SIMO

Soluciones Ingeniería Marítima Operacional

Desarrollo de una herramienta de visualización de datos oceanográficos: Modelos y Observaciones

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Field AC

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FIELD_AC 7th FRAMEWORK EUROPEAN PROJECT

SIMO: Operational Maritime Engineering Solutions. UPC spin-off company aiming to bridge the gap between research centres and end-users.

- *Ad-hoc* spin-off created within the FIELD_AC framework to assess the feasibility of exploiting an innovative local-scale operational service with a new level of predictions for restricted domains. Three main objectives

  - Find suitable end-users
  - Understand end-users needs
  - Develop tailor-made service

Motivation

✓ Difficulty in visualising meteorological, earth observation and oceanographic data binary formats (netCDF, GRIB, HDF5).

✓ Difficulty in assessing quality of numerical modelling results – comparison with observational data.

✓Provision of friendly visualization tools of both observation and numerical data to end-users.

Tailor-made Service

✓ Data (SOS, THREDDS…) – including own observational resources in addition to public ones

✓ Numerical Model (Wave, Ocean Circulation, Oil Spill…)

✓ Visualization tools

DATA - SOS (Sensor Observation Service)

The Sensor Observation Service aggregates readings from live, in-situ and remote sensors. The service provides an interface to make sensors and sensor data archives accessible via an interoperable web based interface. SOS has three mandatory "core" operations:

- *GetObservation*: provides access to sensor observations and measurement data via a spatio-temporal query that can be filtered.
- *DescribeSensor*: retrieves detailed information about the sensors and processes generating those measurements.
- *GetCapabilities*: provides the means to access SOS service metadata.

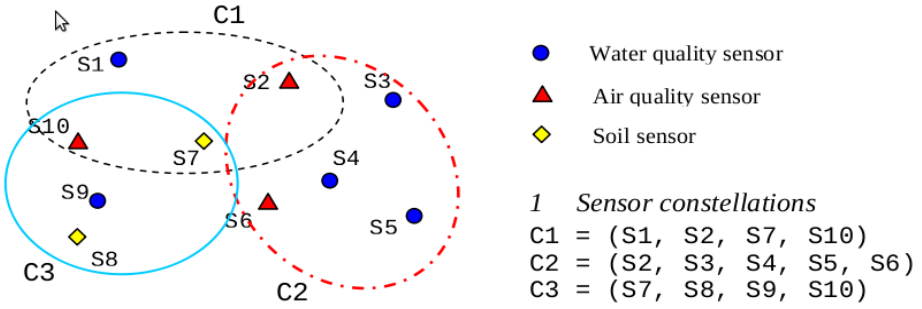


Figure 1-1 General Case for In-Situ Sensors

DATA - SOS (Sensor Observation Service)

Several optional, non-mandatory operations can also be defined, such as RegisterSensor, InsertObservation, GetResult, GetFeatureOfInterest...

The architecture of a SOS implementation requires:

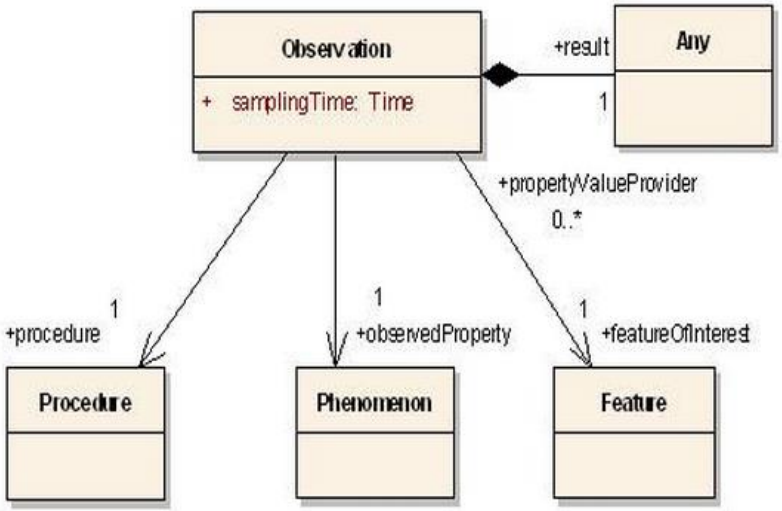
- POSTGRESQL: database
- POSTGIS: spatial database extension for PostgreSQL
- JAVA SDK: Java Software Development Kit
- APACHE TOMCAT: open source web server and servlet container.

52°North distribution used!!

52north exploring horizons

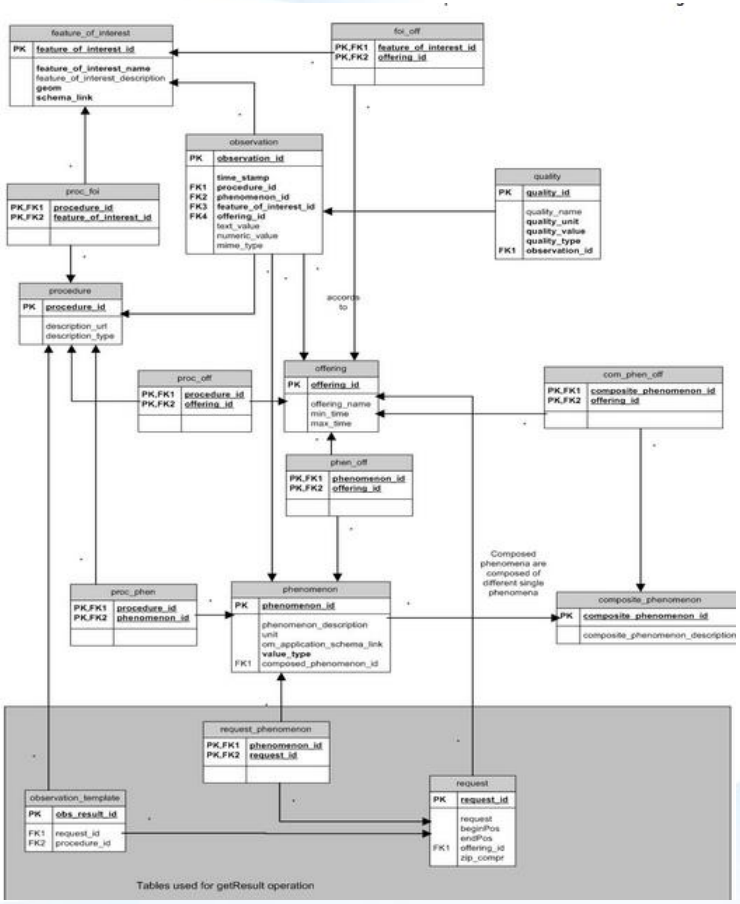
DATA - SOS (Sensor Observation Service)

Basic Observation Model – O&M Specification



DATA - SOS (Sensor Observation Service)

52 North SOS
Standard Data Model



DATA – THREDDS CATALOG

THREDDS

(Thematic Real-time Environmental Distributed Data Services) is a open-source software that allow the interconnection of data providers with end-users. UCAR COMMUNITY PROGRAMS

Objective:

To simplify the discovery and use of scientific data.

To allow learning and scientific material and publications to reference data

Catalogs are the heart of the THREDDS concept.

They are XML documents that describe on-line datasets.

Catalogs can contain arbitrary metadata, and we have also defined a standard set of metadata to bridge to discovery centers like GCMD, DLESE and NSDL.

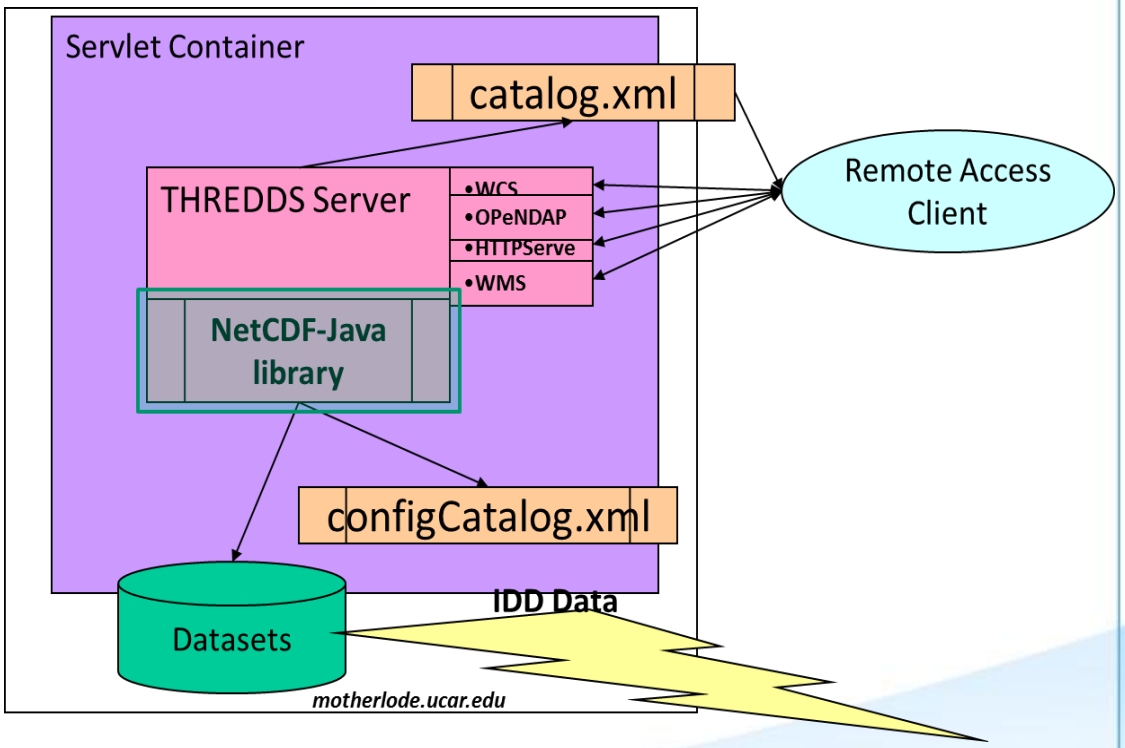
Dynamic Catalog Generation

The THREDDS Catalog Generator produces THREDDS catalogs by scanning or crawling one or more local or remote dataset collections. Catalogs can be generated periodically or on demand, using configuration files that control what directories get scanned, and how the catalogs are created.

The TDS uses the Common Data Model to read datasets in various formats, and serves them through OPeNDAP, OGC Web Coverage Service, NetCDF subset, and bulk HTTP file transfer services. The first three allow the user to obtain subsets of the data, which is crucial for large datasets

Serves scientific data

- Any dataset read by the netCDF-Java library
- E.g., netCDF 3&4, HDF 4&5 (and HDF–EOS), GRIB 1&2
- Using various data access services
- E.g., OPeNDAP, OGC WMS & WCS, NCSS, HTTP



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DATA – THREDDS CATALOG

Dataset	Size	Last Modified
FIELD_AC		--
satellite/		--
Waves/		--
Meteo/		--
Currents/		--

Initial TDS Installation at My Group
THREDDS Data Server [Version 4.2.6 - 20110413.2155] Documentation

NUMERICAL MODELS
OPERATIONAL IMPLEMENTATIONS

Ocean Circulation models

Operational implementation for the Catalan Sea (ROMS). Model suite being implemented using FIELD_AC model suite:

- ROMS implementation by LIM/UPC
- MyOcean boundary conditions
- BSC meteo information.
- KUL continental inflows.

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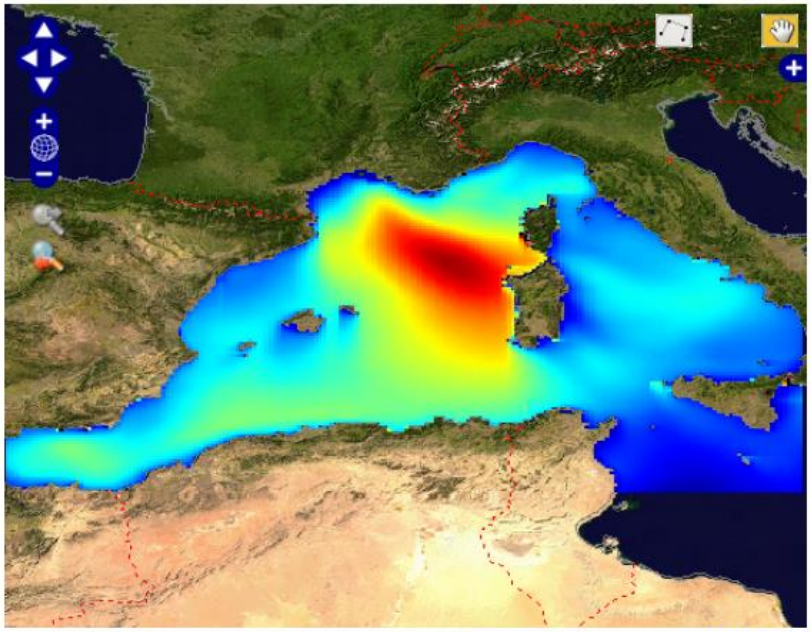
OPERATIONAL IMPLEMENTATIONS
- Wave models

First operational implementations of the FIELD_AC model suite. SWAN 9x9 and 3x3 implementations undertaken.



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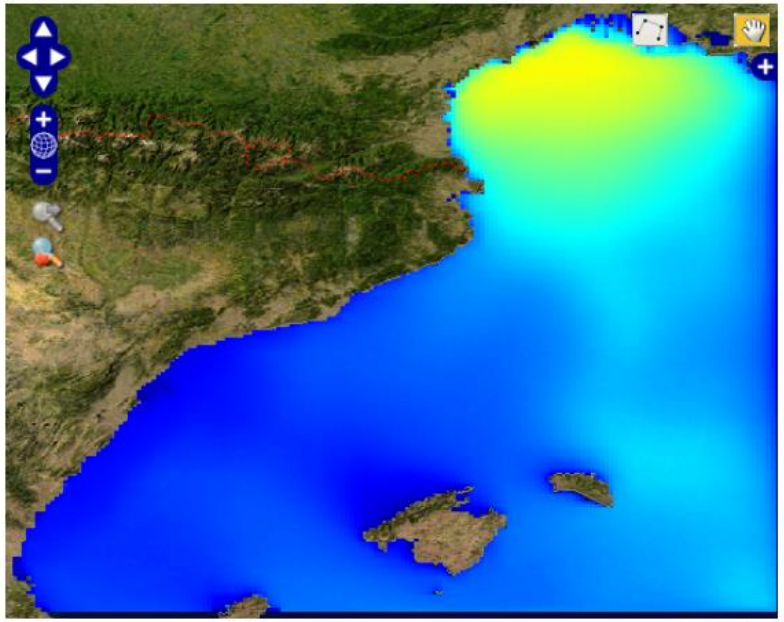

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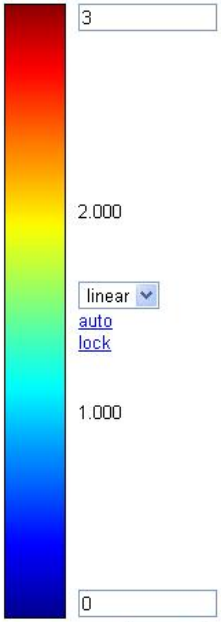

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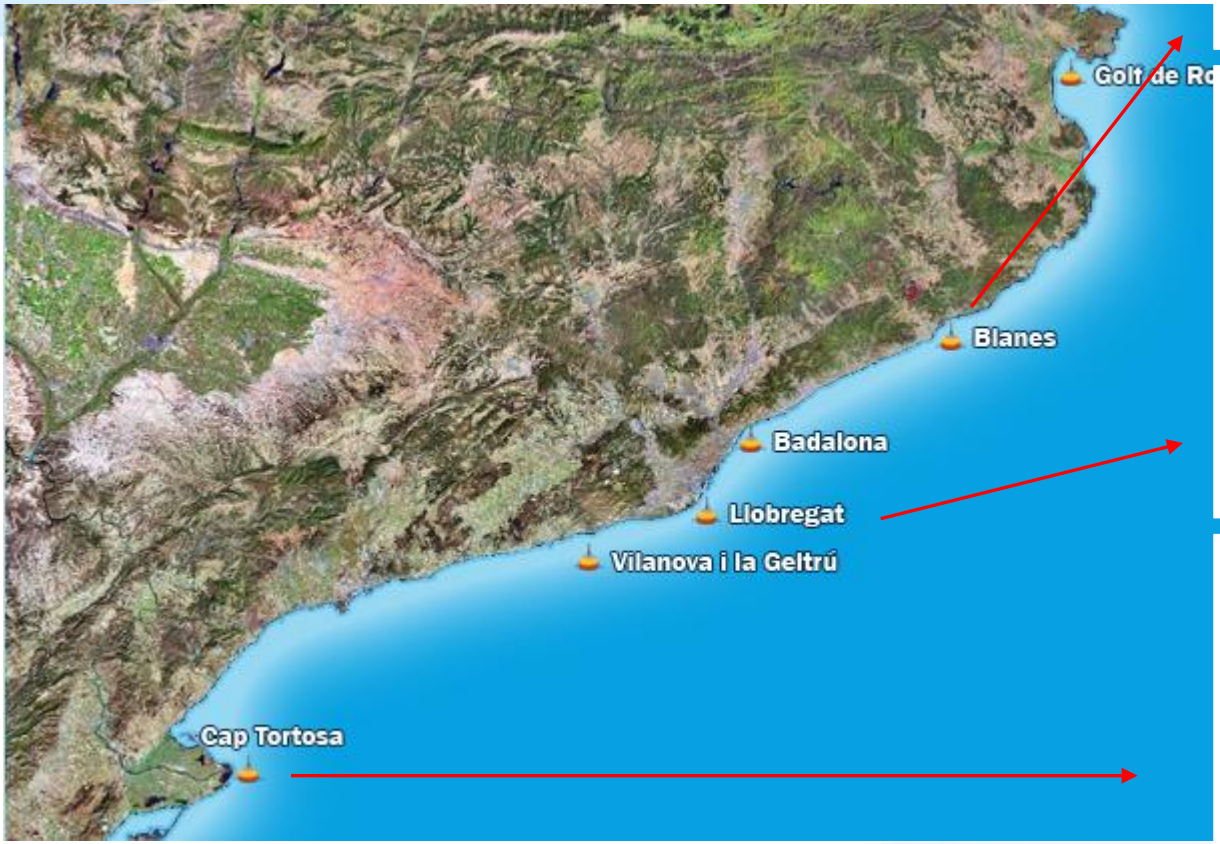
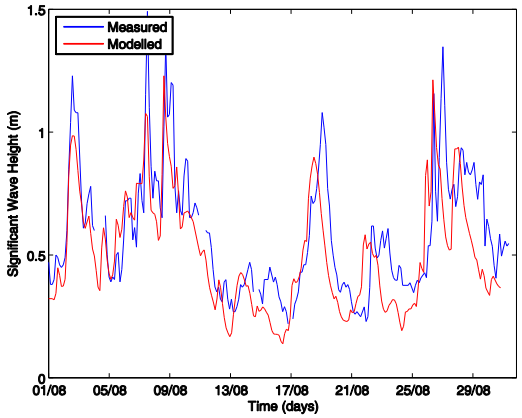
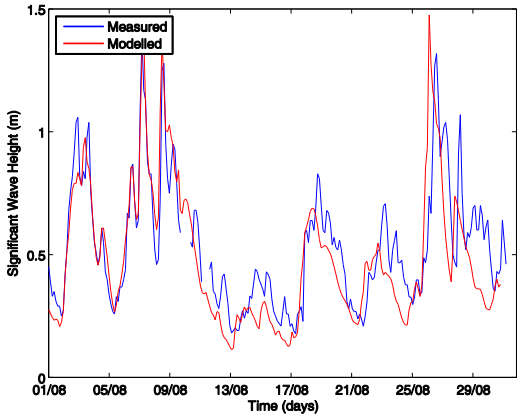
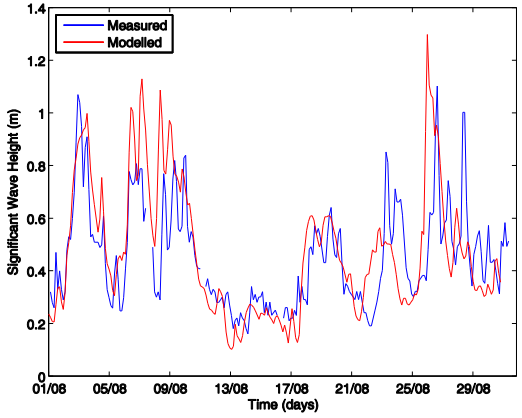
VALIDATION









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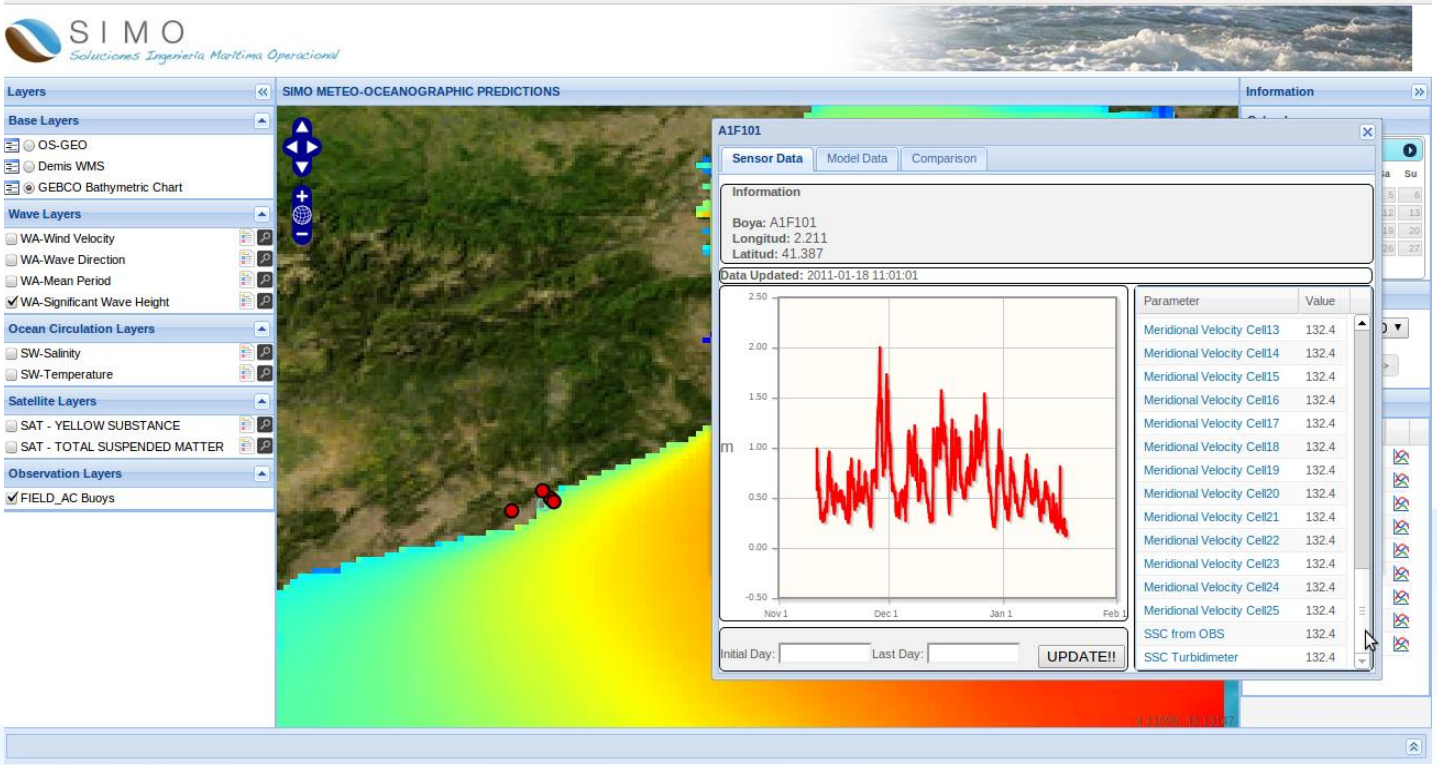
DATABASE

- ✓ Wave modelling results:



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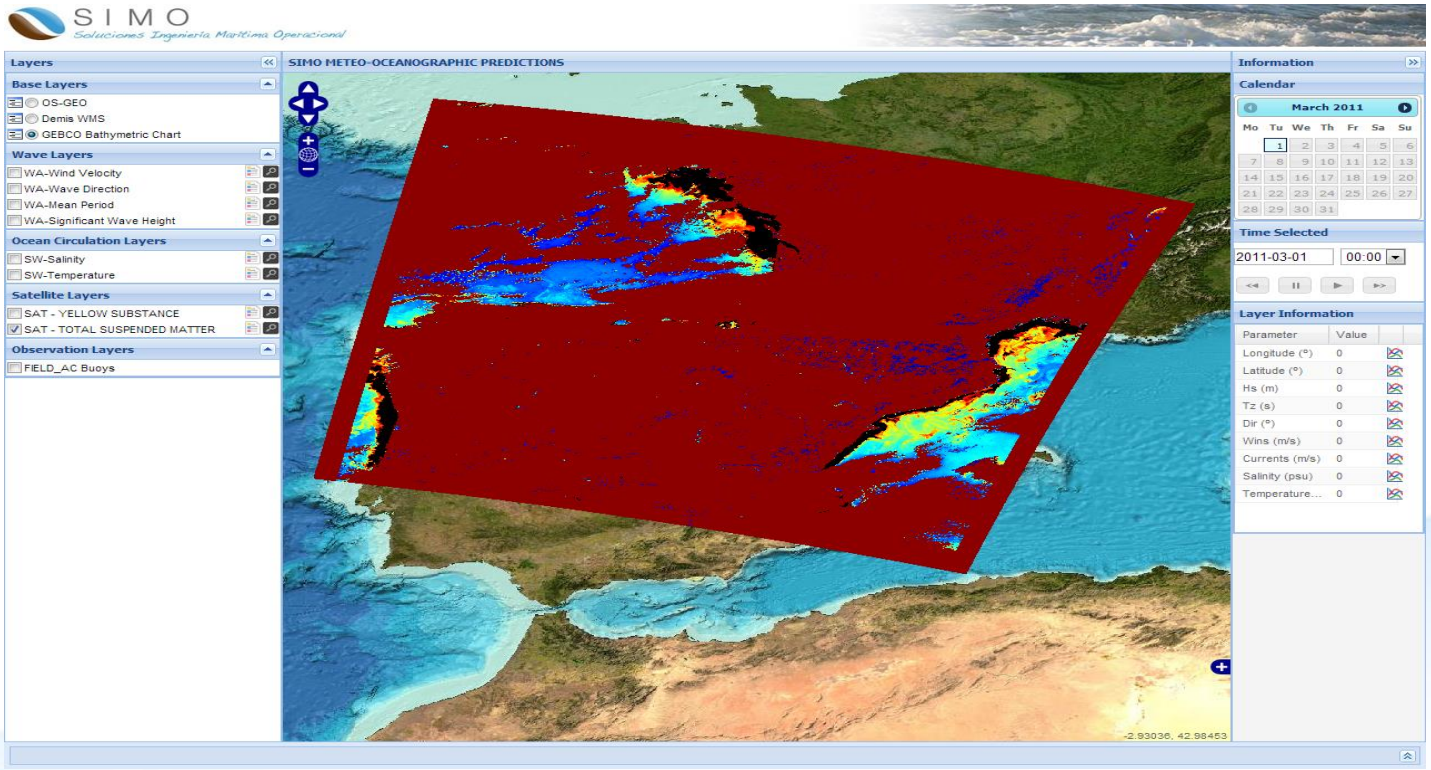
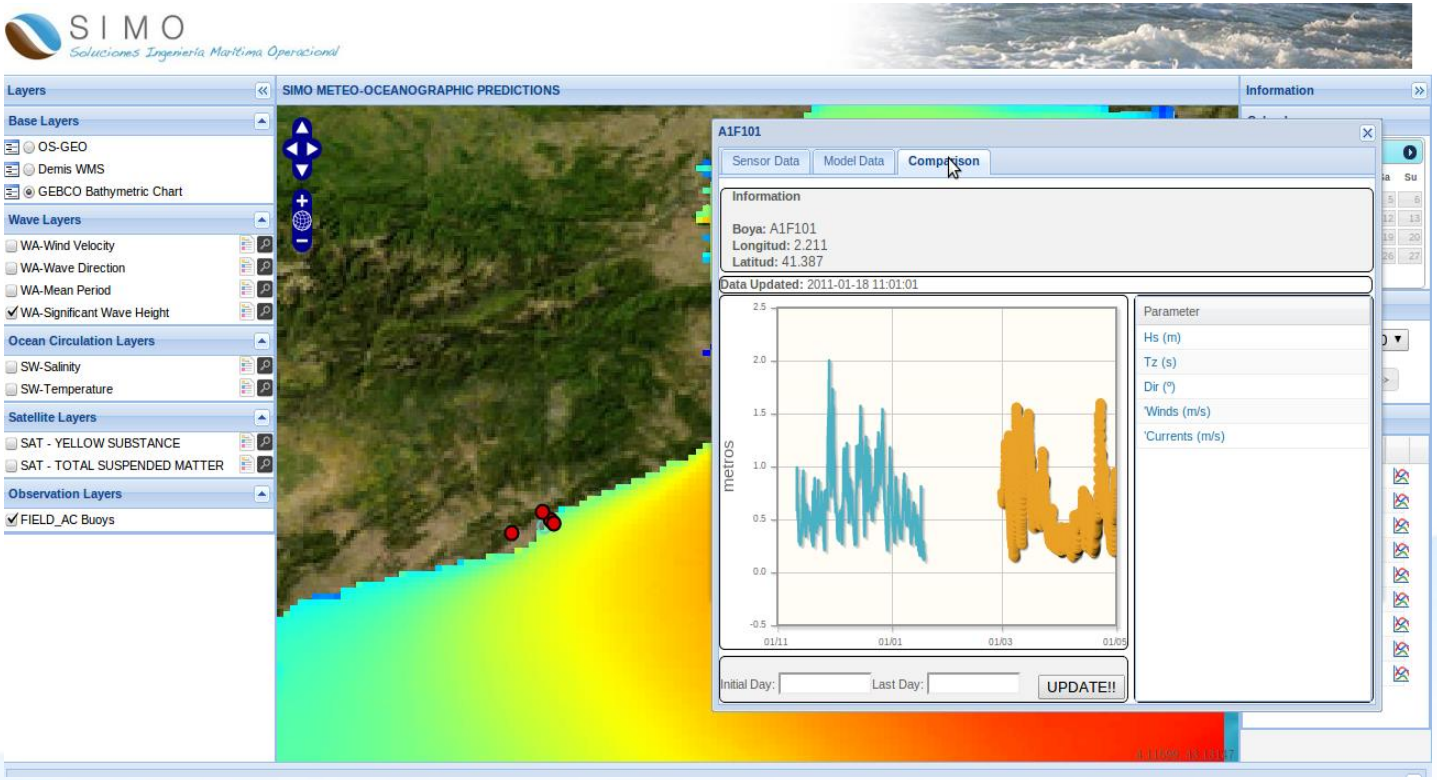
DATABASE

✓ Satellite data:

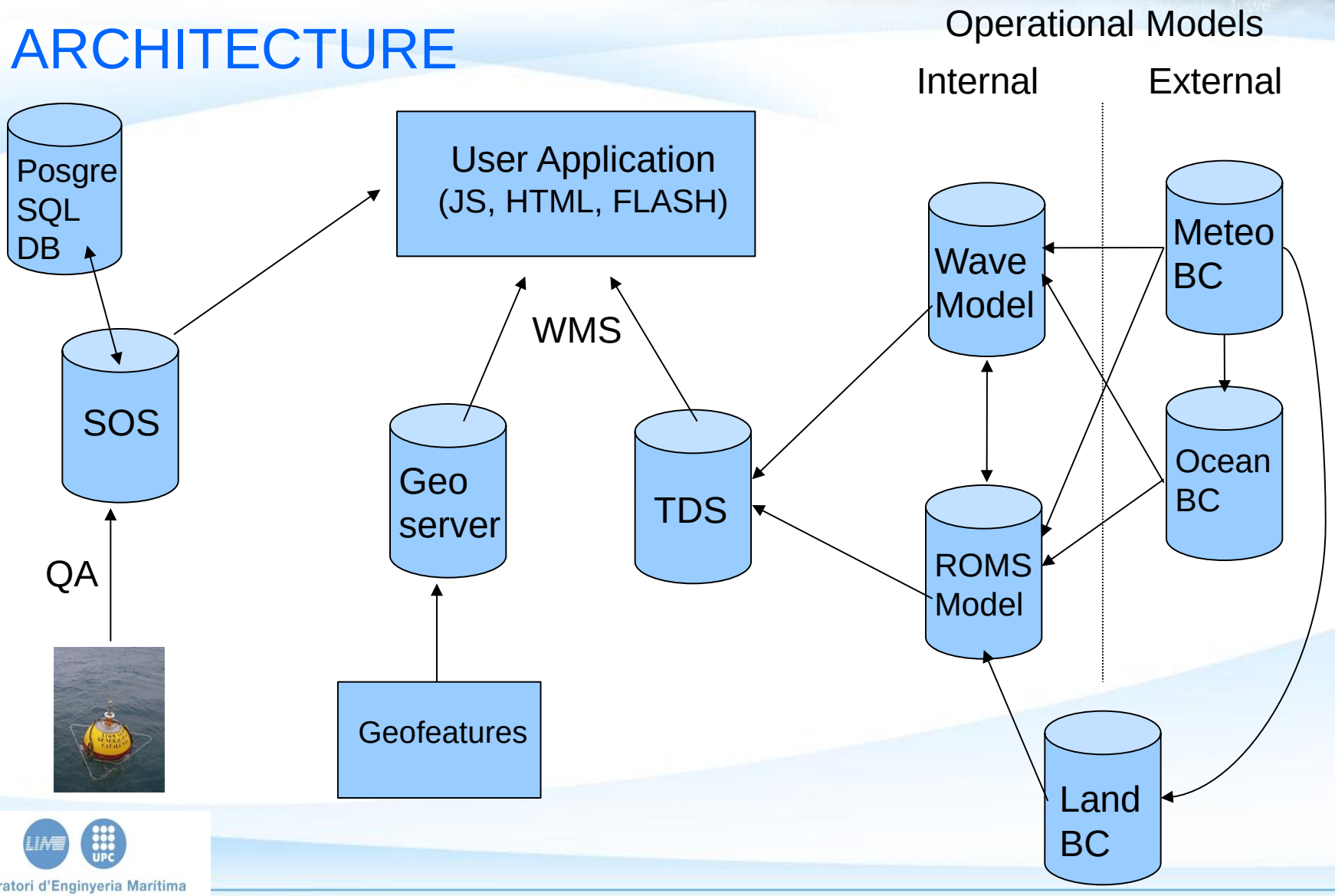


DATABASE

✓ Comparison:



ARCHITECTURE



APPLICATIONS

Using data from all the different sources, a web-application is being developed using different javascript libraries, html code, flash applications and geoserver:

- **Javascript libraries**: openlayers, geoext, ext.js, jquery...
- **Geoserver**

FINAL END-USERS APPLICATION

- Openlayers: An opensource js library to load, display and render maps from multiple sources on web pages. OpenLayers

- Ext JS: a library for building interactive web applications using techniques such as Ajax, DHTML and DOM scripting Ext JS

- GeoExt: GeoExt brings together the geospatial know how of OpenLayers with the user interface savvy of Ext JS for building powerful desktop style GIS apps on the web with JavaScript. GeoExt

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FINAL END-USERS APPLICATION

- Jquery: fast and concise JavaScript Library that simplifies HTML document traversing, event handling, animating, and Ajax interactions for rapid web development.

- jqplot: open-source charting component that can be used to render data-driven and animated charts in web applications.

- Geoserver: open source software server written in Java that allows users to share and edit geospatial data.

FINAL APPLICATIONS

- MARINE TOWAGE COMPANY

- MARINE GEOTECHNICAL COMPANY

- OIL SPILL PREDICTION

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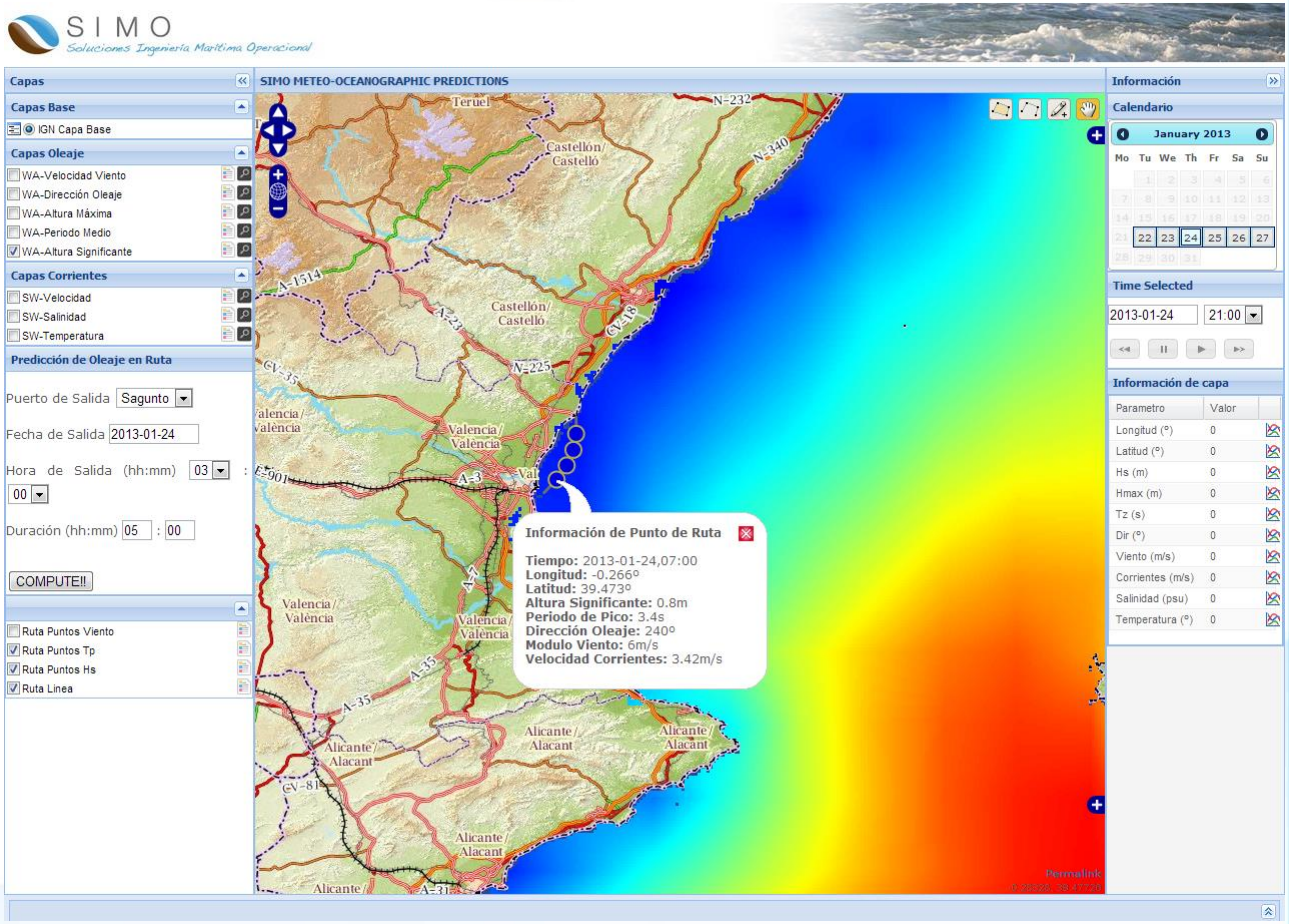
MARINE TOWAGE COMPANY

-Shipment of 25 ‘caissons’ for new Harbour Terminal

-Requirement of wave and wind predictions to ensure safe transport



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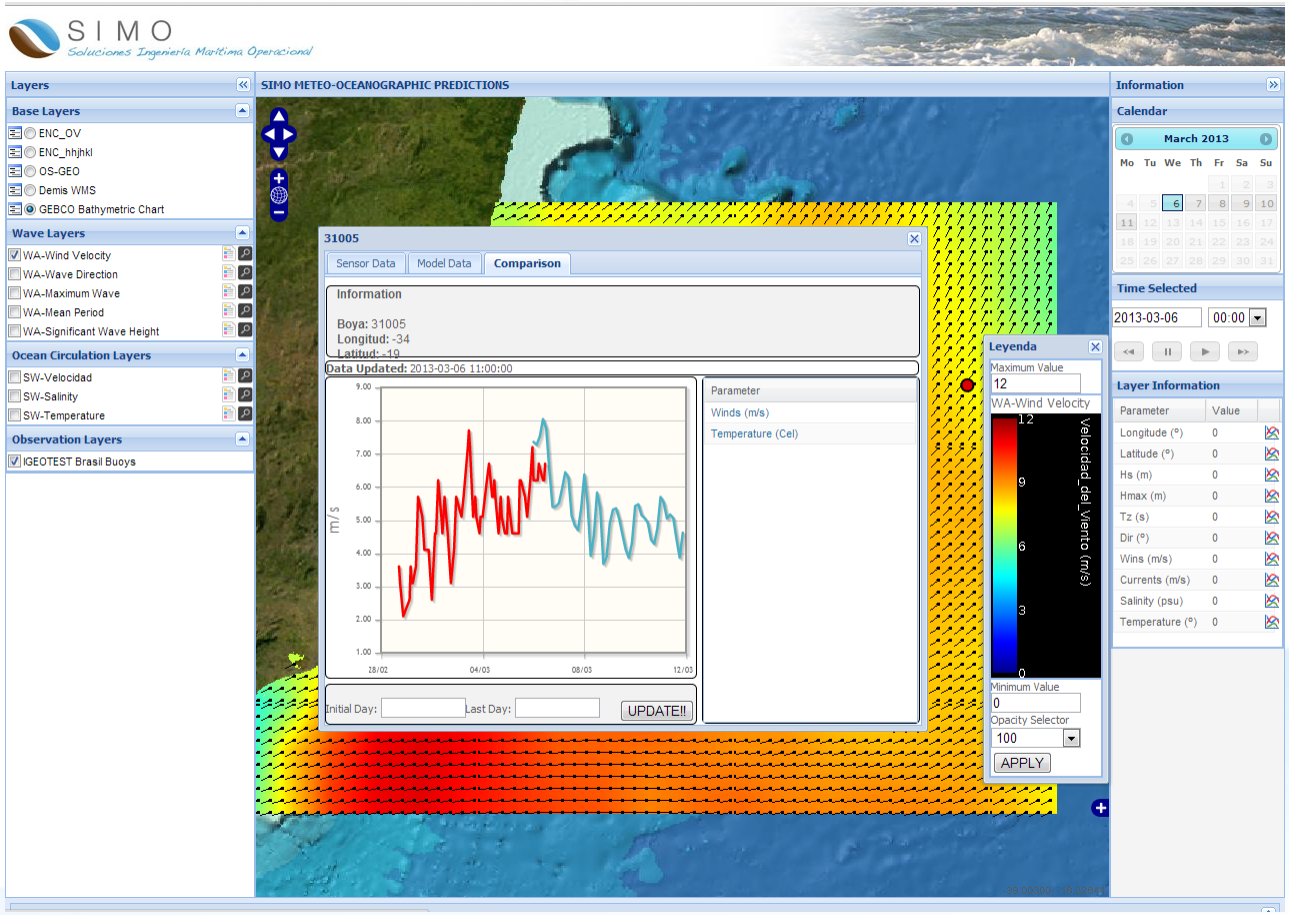
MARINE GEOTECHNICAL COMPANY

- ✓ Different locations and constant changes (routes).
- ✓ Incorporation of buoy and simulated data (validation)
- ✓ User requirements regarding hosting of visualization tools



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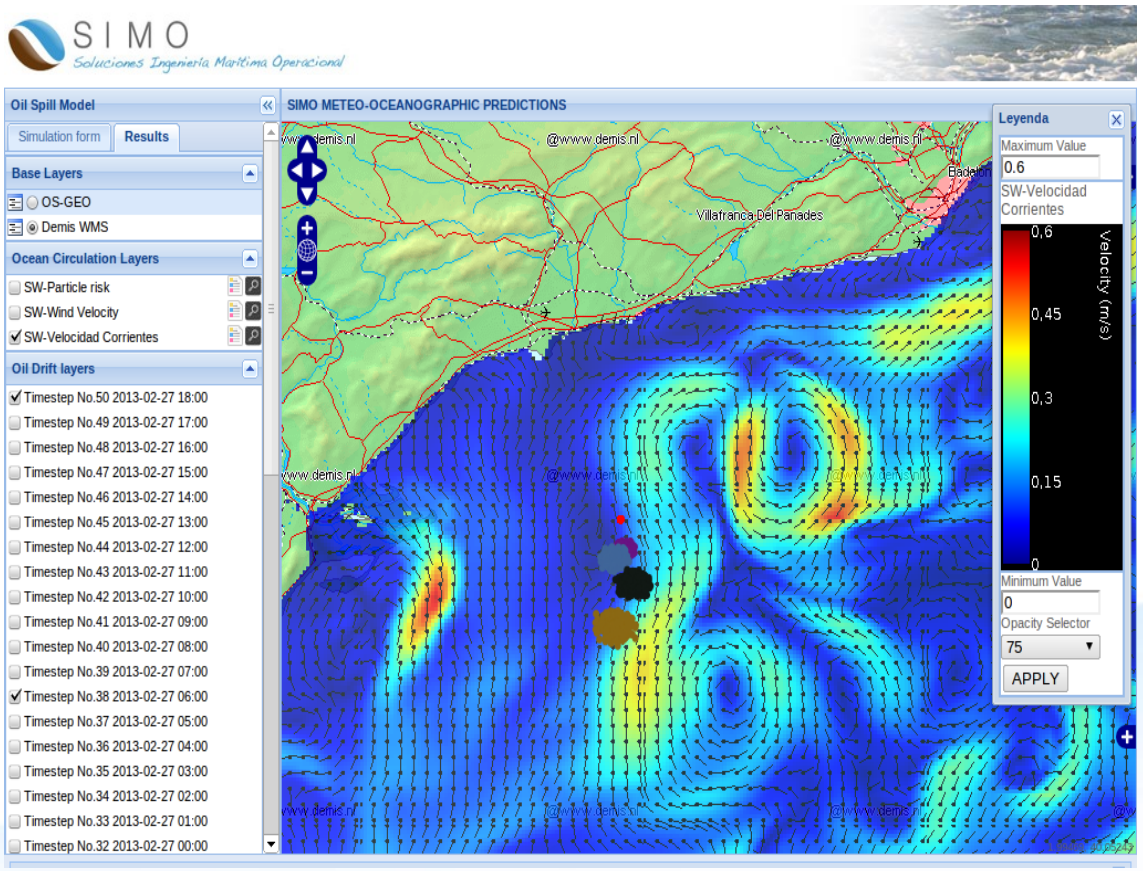
OIL SPILL PREDICTION

- ✓ A new Numerical model has been developed
- ✓Weathering processes incorporated
- ✓Support for decision takers
- ✓ WebGIS application to enter data



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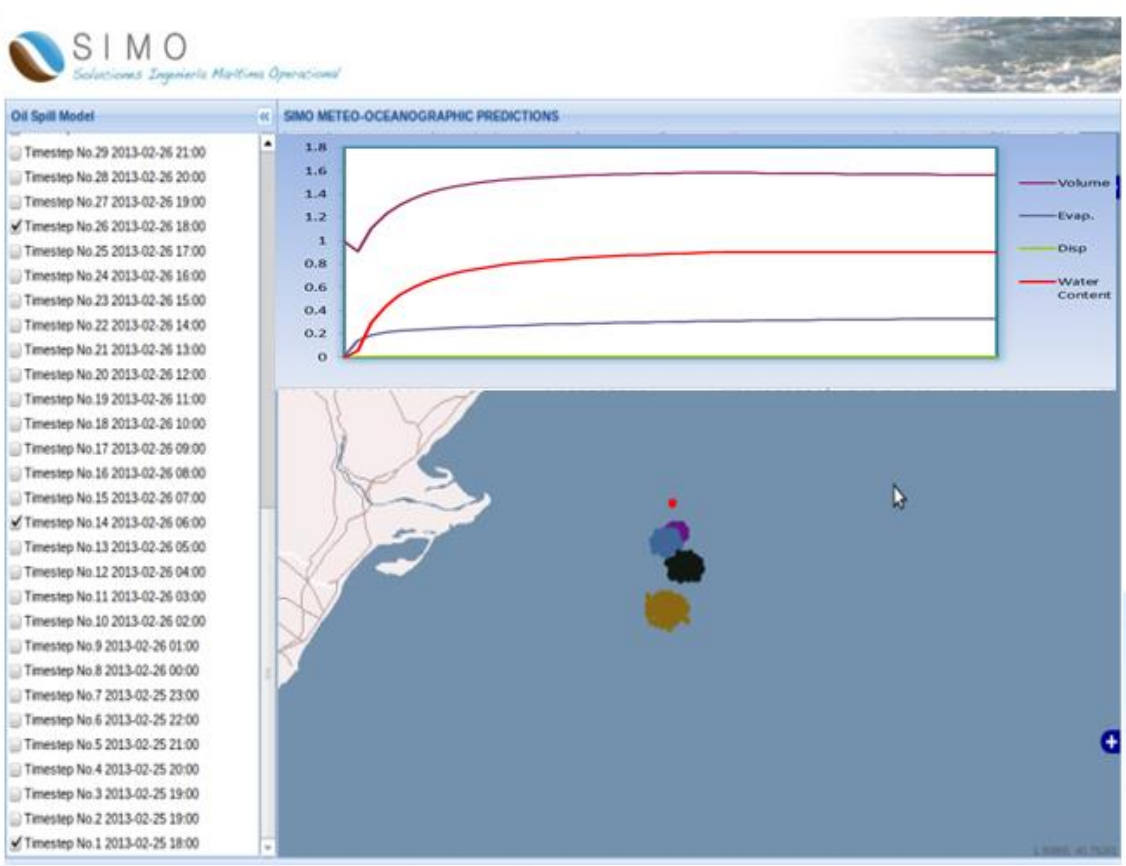
OIL SPILL PREDICTION

✓ Results can be analysed easily

✓Possibility of incorporating different mitigation measures (work in progress)



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