



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

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

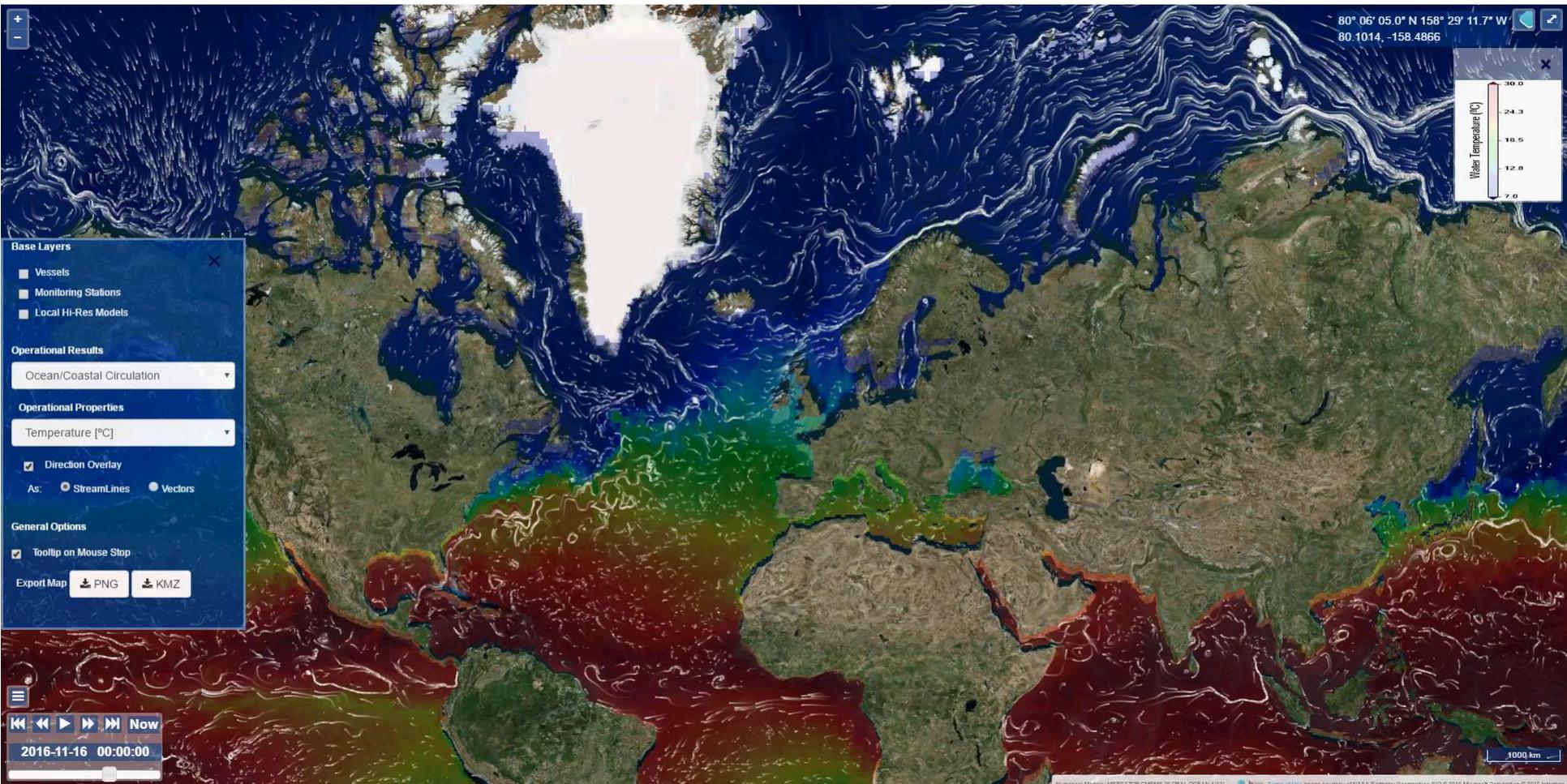
**Rodrigo Fernandes, David Brito, Frank Braunschweig  
(Action Modulers – Consulting & Technology, Lda.)**

**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)

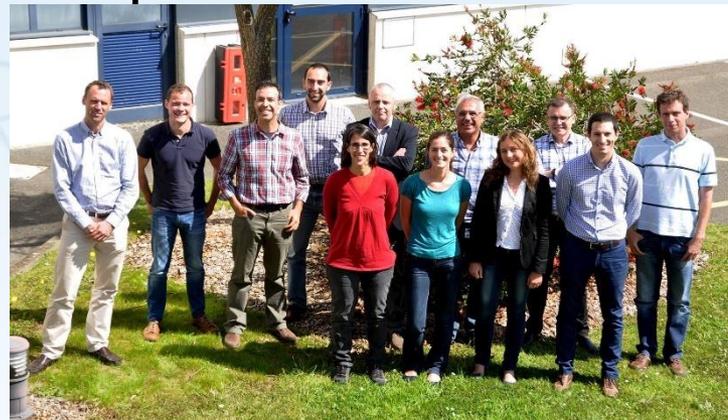
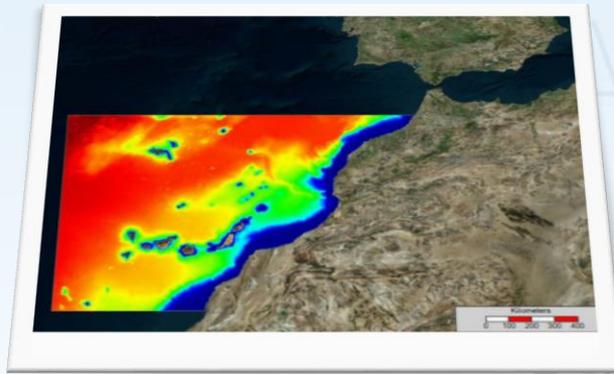
- Active since 1 February 2014
- Main goal: a mechanism to ensure cooperation between the Contracting Parties in the case of pollution incidents
- Geographical boundaries with Bonn Agreement (North Sea) and Barcelona Convention (Mediterranean Sea)



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# MARPOCS

## 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)

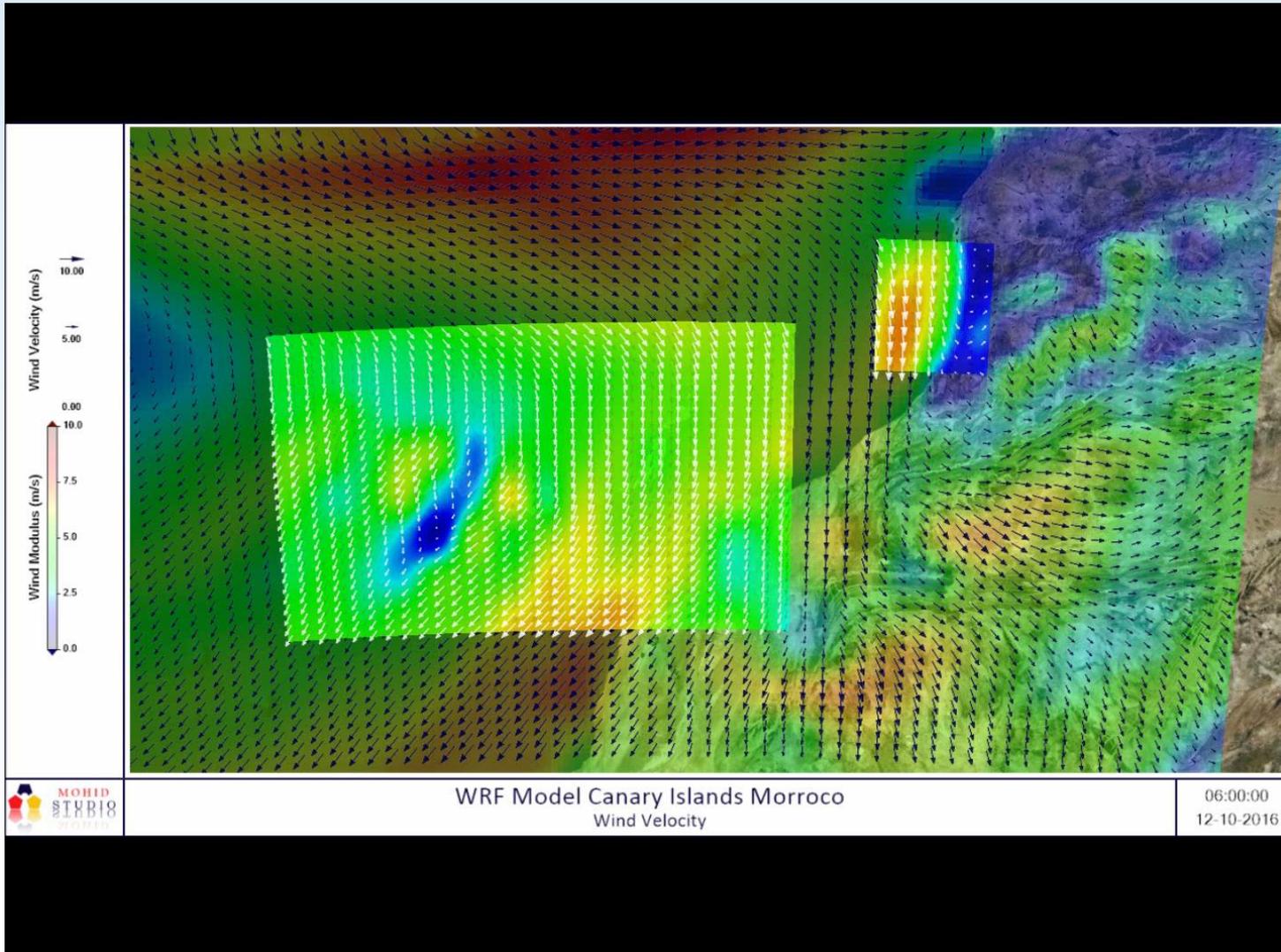
Acronym: MARPOCS  
Grant Agreement no: ECHO/SUB/2015/713854/PREP08



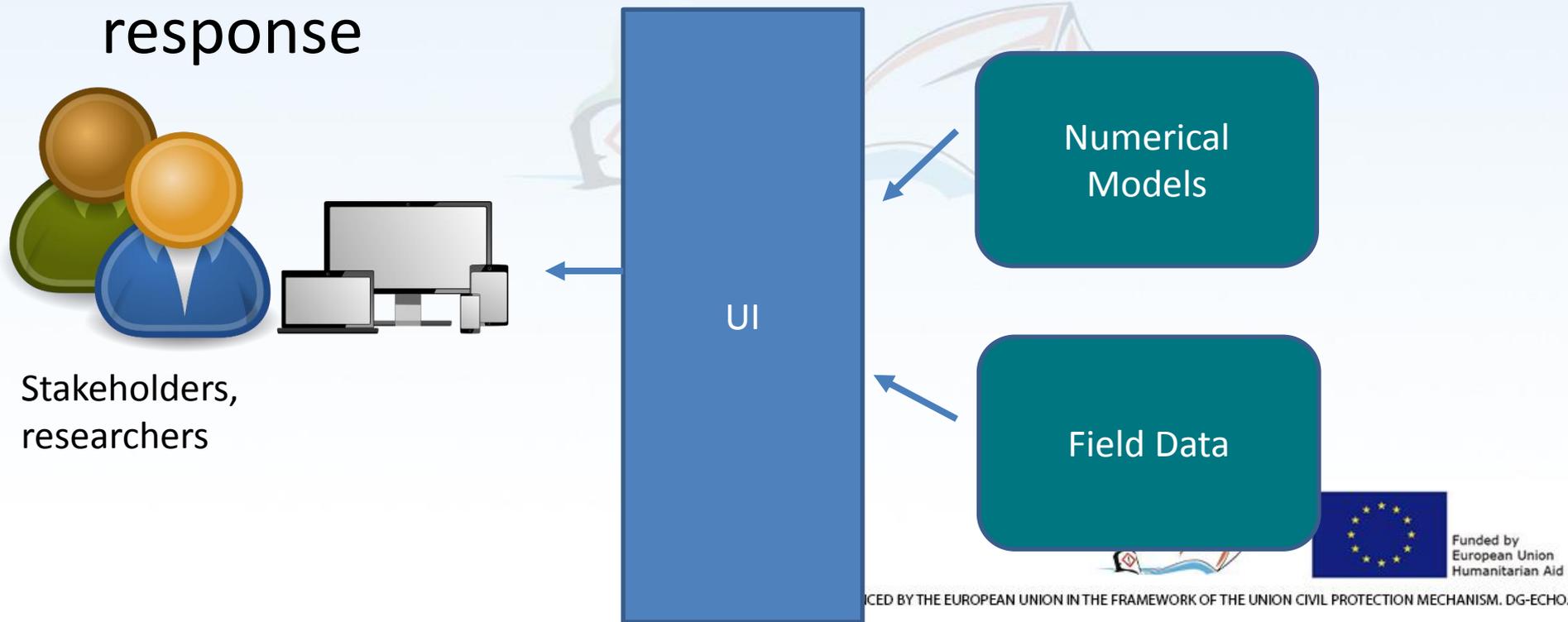
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PROJECT CO-FINANCED BY THE EUROPEAN UNION IN THE FRAMEWORK OF THE UNION CIVIL PROTECTION MECHANISM. DG-ECHO.

# 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



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# Decision Support Systems | web tool

**Layers**

**Domain**  
Madeira/Canary/Morocco

**WMS Layers**

- Vessels
- Monitoring Stations

**Model Results**  
MERCATOR CMEMS Surface Madeira/Marrocco/Canary

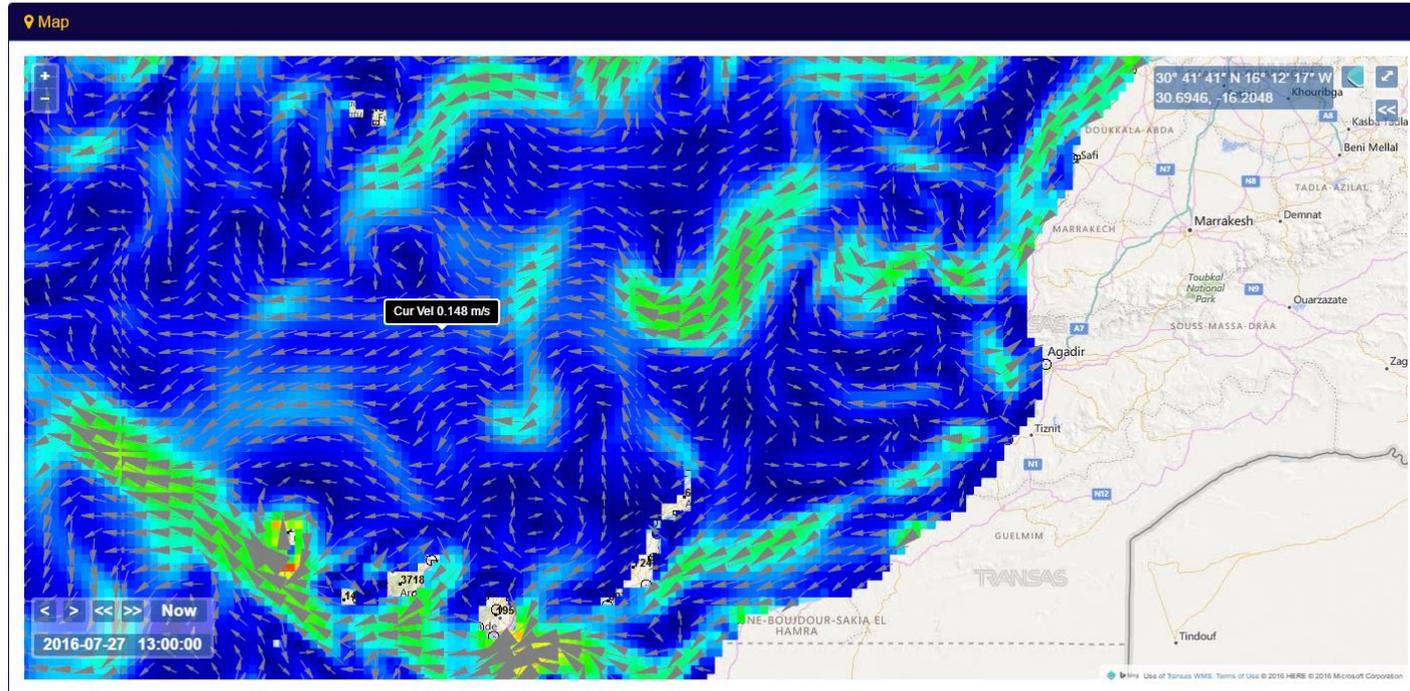
- Current Velocity
- None
- Current Velocity Modulus
- Temperature

**User Simulation Layers**  
"Select one Simulation..."

**Property**  
"Select one Property..."

- Particles
- Barrier

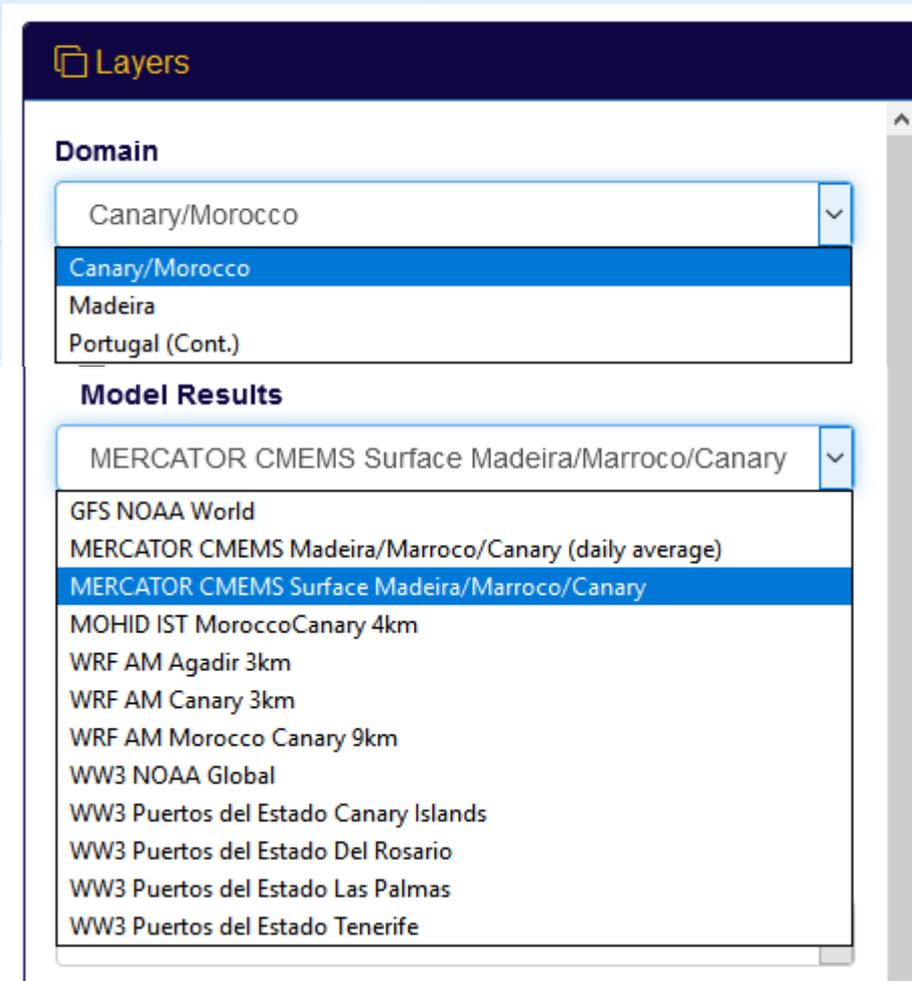
Tooltip on mouse stop



# Marpocs Platform

## Map Domains (modelling Platform)

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



The screenshot shows the 'Layers' panel of the Marpocs Platform. It features a 'Domain' dropdown menu with 'Canary/Morocco' selected, and a 'Model Results' dropdown menu with 'MERCATOR CMEMS Surface Madeira/Marroco/Canary' selected. The list of model results includes:

- GFS NOAA World
- MERCATOR CMEMS Madeira/Marroco/Canary (daily average)
- MERCATOR CMEMS Surface Madeira/Marroco/Canary
- MOHID IST MoroccoCanary 4km
- WRF AM Agadir 3km
- WRF AM Canary 3km
- WRF AM Morocco Canary 9km
- WW3 NOAA Global
- WW3 Puertos del Estado Canary Islands
- WW3 Puertos del Estado Del Rosario
- WW3 Puertos del Estado Las Palmas
- WW3 Puertos del Estado Tenerife

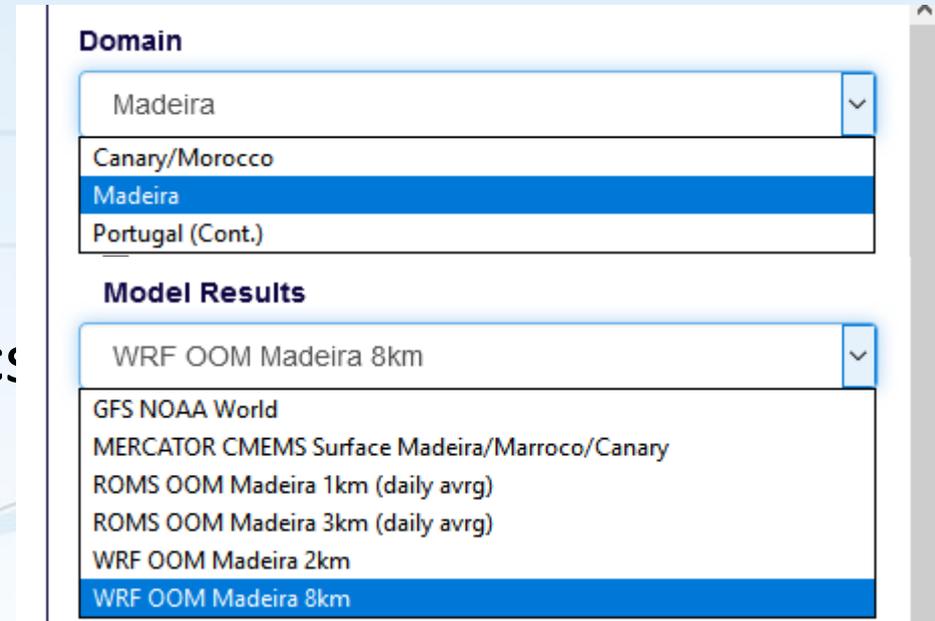


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# Marpocs Platform

## Map Domains

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



The screenshot shows a web interface for the Marpocs Platform. It features two dropdown menus. The first menu, titled "Domain", has "Madeira" selected. The second menu, titled "Model Results", has "WRF OOM Madeira 8km" selected. The background of the slide includes a faint "MAR" watermark and a logo of a boat with a warning sign.

| Domain           |
|------------------|
| Madeira          |
| Canary/Morocco   |
| <b>Madeira</b>   |
| 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                           |
| <b>WRF OOM Madeira 8km</b>                    |



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# 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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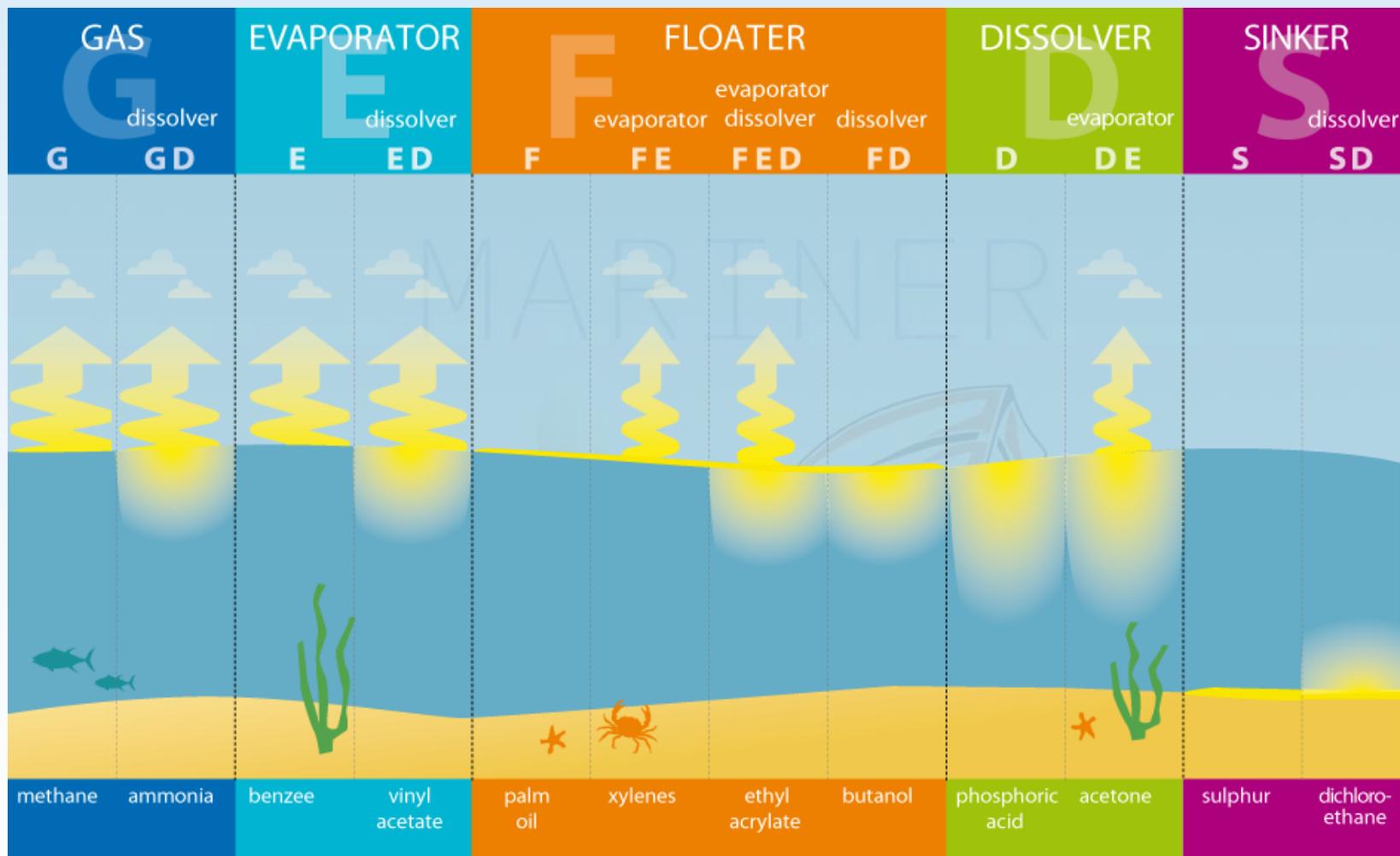
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5. Environmental impact modelling \*

\* CIIMAR presentation



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# HNS: behaviour classes



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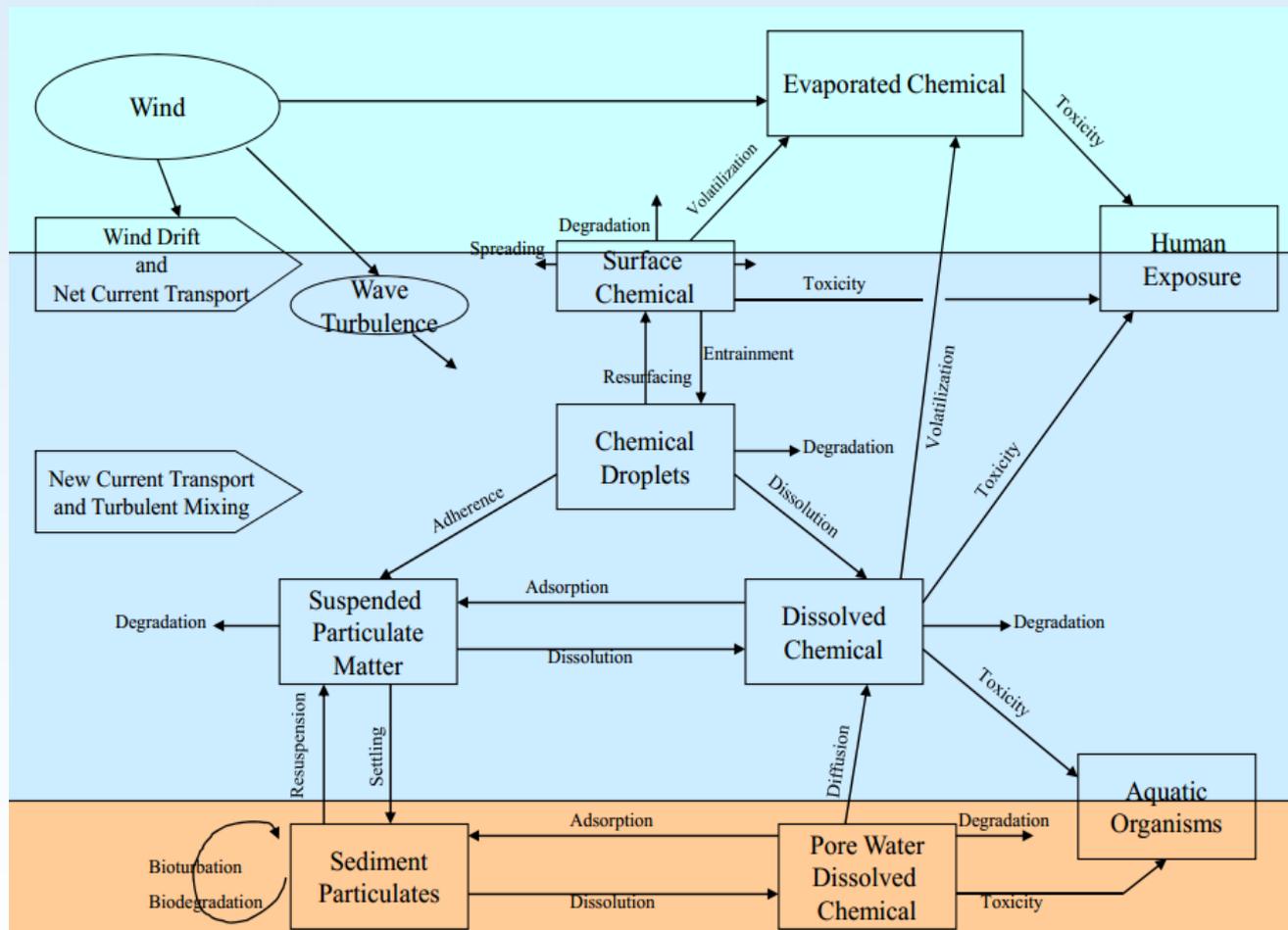
# HNS: behaviour classes

- Classes are far from reality...



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# HNS fate & behaviour



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# MARINER: Achievements

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5. Environmental impact modelling \*

\* CIIMAR presentation



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# HNS modelling and environmental impact

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

Mariner Platform

mariner.actionmodt

MARINER

1. What?
2. Where?
3. When?
4. Run

**Incident Name**

2016-10-15 02:14:41 Sim Name

**Substance Type**

HNS Spill

**Chemical Spill Options**

1-nonanol (Floater)

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Mariner Platform

mariner.actionmodt

MARINER

1. What?
2. Where?
3. When?
4. Run

**Domain**

France

**Pick Incident Locations Interactively**

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Mariner Platform

mariner.actionmodt

MARINER

2. Where?
3. When?
4. Run

**Incident Type**

Continuous  Instantaneous

**Incident Instant/Simulation Start**

2016-10-15 00:00

**Simulation End**

2016-10-15 06:00

**Volume (m3)**

100

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# HNS modelling and environmental impact

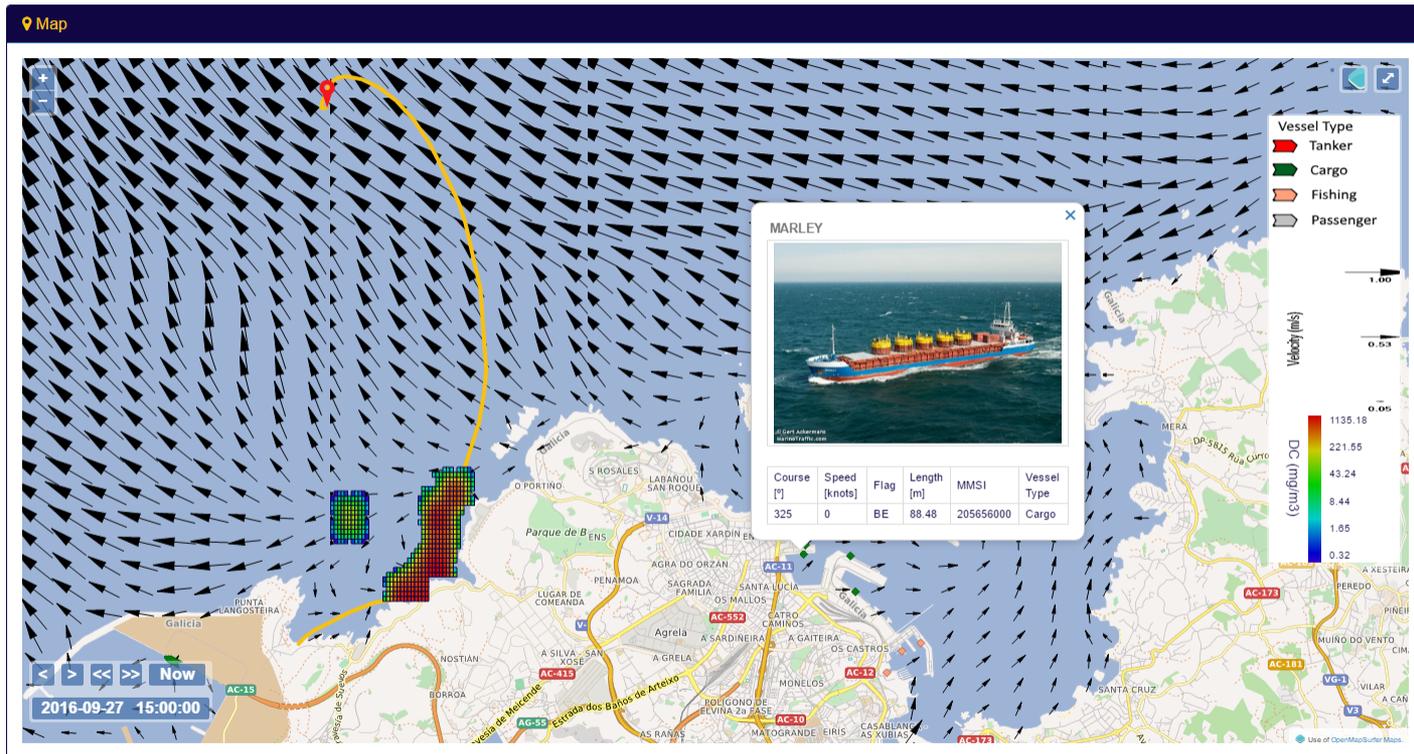
## MARINER PLATFORM: HNS simulations



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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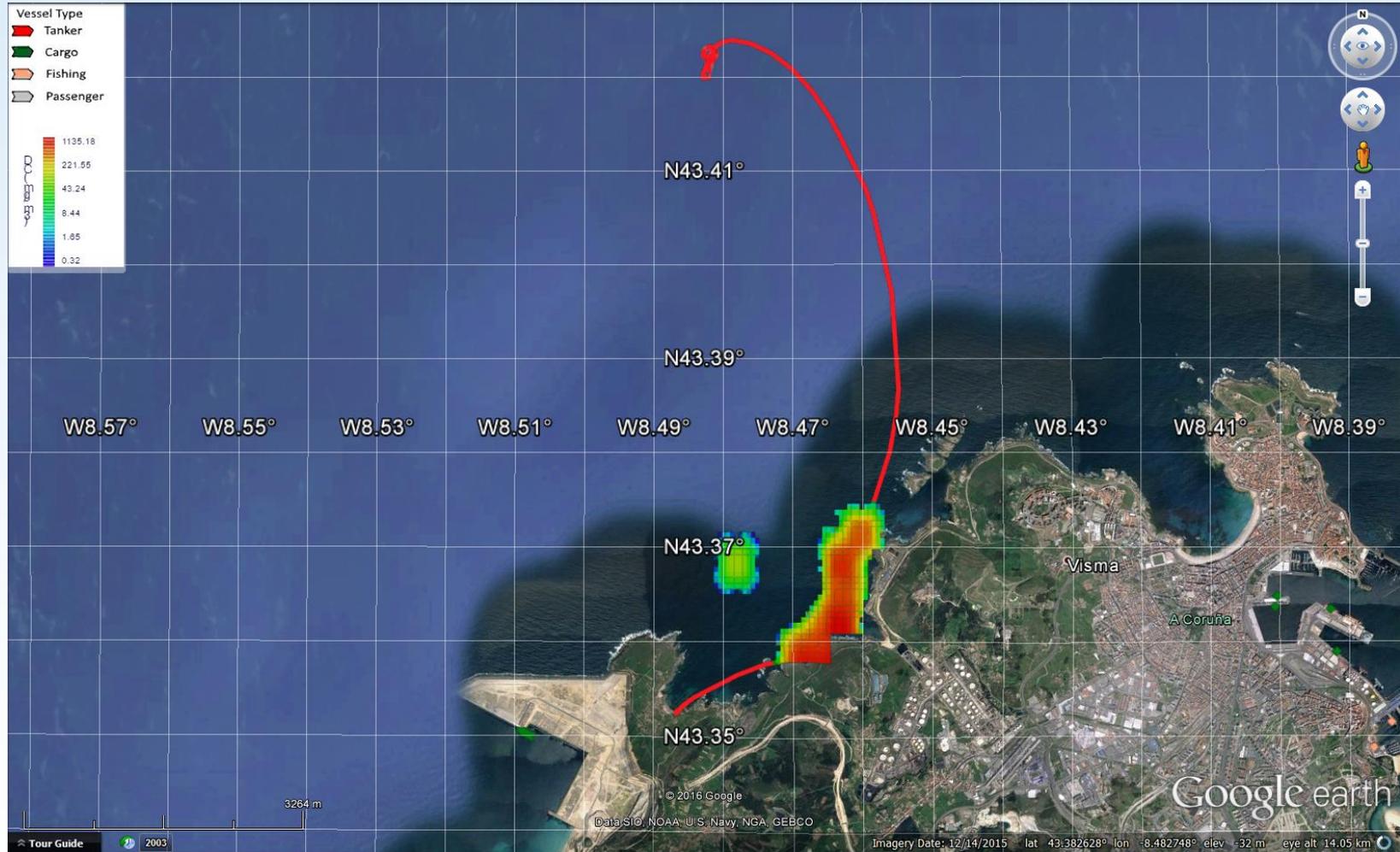


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# HNS modelling and environmental impact

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



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# MARINER: Achievements

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1. Comprehensive water & air behaviour chemical spill model:
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4. Dynamic connection with HNS products database \*
5. Environmental impact modelling \*

\* CIIMAR presentation



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# 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]

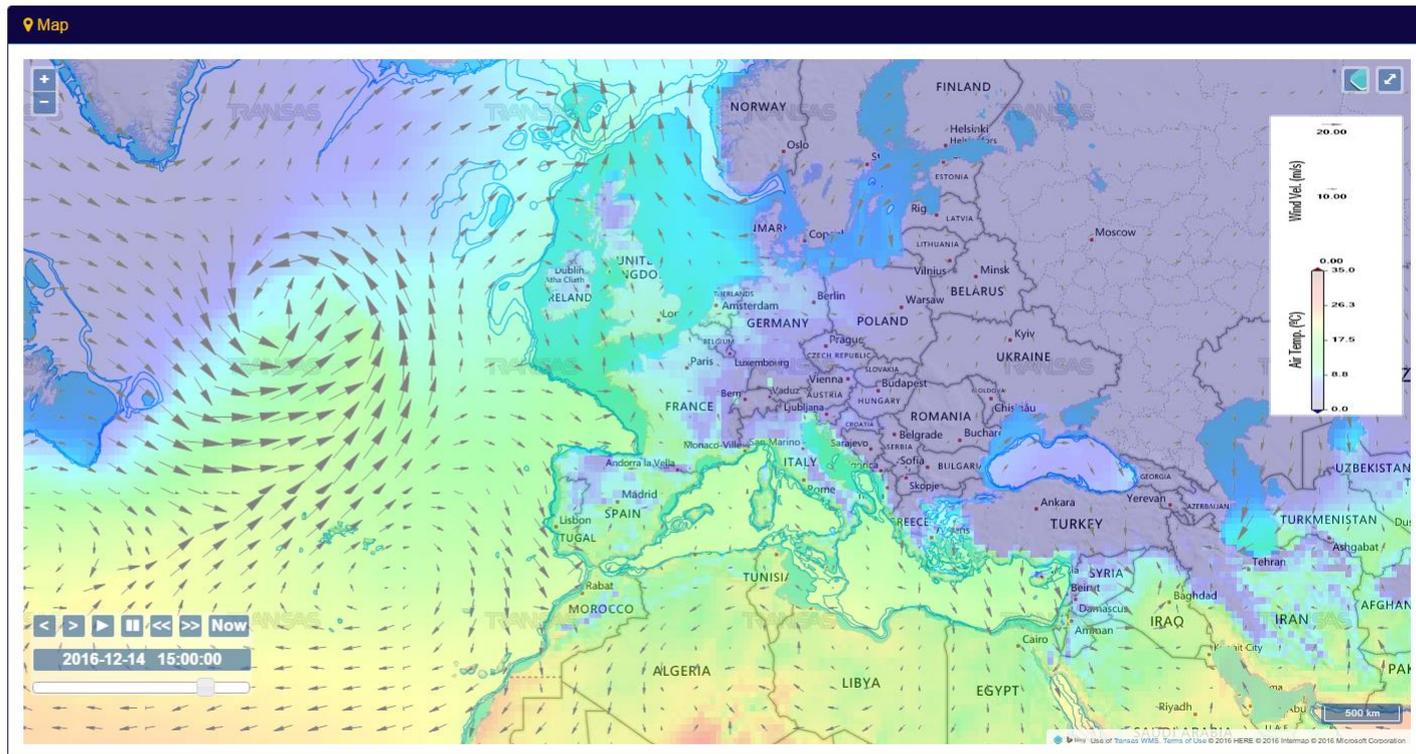
**User Simulation Layers**  
 Zoom to Emission Point  
"Select one Simulation..."

**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



**Layers**

**Domain**  
England

**WMS Layers**  
 Vessels  
 Monitoring Stations

**Model Results**  
Hydro MERCATOR CMEMS Surface England

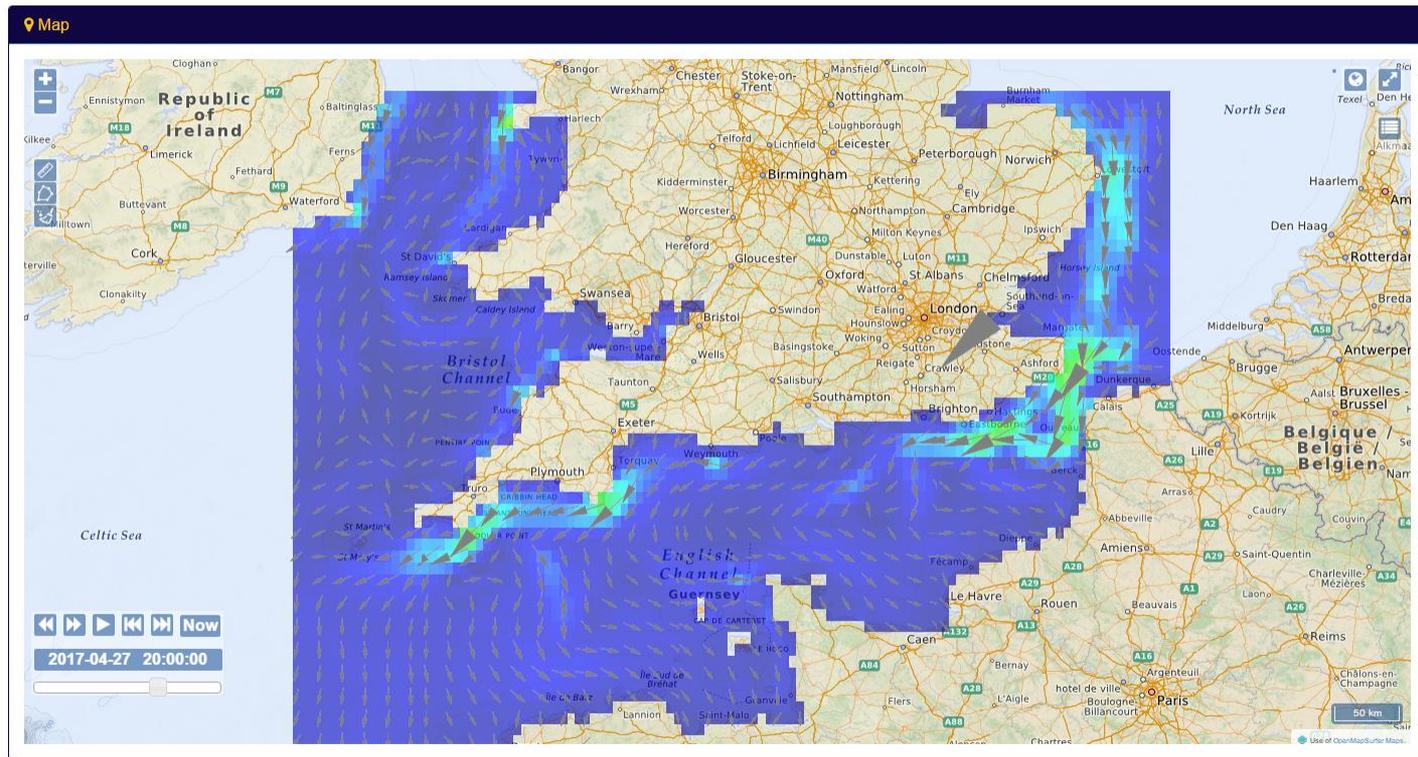
Current Velocity [m/s]  
 None  
 Current Velocity Modulus [m/s]  
 Temperature [°C]

**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



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# HNS modelling and environmental impact



**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



**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

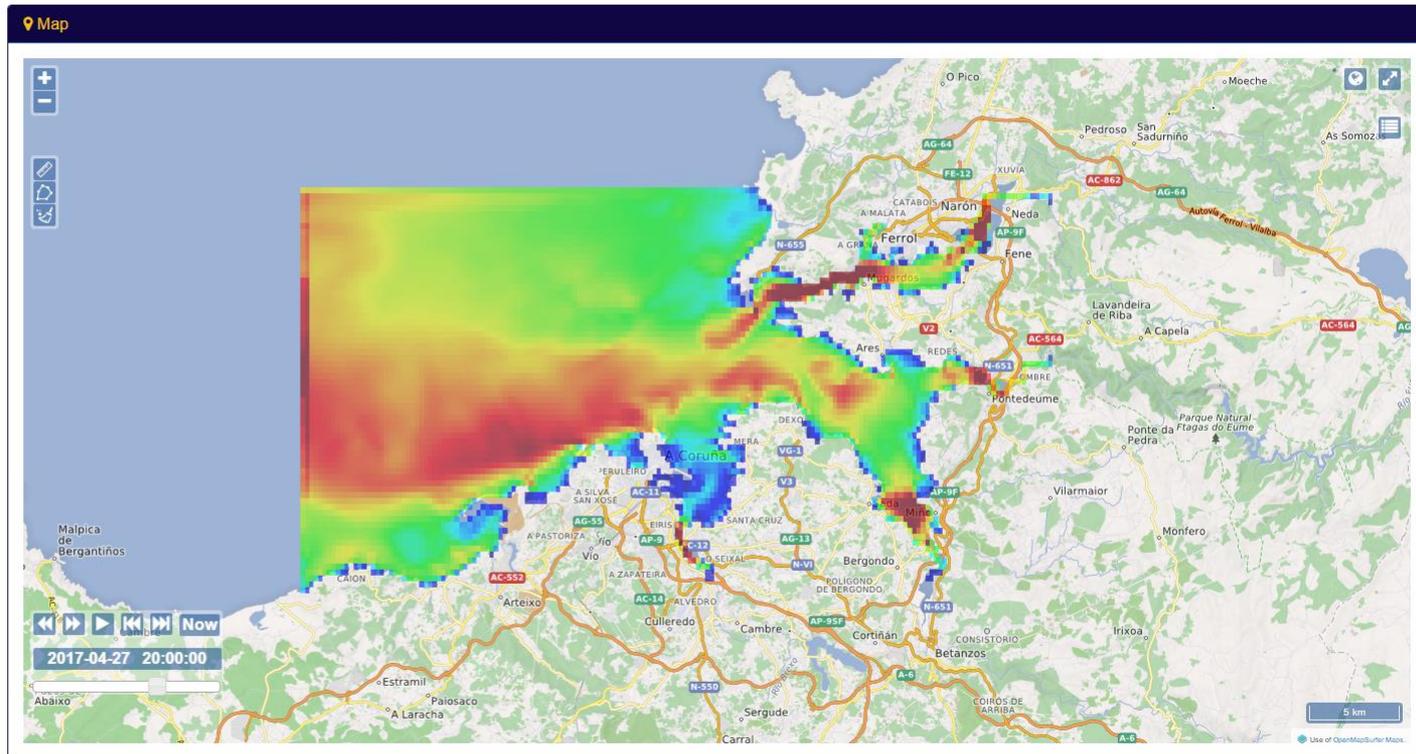
"Select one Simulation..."

**Property**

"Select one Property..."

- Barrier
- Plume Envelope
- Plume Center Trajectory

**General Options**



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# HNS modelling and environmental impact



## 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

## Map



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# HNS modelling and environmental impact



**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

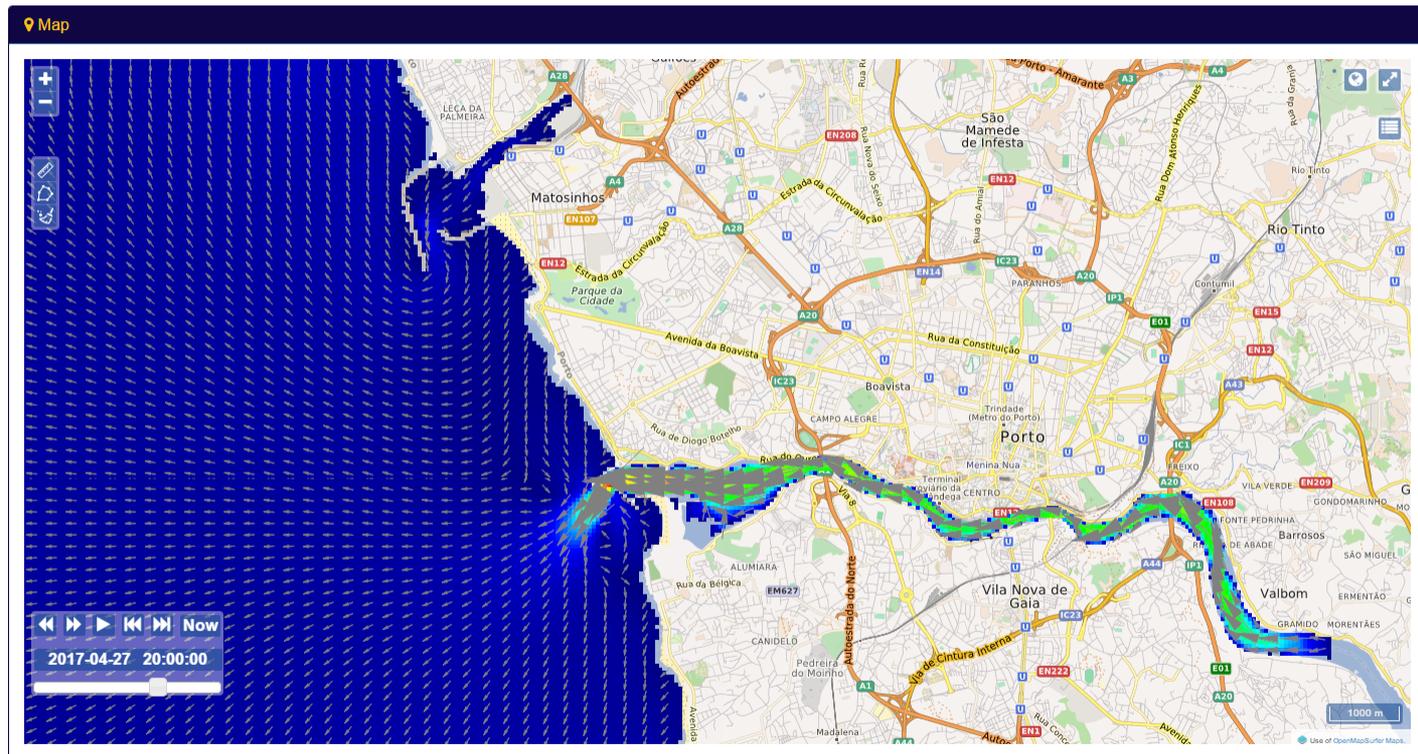
**Risk Index**

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

**User Simulation Layers**

- Zoom to Emission Point

"Select one Simulation..."



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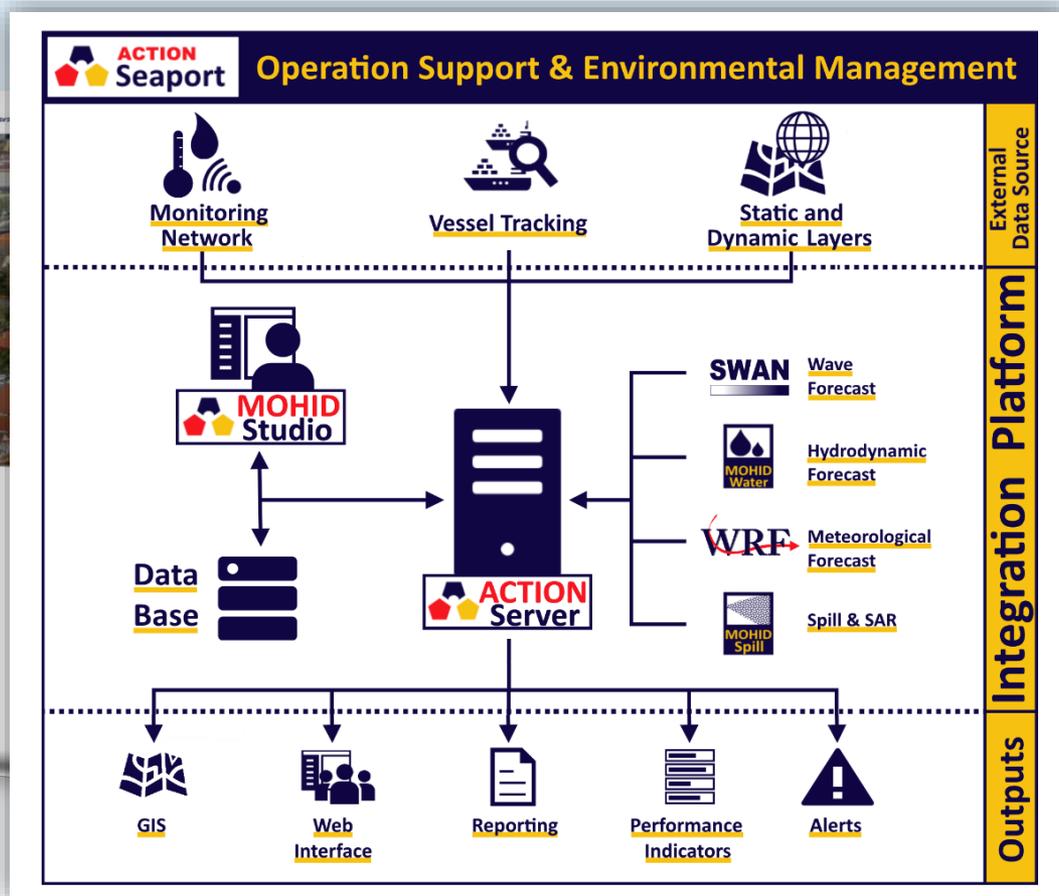
MARINER



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# MARINER technology application in different contexts

## ACTION Seaport / Porto de Lisboa



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

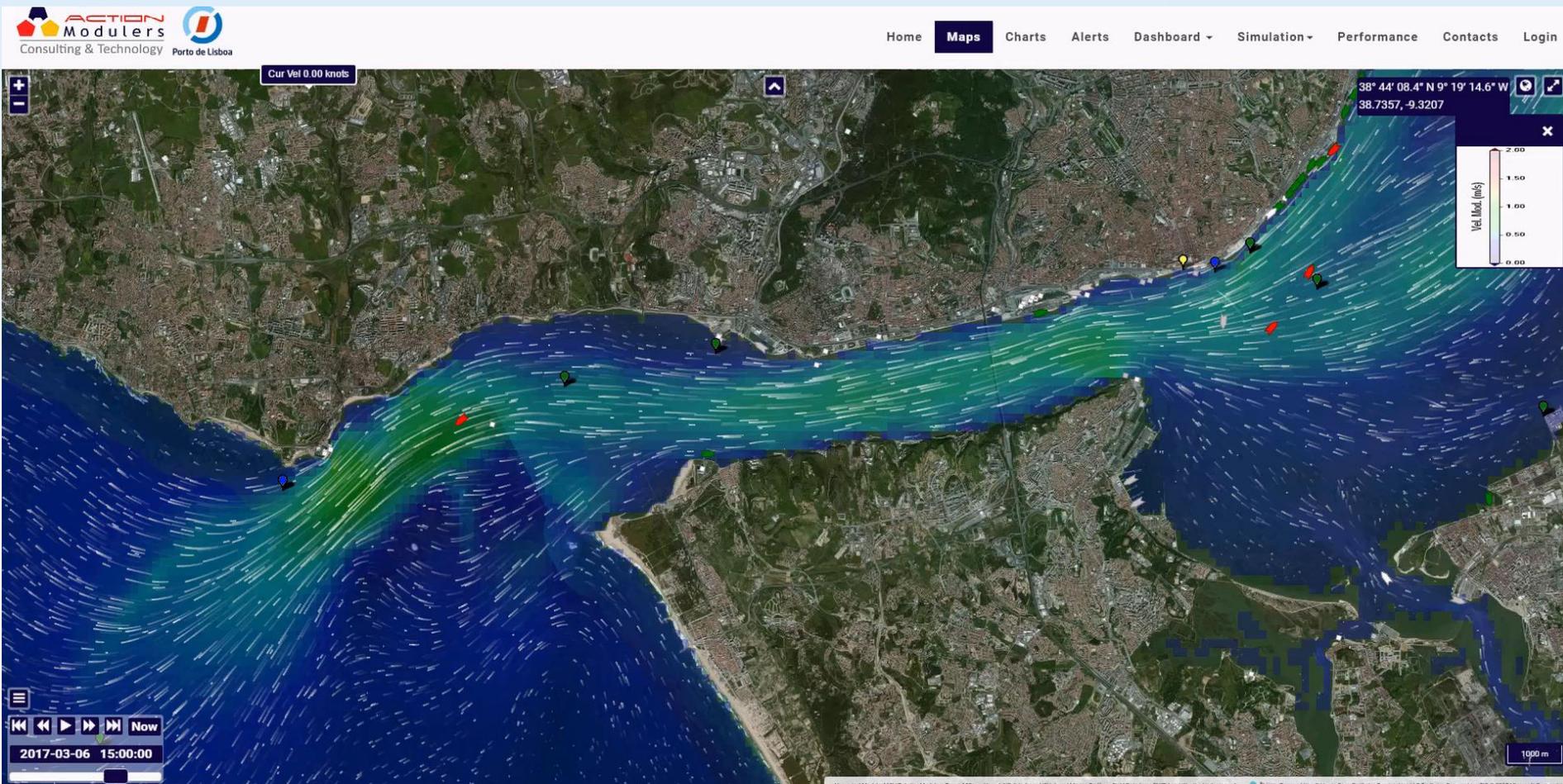


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\* CIIMAR presentation

# MARINER technology application in different contexts

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



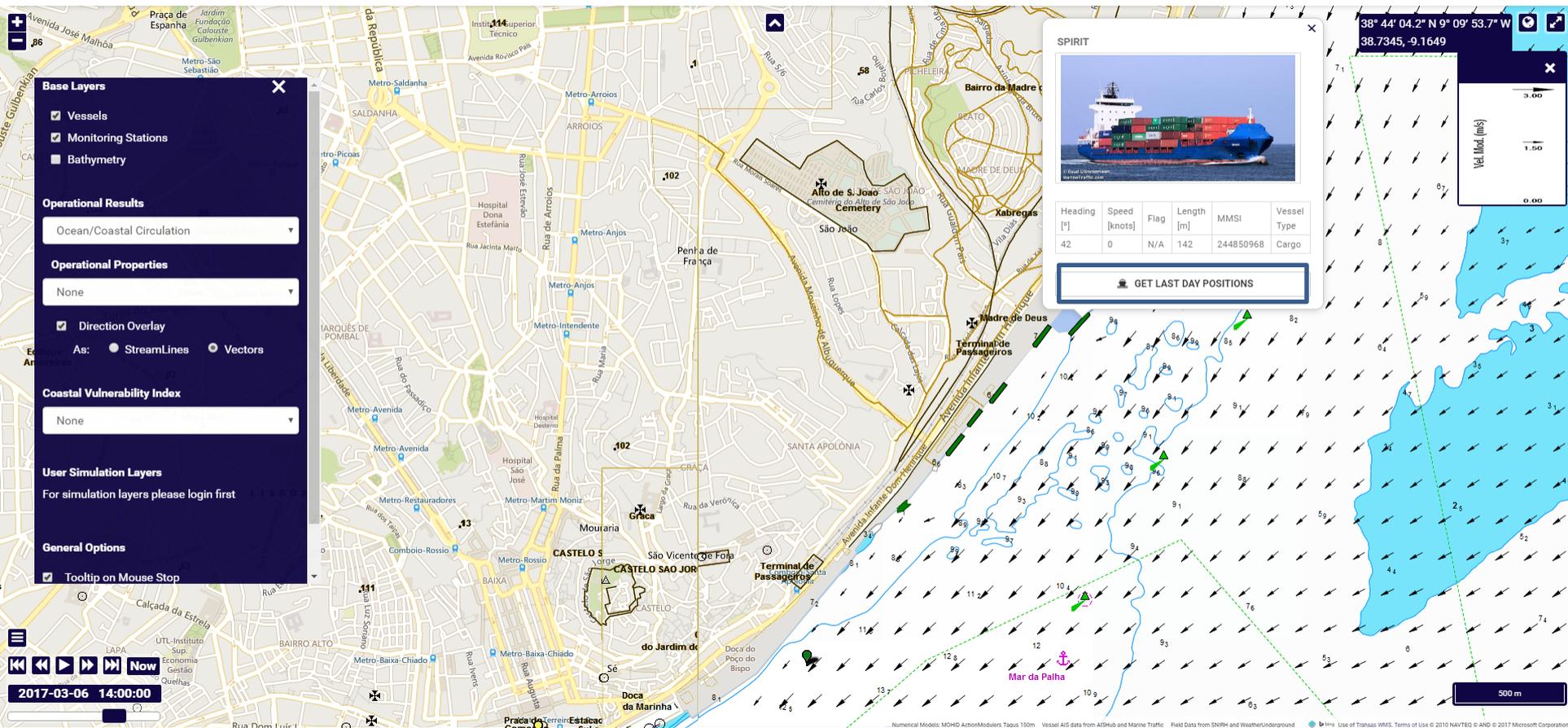
Ultimate user-experience in an advanced web-based platform, with visually striking maps

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



# MARINER technology application in different contexts

## ACTION Seaport in action | Maps & vessels



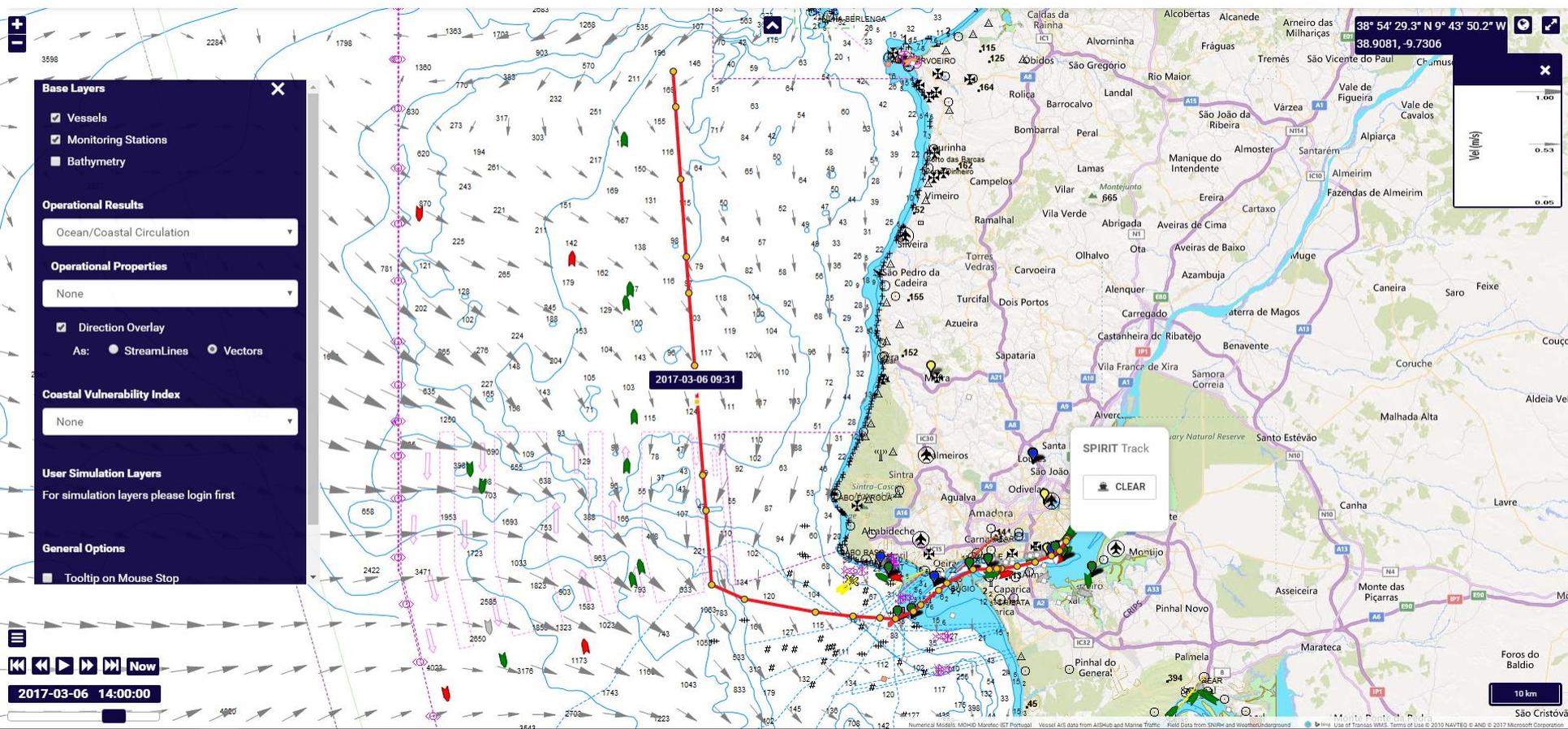
AIS real-time and historic vessel tracking



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# MARINER technology application in different contexts

## ACTION Seaport in action| 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)***

Cascais Anchorage

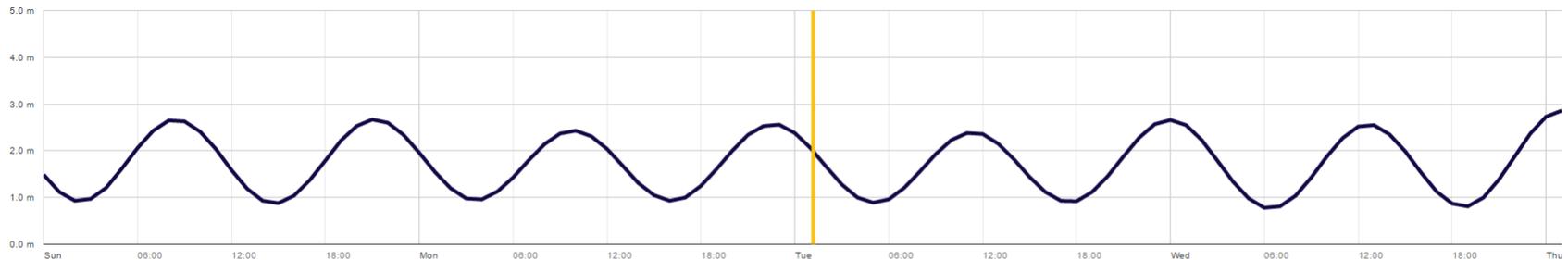


Select Location to obtain modelled values in blue and measured values in yellow (if exist).

Vertical Line indicates current date.

Chart Table

### Water Level [m]



### Current Velocity [knots]

3.0 knots

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

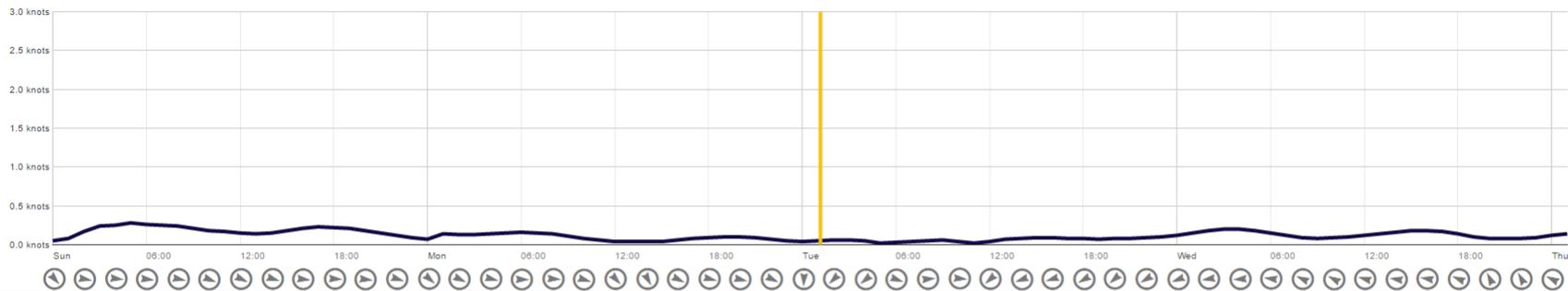


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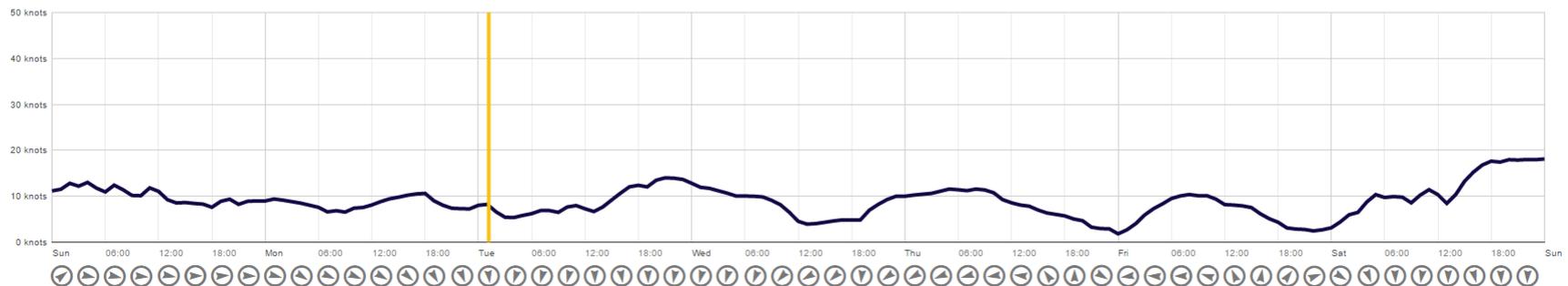
# MARINER technology application in different contexts

## ***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).

Torre VTS

Vertical Line indicates current date.

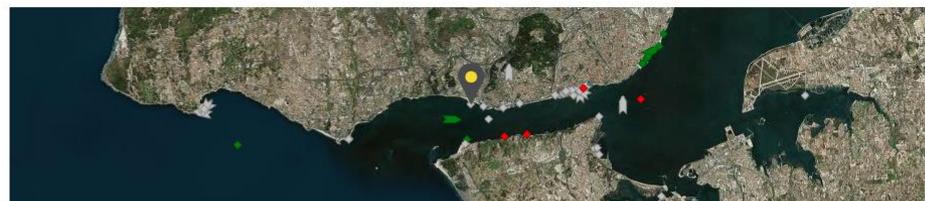


Chart **Table**

|                  | 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   | 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  | 10  | 10  | 11  | 14  | 16  |     |

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



# 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.

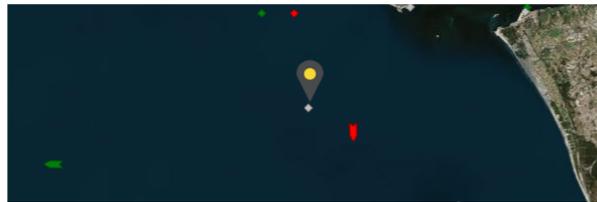
Barra Sul Baliza

Maximum Douglas forecasted is 

Maximum Beaufort forecasted is 

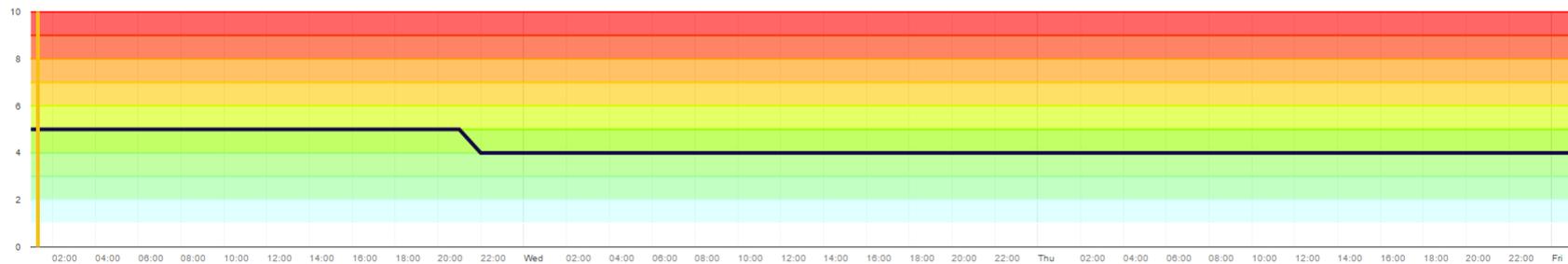
Maximum Precipitation level forecasted is no alert

Vertical Line indicates current date.

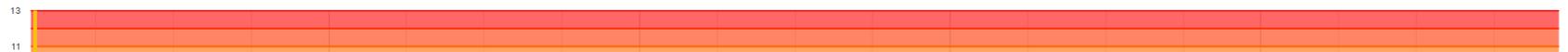


Customized alerts in form of email and SMS can be defined for regular reporting and when alert levels change.

### Douglas sea scale (swell)



### Beaufort wind scale



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

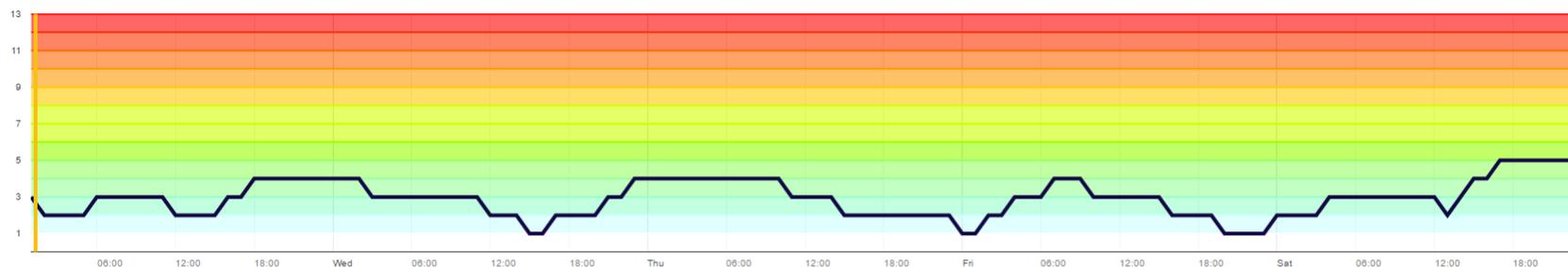


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# MARINER technology application in different contexts

## *ACTION Seaport in action | Alerts & Reporting*

Beaufort wind scale



Precipitation Scale Forecast



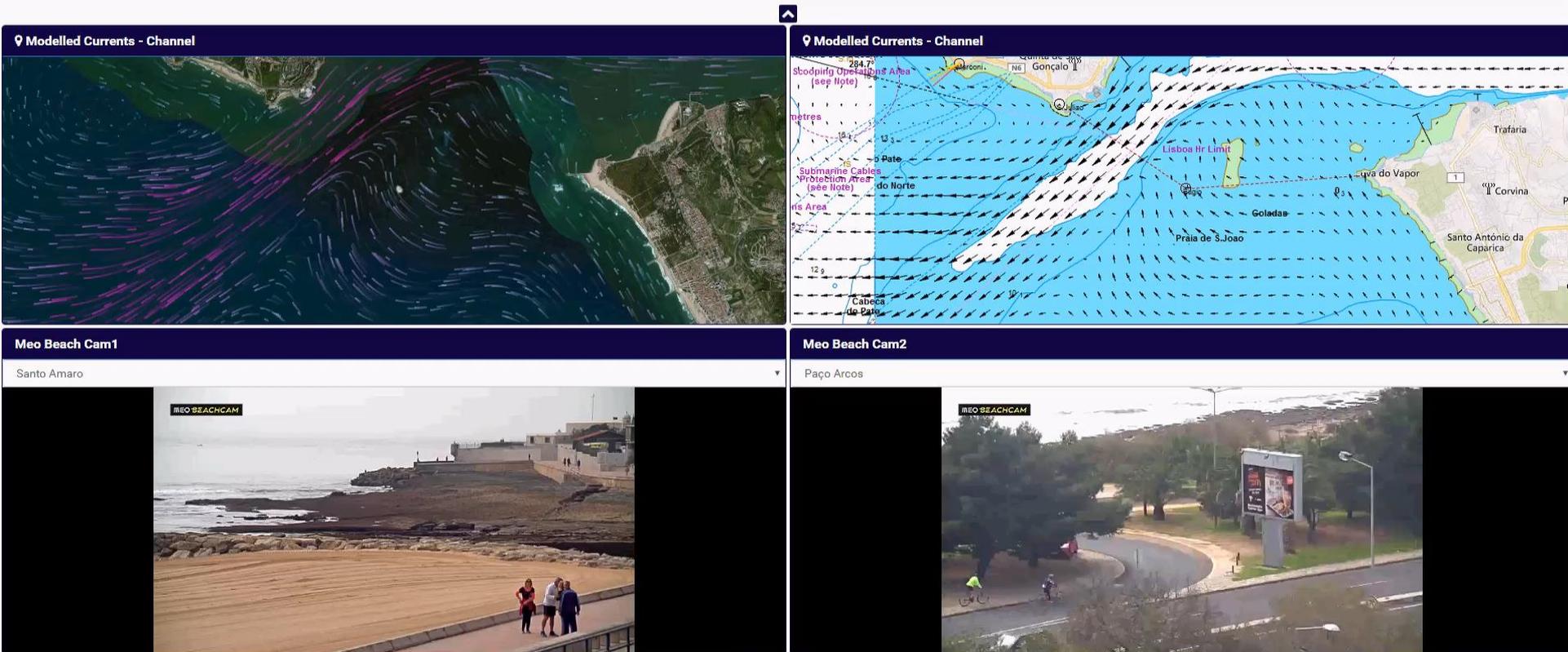
Distribution of digital reports, tailor-made SMS and email alerts based on metocean conditions.



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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



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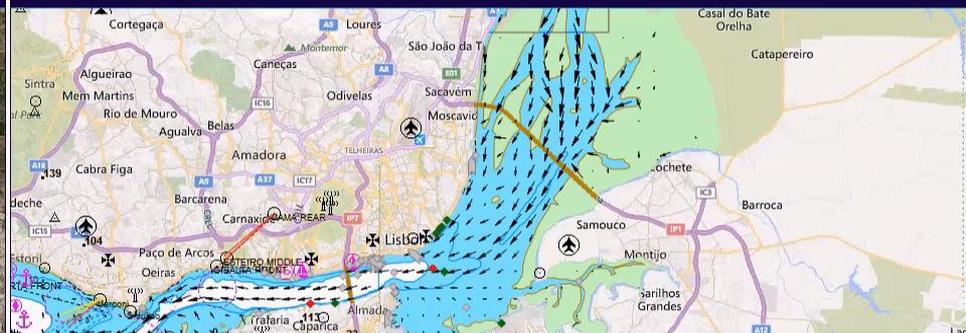
# MARINER technology application in different contexts

## ACTION Seaport in action | Dynamic dashboards II

Modelled Currents - Tagus



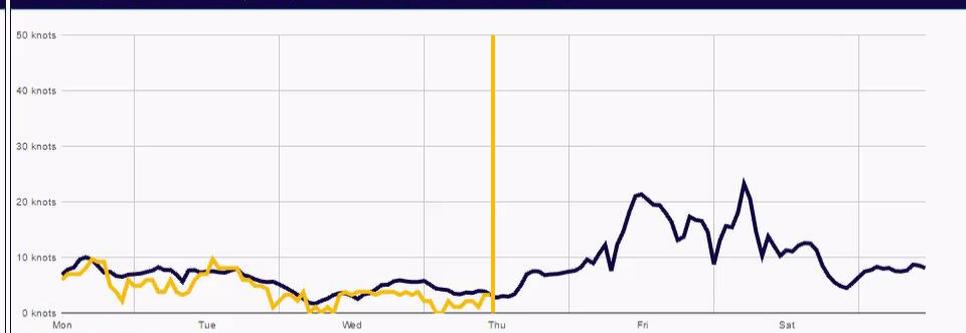
Modelled Currents - Tagus



Modelled (blue) vs Measured (yellow) Water Level [m] - Torre VTS



Modelled (blue) vs Measured (yellow) Wind Velocity [knots] - Lisbon Airport



Current Time : 2017-03-02 11:23:56

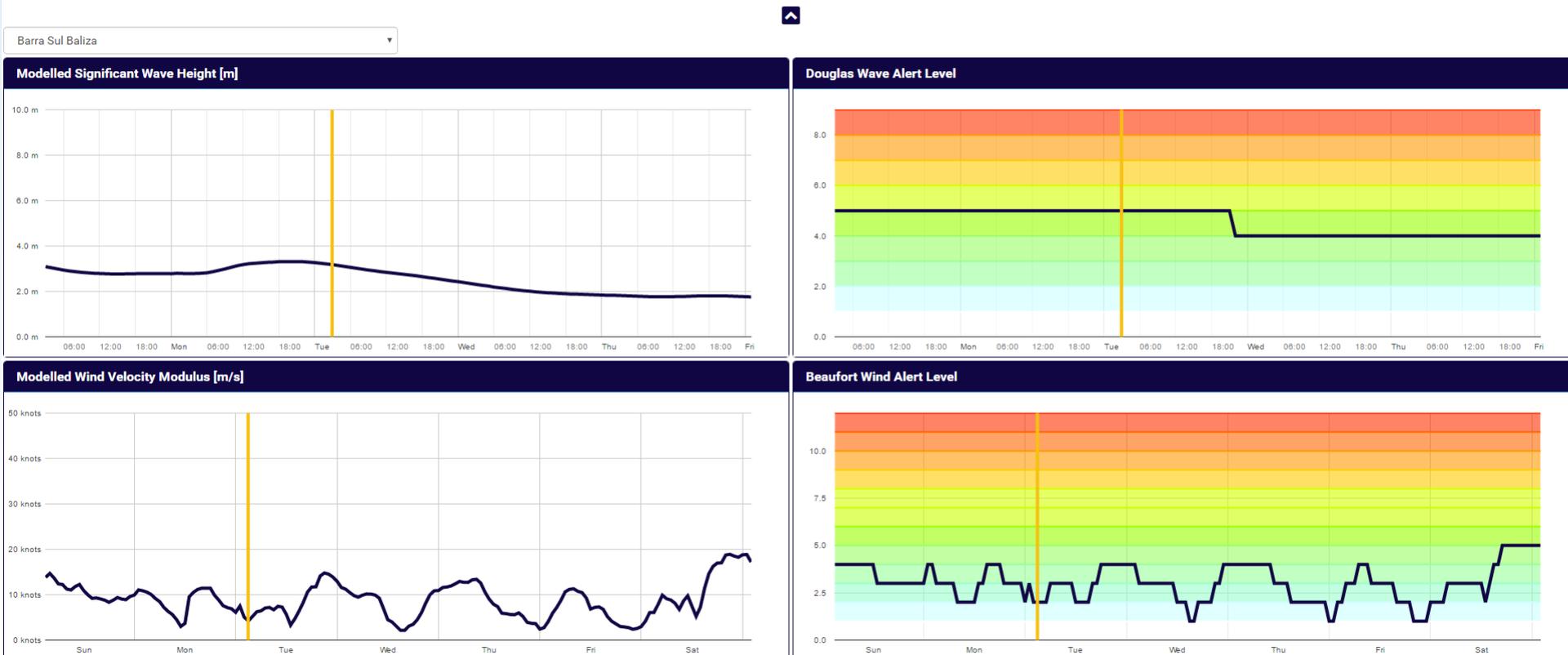
Multiple data sources automatically updated in dynamic dashboards for wall screens



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# MARINER technology application in different contexts

## ACTION Seaport in action | Dynamic dashboards



Current Time : 2017-03-07 02:55:38

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**



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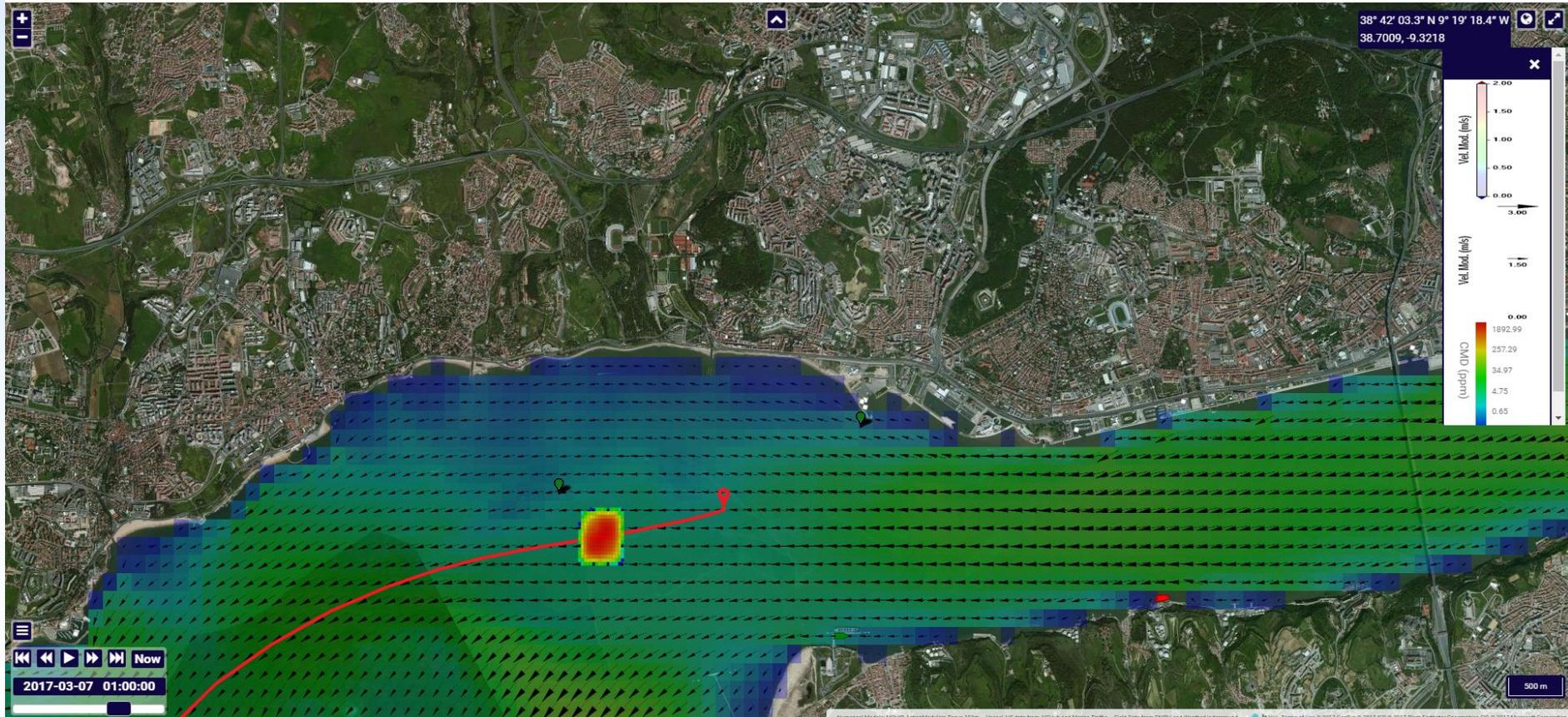
# MARINER technology application in different contexts

## ACTION Seaport in action |

## Emergency response: oil / chemical spill simulations



Home **Maps** Charts Alerts Dashboard Simulation Performance Contacts rodrigo.fernandes



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



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# 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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