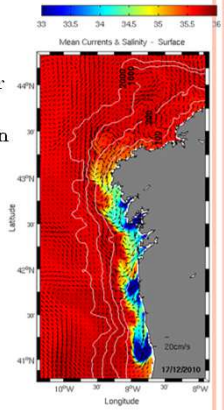
COASTAL OBSERVATORIES

VICENTE PÉREZ-MUÑUZURI. METEOGALICIA (WWW.METEOGALICIA.ES)

Background and justification

- Existence of large scale networks and infrastructures (EMODnet, EuroGOOS, ARGO programme). Forecasting oceanographical models for the Atlantic (MyOcean EU project).
- Existence of local/regional coastal observatories PLOCAN (Macaronesian archipelago), RAIA (Northern Atlantic area of the Iberian Peninsula), LOREA (Eastern part of the Gulf of Biscay), the Western Channel Observatory (Western English Channel) or Smart Bay (Galway, IE), providing services to end-users at the coast, complementing the larger scale networks, such as those managed by Puertos del Estado (ES), Instituto Hidrográfico (PT), Marine Institute (IE), etc.
- Need of quality forecasts and observations for maritime surveillance, oil spills, risks, renewable energy, aquaculture, climate change, tourism…



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ACTION PLAN FOR A MARITIME STRATEGY IN THE ATLANTIC AREA

COMMUNICATION FROM THE COMMISSION. BRUSSELS, 13.5.2013. COM(2013) 279 FINAL

Action Plan. Priority 2. Protect, secure and develop the potential of the Atlantic marine and coastal environment

exploring and protecting marine waters and coastal zones

Developing a **European Atlantic ocean observing and predictive capability,** based on existing structures, platforms and mechanisms to support the implementation of EU policies, reduce costs for industry, public authorities and research institutions, stimulate innovation and reduce uncertainty in the behaviour of the Atlantic ocean and the impact of climate change by:

(a) using existing systems and mechanisms to develop and maintain a sustainable integrated programme for surveying and observing the coasts, seabed and water column, covering the waters of EU Member States, Outermost Regions and Overseas Countries and Territories from the coasts to the deep ocean;

(b) developing new instruments and platforms for ocean observation and ecosystem monitoring (including seabed mapping) that increase the number of parameters that can be measured automatically, lower the costs of observation and accelerate the dissemination of data to users;

(c) contributing to a more effective stewardship, cataloguing and distribution of interoperable marine data and a multi-resolution seabed map through contributions to a European Marine Observation and Data Network;

(d) developing a network of coastal oceanographic forecasting systems (including risk assessments) that build on the Copernicus marine service.

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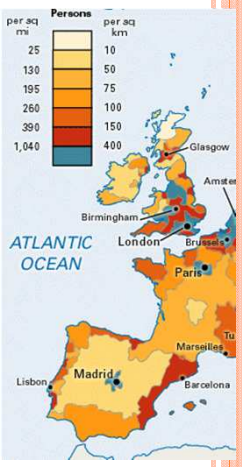
WHAT FOR DO WE NEED OCEAN OBSERVATIONS?

- Most of the EU population lives near the coast (for example, Portugal, Galicia, etc) and in many cases depend on a sea-based economy.
- Atlantic coastal and marine area provides the basis for a wide range of goods and services. In fact coastal zones are often the center of important industrial and commercial activities of great economic relevance boosting urban growth.
- Marine-related industries and services contribute roughly 1.8% to the Gross Domestic Product and 2.1% to employment opportunities. More than a third of the value of the maritime sector in the North-East Atlantic is generated by coastal tourism and shipping, with tourism and the fishing industry being the largest employers.
- Ocean observations are becoming increasingly important to contribute to coastal management, carrying the need for the exploitation of the most advanced and efficient observing technologies.



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WHAT'S STILL MISSING?

- Few observations… For every 100 observations on land, about one observation exists at sea, and less if we are dealing with biological parameters.
- Data sharing is another challenge: It is necessary to work towards interoperable ocean- data management systems to improve data exchange capabilities and interdisciplinary data integration.
- Need for reliable forecasts, both physical and biological parameters.
- As it happens for weather, we need to develop new services and products for end users from specific sectors and with a relevant economical added value in the Atlantic Area (Tourism, Leisure, Marine Renewable Energies, Maritime Sector, Fishing, Shell fishing).

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OBSERVATORIO OCEÁNICO DA MARXE IBÉRICA (RAIA)

Interreg IV-A (2009-2015)
Galicia – Norte de Portugal
http://www.marnaraia.com

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COMO ESTÁ O TEU MAR?

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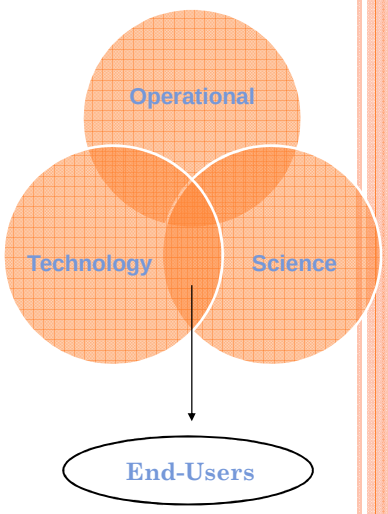
13 INITIAL PARTNERS

- **Portugal**
  - Instituto Hidrográfico (IH)
  - Universidade de Porto (UP); INEGI, INESCP, FEUP, FCUP
  - Universidade de Aveiro (UA)
  - CIIMAR (Porto)
- **Galicia**
  - Instituto Español de Oceanografía (IEO)
  - Universidade de Vigo (UVigo)
  - Intecmar
  - CETMAR
  - Instituto de Investigaciones Mariñas (IIM-CSIC)
  - Consellería de Medio Ambiente. MeteoGalicia. **(Lead partner)**



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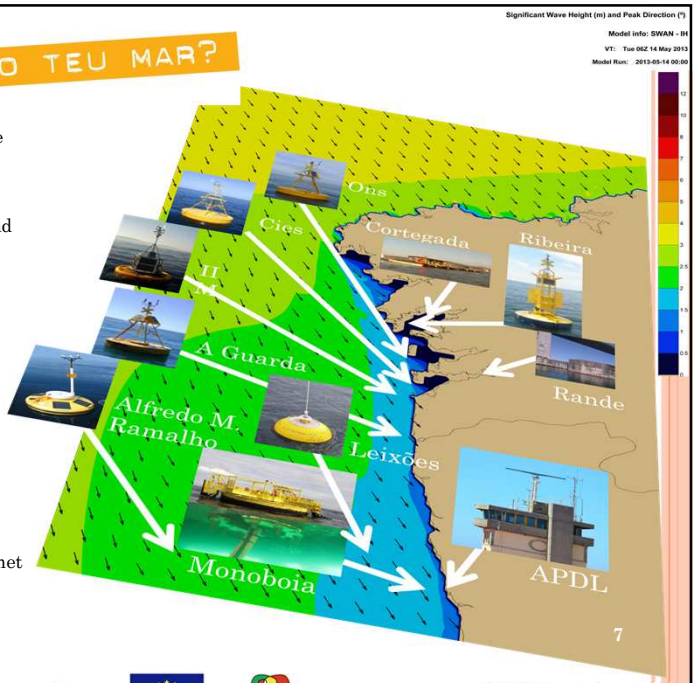
COMO ESTÁ O TEU MAR?

It also incorporate on the same platform other sources of data:

- HF Radar from Marina Mercante (Fisterra-Silleiro) and Intecmar.
- HF Radar from UVigo (Ría de Vigo)
- Tide Gauges from IH and Puertos del Estado
- Other buoys from Xunta de Galicia, IH and Puertos.
- River outflows (real time data and forecast)

The RAIA network increases thanks to new instruments located at monoboia GALP Energia (Leixoes), Faro de Borneira (Porto de Vigo) or a met station at APDL.



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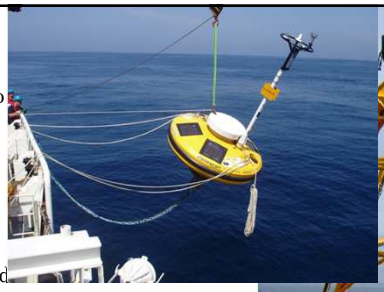
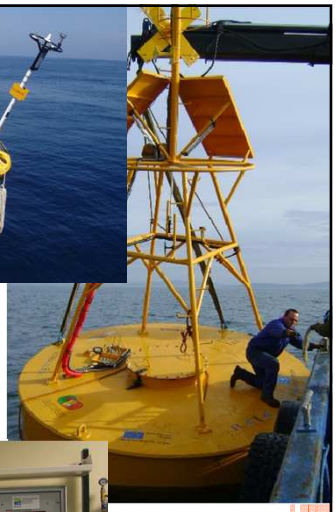
New oceanic infrastructure

New buoys at Ons, A Guarda, Silleiro and Leixoes off-shore (Alfredo M.-Ramalho).
All these buoys have similar instruments; wind, temperature, humidity, solar radiation, sea temperature and salinity at different levels, currents, as well as oxygen and chlorophyll concentrations.
Same validation methods, time acquisition periods (10 min) and data quality.





New Calibration Laboratory (T,C,P) at Cetmar

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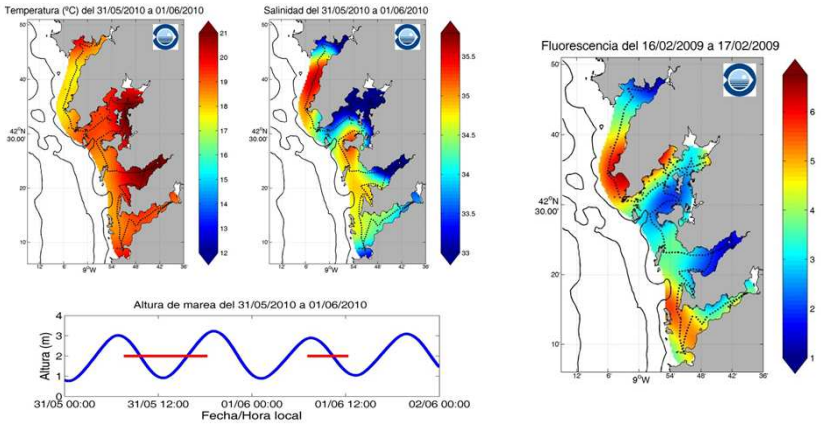
Termosalinómetro from Navaz



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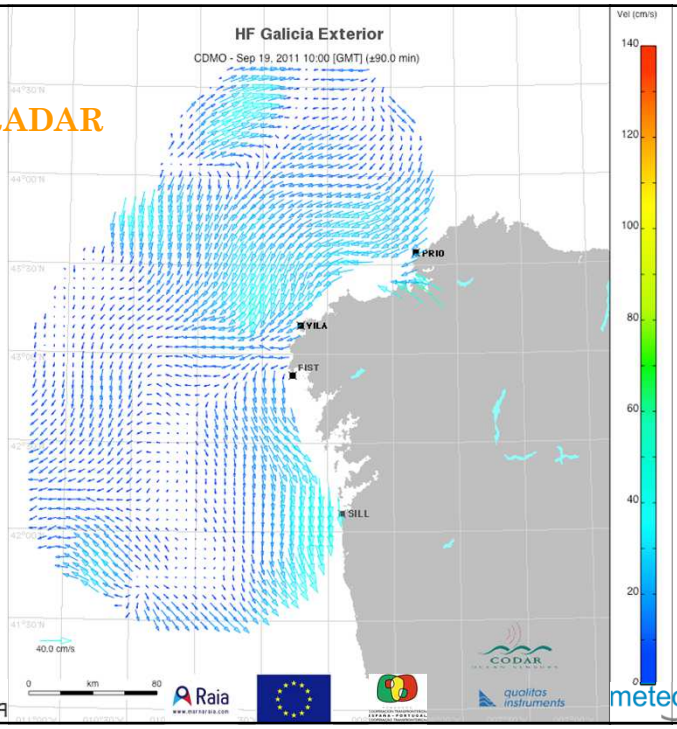
HF Radar



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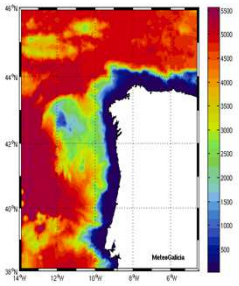
Operational Oceanographic Models



- Meteorological models
  - WRF (12 km for Iberian Peninsula, 4 km for Galicia and 1,3 km for Rías Baixas and North of Portugal)
- Oceanographical models
  - ROMS (IEO, MeteoGalicia, CIIMAR (Porto) and Aveiro).
  - Forecasting 72 hours every day; Currents, temperature, salinity and waves.
  - Redundancy. Different forcings (atmospheric, river outflows) and boundary conditions.
  - Downscaling to harbors, estuaries, end-user applications etc.
- Wave models
  - WWIII and SWAN (0,01º near coast and 250 m at Rias Baixas).

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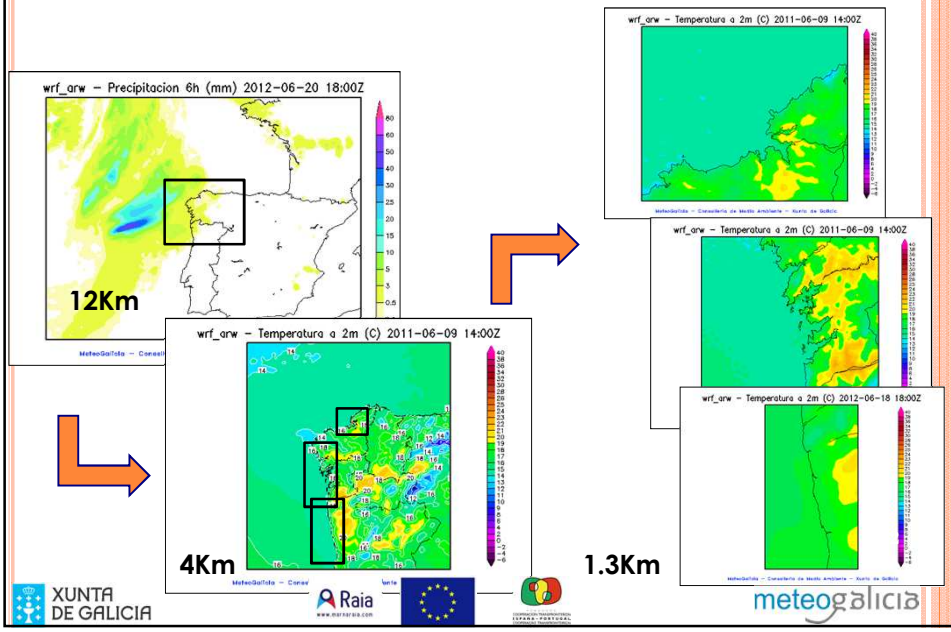
Meteorological model WRF



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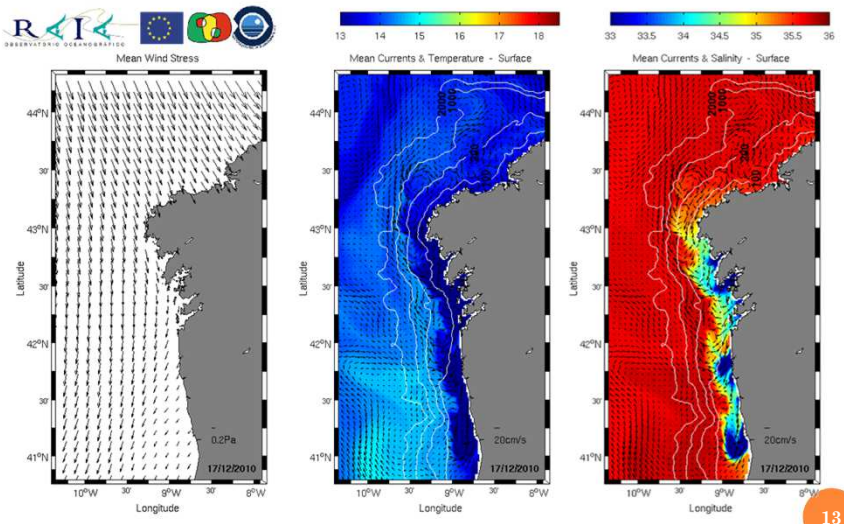
OUTPUT MODEL ROMS



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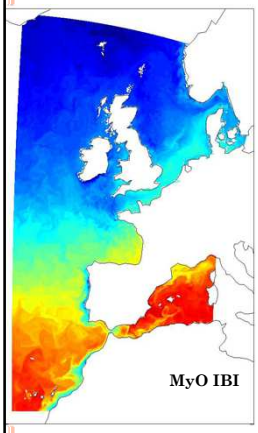
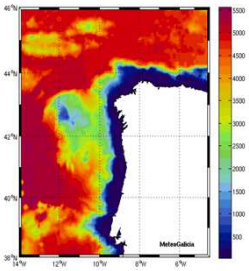
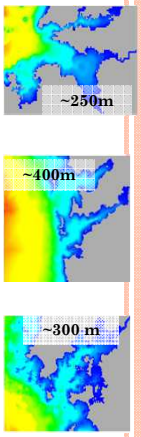
OPERATIONAL MODELS FOR RIAS







- Dx = 0.02°
- DT = 60 s
- Nx = 475, Ny = 401, Nz = 41
- Ocean forcing - Mercator 0.05° (soon 1/36°)
- Meteo Forcing - WRF 12km
- Tidal - OSU Topex/Poseidon
- River - SWAT Flow forecast

(Minho, Ulla, Tambre, Lerez, Umia, Verdugo, Douro)

•Meteo Forcing - WRF 4km or 1,3km

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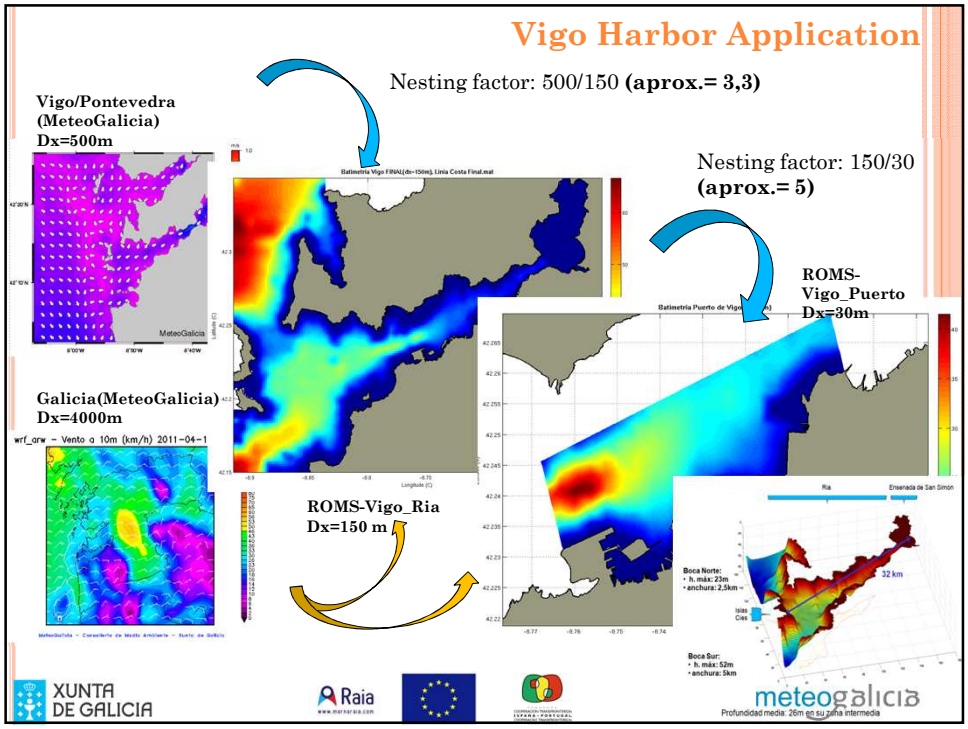
Vigo Harbor Application
Nesting factor: 500/150 (aprox.= 3,3)
Vigo/Pontevedra (MeteoGalicia) Dx=500m
Nesting factor: 150/30 (aprox.= 5)
ROMS-Vigo_Puerto Dx=30m
Galicia(MeteoGalicia) Dx=4000m
ROMS-Vigo_Ria Dx=150 m
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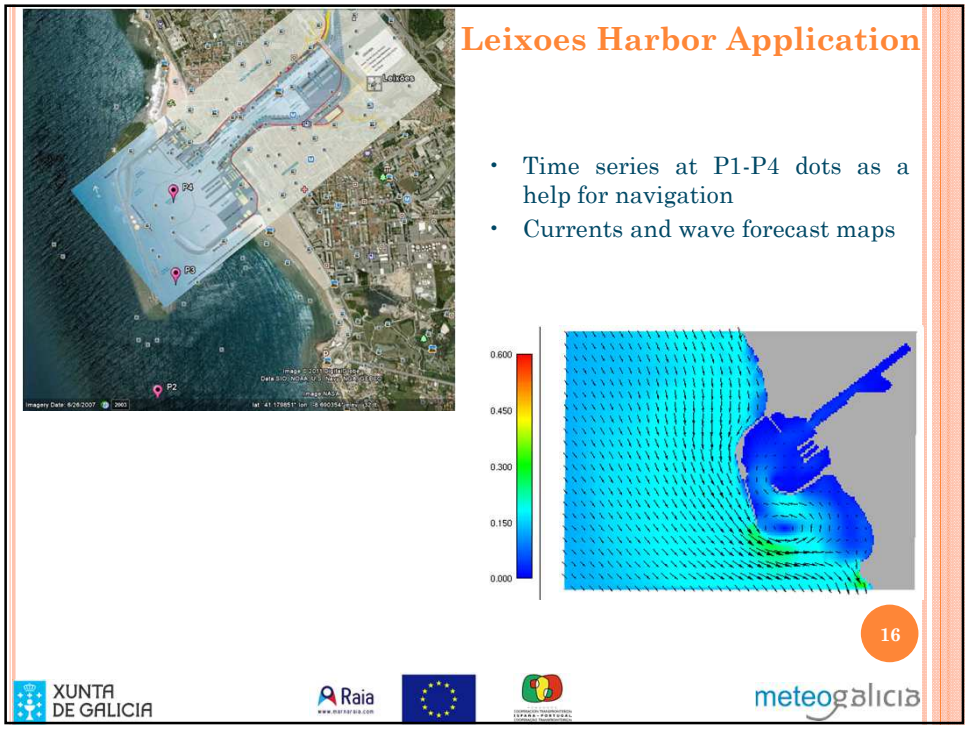
Leixoes Harbor Application
Time series at P1-P4 dots as a help for navigation
Currents and wave forecast maps
P1
P2
P3
P4
0.600
0.450
0.300
0.150
0.000
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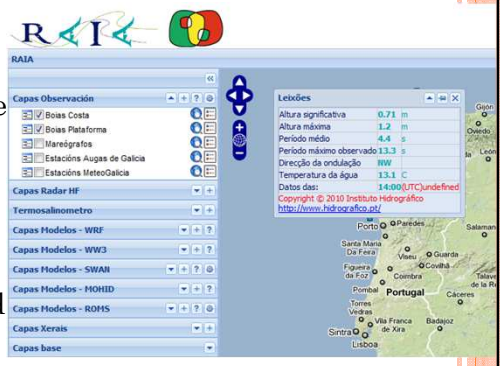
DATA DISSEMINATION

- Both, observations and model forecasts, available through the web site (www.marnaraia.com).
- Real time data from buoys are shown every 10 min. Same criteria for data acquisition.
- Model and observational data are supplied on other operational useful formats through web based access and THREDDS server.
- Development of new data services



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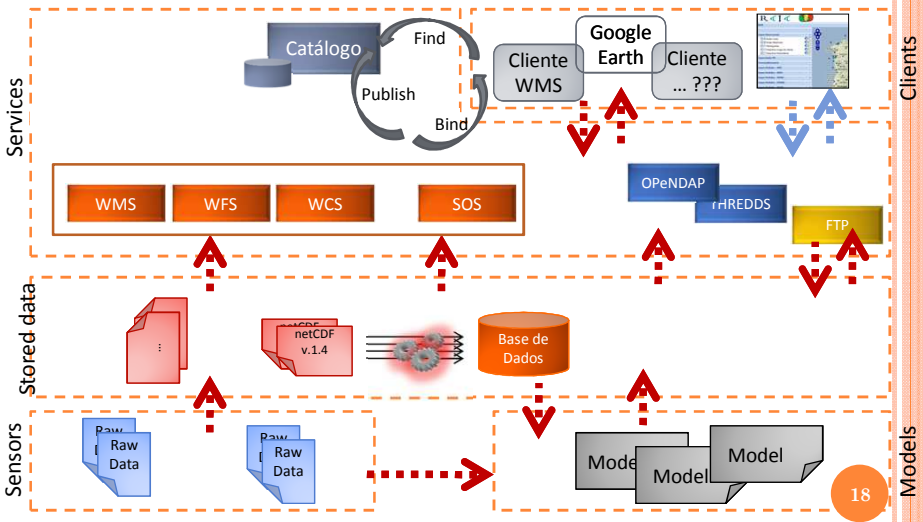
DATA DISSEMINATION



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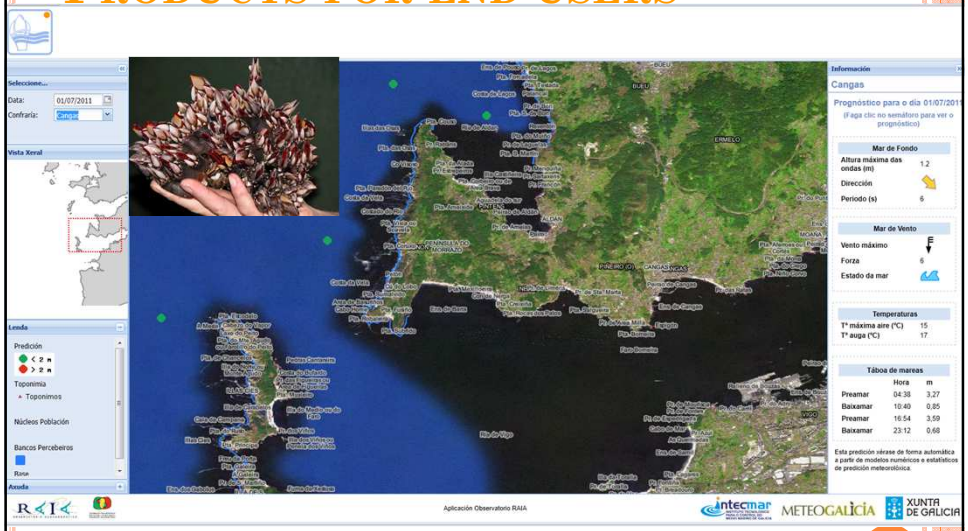
PRODUCTS FOR END USERS



Barnacle fishing

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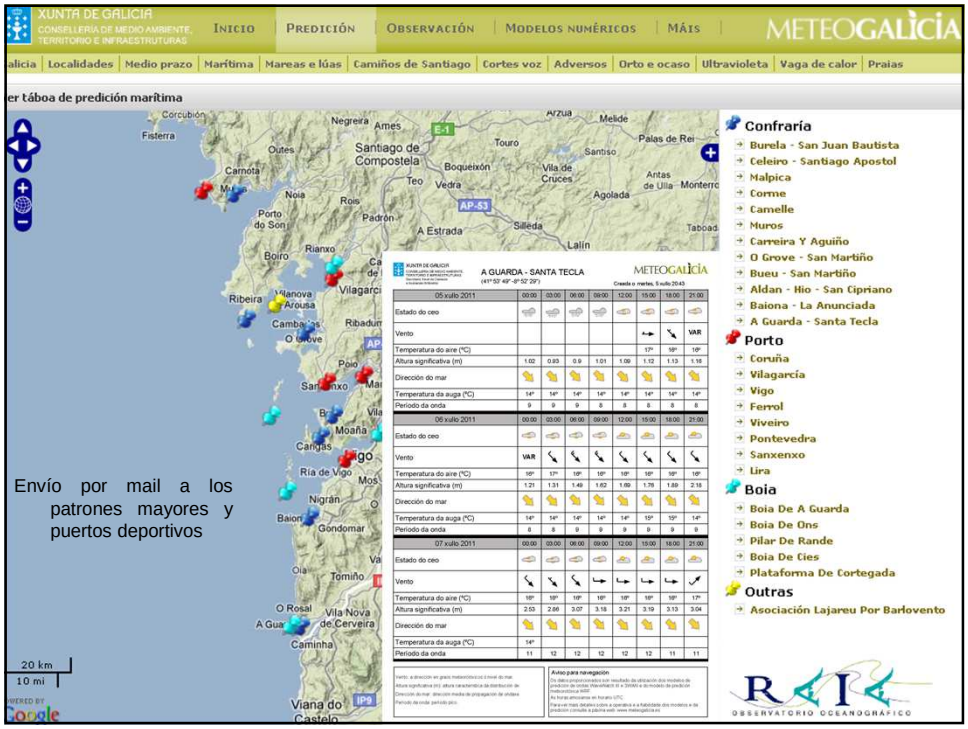
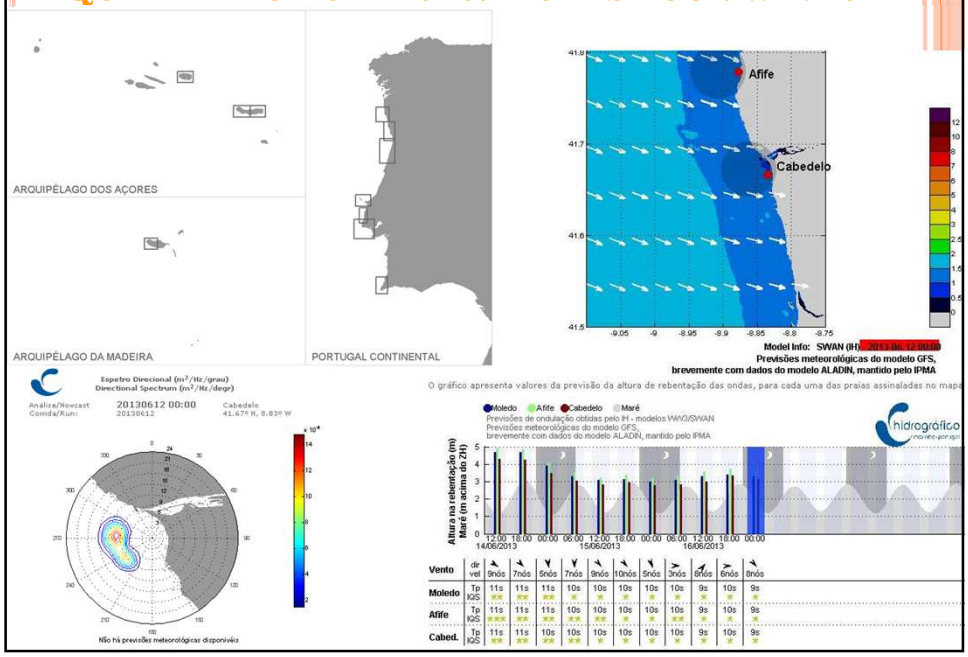


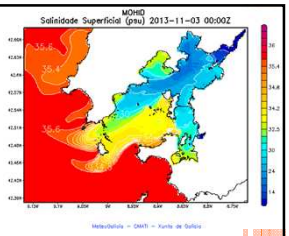
Envío por mail a los patrones mayores y puertos deportivos

Water temperature at beaches

Qual é a tua onda? Which is your wave?



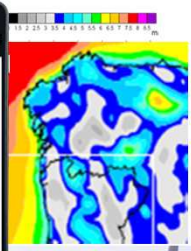
SUPPORT TO THE SHELLFISHING



- **Currents**: Transport of sediments. Accumulation of rests and seaweeds. Transport of larvae.
- **Waves**: Possibilities of access to the resource. Modification of the profile of the sandy areas. Increase of the water turbidity.
- **Tides**: Access to the intertidal areas.
- **Salinity**: With large precipitation rates (avenues), mortality rates increase. Drag of terrestrial sediments.
- **Forecasting** of the environmental conditions

MORE END USERS APPLICATIONS

- Distribution of faecal pollution
- Dynamic maps for fronts and eddies.
- Forecasting wind and wave energy offshore (Portugal)
- Models of sediment transport.
- Prediction of episodes of coastal pollution from residual waters improperly debugged.
- Forecast of waves and wind in the defeats of entrance and exit of the estuaries and ports.
- Apps for smartphones (@Android Market, App Store).
- Etc



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CONCLUSIONS

- The Euroregion Galicia-North of Portugal has at present an infrastructure of oceanic measurement of very high density; points of measurements, number of observations, etc.
- The network of observation provides reliable information and of quality.
- The operational models allow to give forecastings up to 72 hours of the state of the sea.
- We have developed specific applications for end users using the capacity of the Observatory to provide forecastings and observations in real time; harbors, fishermen, percebeiros, tourism, etc.
- The observatory RAIA pretends to be the site of reference of the Euroregion in terms of observation and oceanic prediction. It provides data to IBIROOS.
- **Near Future**:
  - Improve the presence of RAIA in different socioeconomic sectors of activity (energy, fishing, recreational boating, tourism, etc) of the Euroregion North of Portugal – Galicia.
  - **MyCOAST:** a Coordinated Atlantic Coastal Operational Oceanographical Observatory

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GRACIAS, OBRIGADO, THANKS

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http://www.marnaraia.com

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