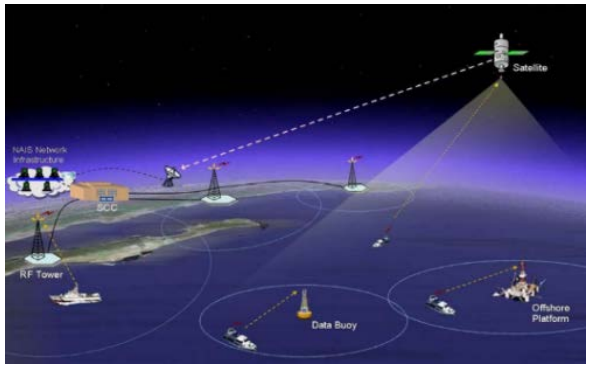
Cyber Security and Block-Chain

5G

HAPS

UMS

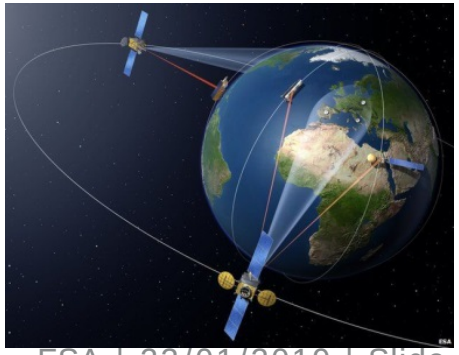
VDES / VDES-SAT



RPAS

AIS / SAT-AIS

EO



→ AUTONOMOUS SHIPS

- 17th may: IMO agreed on the definition of the Maritime Autonomous Surface Ships.

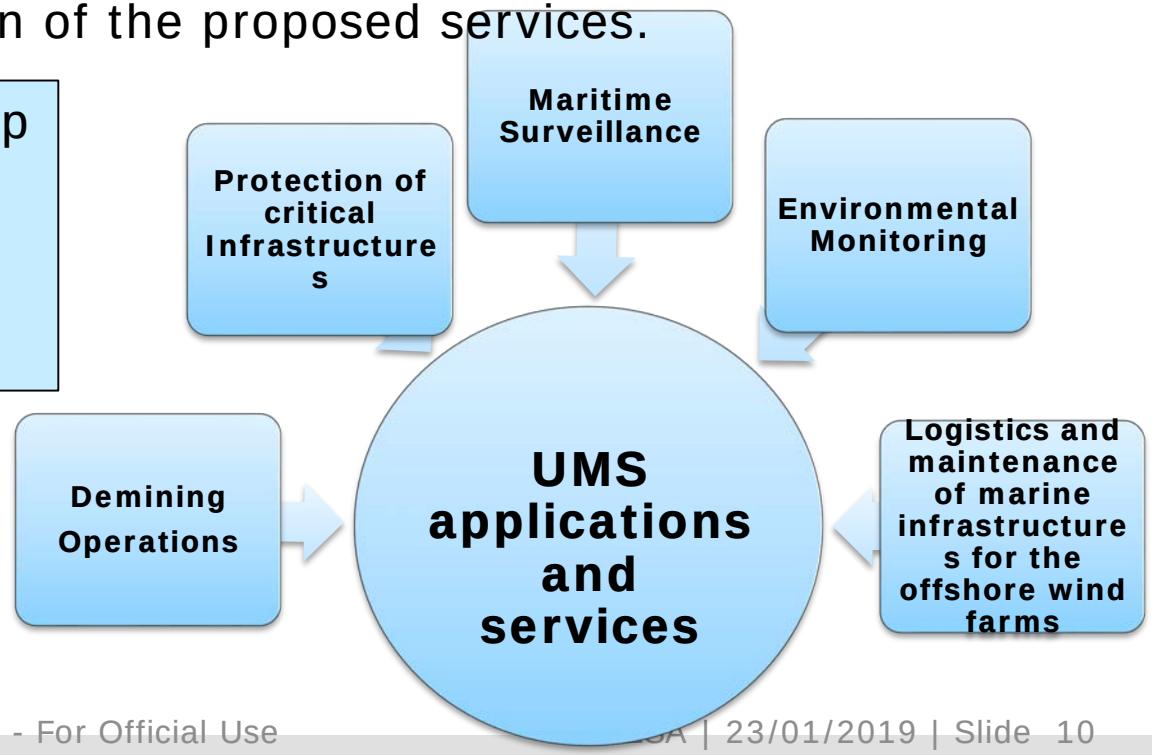
- 17th may: Rolls-Royce and Finferries sign a collaboration agreement to work together on demonstrations of remote and autonomous ferry technologies
- 25th April: OffshoreMarine has signed a MoU with the Maritime Port Authority of Singapore and Technology Centre for Offshore and Marine Singapore, to jointly develop autonomous vessels for a variety of applications including harbor operations.
- 25th April: Maersk to trial autonomous vessels (https://www.maritime-executive.com/article/maersk-to-trial-autonomous-na technology#gs.saOs

SPACE AND UNMANNED MARITIME SYSTEMS (UMS) - BASED MARITIME SERVICES

Feasibility Study Objectives: to identify and characterize UMS based services exploiting at least one space asset, addressing potentially interesting application domains, carry out the analysis of their technical feasibility and commercial viability, select the most promising ones for further development and exploitation, and propose a roadmap for the implementation and demonstration of the proposed services.

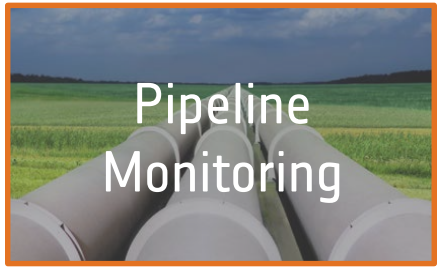
https://business.esa.int/funding/intended-tender/unmanned-maritime-systems-ums

In partnership with the European Defence Agency



User already engaged

OFF-SHORE ENERGY



More than **20** Projects

Over **10MEur** ESA Investment

15MEur Additional Investment

European Space Agency

Wind / wave forecasting for offshore wind farms

→ ISSWIND project example

Wind resource maps: estimate wind farm potential revenues (bankability)

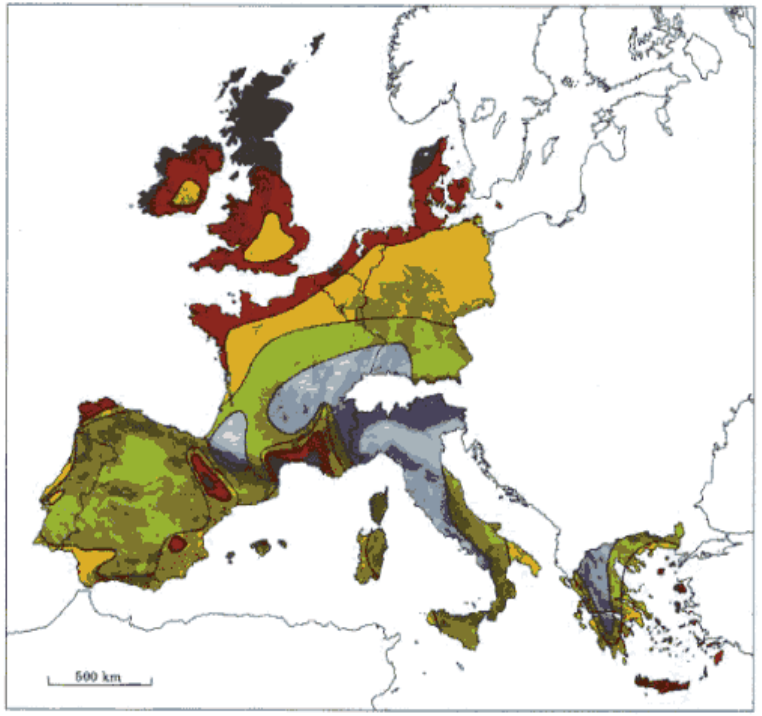
Wind and wave hindcast databases (for site selection)

Short term weather and wave forecasts in support to wind farm maintenance and operations

Wind Power production forecast

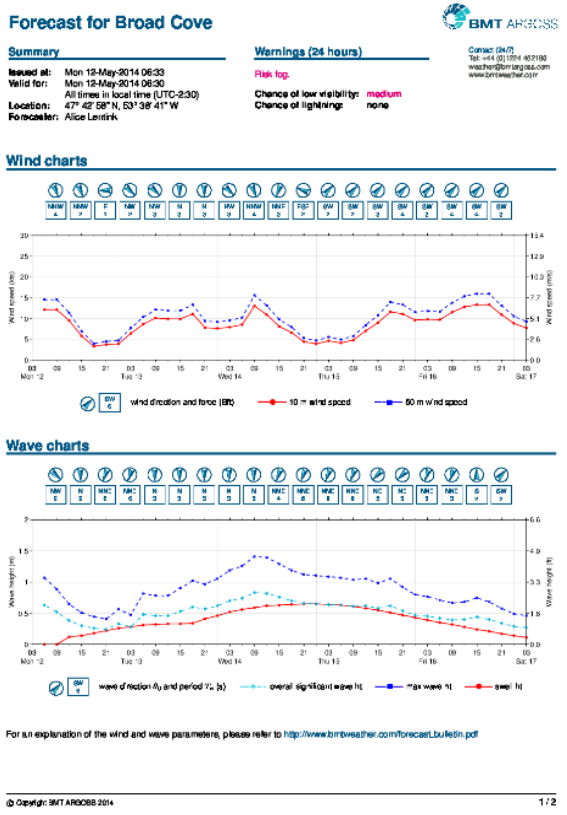
EO provides weather observation services (e.g.: EUMETSAT products)

GNSS near real time observations to extract atmospheric parameters (e.g. stratified relative humidity) to improve weather forecasting models



Wind resources[1] at 50 metres above ground level for five different topographic conditions

	Sheltered terrain[2]		Open plain[3]		At a sea coast[4]		Open sea[5]		Hills and ridges[6]	
	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}	ms^{-1}	Wm^{-2}
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
	4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
	3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0- 8.5	400- 700
	< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400



Credits: ISSWIND ESA IAP project
https://business.esa.int/projects/isswindemo

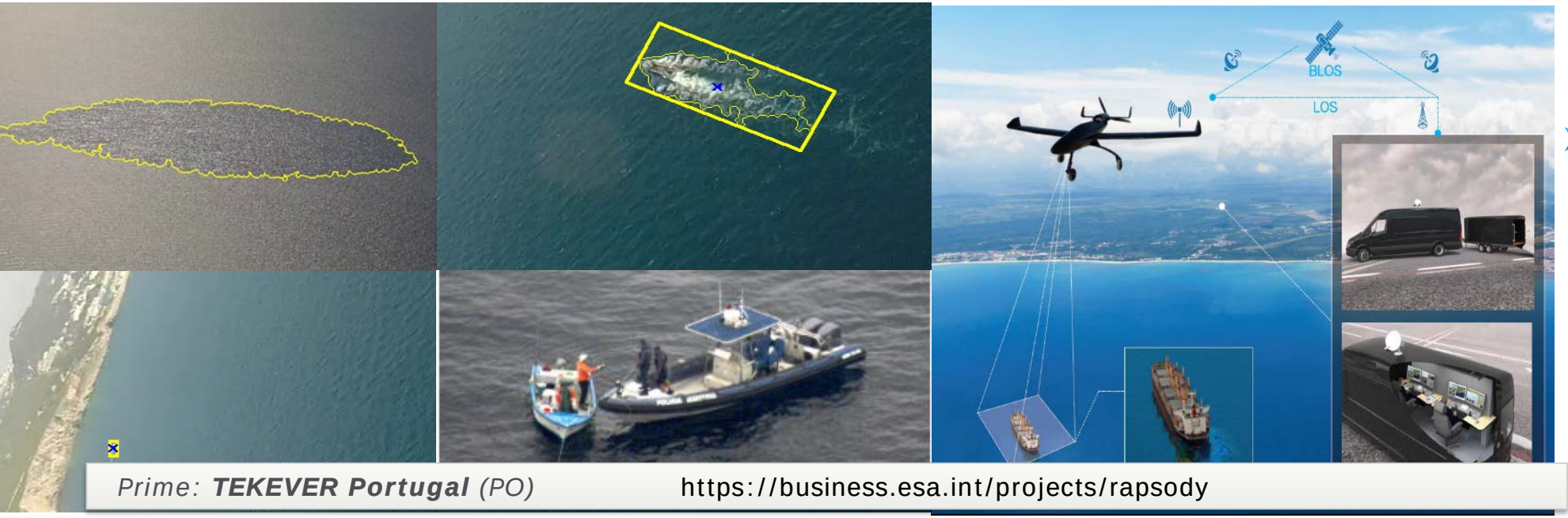
European Space Agency

RAPSODY

Remote Airborne Platform with Satellite Oversight Dependency

- Providing **Maritime Surveillance**, **Search & Rescue and Maritime environment monitoring and response** services **using RPAS**
- **TEKEVER AR5 RPAS** (MTOW: 150 kg, Endurance: 8 to 10 Hours)
- Combining **innovative sensors package (EO, IR, maritime radar, AIS)** to survey wide maritime areas, and reporting its findings in **near real-time** through a **SATCOM link** to the operating centre.

- **First operational missions for EMSA started in December 2017**



- In collaboration with EMSA
- With the involvement of m*aritime safety authorities from* ***Portugal (AMN), Malta (TM), UK (MCA), NL (Dutch Coastguards)***

Prime: ***TEKEVER Portugal*** *(PO)* https://business.esa.int/projects/rapsody

Port challenges

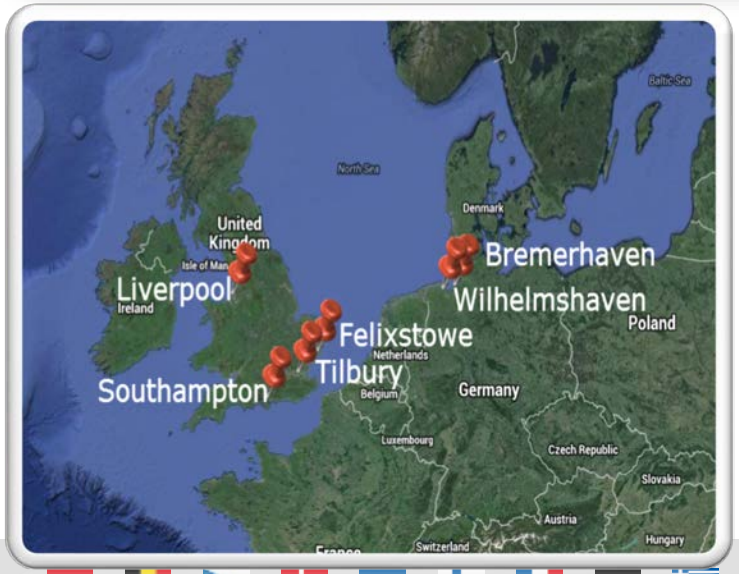
- **Multi-modal** optimised cost-effective and flexible **operations** inside the terminal and in the wider port area.
- Re-engineering of **port operational processes** via process analysis and identification of **interoperable ICT** systems to improve the level of integration among all actors (Port Authorities, terminal operators, shipping companies, customs, security forces, etc.) and facilitate critical decision-making.
- **Sustainable maintenance**, repair and reconfiguration.
- Better **capacity management** with reduced costs and land use.
- Container-specific tags identifies the **location and status of containers** and transmits via Internet.
- Low **environmental** impact, climate change adaptation, towards circular economy.
- Efficient connections with the **hinterland transport** network contributing to an increased use of the most energy-efficient transport modes
- Inland waterways and **short sea shipping** ports

I-PORT: Optimising Intermodal Freight Transport through European Ports

Led by Aimes (UK) with Avanti (UK), Container Port (UK), ISL (DE), DBH (DE)

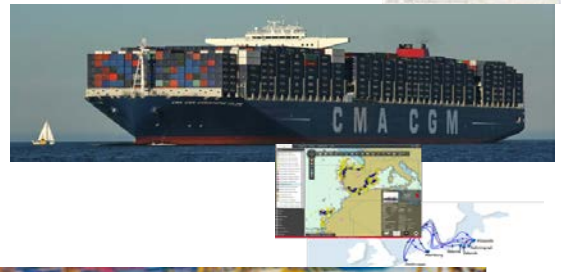
i-Port integrates space with logistics data to:

- track the location of vessels and trucks,
- compute the estimated time of arrival and optimal routing for vessels and trucks,
- optimize container movement by accessing container locations,
- perfom transport job management for container import or export,
- Enable a adjustment of vehicle slots in the port terminal.



EUROPORT - Optimising Intermodal Freight Transport

Led by GMV Innovating Solutions (PL) with TIS.pt (PT), GMV SKYSOFT (PT).



Service 1 – Haulage Operations

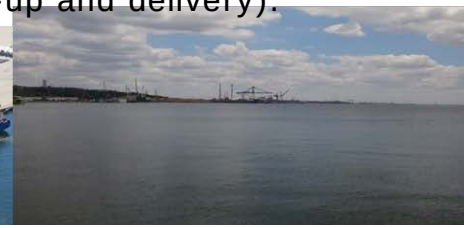
To improve the haulage process by optimizing port related operations; monitor real-time trucks/trains locations, activities and routes; estimate ETA/ETD of trucks/trains at/from ports.

Service 2 – Ship Voyages Optimization

To improve the calculation of ships ETA and ETD to/from ports: ship positioning tracking, optimal ship route calculation based on satellite observation data and weather “en route.

Service 3 – Port Operations

To support the planning and optimization of intermodal transport operations in ports and terminals: access to relevant documents, transport orders management and gate operations, as reception of notices of arrival at the gate, yard operations (pick-up and delivery).



5G: WHAT IS IT?

- 5G is the **next generation** of mobile telecommunicatio
- It can be better described as a **revolution in telecommunications**, a set of technologies, a set of services, a network of networks
- 5G will deliver ultra fast speeds, connect many more devices to the internet, provide security and minimize delays, offering a number of attributes to users

Kickstart Biodiversity

Biodiversity is arguably the most complex and vital feature of Earth; it encompasses life on the planet, in all its forms and interactions.

ESA's kickstart on biodiversity will fund projects that aim to improve agricultural activities, protect marine ecosystems, develop second generation biofuels, and reduce negative impact of transport networks and industry on biodiversity.

Potential end users could include:

- Farmers, goods producers, agriculture ministries
- Supermarkets
- Fishing vessel owners, fishermen, fishing regulators
- Scientific research organisations, marine and forest conservationists
- Biofuel producers and biofuel crop producers
- City planners, civil engineers
- Manufacturing companies
- Oil & gas, nuclear, and chemical companies
- Regulatory authorities

Kickstart Environmental Crimes

- Environmental crime is the fourth largest criminal area in the world, worth roughly $260 billion.
- ESA's kickstart on environmental crimes will fund projects that tackle waste trafficking, illegal dumping, water fraud, pollution and theft, poaching and the unlawful trade of flora and fauna, and illegal logging, fishing and mining.
- Potential end users could include:

Law enforcement and national security agencies

Customs

Park rangers

Certification and labelling bodies

Conservation Groups and NGOs

Petrol companies and offshore drilling contractors

Car manufacturers

Environmental agencies

Emissions trading authorities

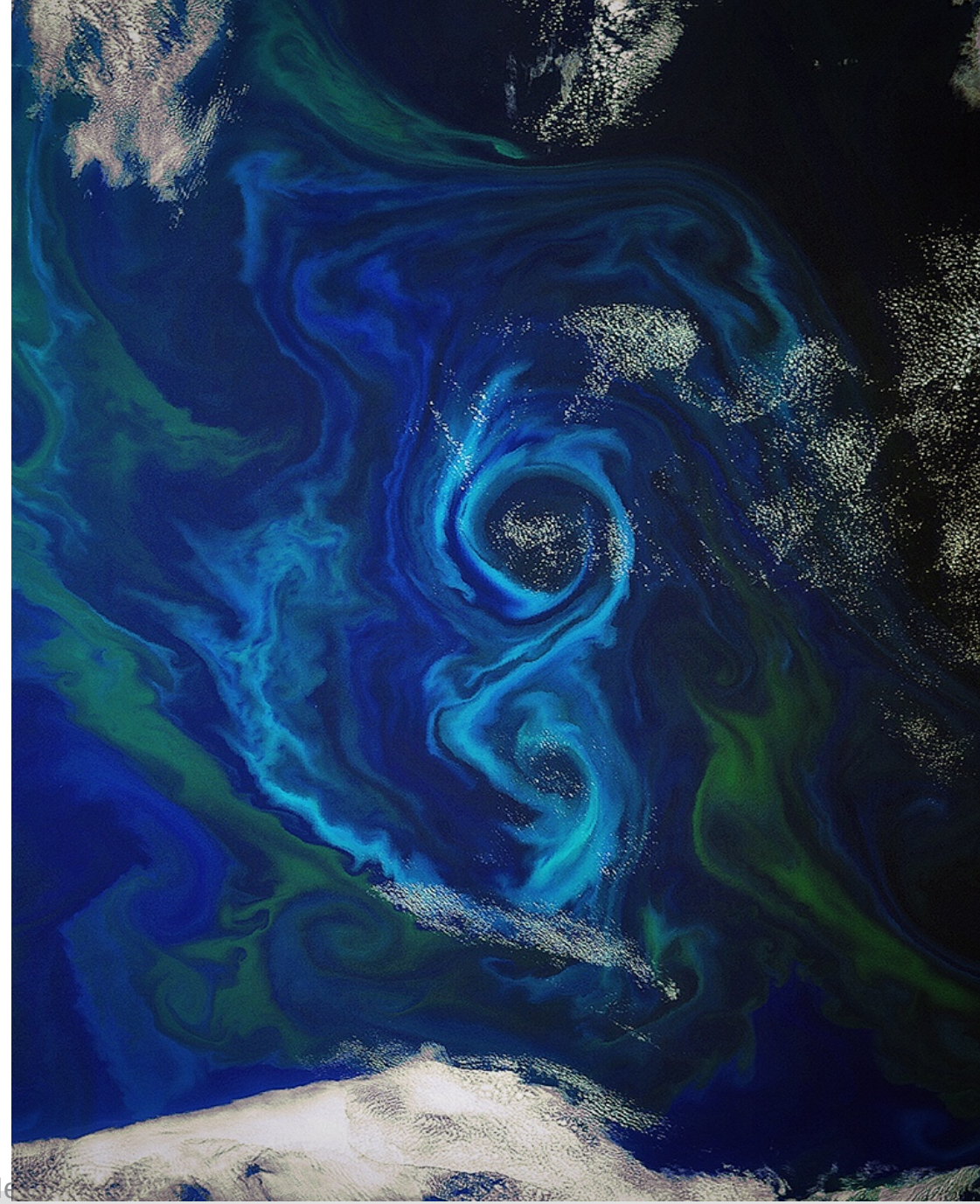
→ KICK-START MINING

- Satellite technology can add value to the four major types of mining operations: surface, underground, dredge, and artisanal & small-scale (ASM).
- It can help to protect miners working in characteristically hazardous environments and to prevent risky illegal mining activities.
- Mining can have a severely adverse impact on the environment. Satellite technology can help mining companies, to prove that they are undertaking activities to minimise environmental damage.
- ESA business application's mining opportunity will fund feasibility studies that cover exploration, construction & operation, closure & rehabilitation, commodity trading, and illegal mining.

European Space Agency

→ KICK-START ATLANTIC AREA

- Challenge is promoting **sustainable development of Atlantic economic sectors** as the marine aquaculture, the ocean renewable energy exploiting the potential of tides and waves, the seabed mining, the hydrocarbon exploration and production.
- Enhancing **safety of navigation** through e-navigation integrating new and existing navigational tools for the monitoring of maritime activities through better organization and exchange of data and communication between ships and shore.
- Emerging Atlantic industries are in particular characterised by the key role played in their operations by **cutting-edge science and technologies**, moving increasingly to high level of automation and benefiting from satellite technology, tracking and imaging.



Kickstart: COLDSUN

COmmunication reLay for Deep-Sea Underwater Networks (COLDSUN)

Goal:

- Interconnect offshore underwater networks with the Internet in a low-cost manner via LEO satellites
- Customers can leverage a ready-to-use, extendable, and open communication service for data transfer from underwater networks

Potential customers:

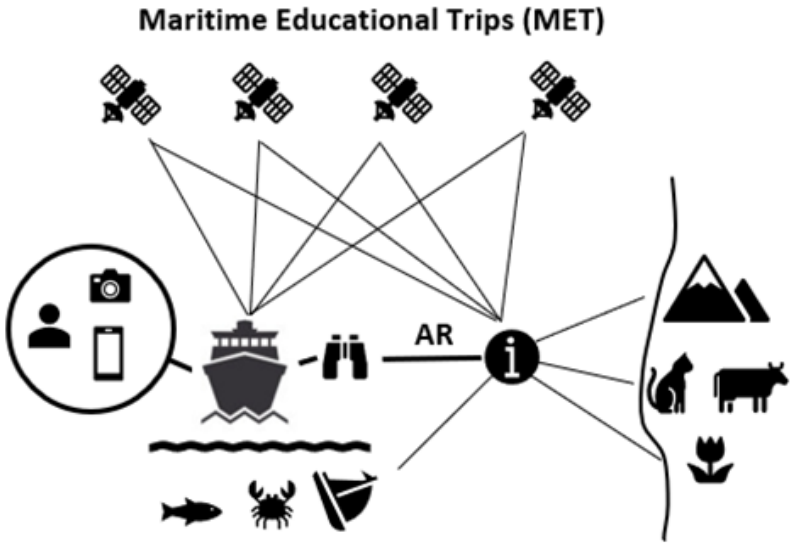
- Offshore windpark operators
- Maritime research institutes
- Underwater mining companies

Kickstart: Maritime Educational Trips

MET ATLANTIC

esa

- The scope is to deliver information about location of historical and environmental interesting places to the people sailing across Atlantic Ocean.
- People will use smartphones to find out what happened in a given location in the past as well as what interesting objects of fauna and flora can be found in a given place.
- A solution using augmented reality to make travel more attractive will be an extra value.
- The system will allow the users to add thematic routes related to the planned trip.



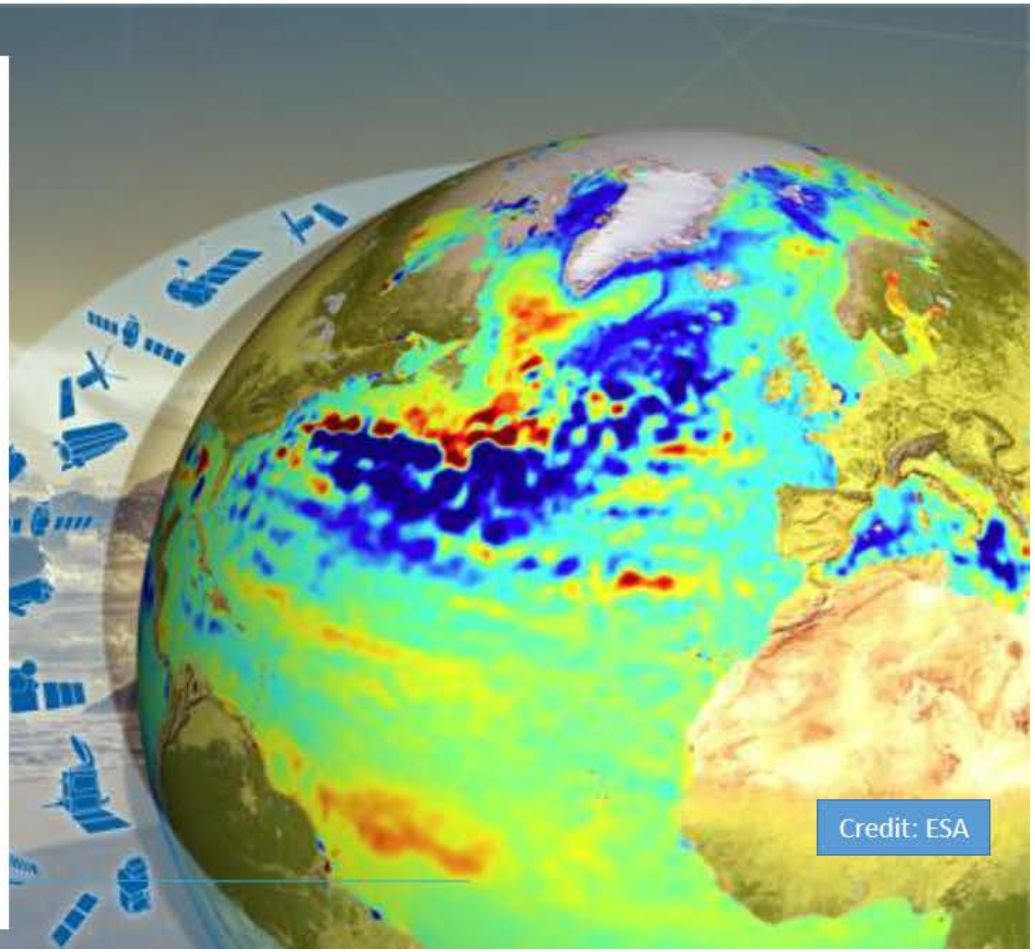
	Traveller		AUGMENTED REALITY
	The ability to take pictures with the additional information provided		Wreck
	Smartphone		Geographical names
	Fauna and flora		Passenger ship

Kickstart: Coastmade

TECHWORKS MARINE

Context:
Supporting Atlantic economic development

- **Atlantic Strategy:** EC regional strategy, open & effective cooperation in Atlantic area
- **Atlantic Action Plan:**
  - promote entrepreneurship & innovation
  - protect, secure and enhance marine & coast
  - improve accessibility & connectivity
  - socially inclusive & sustainable model of regional development
- **Potential services from Kickstart**:
  - combining data from several sensors;
  - Decision support service for operators and policy makers
- **TechWorks Marine proposal**: CoastMADE (Monitoring and Assessing Dredging Environments)



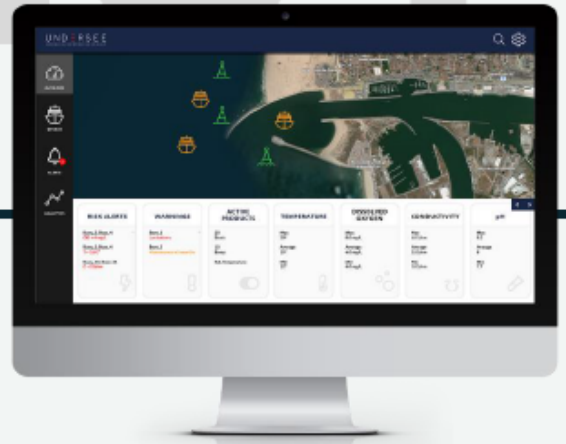
SOLUTION

UNDERSEE

WATERWORLD SENSING FOR PERFORMANCE AND SUSTAINABILITY

WATER DATA

The small and easy-to-install UNDERSEE_water device is used to collect water data from any maritime platform (boats, buoys, etc.) and communicate the results in real-time to UNDERSEE_cloud, via Wifi, 3G or Satcom.



ANALYSIS

The incoming data to UNDERSEE_cloud is continuously treated and analysed together with hydrodynamic models and EOD products for better comprehension of water behaviour and risk assessment.

ALERTS

In UNDERSEE_cloud, user is able to define alerts, faults and insights for each UNDERSEE_water. Notifications can be visualized in a web platform or received by e-mail and/or SMS.

www.undersee.io | IPN – Coimbra, PORTUGAL | T: +351 239 160 318 | undersee@undere.io

CONCLUSIONS

- A number of themes in Business Application are relevant to the Atlantic, some thematic area are already exploited while some others represents challenges ahead.
- The shipping sector is now absorbing the new trends of automation, big data analytics, VR/AR, etc… unlocking a large economic potential, but at the same time requiring a step improvement in communications and data collection capabilities.
- ESA Business Application and our team of implementation are definitely open to collaborative scenarios, particularly in:
  - Understand further needs to initiate new activities
  - Collaborate with key stakeholders
  - Support companies proposing ideas for developing sustainable downstream solutions using space

→ THANK YOU

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