



**“Glocal” approach: MARINER platform, MARPOCS platform & Action Seaport@Port of Lisbon**

**WEB-GIS towards better safety & environmental performances in national and local Authorities**

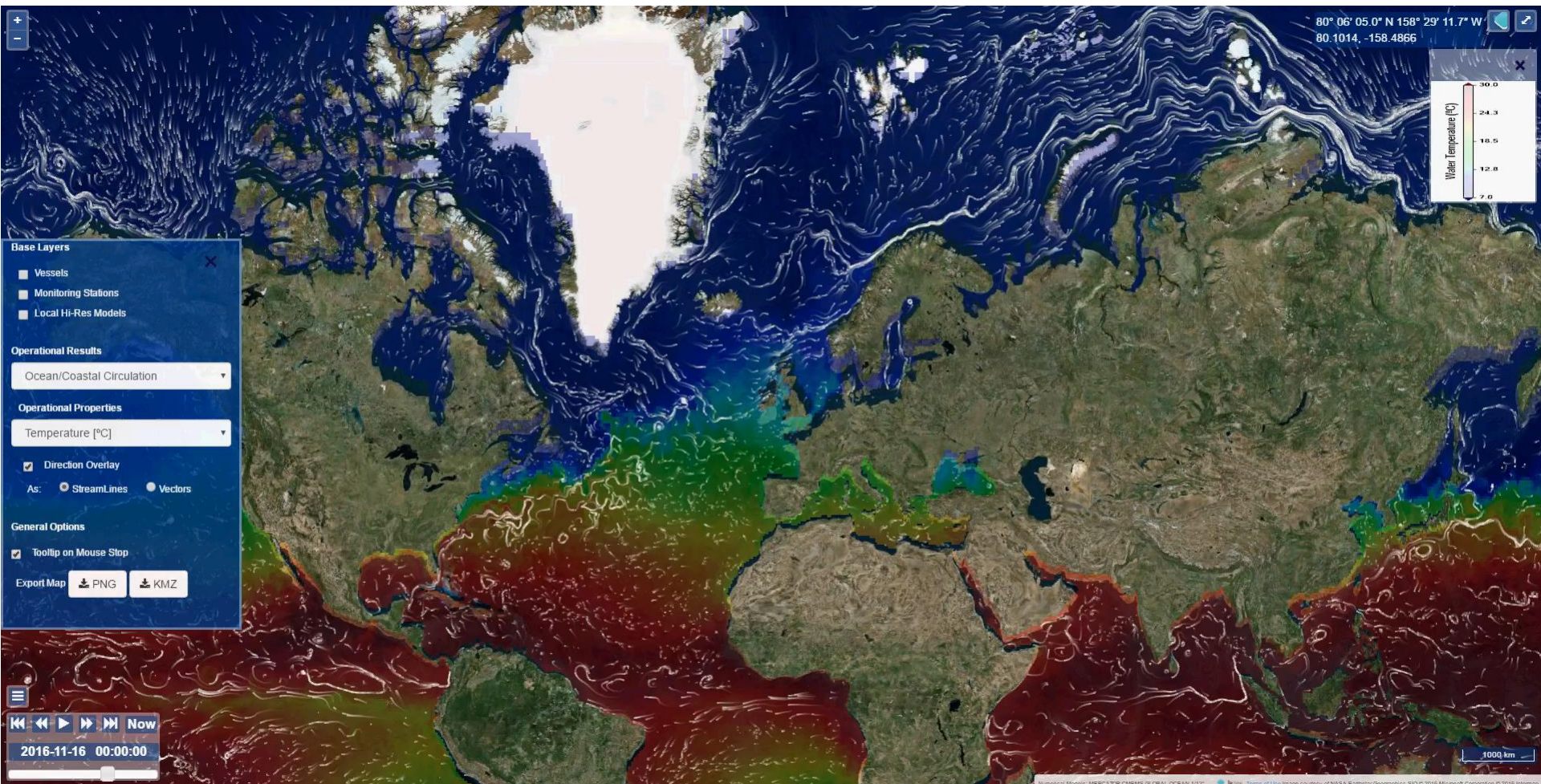
**Rodrigo Fernandes, David Brito, Frank Braunschweig  
(Action Modulers – Consulting & Technology, Lda.)**

**Mariner workshop - Portugal  
27-4-2017**



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## *From global to local*



[www.actionforecast.com](http://www.actionforecast.com)



## Background | The region of application

### ➤ Lisbon Agreement (CILPAN)

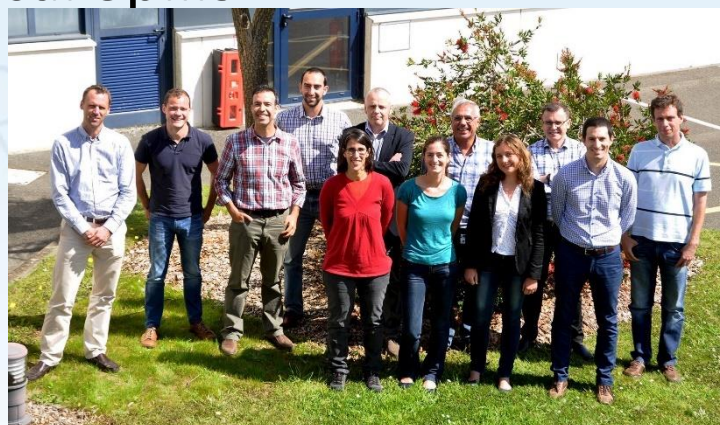
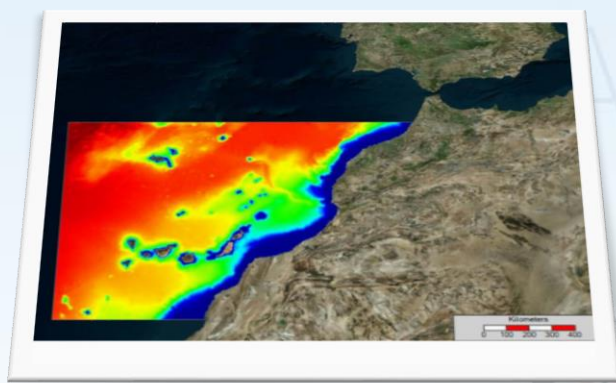
- Active since 1 February 2014
- Main goal: a mechanism to ensure cooperation between the Contracting Parties in the case of pollution incidents
- Geographical boundaries with Bonn Agreement (North Sea) and Barcelona Convention (Mediterranean Sea)



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# Multinational Response and Preparedness to Oil and Chemical Spills



**Consortium:** MARETEC-IST (coordination; Portugal)- [www.maretec.org](http://www.maretec.org) ; Action Modulers (Portugal) – [www.actionmodulers.com](http://www.actionmodulers.com) ; CEDRE (France) [www.cedre.fr](http://www.cedre.fr) ; PLOCAN – Plataforma Oceanica de Canarias (Spain)- [www.plocan.eu](http://www.plocan.eu); Univ. Las Palmas de Gran Canaria (Spain) - [www.pct.ulpgc.es](http://www.pct.ulpgc.es); INRH – Institut National de Recherche Halieutique (Morocco) - <http://www.inrh.ma/> ; OOM- ARDITI – Observatório Oceânico da Madeira (Portugal) - <http://oom.arditi.pt/>



**Support / Advisory Board:** APRAM / Portos da Madeira (Portugal); Proteção Civil da Madeira (Portugal); Directorate General of Security and Emergency of Canarias Government, Spain (Spain); SASEMAR (Spain); DCPM-DGAM (Portugal); African Maritime Safety and Security Agency (AMSSA); Secretary General for Marine Fisheries at the Moroccan Ministry of Agriculture and Marine Fisheries of Morocco; Ministry of Energy, Mining, Water and Environment of Morocco; Marine Traffic (UK); MARINER project (coordination: CETMAR); HNS-MS project (coordination: RBINS)

Acronym: MARPOCS  
Grant Agreement no: ECHO/SUB/2015/713854/REP08

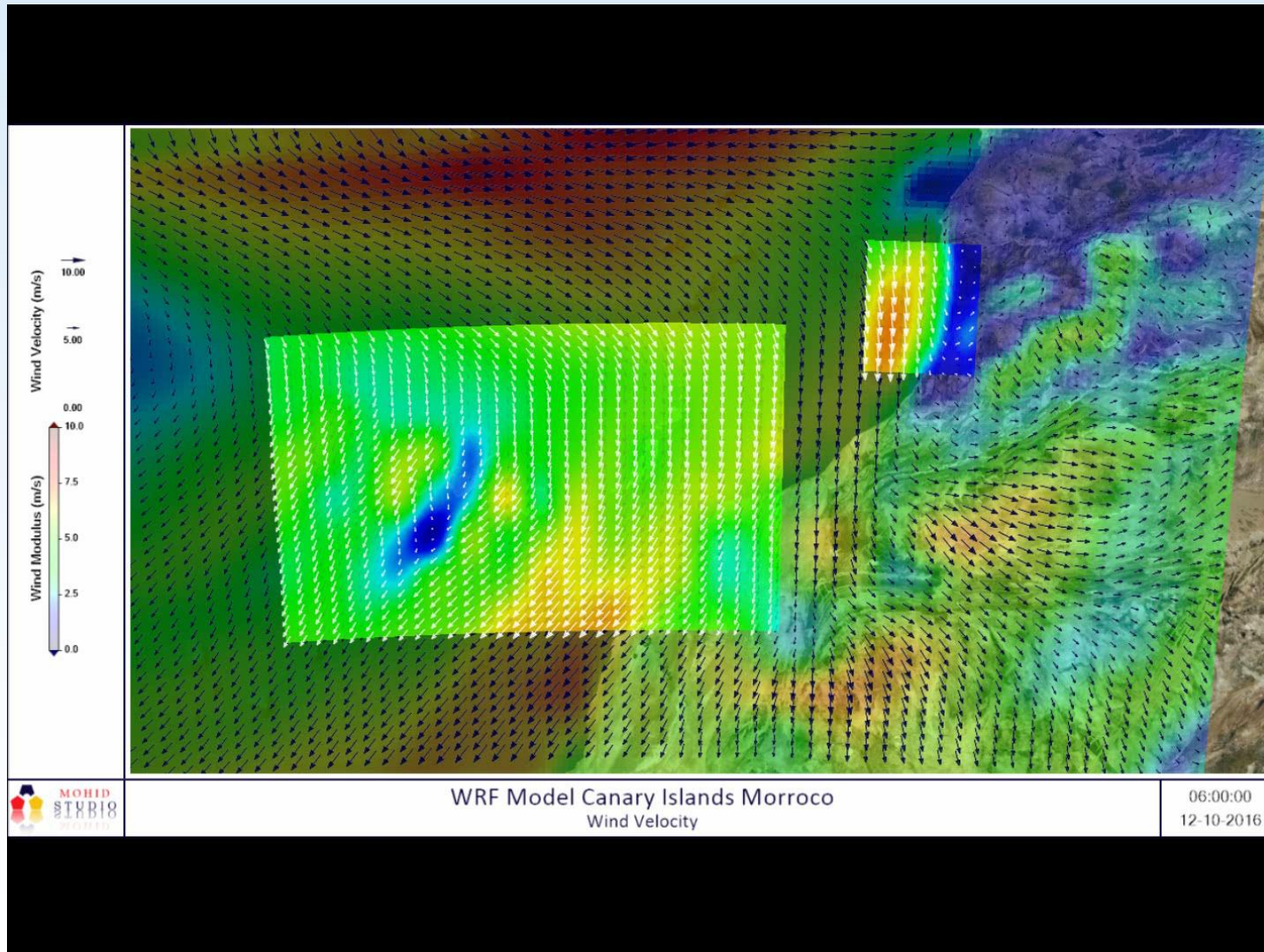


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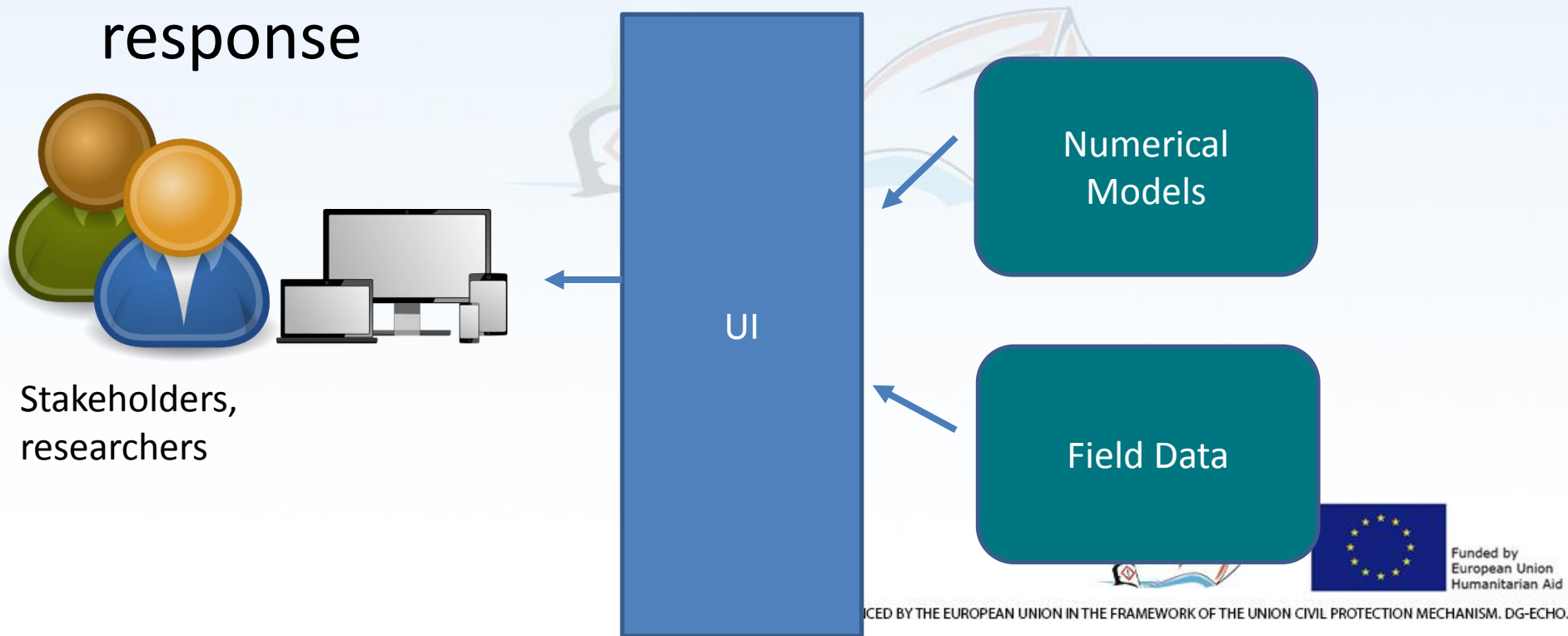
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# Metocean forecasts | model development



- Build a friendly User Interface UI accessible via pc, tablet, smartphone to showcase the project results and support oil and chemical spill response





# Decision Support Systems | web tool

MARP<sup>CS</sup>

Home Maps Charts Simulation Operational Models Login

## Layers

### Domain

Madeira/Canary/Morroco

### WMS Layers

- ☒ Vessels
- ☐ Monitoring Stations

### Model Results

MERCATOR CMEMS Surface Madeira/Marroco/Canary

- ☒ Current Velocity
- ☐ None
- ☐ Current Velocity Modulus
- ☐ Temperature

### User Simulation Layers

"Select one Simulation..."

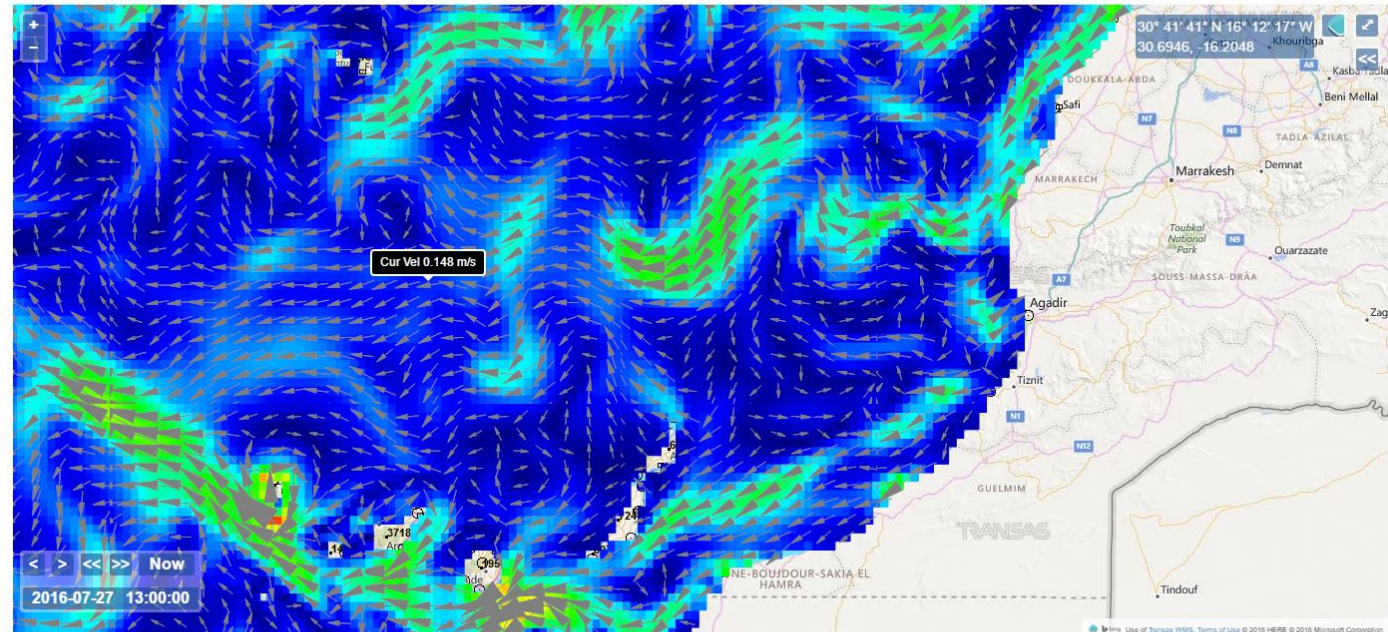
### Property

"Select one Property..."

- ☒ Particles
- ☒ Barrier

- ☒ Tooltip on mouse stop

## Map



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MARP<sup>CS</sup>



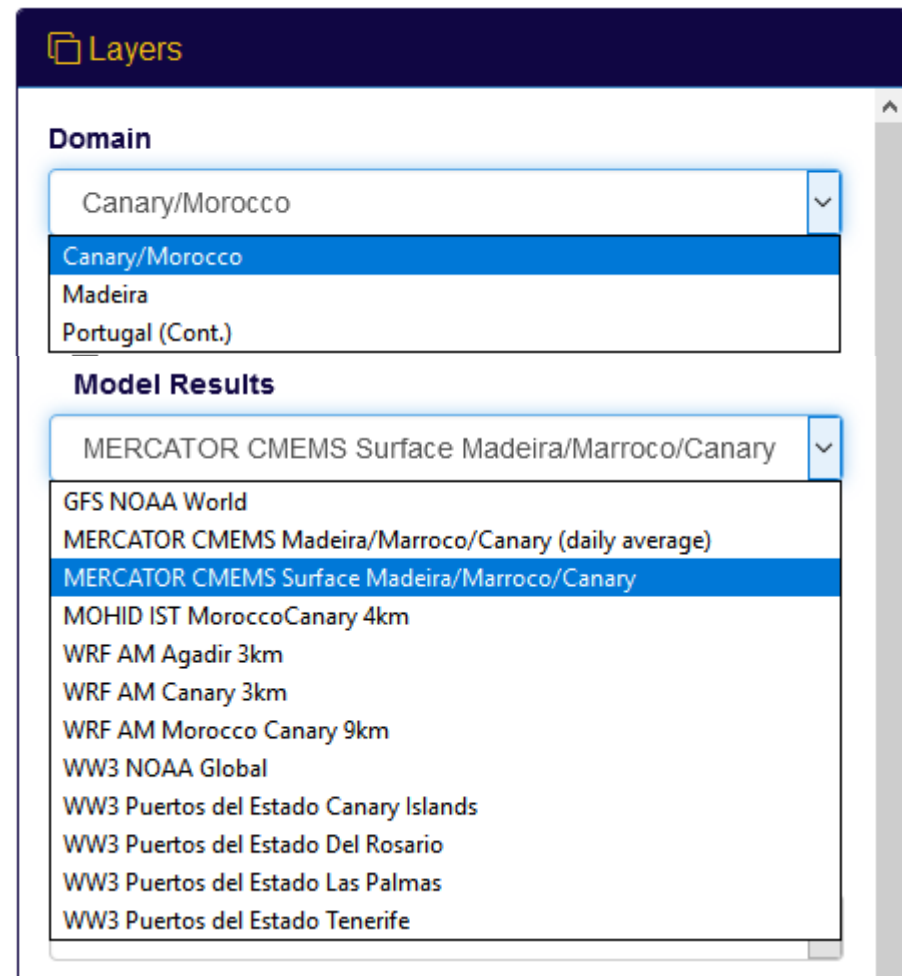
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# Marpocs Platform

## Map Domains (modelling Platform)

- Canary/Morocco
  - IST Hydrodynamics
  - CMEMS Hydrodynamics
  - AM Meteorology
  - GFS Meteorology
  - Puertos del Estado Waves
  - WW3 waves



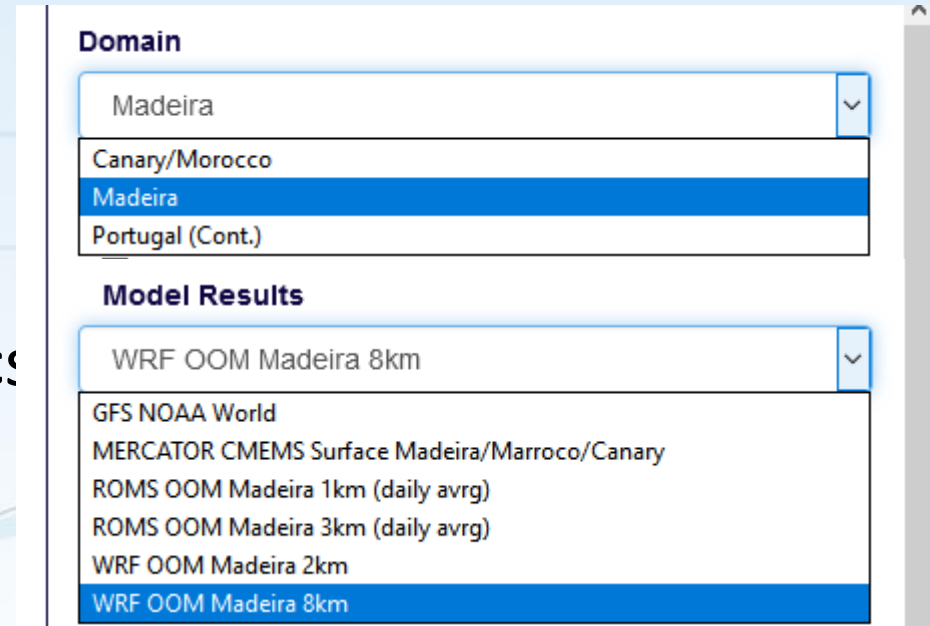
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# Marpocs Platform

## Map Domains

- Madeira
  - OOM Hydrodynamics
  - CMEMS Hydrodynamics
  - OOM Meteorology
  - GFS Meteorology



The screenshot shows a web interface for the Marpocs Platform. It features two main sections: 'Domain' and 'Model Results'. The 'Domain' section has a dropdown menu with 'Madeira' selected, and a list of options including 'Canary/Morocco', 'Madeira', and 'Portugal (Cont.)'. The 'Model Results' section has a dropdown menu with 'WRF OOM Madeira 8km' selected, and a list of options including 'GFS NOAA World', 'MERCATOR CMEMS Surface Madeira/Marroco/Canary', 'ROMS OOM Madeira 1km (daily avrg)', 'ROMS OOM Madeira 3km (daily avrg)', 'WRF OOM Madeira 2km', and 'WRF OOM Madeira 8km'.

Domain
Madeira
Canary/Morocco
Madeira
Portugal (Cont.)

Model Results
WRF OOM Madeira 8km
GFS NOAA World
MERCATOR CMEMS Surface Madeira/Marroco/Canary
ROMS OOM Madeira 1km (daily avrg)
ROMS OOM Madeira 3km (daily avrg)
WRF OOM Madeira 2km
WRF OOM Madeira 8km

# MARINER: Achievements

---

1. Comprehensive water & air behaviour chemical spill model:
  - multiple processes and properties evolution at the same time;
  - Based on physical and chemical characteristics (not in classes)
2. Integration of the model in a web, mobile-friendly technology, and results exportable to other systems
3. Flexibility & transferability: applicable in any place, and with seamless integration of different metocean models
4. Dynamic connection with HNS products database \*
5. Environmental impact modelling \*

\* CIIMAR presentation



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# MARINER: Achievements

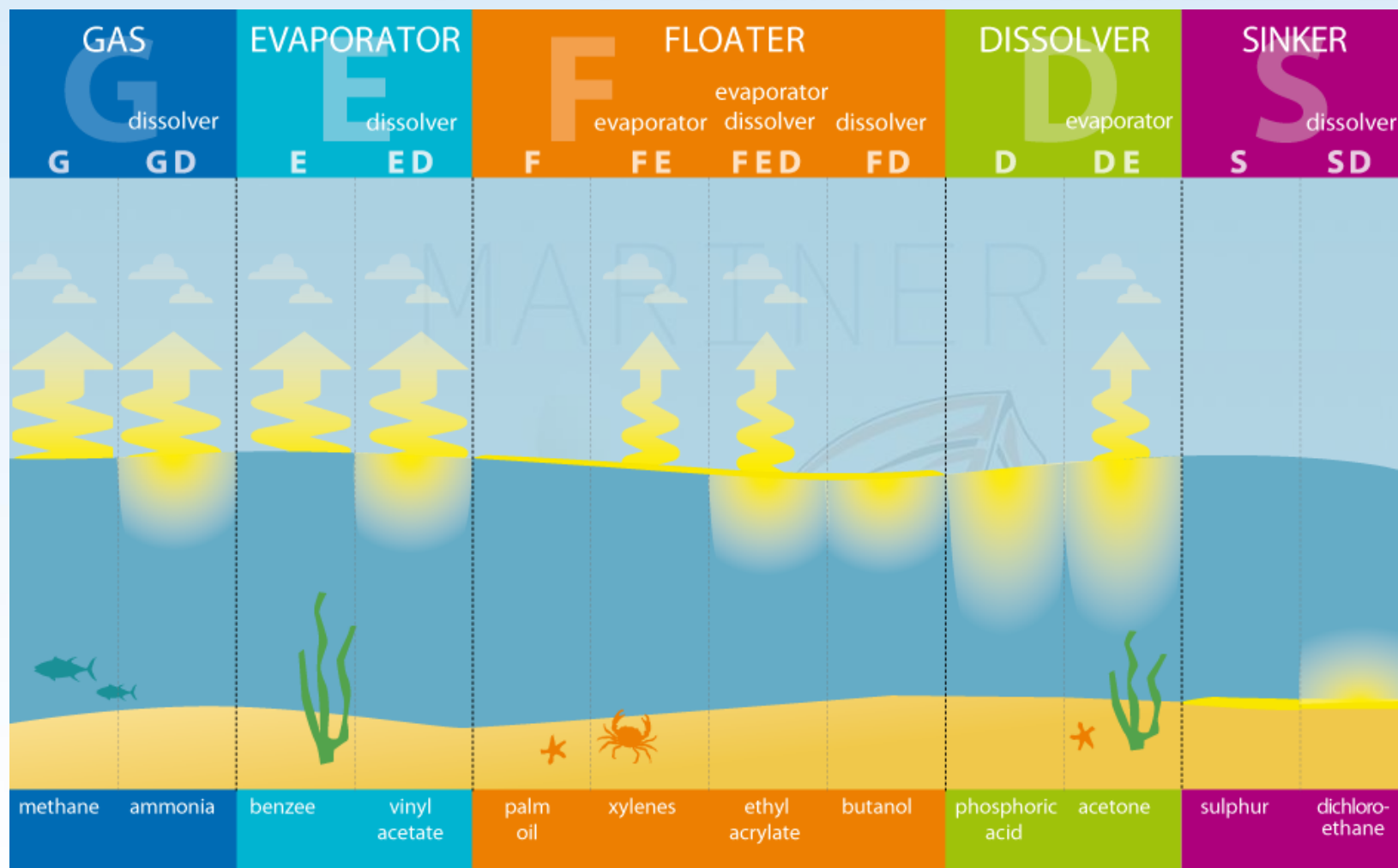
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\* CIIMAR presentation



# HNS: behaviour classes



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# HNS: behaviour classes

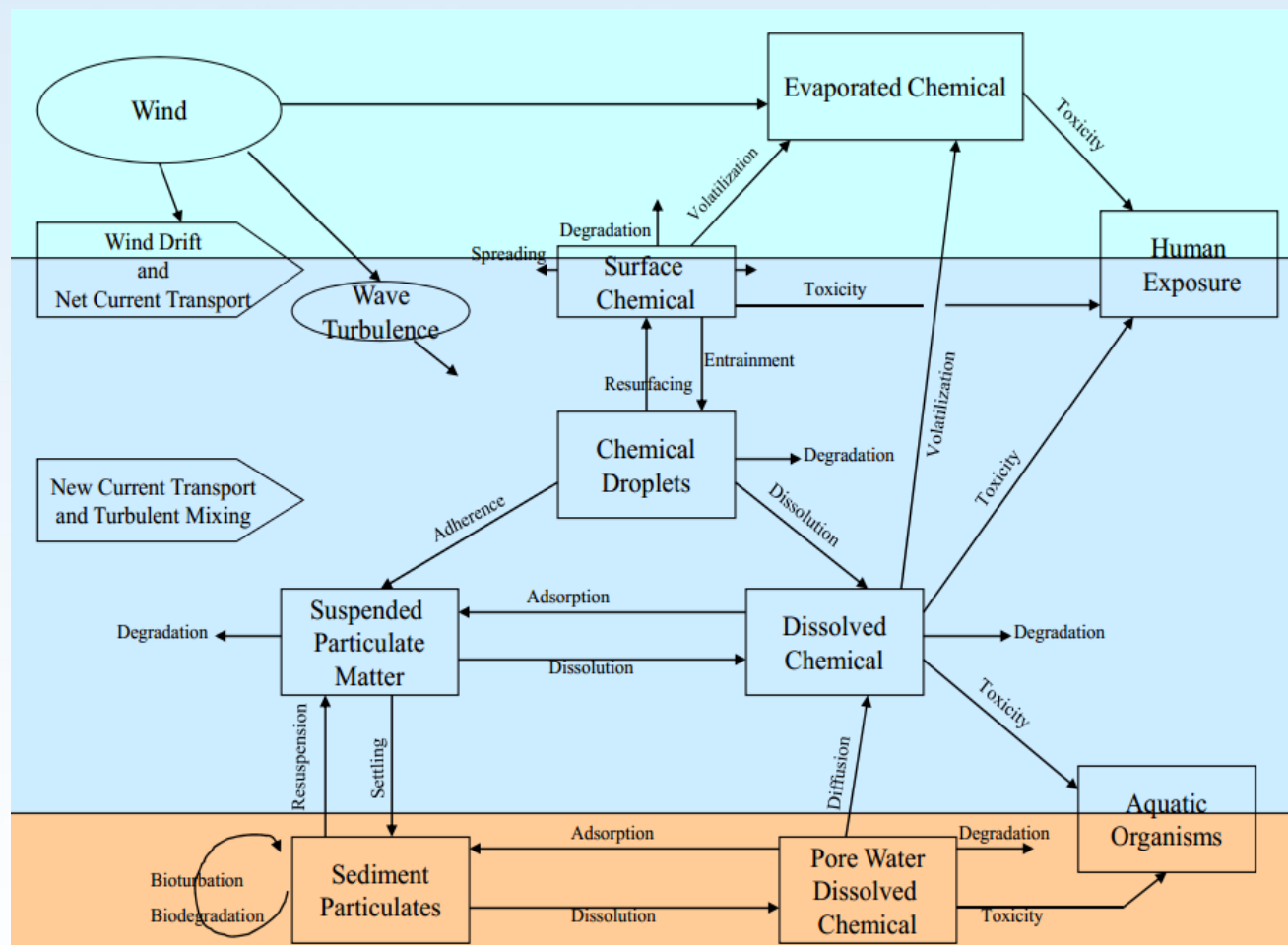
- Classes are far from reality...



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# HNS fate & behaviour



# MARINER: Achievements

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\* CIIMAR presentation



# HNS modelling and environmental impact

## MARINER PLATFORM: Web responsive design / mobile friendly technology

The image displays three side-by-side screenshots of the MARINER web platform, illustrating its web-responsive design and mobile-friendly technology. Each screenshot shows a browser window with the URL `mariner.actionmodul`.

**Left Screenshot:** The interface shows a sidebar menu with four options: 1. What? (highlighted in yellow), 2. Where?, 3. When?, and 4. Run. Below the menu, there is a form for "Incident Name" (2016-10-15 02:14:41 Sim Name), "Substance Type" (HNS Spill), and "Chemical Spill Options" (1-nonanol (Floater)).

**Middle Screenshot:** The interface shows a sidebar menu with four options: 1. What? (highlighted in yellow), 2. Where? (highlighted in yellow), 3. When?, and 4. Run. Below the menu, there is a "Domain" dropdown menu (France) and a "Pick Incident Locations Interactively" map showing the location of the incident in the Bay of Biscay, near France and Spain.

**Right Screenshot:** The interface shows a sidebar menu with four options: 1. What? (highlighted in yellow), 2. Where? (highlighted in yellow), 3. When? (highlighted in yellow), and 4. Run. Below the menu, there is a "Incident Type" dropdown menu (Instantaneous), "Incident Instant/Simulation Start" (2016-10-15 00:00), "Simulation End" (2016-10-15 06:00), and "Volume (m3)" (100).

Each screenshot includes a footer with logos for CETMAR, Intermar, Universidad de Vigo, ACTION Modulers, cilmar, Cedre, and the European Union, along with the text: "Copyright © Action Modulers 2016. Powered by Action Seaport".



# HNS modelling and environmental impact

## MARINER PLATFORM: HNS simulations



Home Maps Charts Simulation Operational Models

**Layers**

Monitoring Stations

**Model Results**

MOHID MeteoGalicia Artabro

☒ Current Velocity [m/s]

☐ None

☐ Velocity Modulus [m/s]

☐ Temperature [°C]

☐ Salinity [psu]

**User Simulation Layers**

☒ Zoom to Emission Point

2016-09-29 15:50:49 Sim Name

**Property**

Droplets Concentration [mg/m3]

☒ Barrier

☐ Plume Envelope

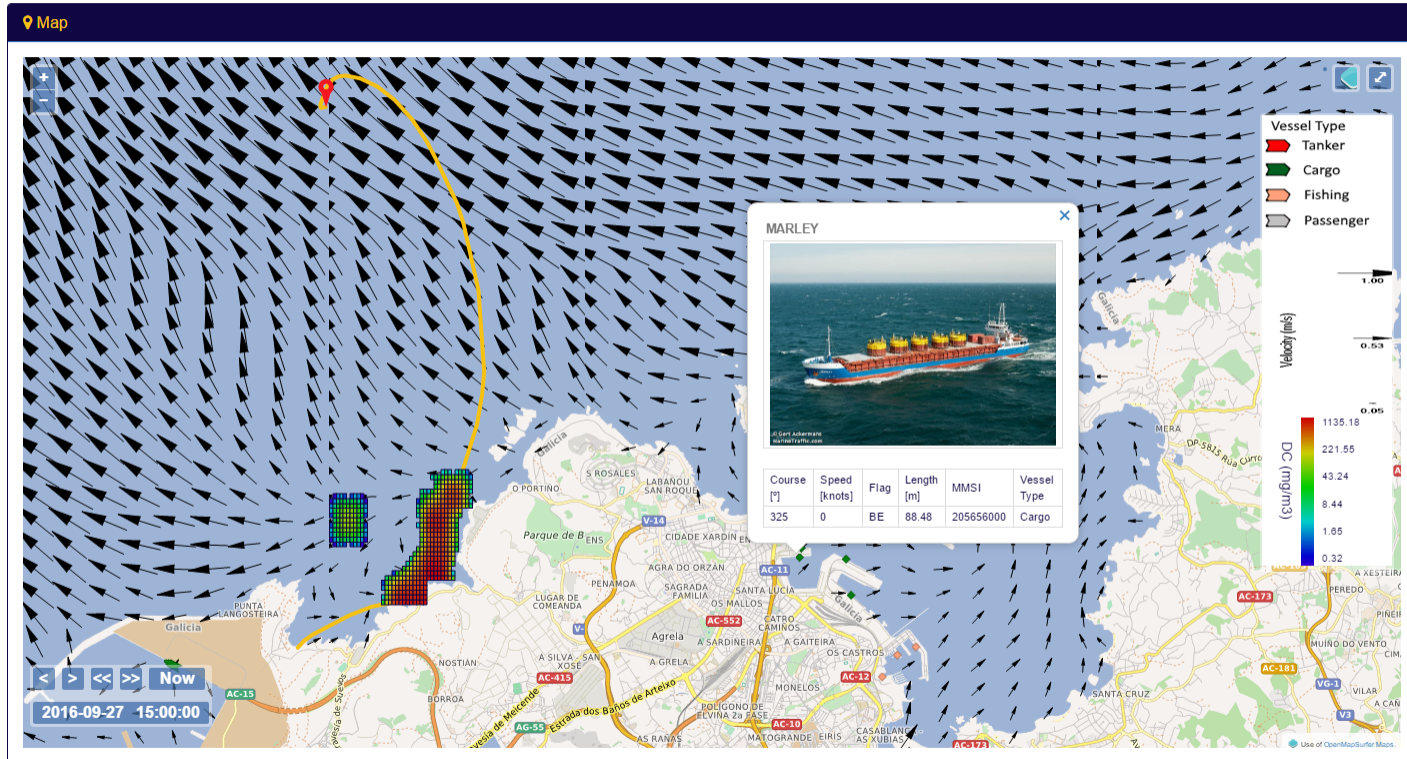
☒ Plume Center

**General Options**

☒ Tooltip on Mouse Stop

Export Map

Export Results



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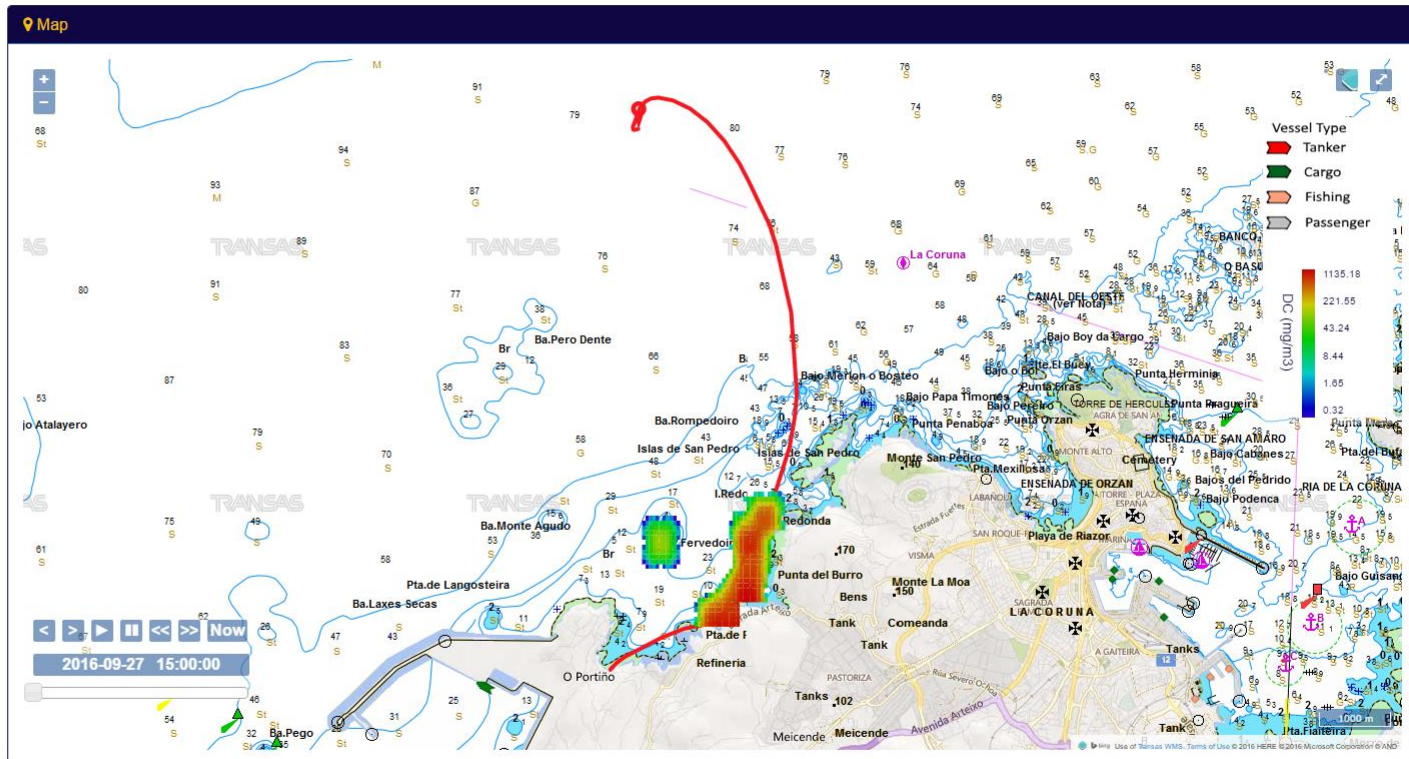
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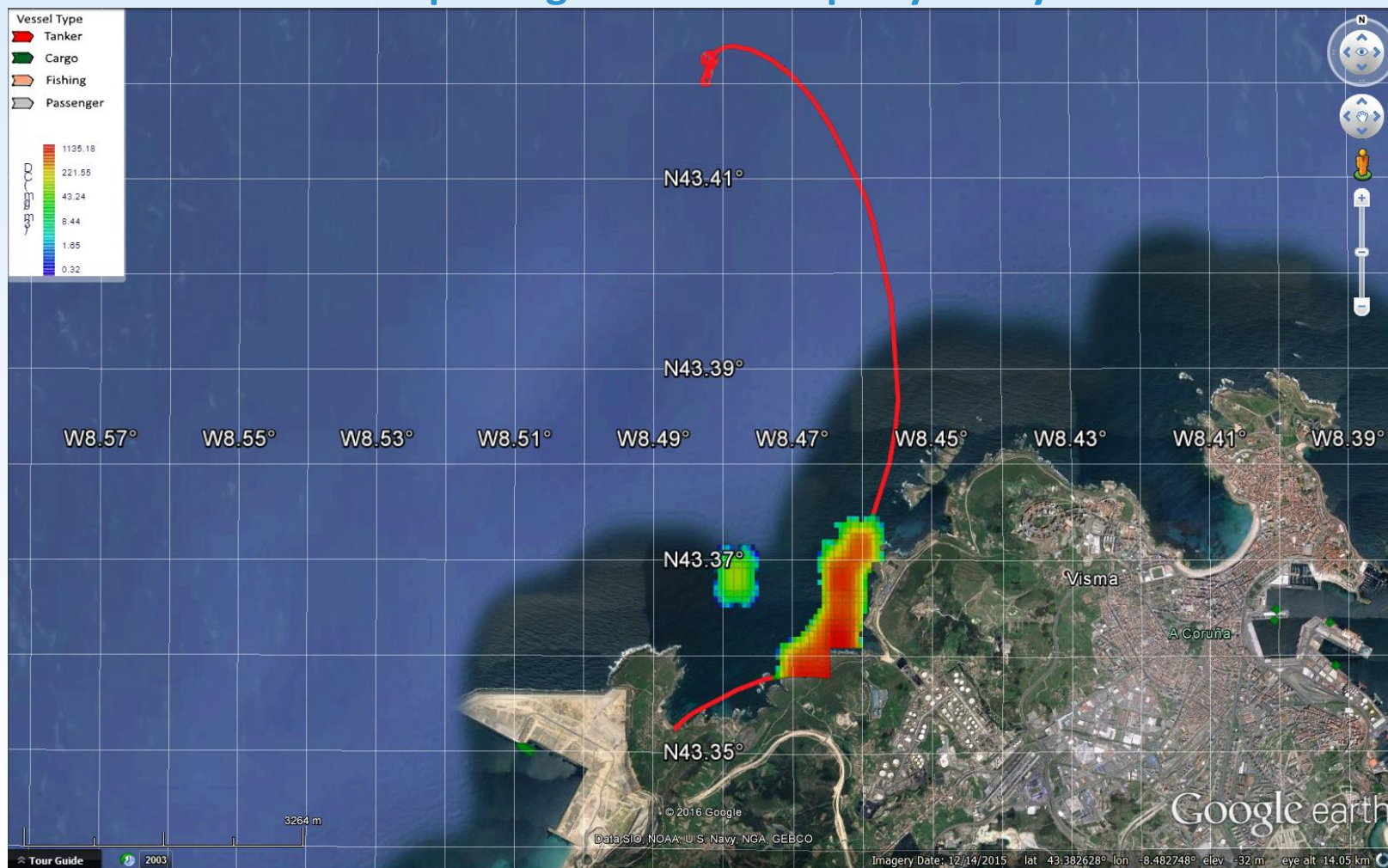
## MARINER PLATFORM: exporting results to 3<sup>rd</sup> party GIS systems





# HNS modelling and environmental impact

## MARINER PLATFORM: exporting results to 3<sup>rd</sup> party GIS systems



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# MARINER: Achievements

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5. Environmental impact modelling \*

\* CIIMAR presentation



# HNS modelling and environmental impact

## MARINER PLATFORM: Global models



Home Maps Charts Simulation Operational Models Login

**Layers**

**Domain**

France

**WMS Layers**

☐ Vessels

☐ Monitoring Stations

**Model Results**

GFS NOAA World

☒ Wind Velocity [m/s]

☒ Air Temperature [°C]

**User Simulation Layers**

☒ Zoom to Emission Point

"Select one Simulation..."

**Property**

"Select one Property..."

☒ Barrier

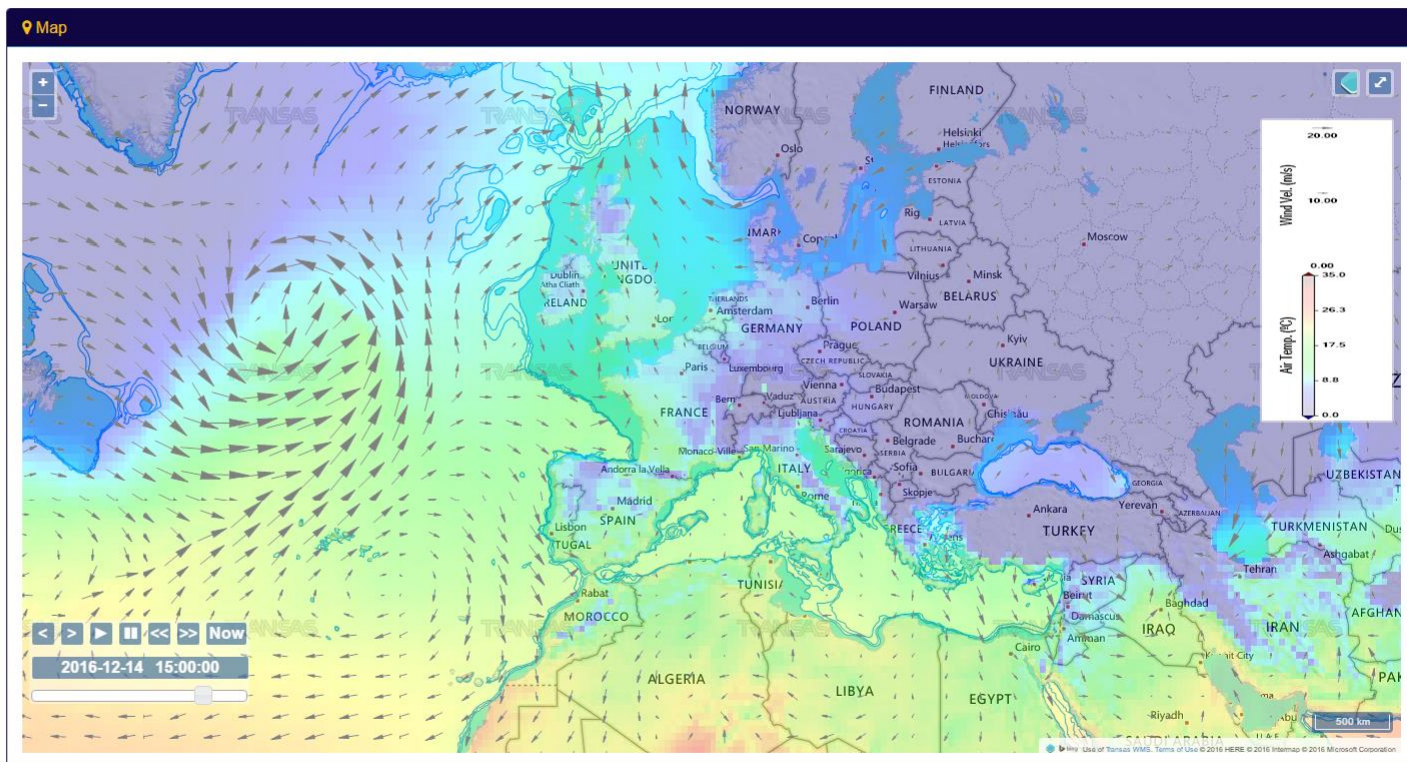
☒ Plume Envelope

☒ Plume Center Trajectory

**General Options**

☒ Tooltip on Mouse Stop

Export Map



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# HNS modelling and environmental impact



Home Maps Charts Simulation Operational Models rodrigo.fernandes Help

## Layers

### Domain

England

### WMS Layers

- ☐ Vessels
- ☐ Monitoring Stations

### Model Results

Hydro MERCATOR CMECS Surface England

- ☒ Current Velocity [m/s]
- ☐ None
- ☐ Current Velocity Modulus [m/s]
- ☐ Temperature [°C]

### User Simulation Layers

- ☒ Zoom to Emission Point

"Select one Simulation..."

### Property

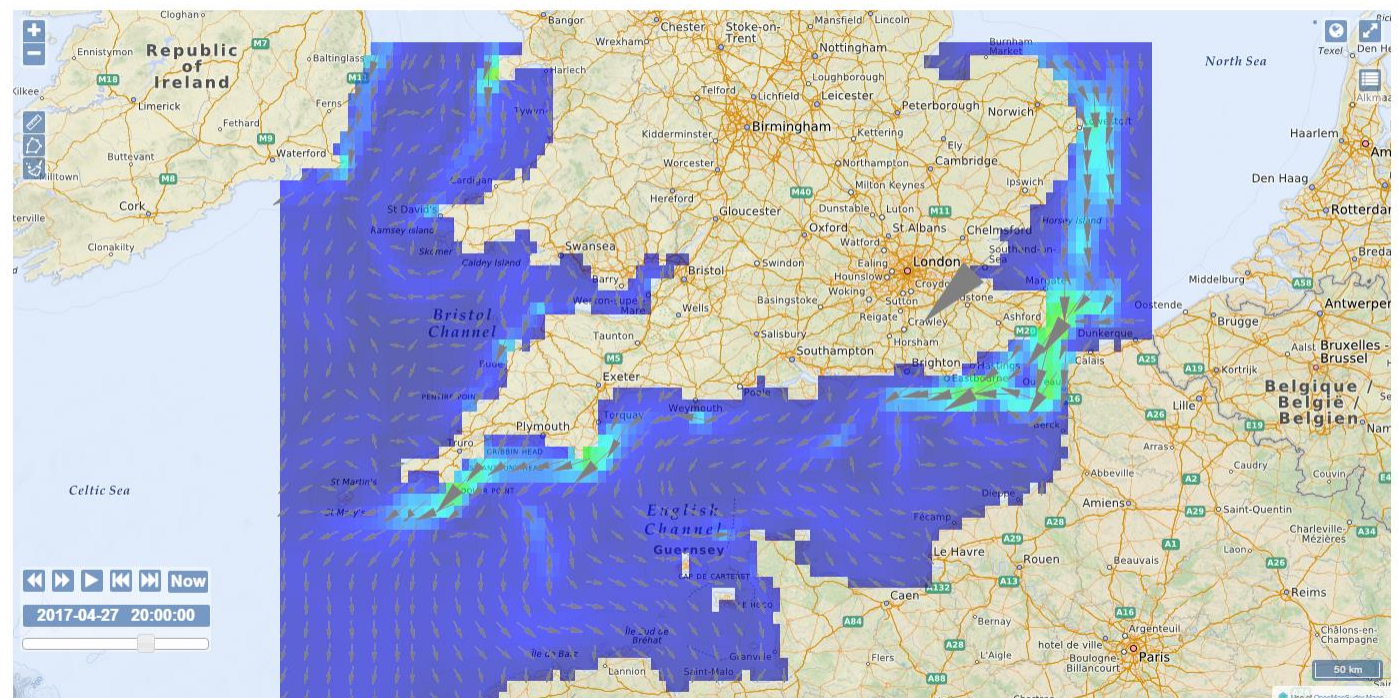
"Select one Property..."

- ☒ Barrier
- ☒ Plume Envelope
- ☒ Plume Center Trajectory

### General Options

- ☒ Tooltip on Mouse Stop

## Map



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MARINER



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# HNS modelling and environmental impact



Home Maps Charts Simulation Operational Models rodrigo.fernandes Help

**Layers**

**Domain**  
France

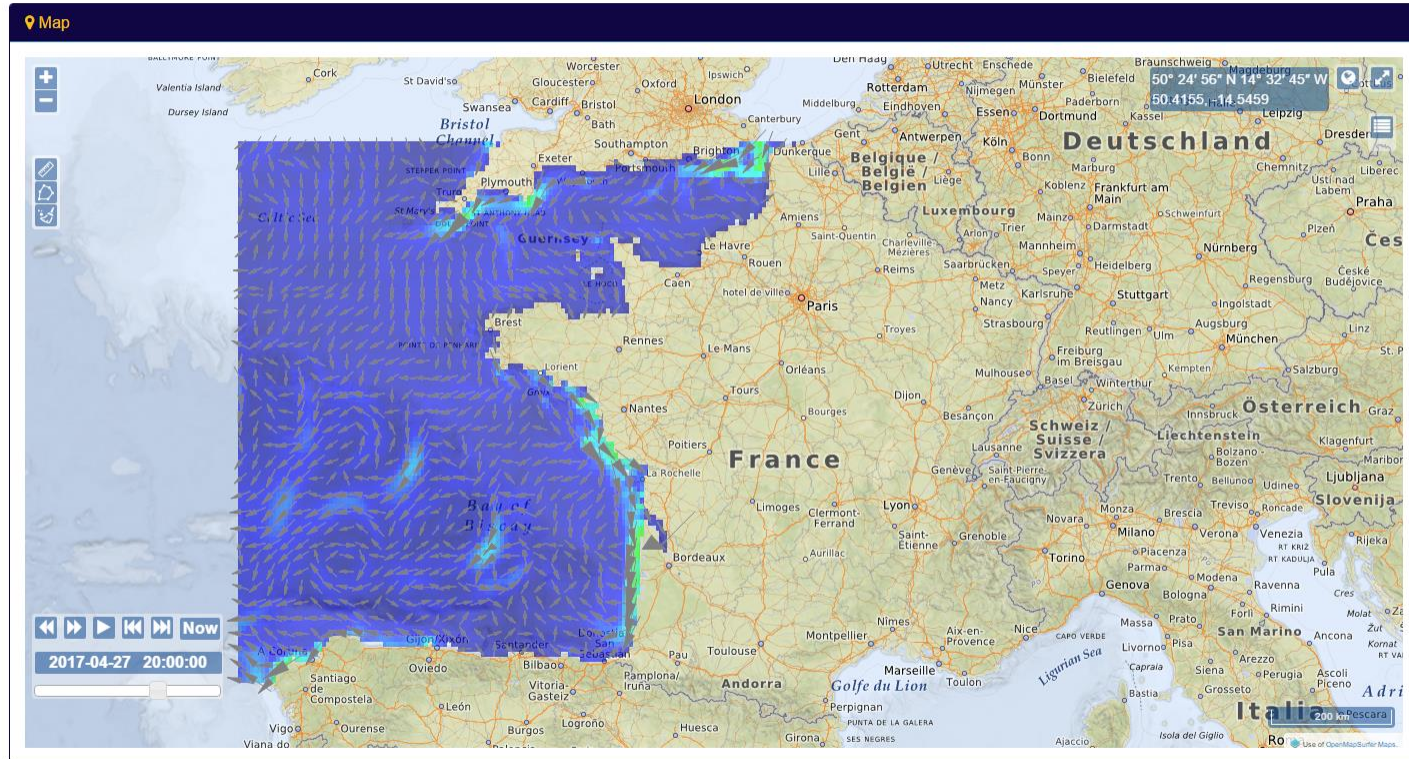
**WMS Layers**  
☐ Vessels  
☐ Monitoring Stations

**Model Results**  
Hydro MERCATOR CMEMS Surface France  
☒ Current Velocity [m/s]  
☐ None  
☒ Current Velocity Modulus [m/s]  
☐ Temperature [°C]

**User Simulation Layers**  
☒ Zoom to Emission Point  
"Select one Simulation..."

**Property**  
"Select one Property..."  
☒ Barrier  
☒ Plume Envelope  
☒ Plume Center Trajectory

**General Options**  
☒ Tooltip on Mouse Stop



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# HNS modelling and environmental impact



Home Maps Charts Simulation Operational Models rodrigo.fernandes Help

**Layers**

**Domain**

Galiza

**WMS Layers**

☐ Vessels

☐ Monitoring Stations

**Model Results**

Hydro MOHID MeteoGalicia Artabro

☐ Current Velocity [m/s]

☐ None

☒ Velocity Modulus [m/s]

☐ Temperature [°C]

☐ Salinity [psu]

**User Simulation Layers**

☒ Zoom to Emission Point

"Select one Simulation..."

**Property**

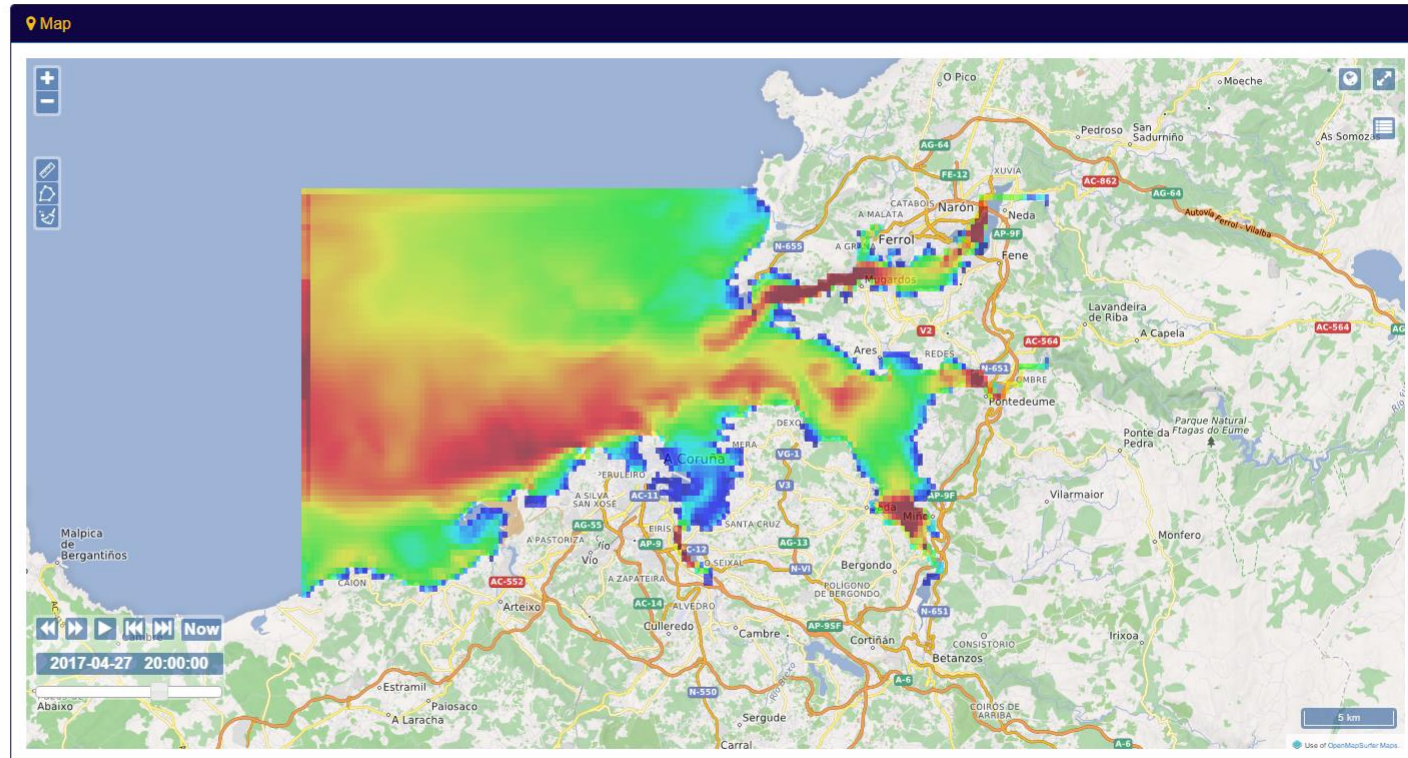
"Select one Property..."

☒ Barrier

☒ Plume Envelope

☒ Plume Center Trajectory

**General Options**



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# HNS modelling and environmental impact



Home Maps Charts Simulation Operational Models rodrigo.fernandes Help

**Layers**

**Domain**

Portugal (Cont.)

**WMS Layers**

- ☐ Vessels
- ☐ Monitoring Stations

**Model Results**

Hydro MOHID IST Portugal

- ☒ Current Velocity [m/s]
- ☐ None
- ☐ Current Velocity Modulus [m/s]
- ☐ Temperature [°C]
- ☐ Salinity [psu]

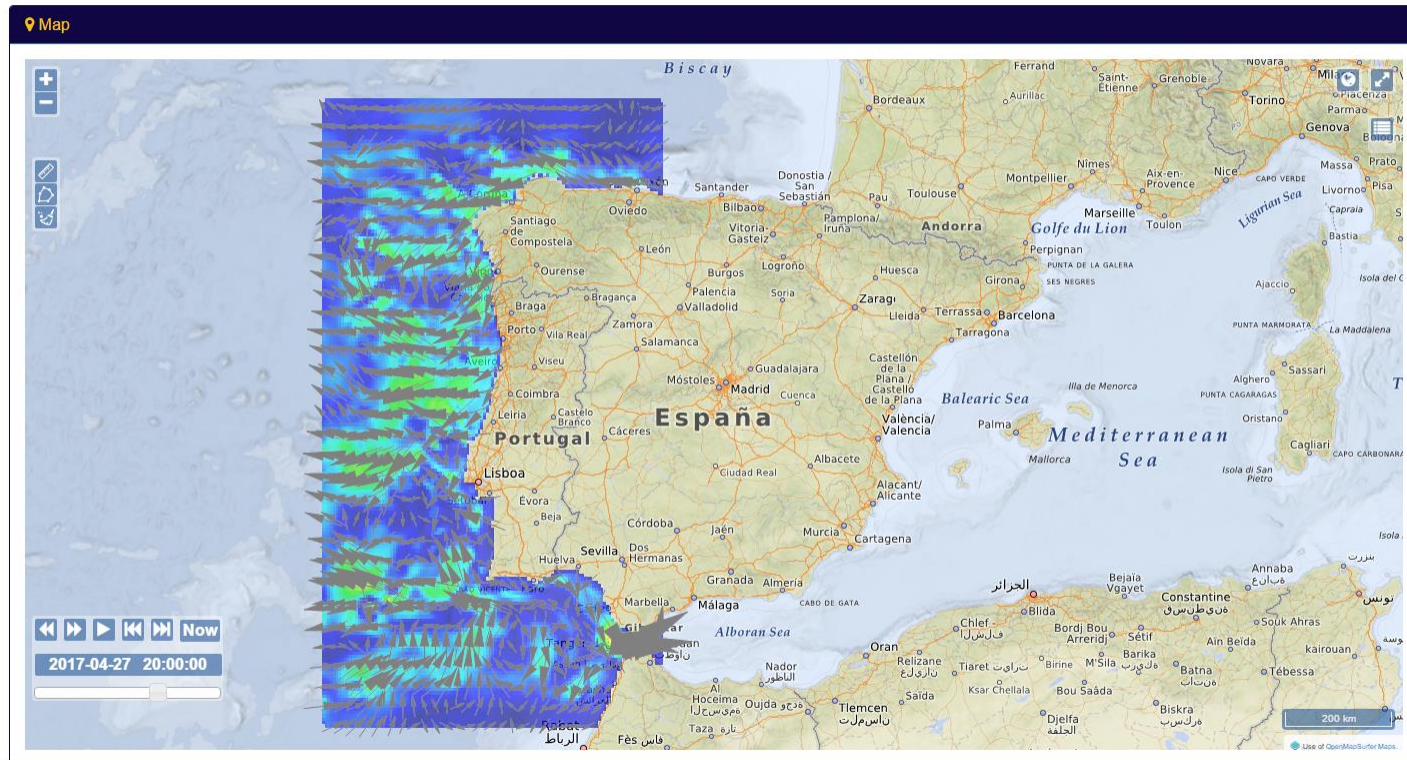
**Vulnerability Index**

- ☒ None
- ☐ Socio-Economic
- ☐ Ecological
- ☐ Environmental

**Risk Index**

- ☐ Vessel Accident Risk
- ☐ Shoreline Contamination Risk (non-modelled)

**User Simulation Layers**



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# HNS modelling and environmental impact



Home Maps Charts Simulation Operational Models rodrigo.fernandes Help

Layers

Domain

Portugal (Cont.)

WMS Layers

☐ Vessels

☐ Monitoring Stations

Model Results

Hydro MOHID AM Douro 50m

☒ Current Velocity [m/s]

☒ Current Velocity Modulus [m/s]

Vulnerability Index

☒ None

☐ Socio-Economic

☐ Ecological

☐ Environmental

Risk Index

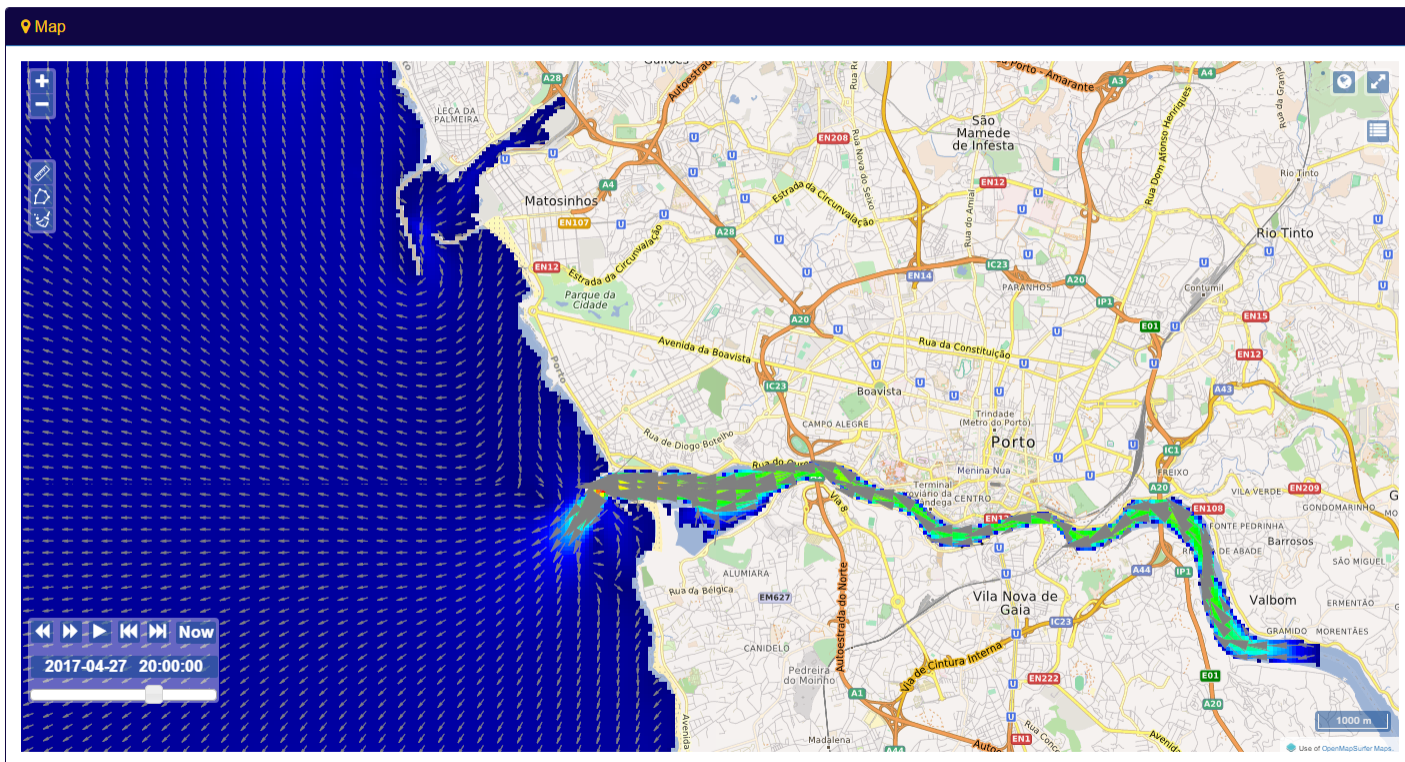
☐ Vessel Accident Risk

☐ Shoreline Contamination Risk (non-modelled)

User Simulation Layers

☒ Zoom to Emission Point

"Select one Simulation..."



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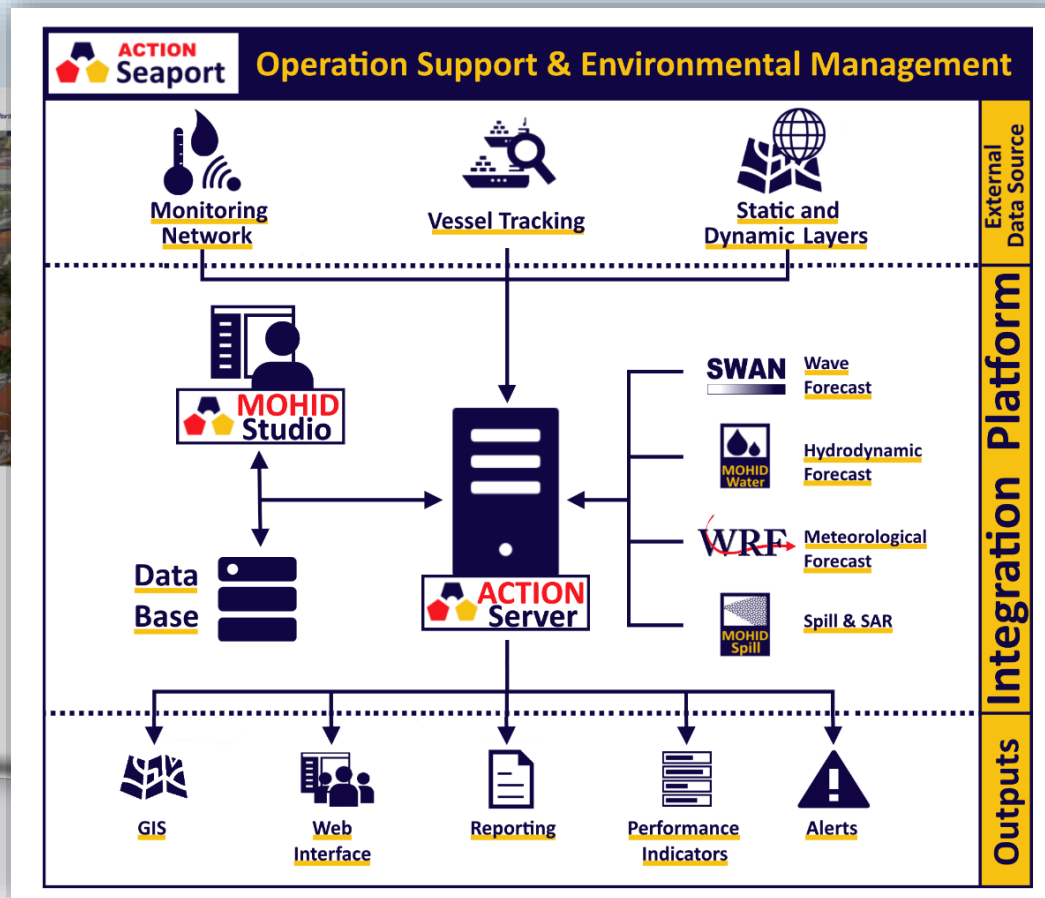
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# MARINER technology application in different contexts

## ACTION Seaport / Porto de Lisboa



[www.actionseaport.com](http://www.actionseaport.com)



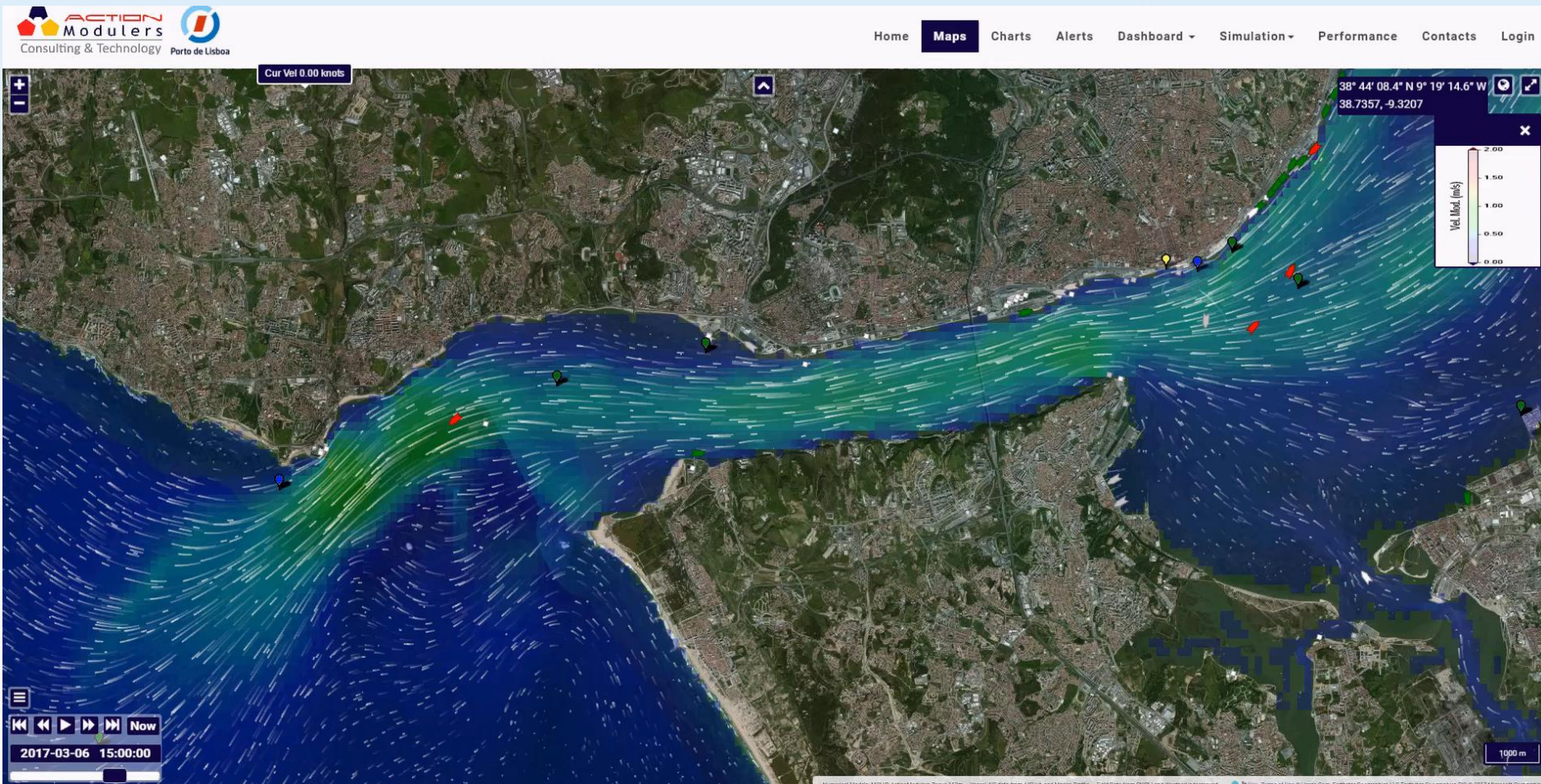
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# MARINER technology application in different contexts

## *ACTION Seaport in action | Maps & metocean models*



**Ultimate user-experience** in an advanced web-based platform, with visually striking maps

**Seamless integration high resolution metocean** (waves, currents, meteo) **forecasting systems.**



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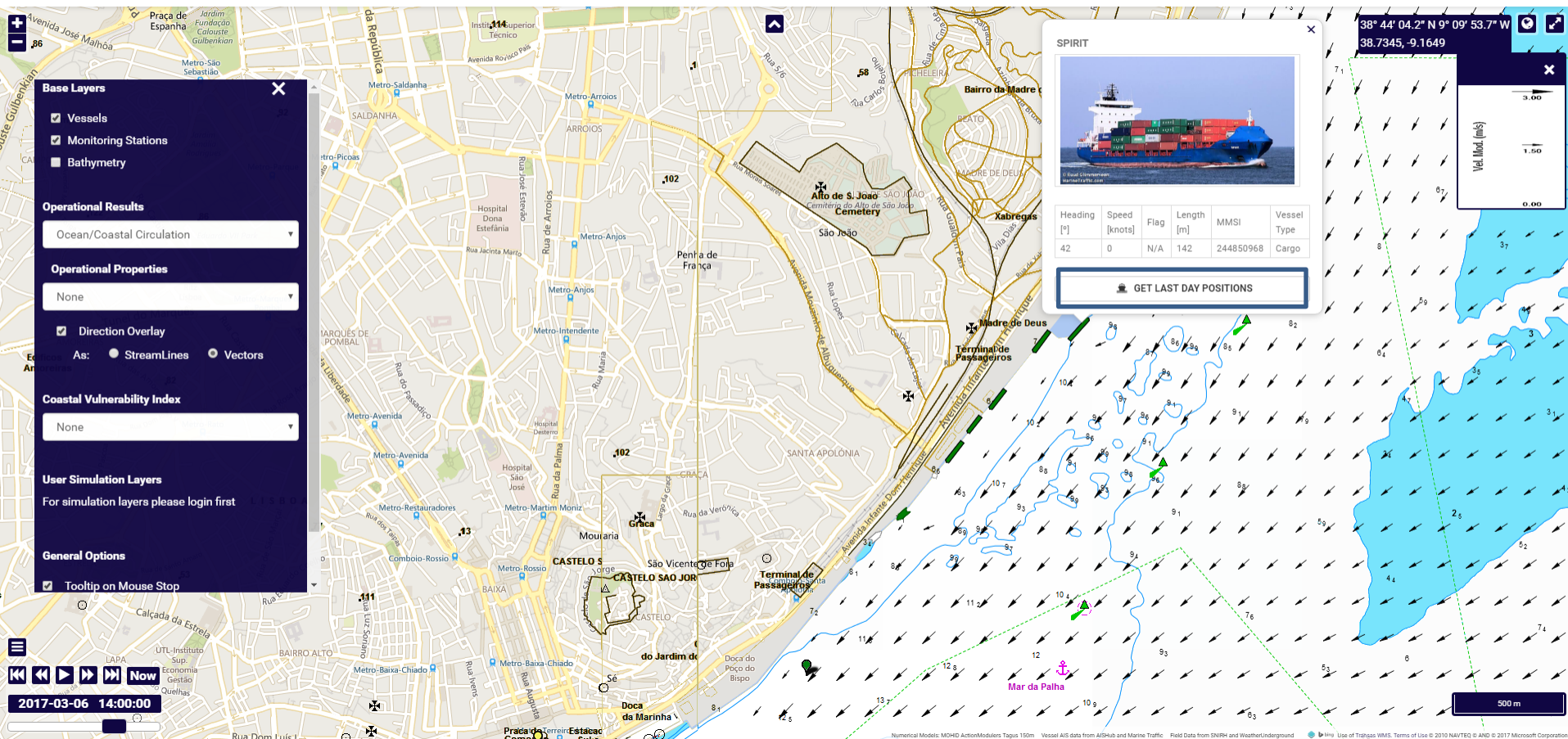


## MARINER technology application in different contexts

## ***ACTION Seaport in action | Maps & vessels***



[Home](#)
[Maps](#)
[Charts](#)
[Alerts](#)
[Dashboard ▾](#)
[Simulation ▾](#)
[Performance](#)
[Contacts](#)
[Login](#)



## AIS real-time and historic vessel tracking



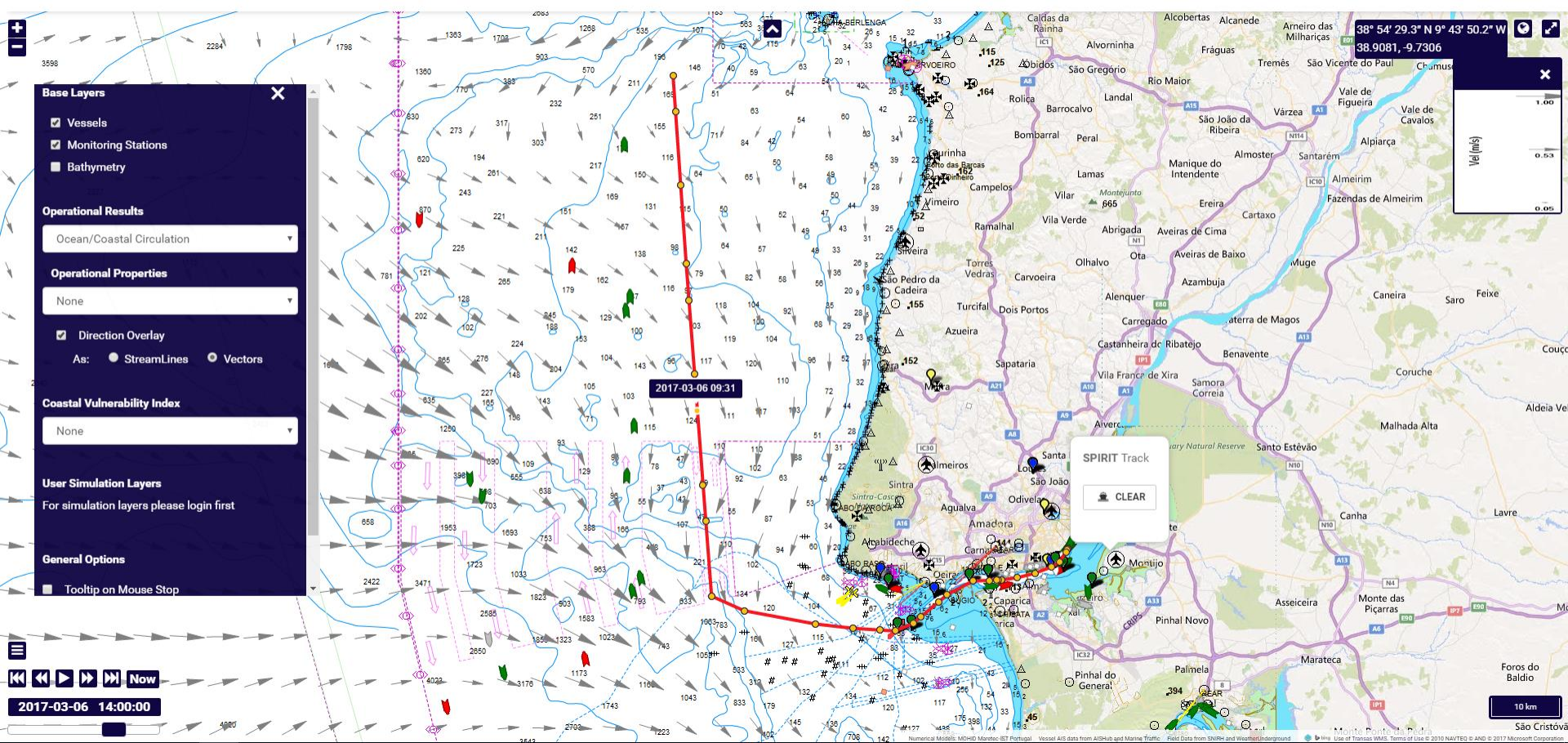
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# MARINER technology application in different contexts

## ACTION Seaport in action| Maps & vessels



AIS real-time and historic vessel tracking



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# MARINER technology application in different contexts

## ***ACTION Seaport in action | Charts (graph format)***

Select Location to obtain modelled values in blue and measured values in yellow (if exist).

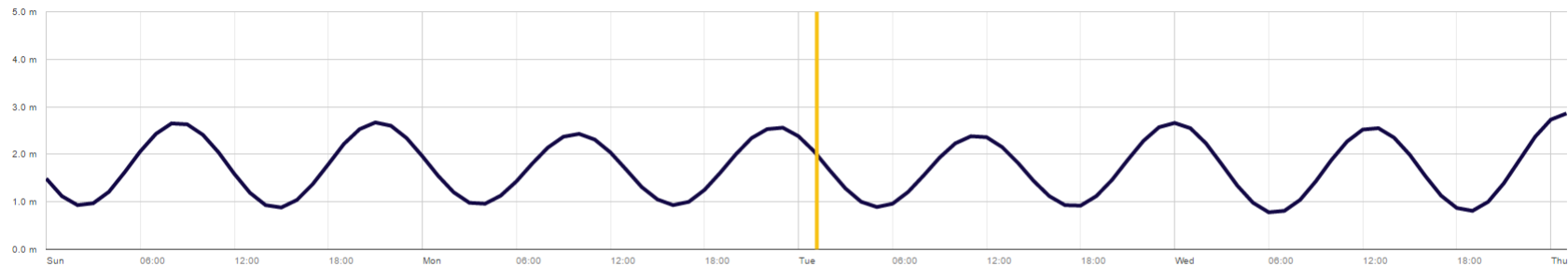
Vertical Line indicates current date.

Cascais Anchorage



**Chart** Table

### Water Level [m]



### Current Velocity [knots]

3.0 knots

Possibility of online comparison (measures vs. models) in multiple points

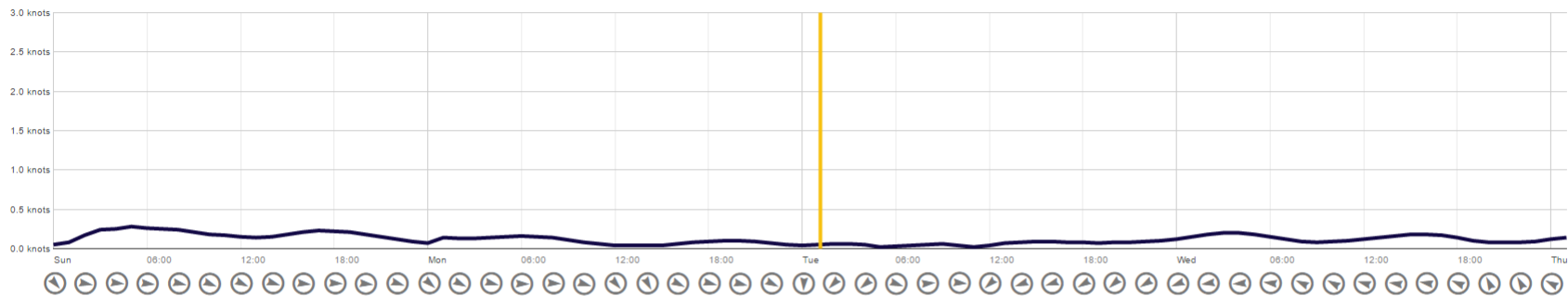


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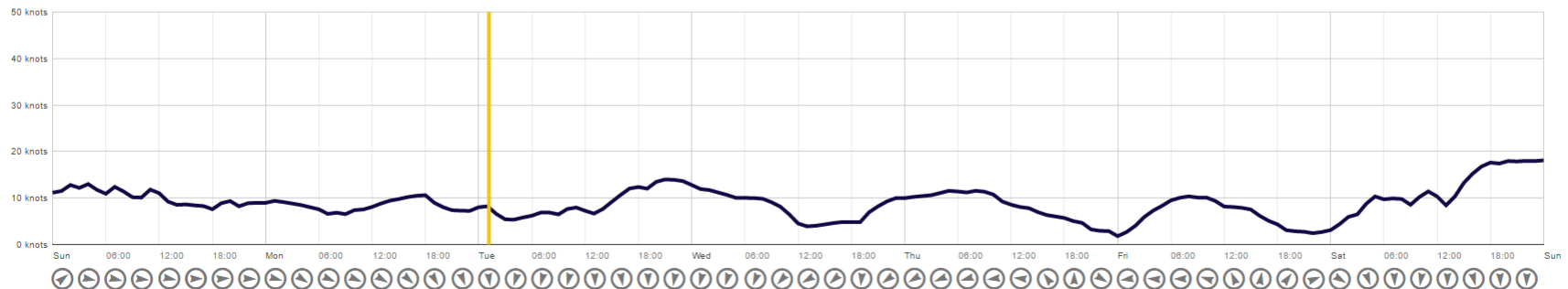
# MARINER technology application in different contexts

## ***ACTION Seaport in action | Charts (graph format)***

### **Current Velocity [knots]**



### **Wind Velocity [knots]**



### **Rainfall [mm/h]**

Possibility of online comparison (measures vs. models) in multiple points



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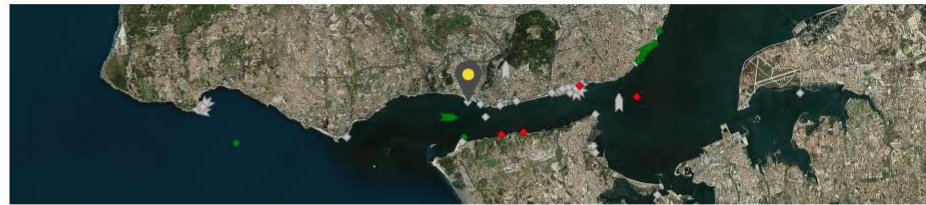
# MARINER technology application in different contexts

## ACTION Seaport in action | Charts (table format)

Select Location to obtain modelled values in blue and measured values in yellow (if exist).

Vertical Line indicates current date.

Torre VTS



Chart

**Table**

	Tue 07																							Wed 08												
🕒 Hours	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	0	1	2	3	4	5	6	7	8	9	10	11
📏 Level m	3	2.6	2.1	1.6	1.3	1.1	1.2	1.5	1.9	2.3	2.7	2.9	2.9	2.7	2.3	1.8	1.4	1.2	1.1	1.3	1.7	2.2	2.7	3	3.2	3.1	2.8	2.2	1.7	1.3	1	1	1.3	1.7	2.2	2.7
🌀 Cur Vel knots	0.5	0.8	0.6	0.3	0.1	0.2	0.5	0.7	0.7	0.8	0.7	0.5	0	0.6	0.7	0.5	0.3	0	0.4	0.6	0.7	0.8	0.9	0.8	0.5	0.2	0.8	0.7	0.4	0.2	0.1	0.4	0.7	0.8	0.8	0.9
🌀 Cur Dir °	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	
🌬 Wind Vel knots	3.8	3.4	3.3	3.8	4.4	5	5.3	5.9	5.5	5.6	6.4	6.3	5.8	4.9	4.3	4.3	5.2	8	10.1	9.4	10.3	10.3	10	9.5	9.1	9.2	9.1	8.7	8.2	8	8.1	8.3	8.1	7.8	9	9
🌀 Wind Dir °	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	↻	
☁ Rain mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
🌡 Air Temp °C	12	11	12	12	12	12	12	12	12	12	12	13	15	17	18	19	20	20	20	17	15	14	14	13	13	13	12	12	11	11	11	10	10	11	14	16

Possibility of online comparison (measures vs. models) in multiple points



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# MARINER technology application in different contexts

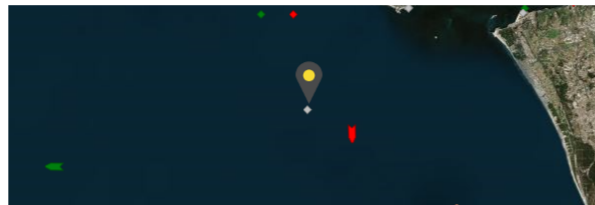
## ACTION Seaport in action | Alerts & Reporting

Select Location to obtain graphs of predicted Douglas (waves), Beaufort (wind) and Precipitation Scales for selected location.

Barra Sul Baliza

Vertical Line indicates current date.

Customized alerts in form of email and SMS can be defined for regular reporting and when alert levels change.

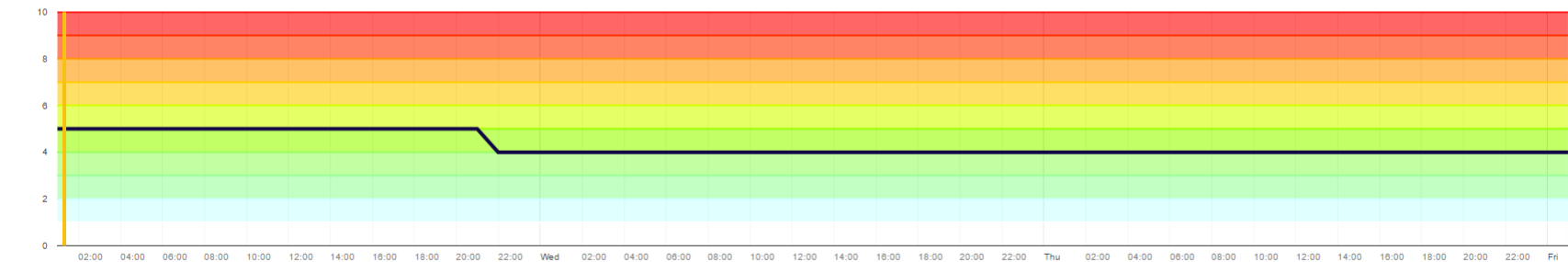


Maximum Douglas forecasted is 5

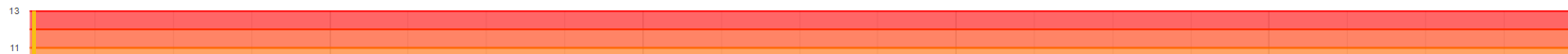
Maximum Beaufort forecasted is 5

Maximum Precipitation level forecasted is no alert

### Douglas sea scale (swell)



### Beaufort wind scale



Distribution of digital reports, tailor-made SMS and email alerts based on meteocean conditions.

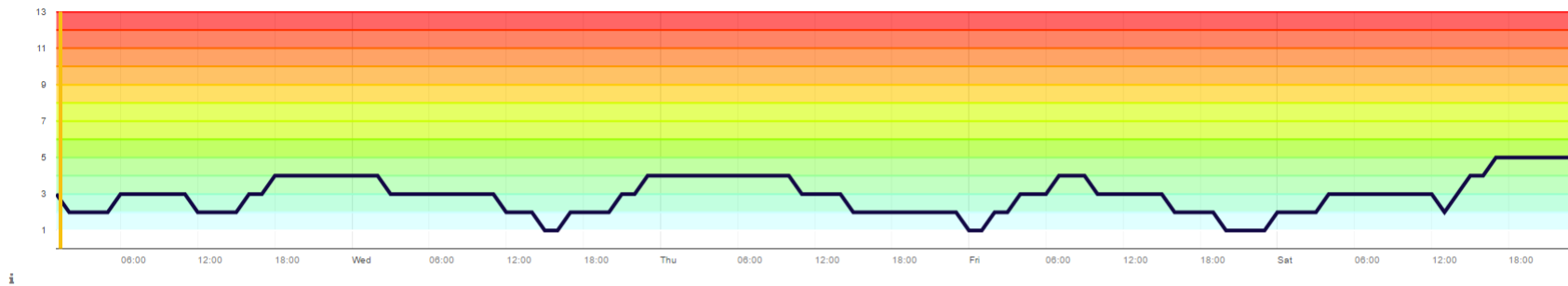


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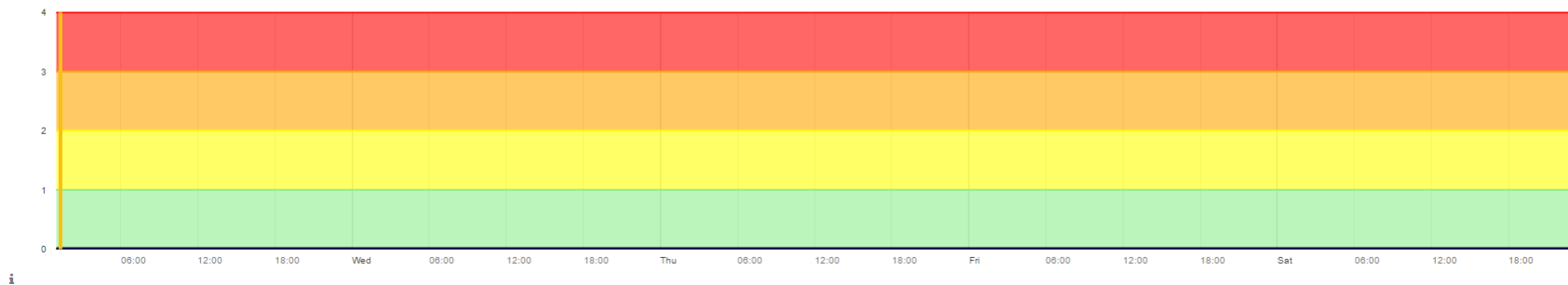
# MARINER technology application in different contexts

## ACTION Seaport in action | Alerts & Reporting

### Beaufort wind scale



### Precipitation Scale Forecast



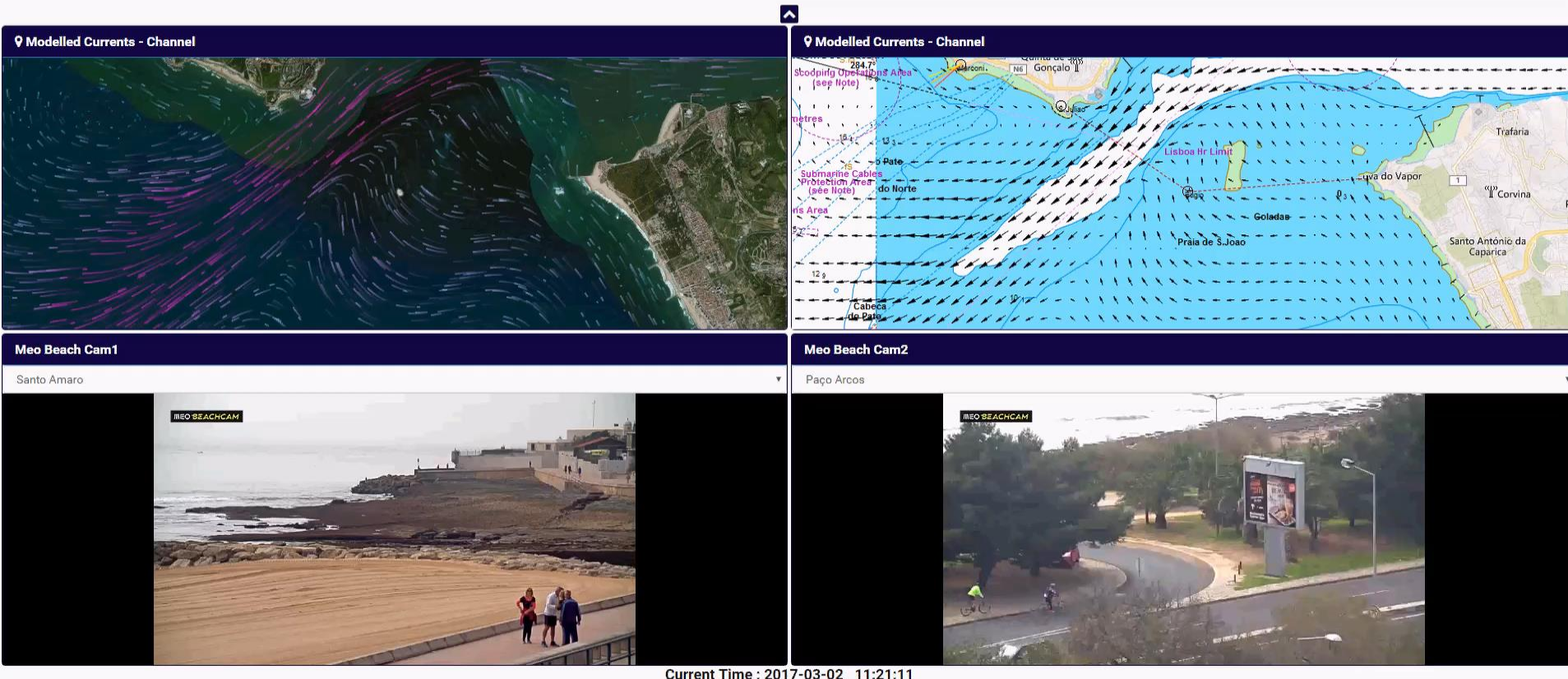
Distribution of digital reports, tailor-made SMS and email alerts based on metocean conditions.



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# MARINER technology application in different contexts

## *ACTION Seaport in action | Dynamic dashboards I*



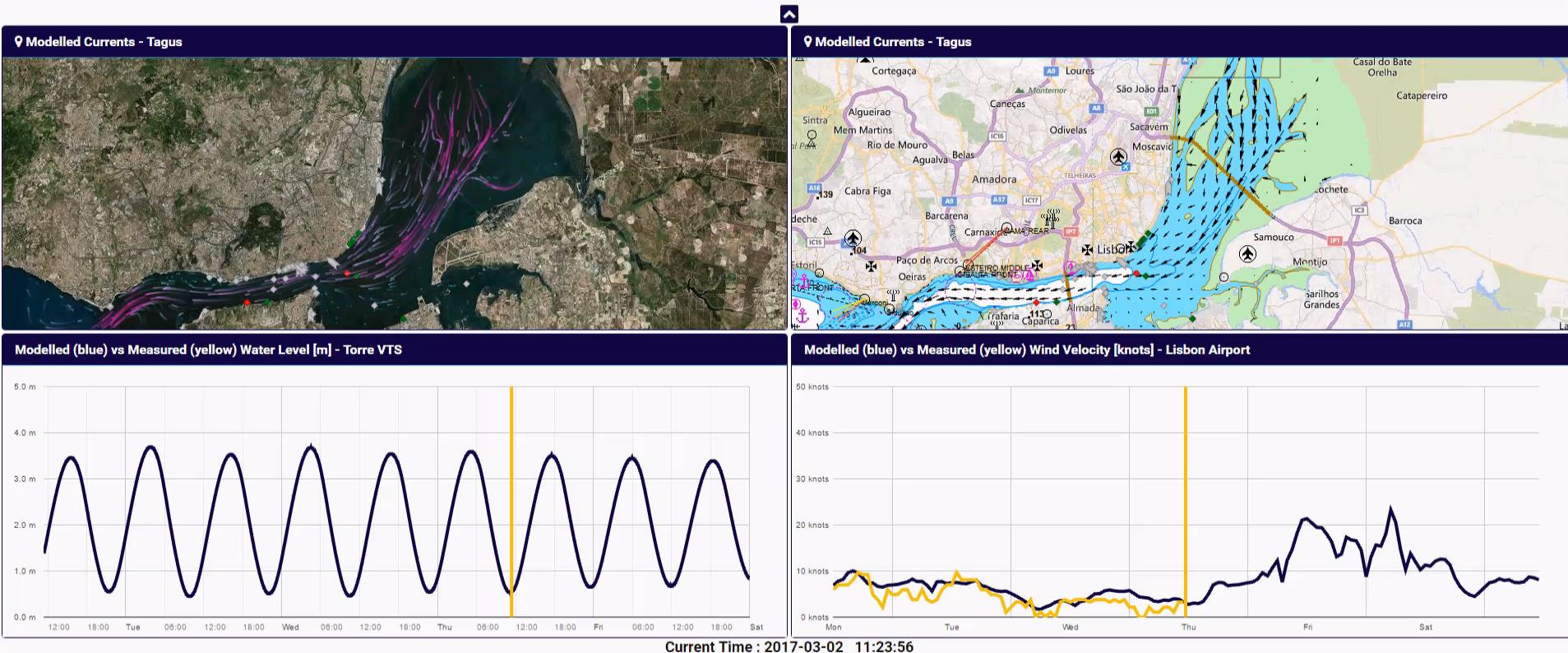
Multiple data sources automatically updated in dynamic dashboards for wall screens





# MARINER technology application in different contexts

## ACTION Seaport in action | Dynamic dashboards II



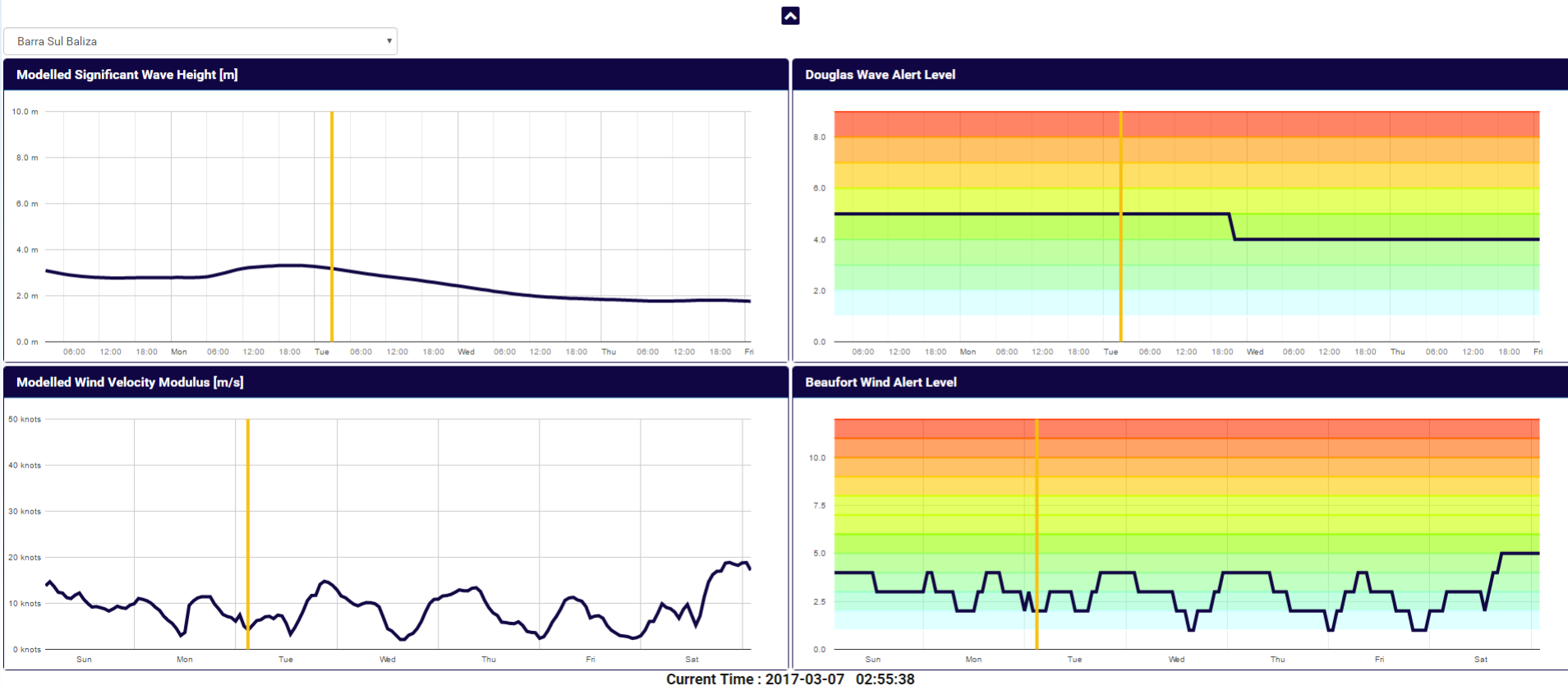
Multiple data sources automatically updated in dynamic dashboards for wall screens



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# MARINER technology application in different contexts

## ***ACTION Seaport in action | Dynamic dashboards***



Multiple data sources automatically updated in dynamic dashboards for wall screens



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# MARINER technology application in different contexts

***ACTION Seaport in action |***

***Emergency response: oil / chemical spill simulations***

1. What?

2. Where?

3. When?

4. Run

Incident Name

2017-03-07 01:39:37 Sim Name

Substance Type

Oil Spill

Oil Spill Options

Medium Oils (Most Crude Oils)

Previous

Next

**State-of-the-art, on-the-fly, and reliable water and air dispersion modelling for floating containers, inert, oil and HNS spills**

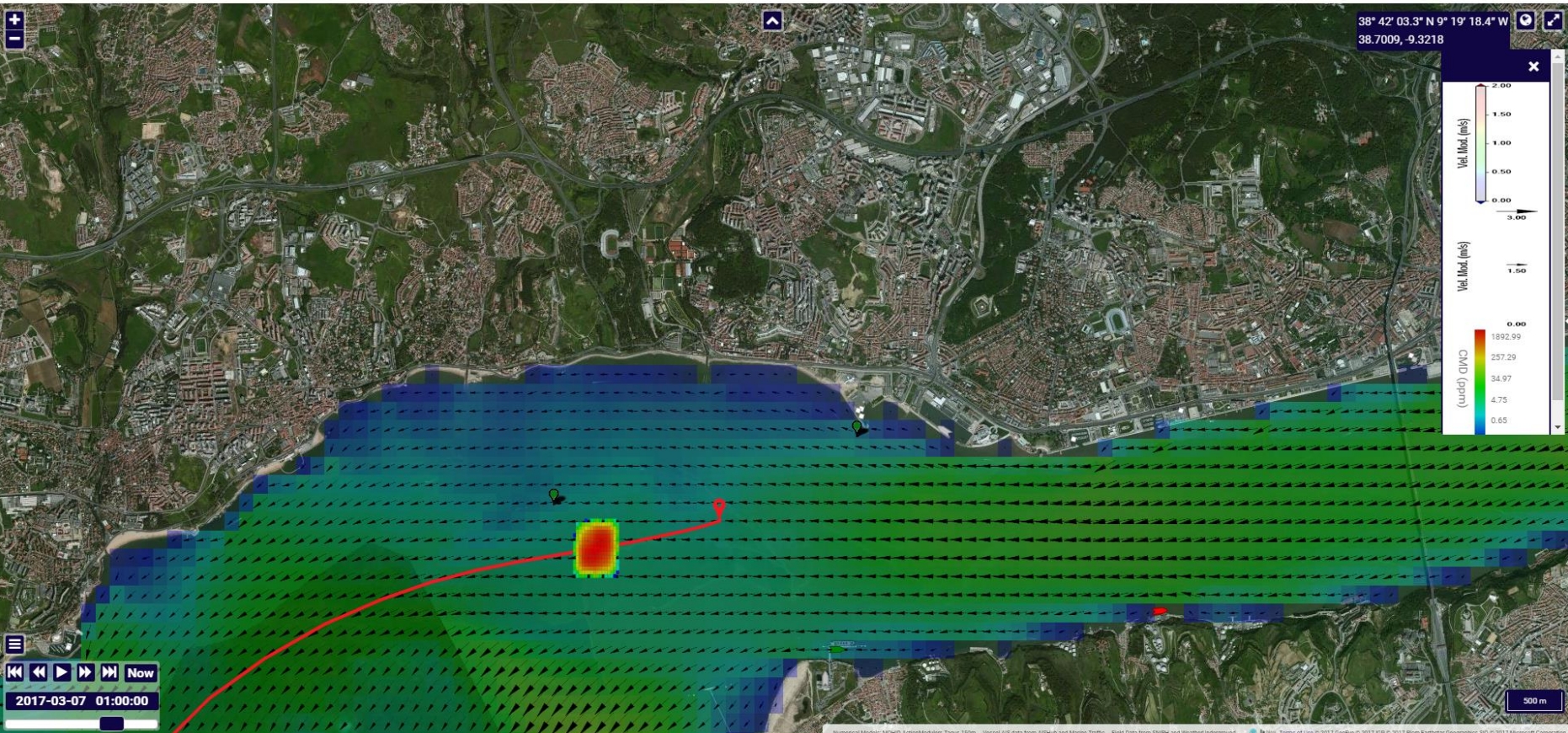




# MARINER technology application in different contexts

## ACTION Seaport in action |

## Emergency response: oil / chemical spill simulations



State-of-the-art, on-the-fly, and reliable water and air dispersion modelling for floating containers, inert, oil and HNS spills

# MARINER: Achievements

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1. Comprehensive water & chemical air spill model:
  - multiple processes and properties evolution at the same time;
  - Based on physical and chemical characteristics (not in classes)
2. Integration of the model in a web, mobile-friendly technology, and results exportable to other systems
3. Flexibility & transferability: applicable in any place, and with seamless integration of different metocean models
4. Dynamic connection with HNS products database \*
5. Environmental impact modelling \*

\* CIIMAR presentation



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# MARINER



*Thank you!*



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