



### THE MOHID OPERATIONAL FORECASTING SYSTEM AT METEOGALICIA

### A GENERAL OVERVIEW OF THE PRESENT STATE AND FUTURE IMPROVEMENTS

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### **MeteoGalicia**

	CALIDADE AIRE FORMACIÓN E METEOEBECULAS	Catego Catelaro XUNTA DE GALICIA ONSELLERÍA DE MEDIO AMBIENTE, TERRITORIO E VIVENDA PUBLICACIONE MAIS
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máis		
A		
Mais MeteoGalicia		
XUNTA @ Xunta da Galicia defensación ma	Teléfono: +34	4-881-999654 galicia
DE GALICIA	Fax: +34-981	.957466

### Galician Weather Service since 2002

Our core activities are:

- Numerical forecasts for atmosphere, ocean and air quality
- Weather and climate Monitoring
- End user services
- Active participation in research projects
- Colaboration with several institutes to improve observation network, highlighting colaboration with INTECMAR



Operational Implementation

**Products & Services** 

meteogalicia

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### **Observational Network** (INTECMAR & MeteoGalicia)

### Galicia has an observational network comprising:

- Ocean-Meteorological buoys (MeteoGalicia/INTECMAR)
- CTD Stations (INTECMAR)

Also :

- Wave Buoys (MeteoGalicia/ INTECMAR /Puertos del Estado
- HF Radars
- Tide Gauges
- Flow Stations
- Meteorological Stations
- Weather Radar
- Weekly Radiosonde
- Lightning Network









#### XUNTA DE GALICIA

### MeteoGalicia Forecast System



#### For an efficient answer :

- Several models are run at regional to local scale, routinely providing predictions for atmospheric and oceanic variables along the Galician coast, including the rias and harbours of greatest interest.
- To run these numerical models, the computational resources offered by AMTEGA and CESGA are used. In this context, the Galician High Performance Cluster "Finisterrae2" (FT2) is key to assume the ever increasing computational costs.

CESGA - Centro de Supercomputación da Galiza AMTEGA - Agencia para la Modernización Tecnológica de Galicia

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meteogalicia

## Hydrodynamic Forecast



### **MOHID Operational Forecast in Present**



#### Local Model: MOHID

- Forecast: 3 days
- 4 grids at 300m + 2 grids at 50m: Artabro, Noia/Muros, Arousa, Vigo/Pontevedra & Harbors: Langosteira, Coruna
- Dx = 300m/ DT = 30s
- Dx =50m, DT= 15
- Ocean forcing Roms 2km/DT=900s
   Nx = 400, Ny = 475, Nz = 41
   Tidal OSU Topex/Poseidon
- Meteo Forcing WRF 4km
- Rivers SWAT model

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## **MOHID Pre-Operational Forecast in Present**

### RUN performed in FT2 (CESGA) with 24 procs



Local Model: MOHID parallel mode (MPI)

- Forecast: 4 days
- 2 grids at 300m + 2 grids at 50m: Artabro, Rías Baixas & Harbors: Langosteira, Coruña
- Dx = 300m, DT = 30s
- Dx =50m, DT= 15
- Ocean forcing Roms 2km/DT=900s
   Nx = 400, Ny = 475, Nz = 41
   Tidal OSU Topex/Poseidon
- Meteo Forcing WRF 4km
- Rivers SWAT model

# MOHID Operational Forecast Improvements in the Near Future

### RUN performed in FT2 (CESGA) with 24 procs

1.667

boxfill opaque

linear

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Upgrade the Rias Baixas model by incorporating a biogeochemical module capable to predict the main biogeochemical properties.

- Domain: 305 x 232
- Horizontal resolution: 400m
- Vertical resolution: 12 sigma layers up to 20 m + 63 Cartesian
   Boundary conditions :

WRF 4 km MeteoGalicia

- SWAT MeteoGalicia (flow, nutrients, organic matter, sediments)
- Ocean: Hydrodynamics (ROMS MeteoGalicia) and biogeochemistry (CMEMS IBI Bio)

This improvement are made in the scope of MYCOAST project Collaboration with HIDROMOD



# Future improvements of the MOHID Operational Forecast System

FT2 (CESGA)

Only: 1 DOMAIN along the coast with 300 meters of resolution



**Others:** 

- Increasing Atmospheric boundary condition (WRF MODEL) to 1 km
- Improvement rivers discharges (SWAT model)

The main <u>DIFFICULTIES</u> to these improvements:

Computational Costs



### XUNTA DE GALICIA

## **Data Dissemination**

Model data and observations are distributed by: WEB based access and **THREDDS** server

Different kind of

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Model data and observations are	meteogalicia.es/web/modelos/threddsIndex.action	☆ ▾ C S ▼ meteosix visor	
	Castellano   Galego 🔗 Personalizar páxina	📇 Mapa web 💭 Envío de Suxestións	
distributed by: WEB based access and	XUNTA DE GALICIA CONSELERA DE MEDIO AMENTE, INICIO PREDICIÓN OBSERVACIÓN CLIMA MODELOS NUMÉRICOS	MÁIS   METEO <b>GALÌCIA</b>	
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M Gmail - Recib. R 🕫 FASYCO I Fur. R 🔍 Untitled Docu. R 🚺 MeteoGalicia. R 💿 http://.cia.es/ R 📾 Catalog Servi R 🕷 filo - Dicciona. R 💿 Facultad Cien. R 🔶	<ul> <li>O servidor baséase na xeración dinámica de católogos en formato xml a través dos cales proporciónanse ligazóns de</li> </ul>	Thredds	
MeteoGalicia TDS	acceso mediante diferentesprotocolos ás diferentes coleccións e conxuntos de datos. Así pois, a travésde esta ferramenta	Para manterse informado dos cambios	
Meteo Galicia TDS	permitese o acceso público aos datos de predición numérica que se xeran operativamente en MeteoGalicia.	MeteoGalicia pode subscribirse a esta	
THREDDS Data Server	Servidor THREDDS de MeteoGalicia	lista. É un servizo, polo momento, en	
Catalog http://mandeo.meteogalicia.es/thredds/catalog/modelos/mohid/baroclinaNX/arousa/20110308/catalog.html	Subscrición en lista de correo A través desta lista de correo, informarase dos cambios que se produzan no Thredds de MeteoGalicia. É un servizo, polo	proses.	
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K	Modelo WRF 3D		
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I SAG.	for 36Km, 12Km and 4km resolution.		

Surface and 3D diagnostic model variables FoxyProxy: Deshabilitado 🛛 🎯

http://www.meteogalicia.es/ http://www.marnaraia.org

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## Products where MOHID data is used

- Institutions responsible for the management of marine resources (harbor infrastructures, fisheries and seafood).
- Fishing associations and nautical clubs
- Authorities responsible for water quality control
- Institutions responsible for maritime safety
- Research and technology centers (universities, research centers, technology companies)
- Society in general
- API y Mobiles Apps: Meteosix
- In scope of European projects, such RAIA, MyCOAST, COCKLES



#### XUNTA DE GALICIA

## **Predictions: Associations and Harbours**

- 3 hours forecasts
- More accuracy
- Available in the web and via email (in pdf)



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Dirección do mar									
Temperatura da auga (ºC)									
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#### XUNTA De galicia

### **Beach Forecast**





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#### DEVELOPED BY INTECMAR - Technological Institute for the monitoring of the marine environment

galicia



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# Simulations of cockle larval dispersion in Rías Baixas

Leadership: Centro Tecnológico del Mar (CETMAR)









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Floodtool

#### Based on a Qgis plugin in python3

	FloodtoolProyect - QGIS
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Allows by combined :

sea surface level + significant wave height

Predicts an alarm of a posible flood

### **Multiplataform Tool**

### Portable to all places of the World

#### **Requirements:**

- Qgis software
- Python3 –netCDF4 and PANDAS in system
- Thredds server
- Standard structure thredds and variables (manual available at MeteoGalicia)

Tool developed in the scope of the project MyCoast by: Pablo Carracedo, Dep.Numerico MeteoGalicia









### Based on a Qgis plugin in python3

Floodtool

#### Important:

- For that kind of plugin to work, should be followed the protocol data-sharing
- There is available a good practices document made by MeteoGalicia

#### **Thredds server**

← → C	🖾 🛧 🔍 Buscar	lu\ 🚳 🗉 🔹 ≓≜
🌣 Más visitados 🔞 Getting Started 虑 MeteoGalicia 虑 Servidor THREDDS de 🔈 Python Web Console 🖨 Fichajes 🦉 World Ocean	Radio Gl 🔘 Copernicus - Marine e 🛱 https://www.card.ias	»
Catalog http://193.144.35.143/thredds/catalog/MyCoast/MOHID/artabro/catalog.html		
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MyCOAST V1 MeteoGalicia MOHID artabro 01hr 2019112700 PR.ncml	3.015 Kbytes	Pablo Carracedo <sup>1</sup> , Sabela Regueiro <sup>1</sup> , Pedro Montero <sup>2</sup>
MyCOAST V1 MeteoGalicia MOHID artabro 01hr 2019112600 PR.ncml	3.015 Kbytes	Juan Taboada <sup>1</sup>
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MyCOAST V1 MeteoGalicia MOHID artabro 01hr 2019112000 PR.ncml	3.015 Kbytes	
Initial TDS Installation at My Group see Info		Abstract

THREDDS Data Server [Version 4.6.14 - 2019-07-23T11:04:31-0600] <u>Documenta</u>

In recent years in the field of Geo-science, it has become apparent that there is a requirement to share oceanic data more efficiently. In the past few months, the need to standardise some aspects of our shared data has come up among the MyCOAST project, partners. In the present report, two partner institutions of the MyCOAST project, the Technological Institute for the Monitoring of the Marine Environment in Galicia *INTECMAR* and the meteorological agency of the regional Galician government, *MeteoGalicia* propose a standardisation system for distributing shared data among the partners.

Tool developed in the scope of the project MyCoast by: Pablo Carracedo, Dep.Numerico MeteoGalicia







Atlantic Area

EUROPEAN UNION

meteogalicia

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oast

Floodtool

#### Based on a Qgis plugin in python3



Tool developed in the scope of the project MyCoast by: Pablo Carracedo, Dep.Numerico MeteoGalicia





Floodtool

#### Based on a Qgis plugin in python3

This tool is currently under development and is thus constantly improved, e.g. the color codes representing distinct alarm levels or return periods.



### Soon code available in GitHub repository

Tool developed in the scope of the project MyCoast by: Pablo Carracedo, Dep.Numerico MeteoGalicia



# Fim! OBRIGADA PELA VOSSA ATENÇÃO!

# The End! THANKS FOR YOUR ATTENTION!





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