



CONSTRUCCIÓN DE MODELOS OPERACIONALES EN OCEANOGRAFÍA

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Puertos del Estado

MY OCEAN

Marine
Core
Service

CESGA HPCN WORKSHOP 2010 PROGRAMME



CONTENTS:

- ✓ **PdE: Operational oceanography (OO) activities**
- ✓ **MyOcean Project: Towards a Pan-european OO Service**
- ✓ **The IBI Monitoring & Forecasting Center (MFC)**
- ✓ **IBI Developments in CESGA**



■ Puertos del Estado

□ *Área de Medio Físico (R&D Section)*

Main objective: To provide the required oceanographical & meteorological information need to support and to manage the Spanish harbours activities.

□ **Activities**

- Permanent measuring networks
- Forecasting systems (numerical modelling)
- Multi-parameter Marine Database
- Web display services
- R&D Projects



Operational Oceanographic Centre

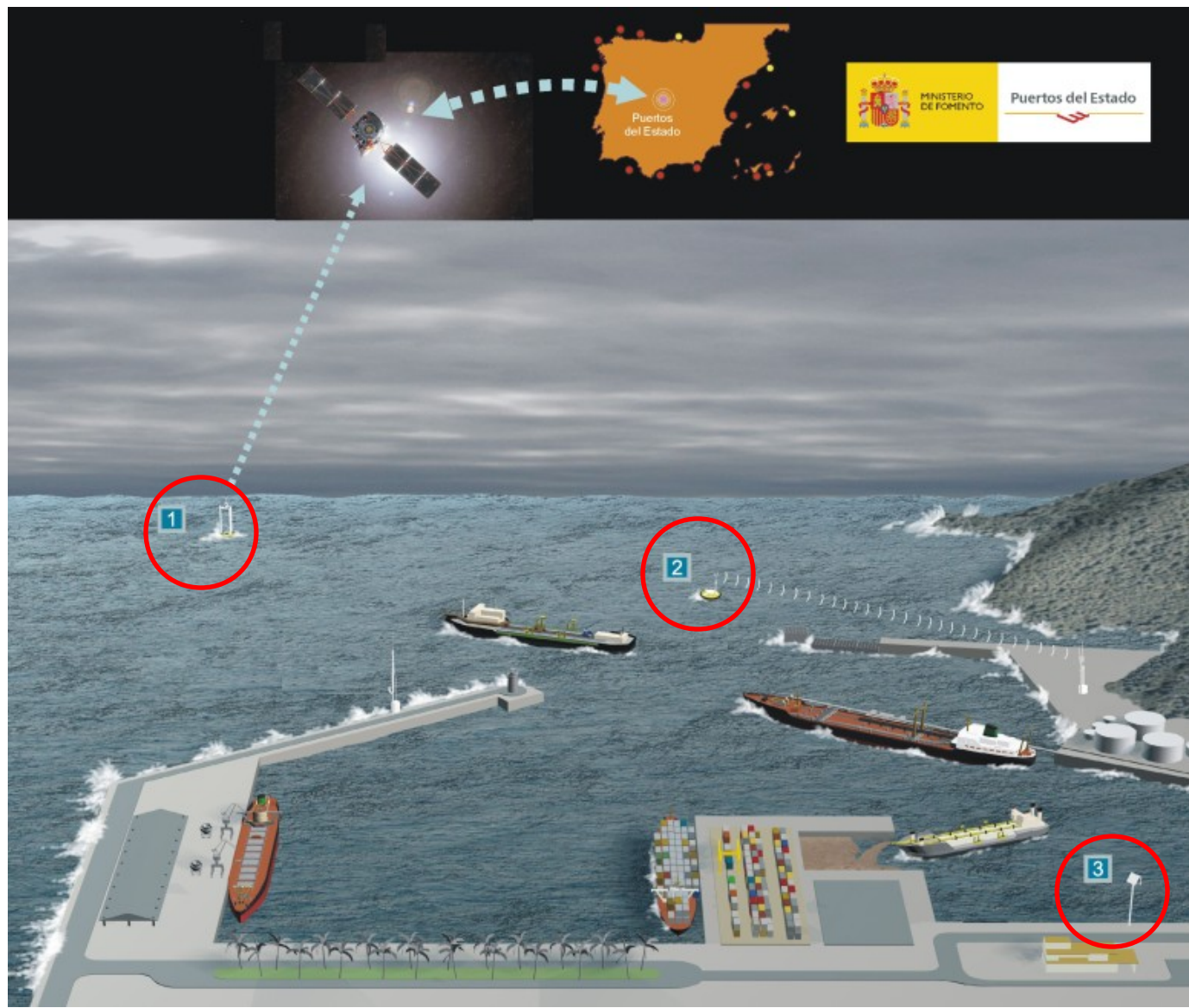


Permanent Real-time monitoring

1. Deep water Buoy Network

1. Coastal Buoy Network

1. Tide-gauge Network

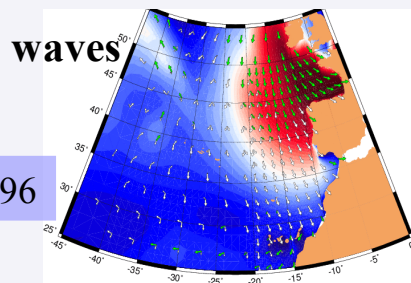




Forecasting Systems

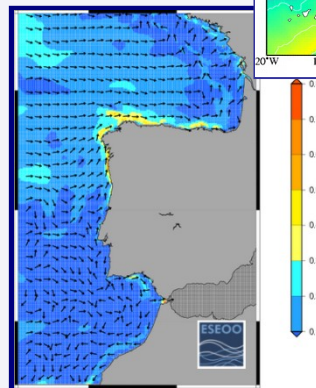
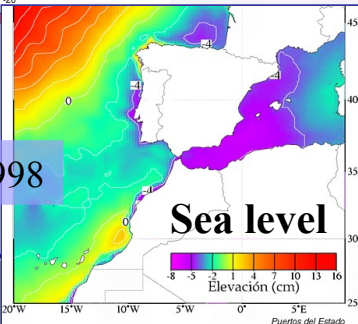
- **Main Aim: To provide oceanographic prediction (harbours)**

Since 1996



0.00 1.00 2.00 3.00 4.00 5.00 6.00

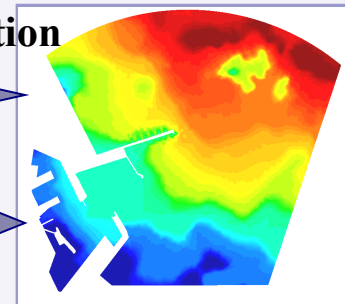
Since 1998



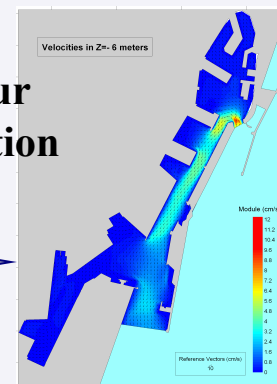
Forecasting Systems

Local scale
(Harbour Applications)

Waves & Agitation

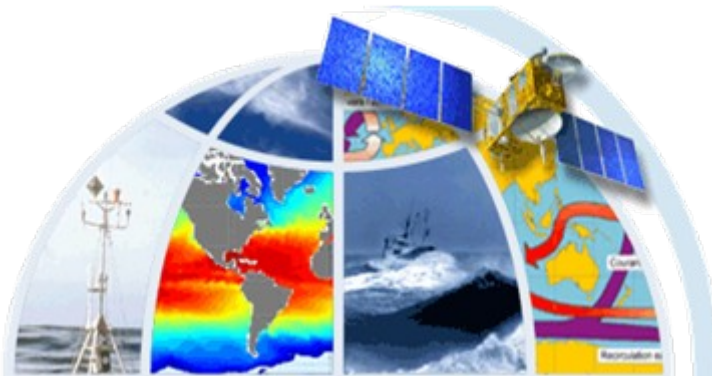


Harbour Circulation



<http://www.puertos.es>

- **MyOcean** (European project, FP7) objective: To implement the **GMES Marine Core Service** for ocean monitoring and forecasting (dealing with environment, security and resources).
- GMES based on **observation data** (satellites & ground based information).
 - Data coordinated, analysed and **prepared for end-users**.



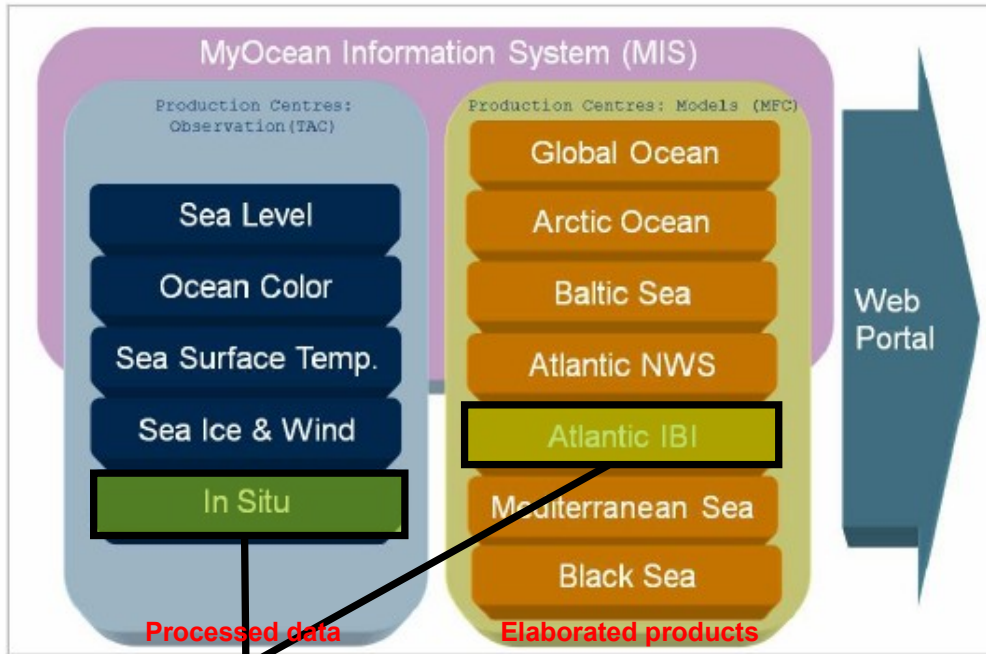


MyO: Towards a pan-European OO Service

Marine Core Service

- MyOcean aims for delivering **regular and systematic reference information** (processed data, elaborated products) on the state of the oceans and regional seas (<http://www.myocean.eu.org/>).
- MyOcean information enables to describe the physical state of the ocean through **analysis, hindcasts, nowcasts and forecasts**, and also contributes to **climate research** providing time series of analysed parameters.

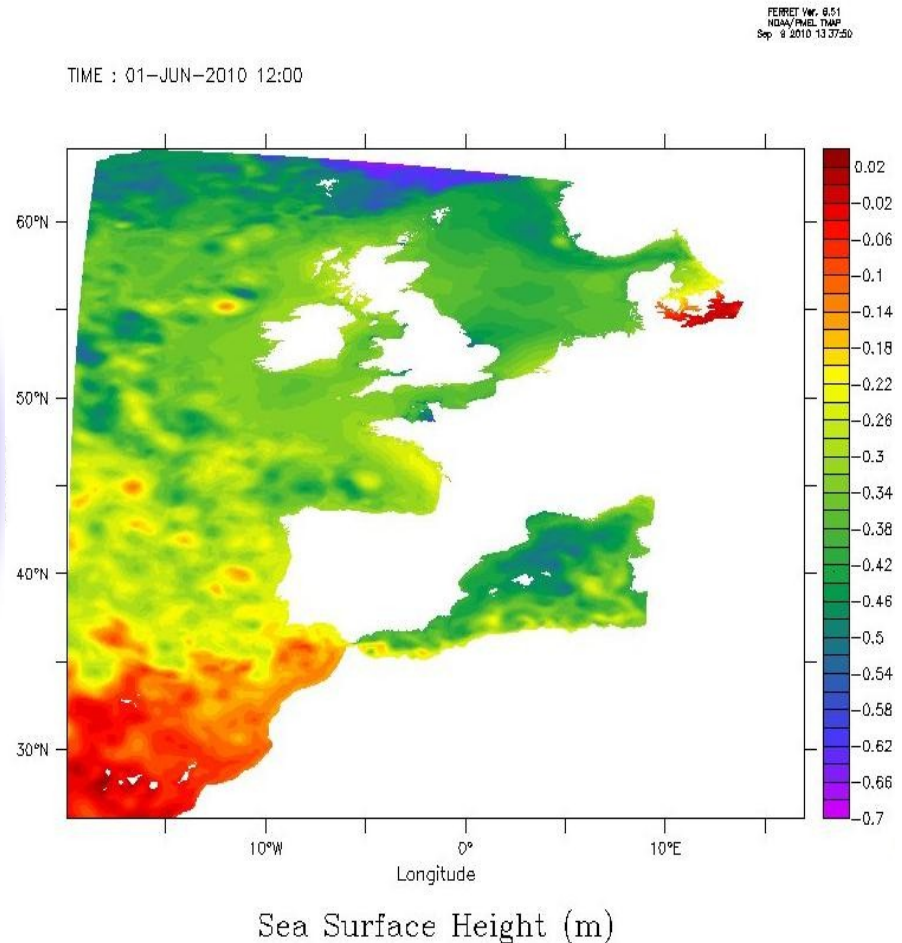
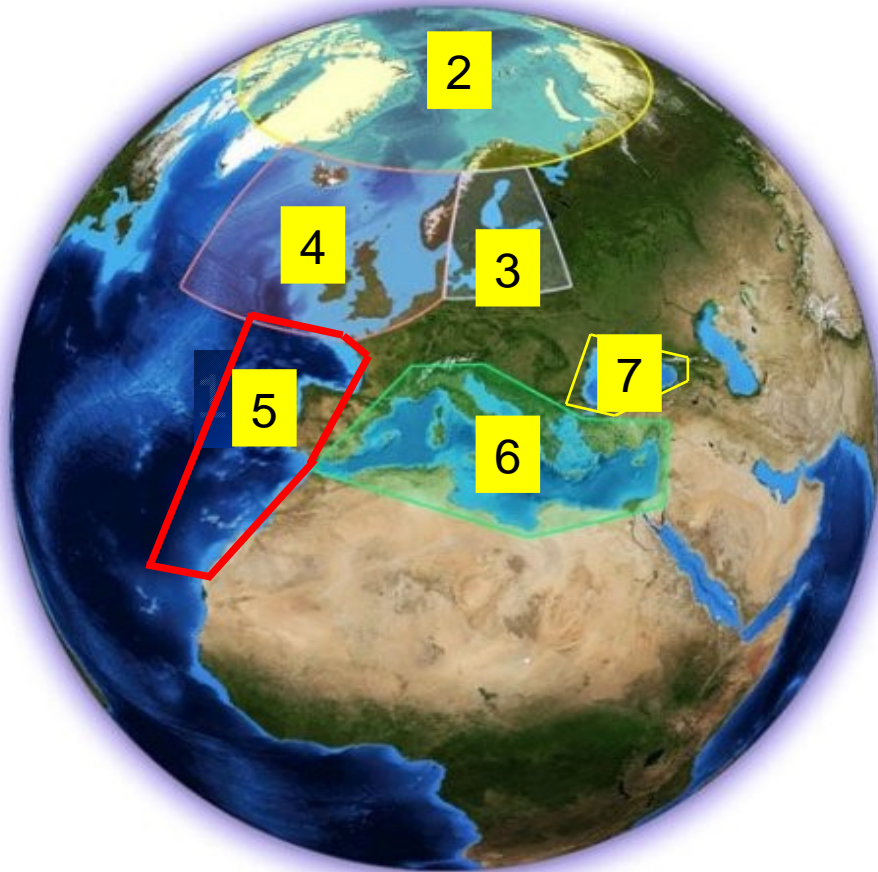
- The MyOcean system is composed of 14 sub-systems:
 - 12 PC: 5 observation assembly (Thematic Assembly Centres – **TACs**) and 7 Monitoring & Forecasting Centres (**MFCs**),
 - a unified **Web Portal** and an
 - Information System (**MIS**).



The IBI MFC: A system description

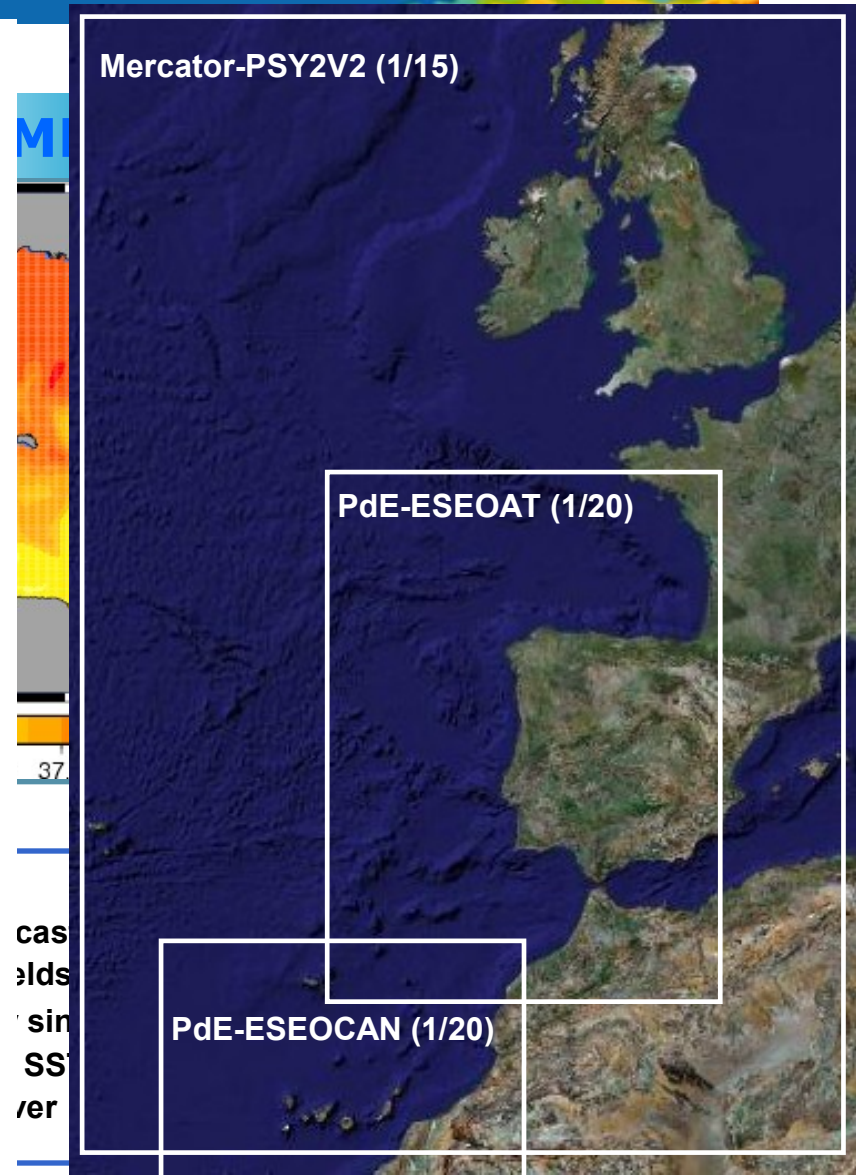
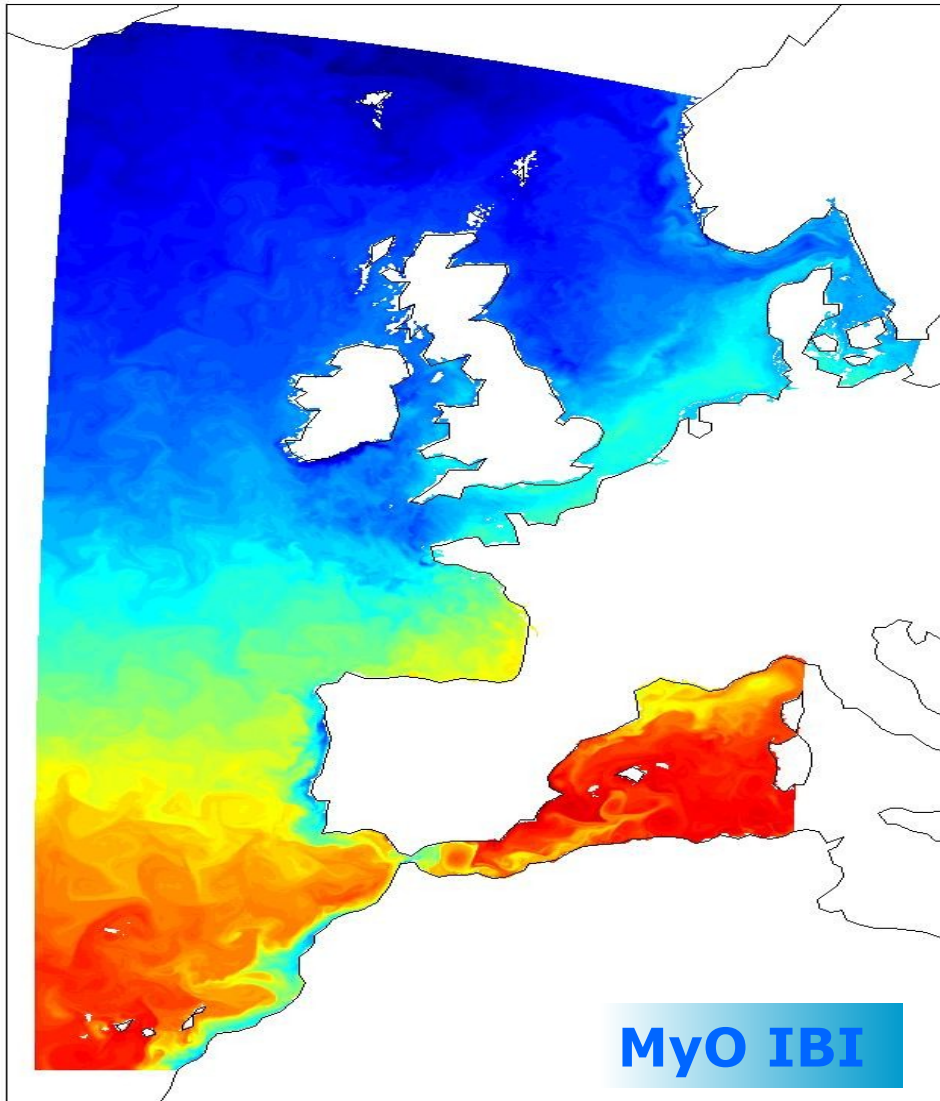
Marine Core Service

- PdE responsible of the “Nominal” IBI-MFC and **MERCATOR** will provide a full **back-up** Application



The IBI MFC: A system description

Marine Core Service



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IBI Application based on NEMO model

- **NEMO** (Nucleus for European Modeling of the Ocean) model V3.2.
 - NEMO (3D baroclinic model) solves Navier-Stokes equations in geopotential coordinates under hydrostatic and Boussinesq approximations. Finite differences.
 - Free surface model
- IBI NEMO application includes:
 - **Tidal processes**
 - **3h atmospheric forcing** from ECMWF
 - **Nesting in GLOBAL MyO** system (OBC & IC)
 - Inclusion of **river discharge inputs**

- **NEMO is FORTRAN90 code**
- **Parallelization: MPI**
- **71241 code lines**

The IBI MFC: A system description

Marine Core Service

✓ ESEOAT (IBI V0) Vs. NEW IBI V1

- ↑ spatial resolution **1/20°, 34 lev => 1/36°, 50 lev**
- ↑ forecast horizon **3 days => 5 days**
- ↑ dissemination/visualization
improved channels for products **ftp => ftp, web, thredds/OpenDap**
- ↑ Operational robustness



IBI ⇒ 1093x1894 x 50 = **1.035e08** ; tstep=150s ⇒ **576** steps/day ; **6** days
 ESEOAT ⇒ 291x321x34 = **3.17e06** ; tstep=240s ⇒ **360** steps/day ; **4** days

Noticeable increase of computing resources!!!
CESGA support required!

Colaboración CESGA-MG-PdE



myOcean

CONVENIO MARCO:

- ✓ CONVENIO MARCO DE COLABORACIÓN ENTRE EL CENTRO DE SUPERCOMPUTACIÓN DE GALICIA, METEOGALICIA Y PUERTOS DEL ESTADO PARA LA COOPERACIÓN CIENTÍFICO-TÉCNICA EN LA SIMULACIÓN Y ANÁLISIS DEL MEDIO FÍSICO MARINO Y SU IMPACTO EN EL ÁMBITO PORTUARIO



Adenda Número 1 para la consecución de los trabajos de I+D necesarios para configurar un Sistema de Predicción Oceanográfica para la Fachada Atlántica Europea (zona IBI).



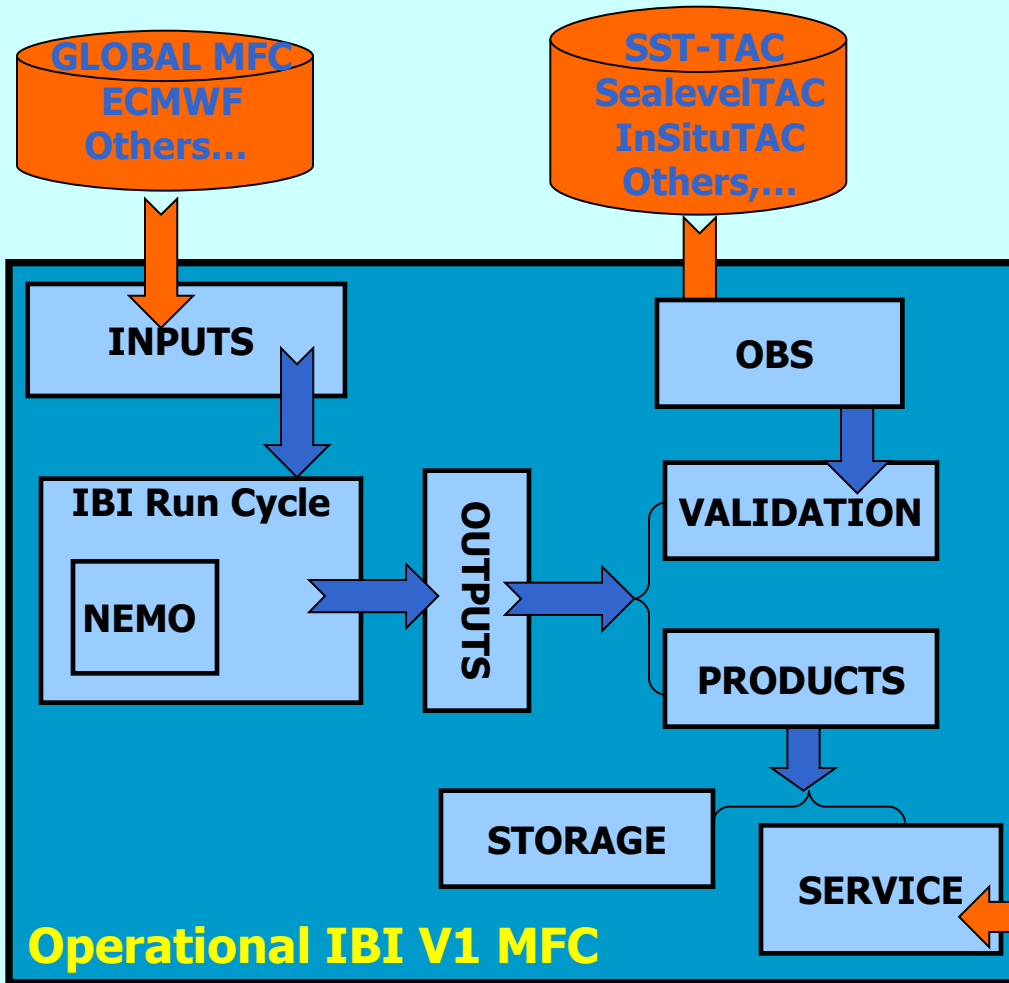
Adenda Número 2 para la puesta en marcha y evaluación del servicio operacional de un Sistema de Predicción Oceanográfica para la Fachada Atlántica Europea (zona IBI).

MY OCEAN

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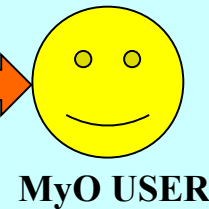
IBI Developments in CESGA

Marine Core Service



Finisterrae (Cluster Architecture)

- Number of Processors: 2.528 (190 calculus nodes)
- Type of Processor: Intel IA 64 Itanium 2 Montvale Dual Core 1.600MHz(6.4 Gflops)
- Peak Performance: 15.360 GFLOPS
- Interconnect: Infiniband 4x DDR 20 Gbps
- Memory: 19.670 GB
- Disc: 390.000 GB

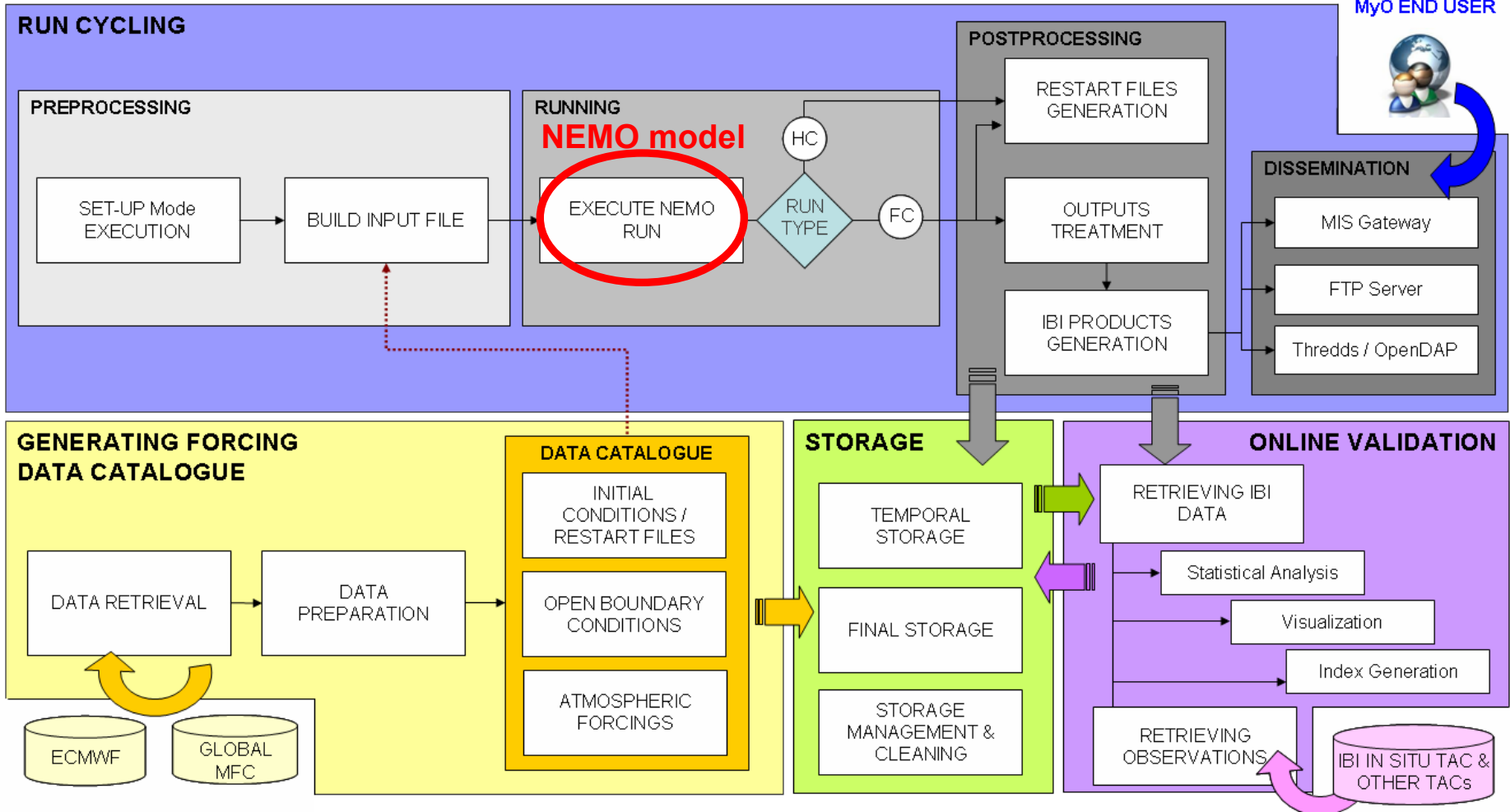




myOcean

Marine Core Service

IBI Developments in CESGA





IBI Scientific Validation Plan

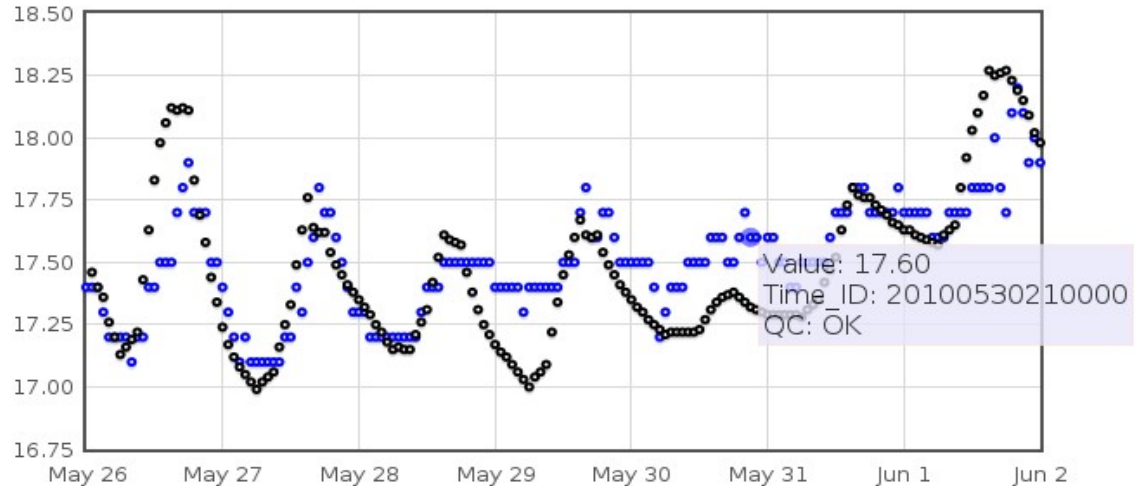


MyOcean IBI MFC

MyO IBI ON-LINE VALIDATION:
MOORING AND TIDE-GAUGE VISUALIZATION

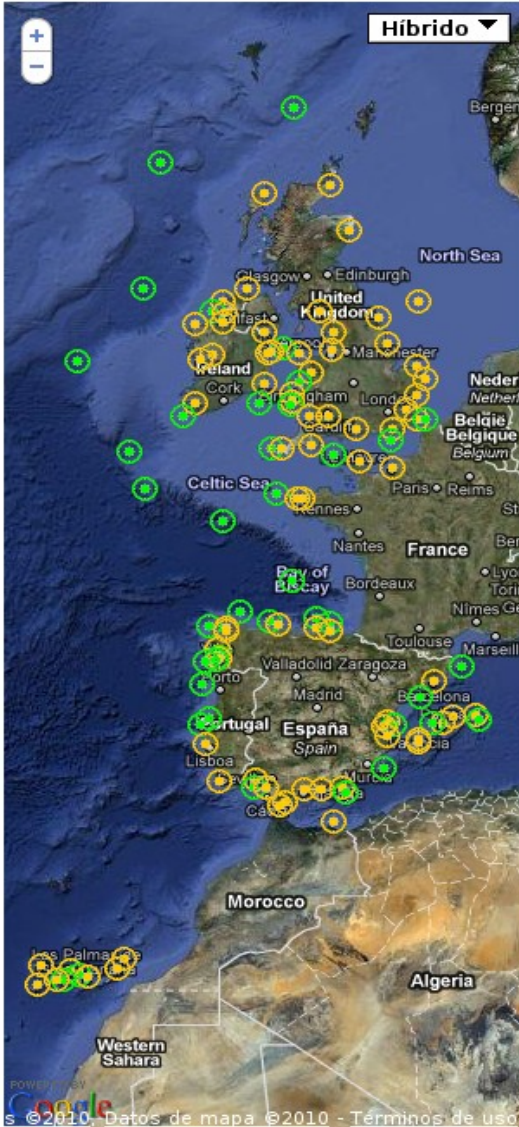


Data from **Bilbao_buoy** station.
Provider: **Puertos del Estado (Spain)**.
Param: **SEA WATER TEMPERATURE (degree_Celsius)**.
Last received data: **20100602000000** (GMT)



- Observation
- QC: Wrong
- IBI Output

Observational data gathered and disseminated by Puertos del Estado.
Data Providers:



MyO IBI products & dissemination

Marine Core Service

IBI Products

Daily updated Predictions

Forecast horizon: 5 days

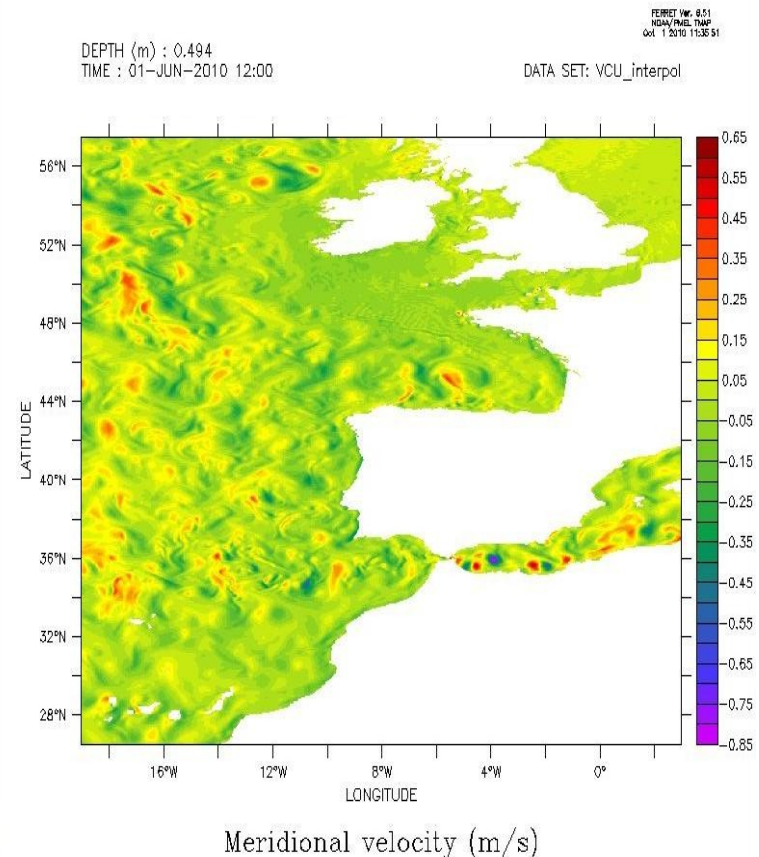
- Daily means (3D fields): TMP, SSH, SAL, UCU & VCU
- Hourly values (single level): THF, HHF, UHF & VHF

Data Dissemination

Through MyO Web Portal ;

THREDDS/OpenDap/WMS ; FTP

Variables: **TMP** SSH, SAL, UCU, VCU, THF, HHF, UHF, VHF



MyO IBI V1 will be launched in **April 2011**

Final Remarks



- **IBI Benefits & potential End-user Applications:**
 - Marine safety
 - Search & Rescue Operations, Fight against oil spill pollution, Harbour operational activities, ...
 - Marine Resources
 - Fisheries, aquaculture, offshore activities...
 - Science
 - Increase of ocean knowledge, Climate & seasonal forecasting, ...
 - Marine & coastal environment
 - Support to water quality control, monitoring of marine protected areas, coastal & beach management, ...