OPENCoastS - On-demand Operational Coastal Circulation Forecast Service

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- *The OPENCoasts platform*
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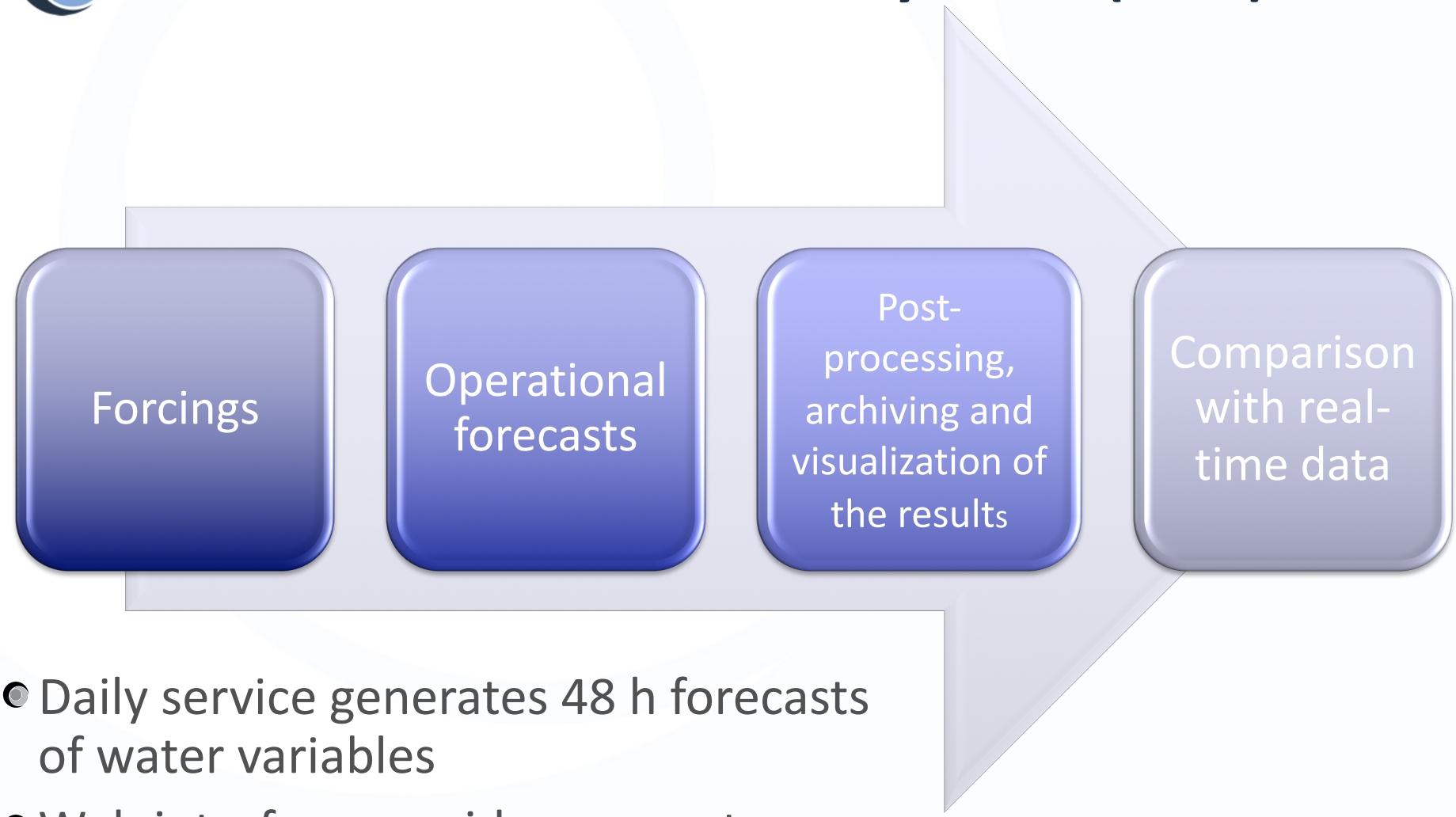
Water forecast systems (WFS)



- Daily service generates 48 h forecasts of water variables
- Web interface provides access to model predictions and field data

Why do we need water forecast systems?

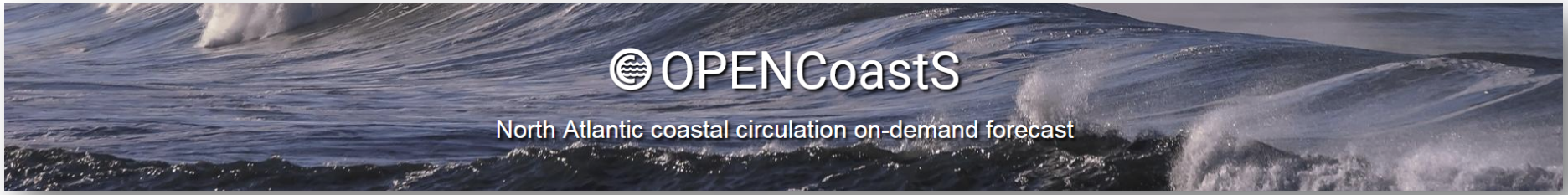
- Antecipate hazard situations and support emergency
- Guide management decisions to minimize risk
- Support water economy daily tasks as well as leisure and recreation

Water forecast systems: present difficulties

- *The development requires mixed teams, with expertise in both numerical modeling and information technologies*
- *Significant effort for development and maintenance*
- *Redundancies are necessary to minimize failures*
- *Computational resources must be available every day*

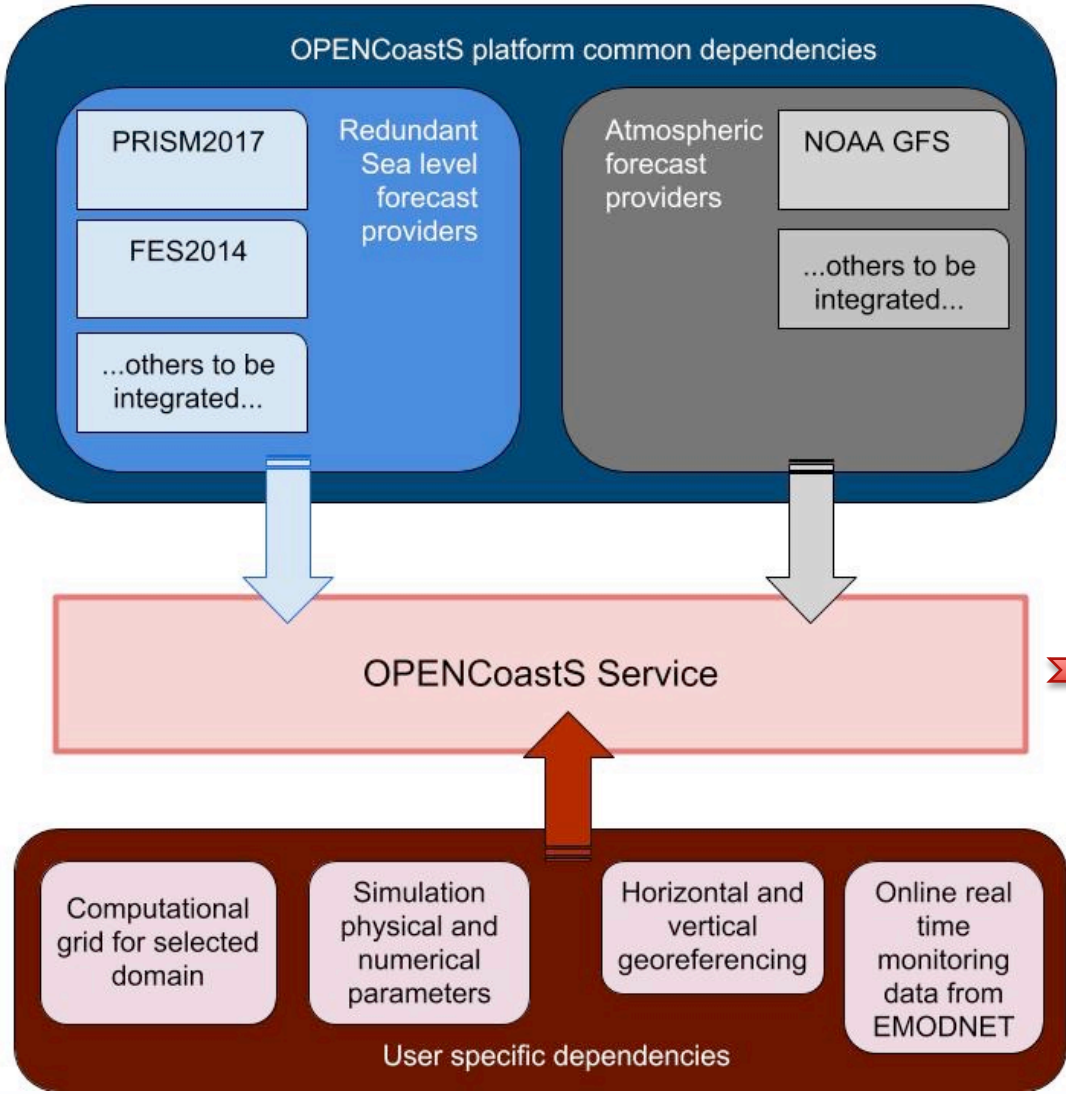
- ***Develop forecast systems as a service***
- *Provide computational resources*
- *Manage output files generated daily*
- *Make the development **flexible, quick and easy***

The OPENCoastS platform: concept

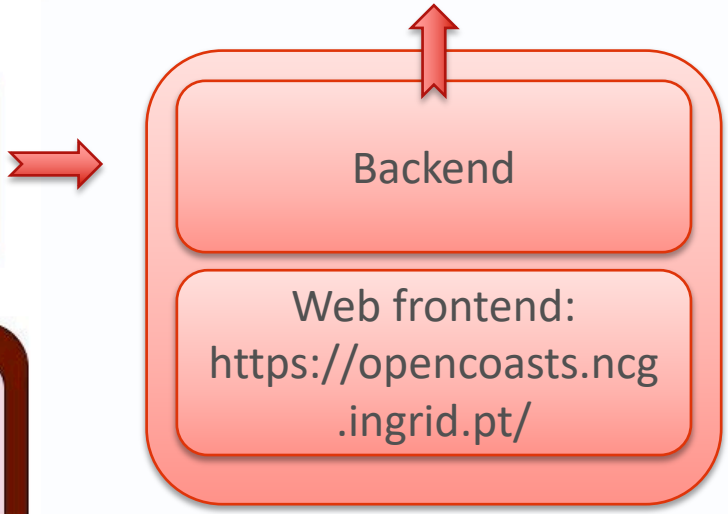


- *A platform to:*
  - *Implement forecast systems for a system chosen by the user, using a browser-based, user-friendly, interface*
  - *Make WFS accessible to people with modeling expertise, but not necessarily IT experts*
  - *Make the service flexible in its configuration (forcings, processes and models)*
  - *Allow multiple actions over forecast systems*
  - *Take advantage of the European Open Science Cloud (EOSC) to provide the required computational resources*

The OPENCoastS platform: architecture and interfaces

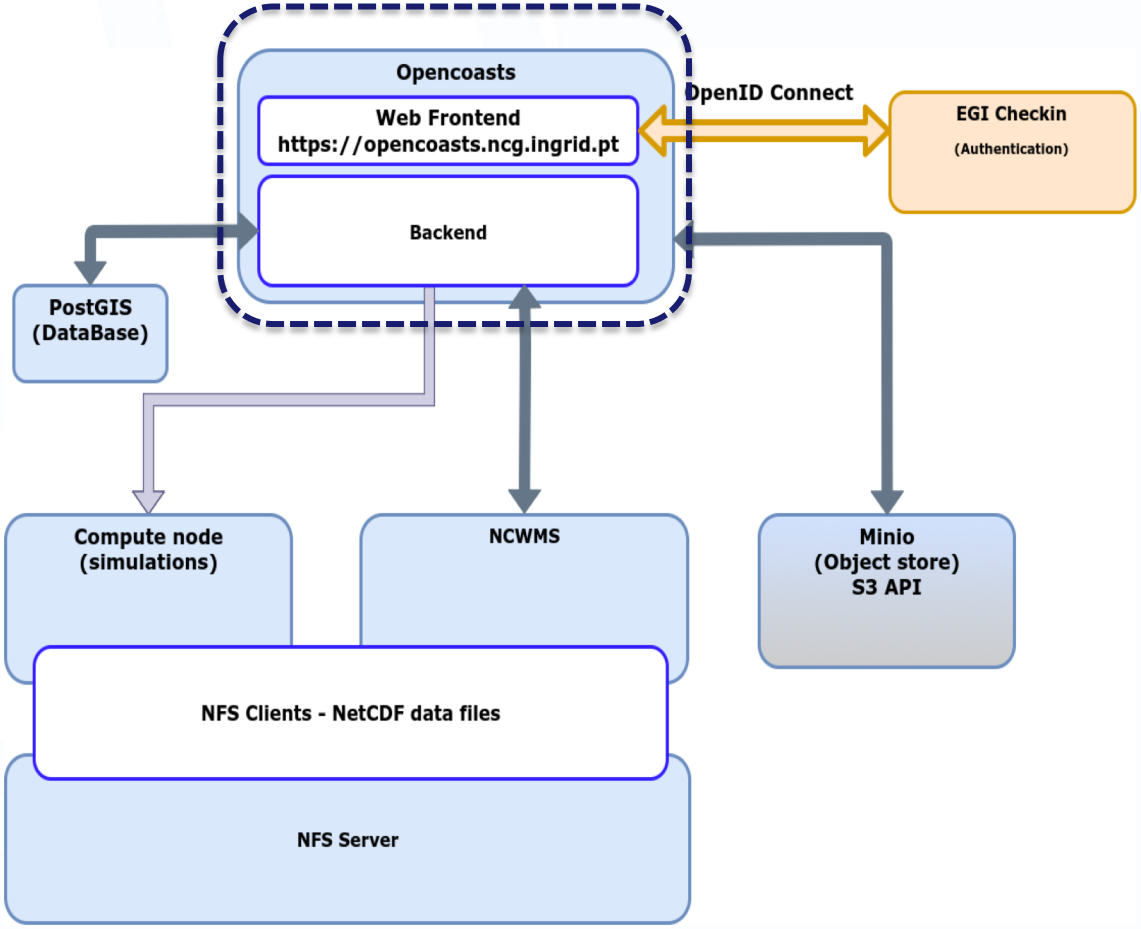


- Strong computational and storage requirements:
  - Real time operation and timely delivery of forecasts
  - Accuracy: Proper representation of the relevant environmental processes
  - Robustness – redundancy of simulations
  - Long term analysis of water systems – large storage capacity



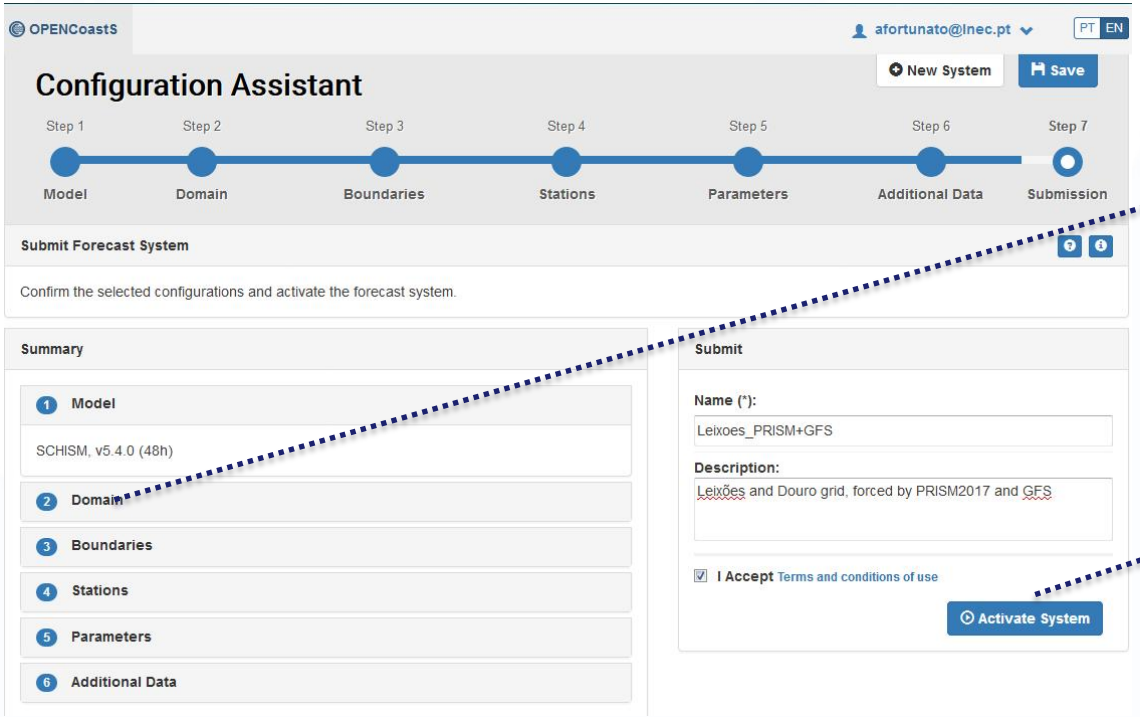
The OPENCoastS platform: architecture and interfaces (2)

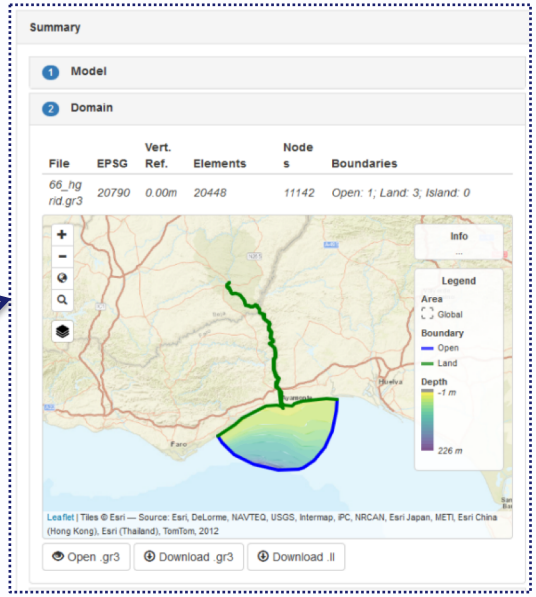
- *Authentication and Authorization*
  - *EGI check-in - front-end*
  - *Using X.509 for Computing Elements and DIRAC (robot certificates)*
- *Cloud computing*
  - *INCD OpenStack cloud integrated in the EGI Fedcloud*
  - *Housing the front-end, back-end and Geo-processing*
  - *Object storage for data*
  - *Cloud also being used for executing the simulations*
- *EGI High Throughput Compute service*
  - *Provides additional computing capacity*
  - *Using Computing Elements (batch clusters) for simulation*
  - *Brokering of compute tasks via DIRAC*

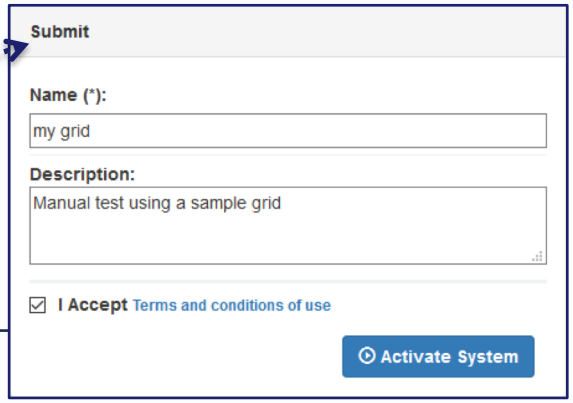


Web interface: 3 Building blocks

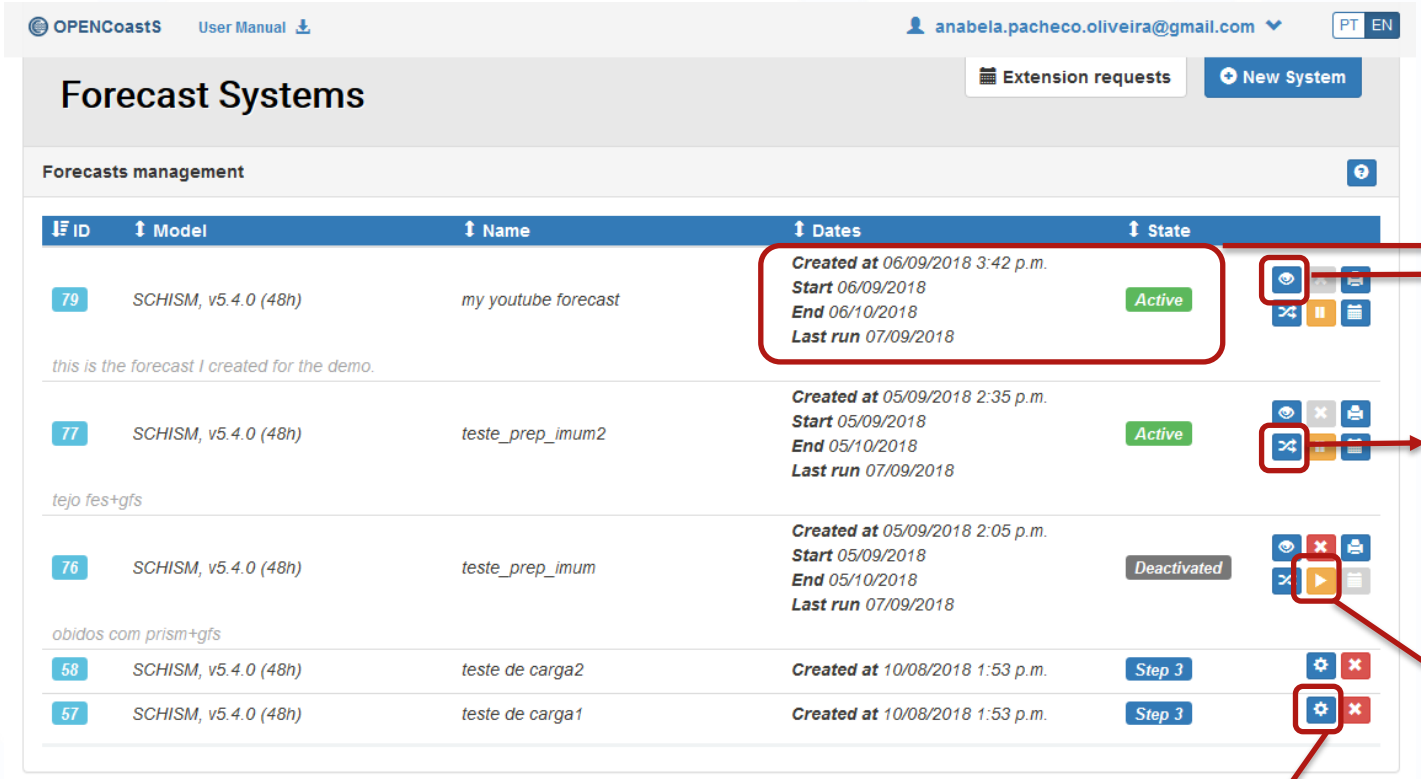
1. *Configuration assistant: building a deployment step by step*
2. *Forecast manager – what can we do with our forecasts*
3. *Outputs Viewer: visualization and more*







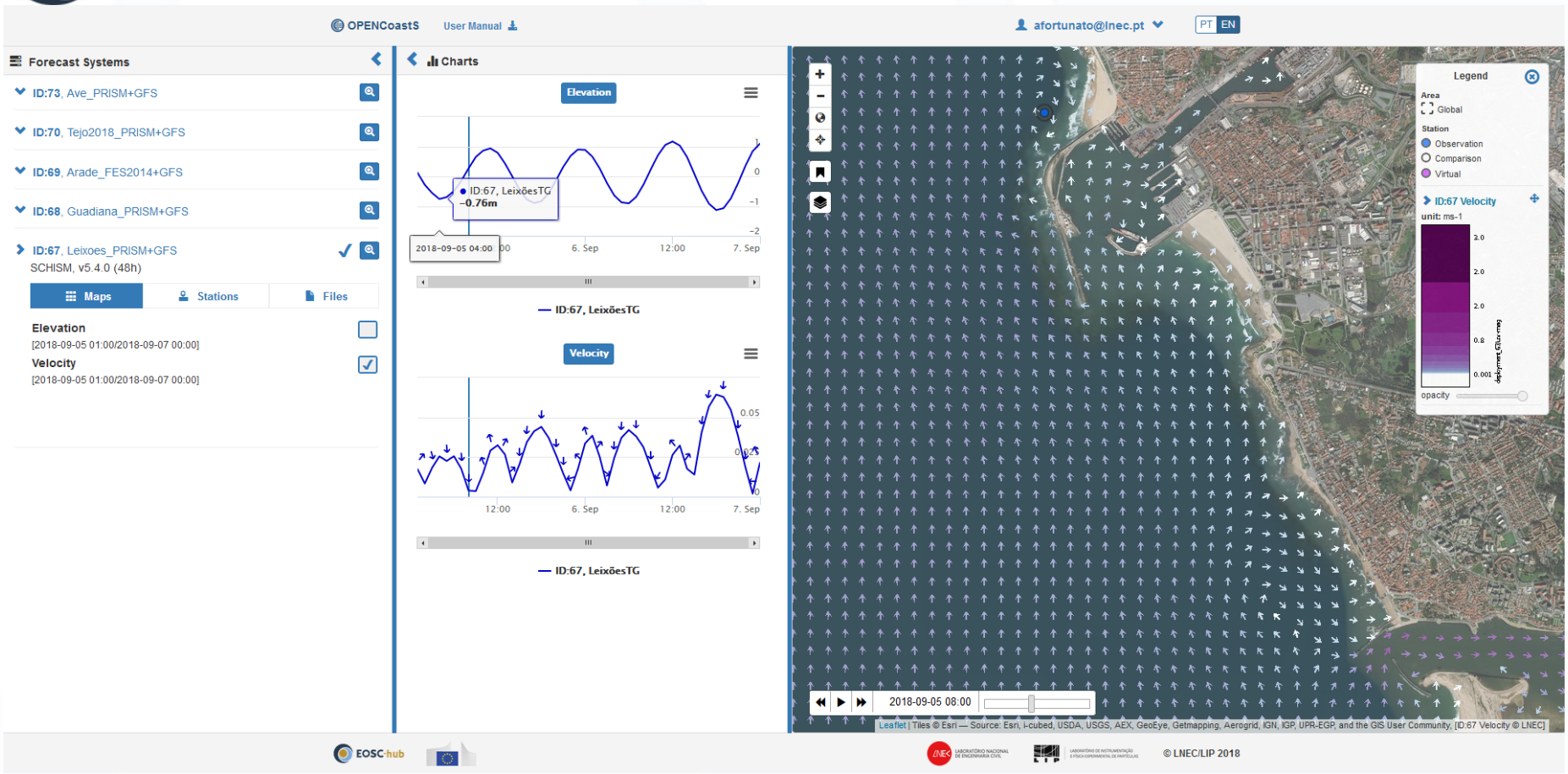
Forecast Systems Manager



- *Checking the status and the settings of my runs*
- *Clone it – duplicate to change: b.c., parameters, outputs*
- *Re-activate a deactivated system or eliminate it*
- *Return to C.Assist. to continue to setup my forecast*

- *<u>Many states are possible</u>:*
  - *"step k" – in construction, we can continue later or just eliminate it*
  - *Active – we can deactivate, clone it, check it,…*
  - *Deactivated – we can activate it again or eliminate it*

Outputs viewer



- Adding data/model points on the fly
- Saving time series and model outputs in your PC
- Compare time series from several deployments

Summary

- Innovative platform to generate on-demand ocean forecasts is publicly available (opencoasts.ncg.ingrid.pt)
- Service is operational since last May, over 30 deployments in Europe, America and Africa
- Users' reception at EU level was good (7 countries trained and using the service)
- Integration of this tool as part of M.Sc. Courses in Spain and France in the coming months
- Good integration with some EOSC core services (EGI based)

Integration next steps (1)

- Integration with additional forcing / data providers:
  - Improved and extended NE Atlantic model for boundary conditions (PRISM2018)
  - Atmospheric forcings from METEO-FRANCE
  - Include more EMODnet Physics stations
- Improved physics – integrate coupled wave-current model (SCHISM-WWM)
- Perform 72 hour forecasts

Integration next steps (2)

- Integration with EUDAT services
  - Data staging
  - Long-term data storage and FAIR
- Improve high availability
  - Exploit geographic distributed resources
  - Cloud, High Throughput Computing and data storage
- On-demand instances
  - Possibility of deployment of own instances of the service in the EOSC cloud sites

Thank you for your attention!

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