



# OPENCoastS - On-demand Operational Coastal Circulation Forecast Service

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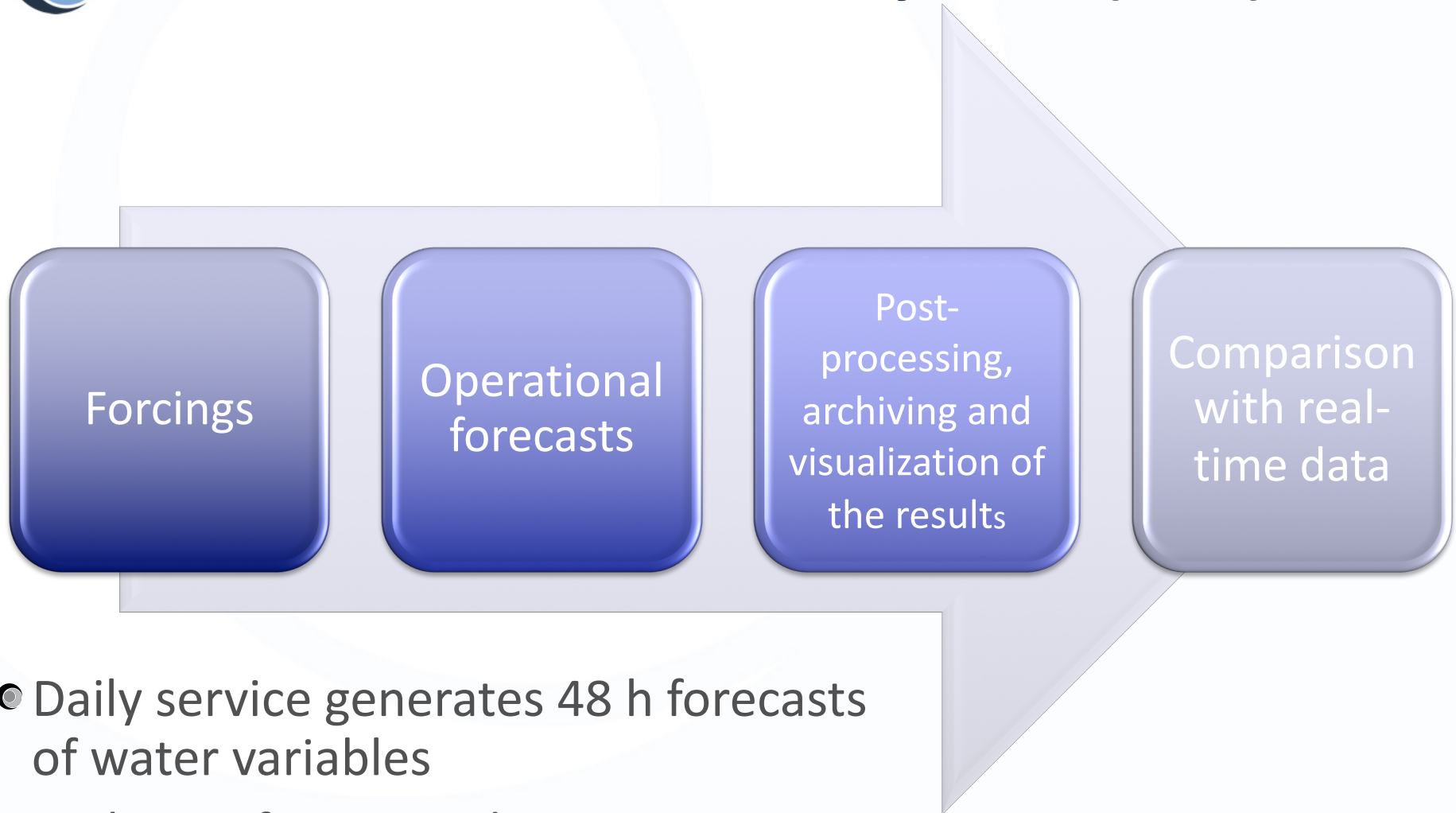
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- *Motivation: concept, need for water forecast systems*
- *The OPENCoasts platform*
  - *Concept*
  - *Interface components and architecture*
  - *The 3 building blocks*
- *Summary and perspectives*



- 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?

- Anticipate 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***

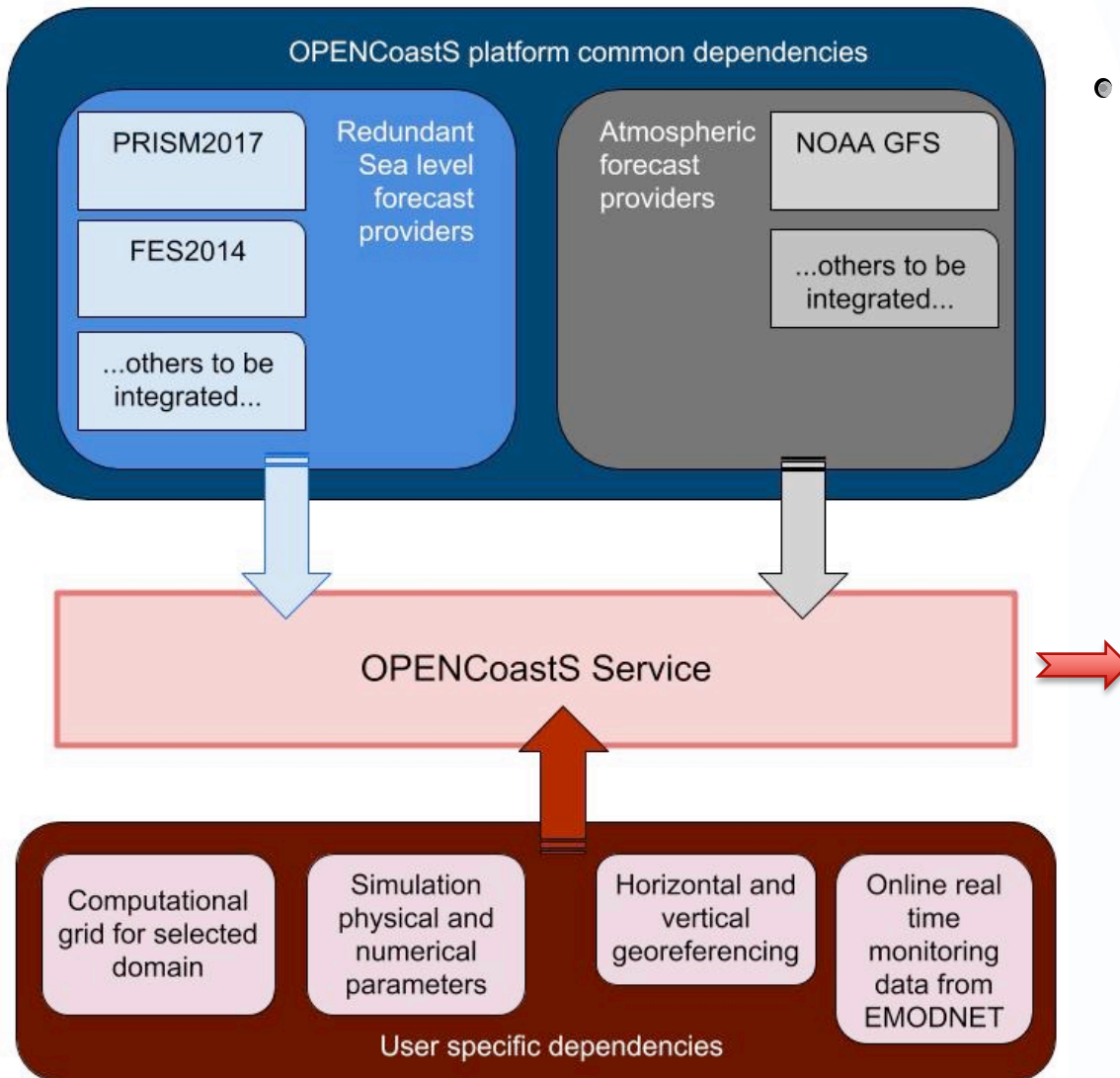
 OPENCoastS

North Atlantic coastal circulation on-demand forecast

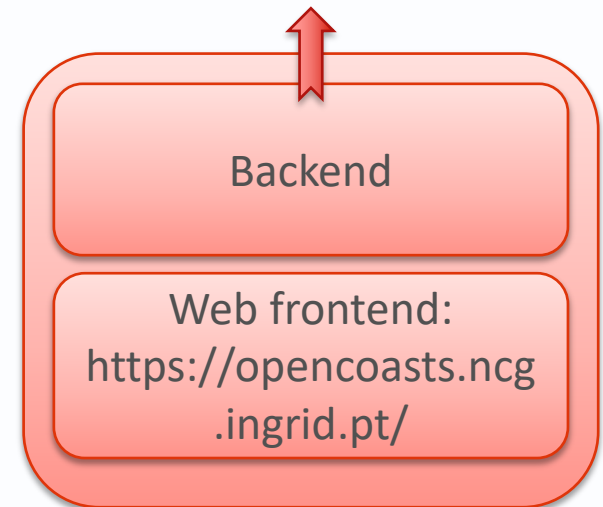
● *A platform to:*

- *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

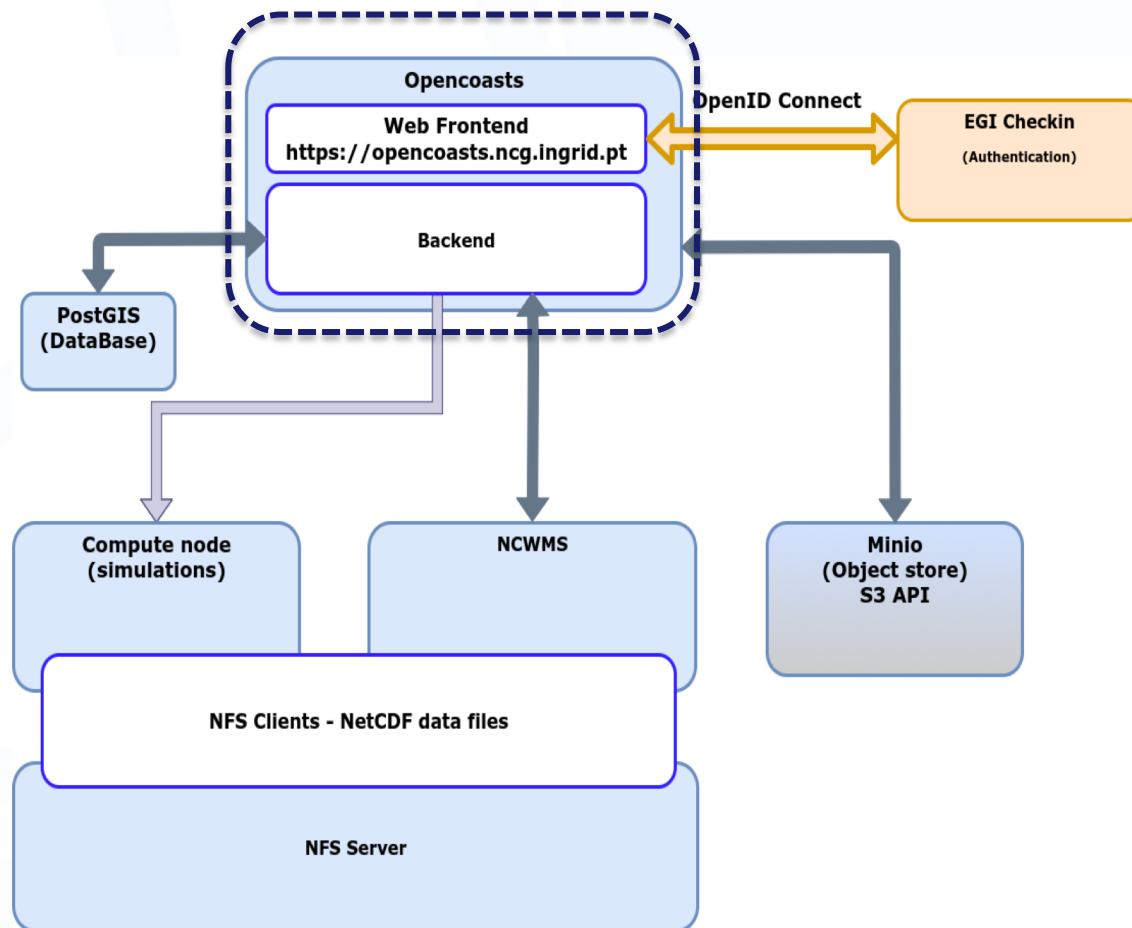


- Strong computational and storage requirements:
  - Real time operation and timely delivery of forecasts
  - Accuracy: Proper representation of the relevant environmental processes
  - Robustness – redundancy of simulations
  - Long term analysis of water systems – large storage capacity



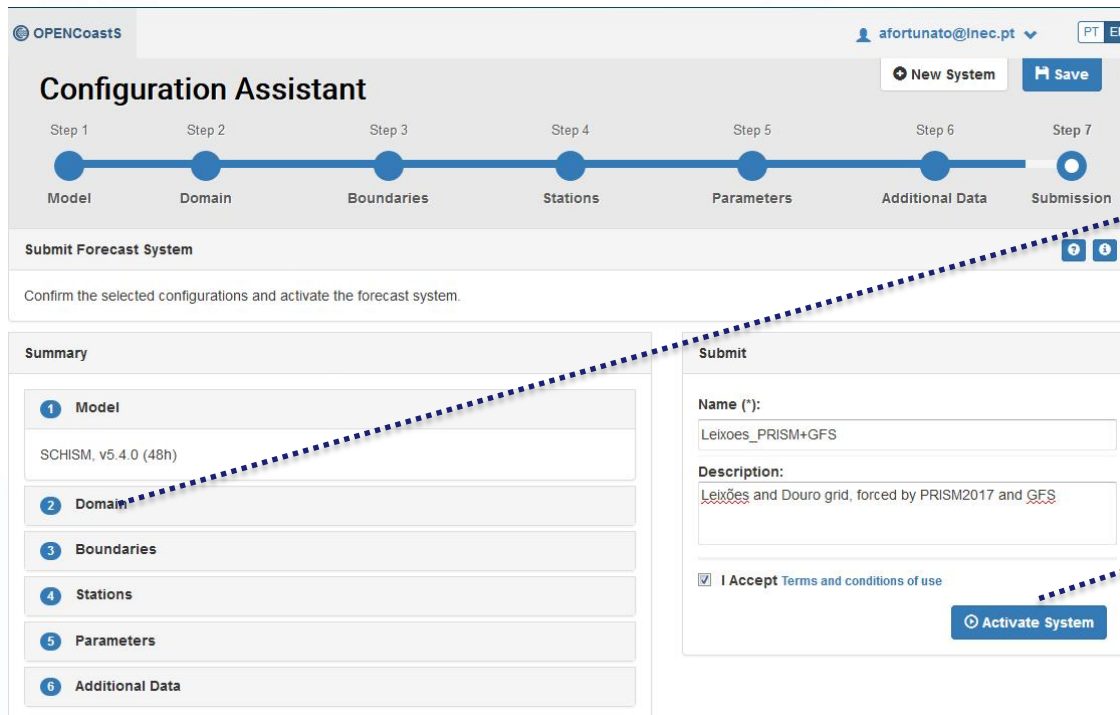
# The OPENCoastS platform: architecture and interfaces (2)

- *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*





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



**Configuration Assistant**

Step 1 Model Step 2 Domain Step 3 Boundaries Step 4 Stations Step 5 Parameters Step 6 Additional Data Step 7 Submission

**Submit Forecast System**

Confirm the selected configurations and activate the forecast system.

**Summary**

- 1 Model
- 2 Domain
- 3 Boundaries
- 4 Stations
- 5 Parameters
- 6 Additional Data

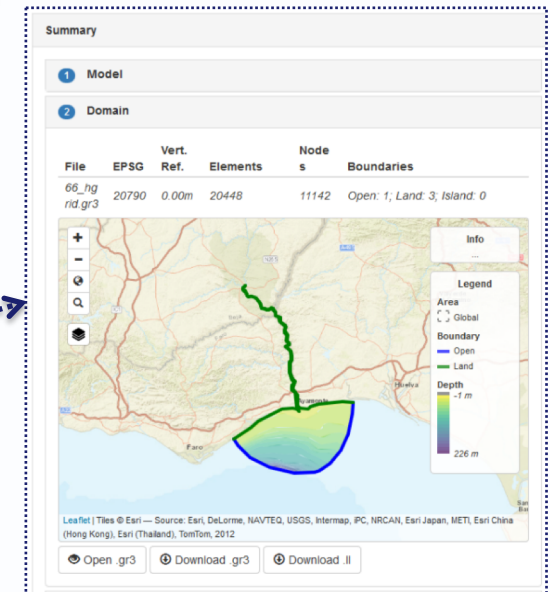
**Submit**

Name (\*): Leixoes\_PRISM+GFS

Description: Leixoes and Douro grid, forced by PRISM2017 and GFS

I Accept Terms and conditions of use

**Activate System**



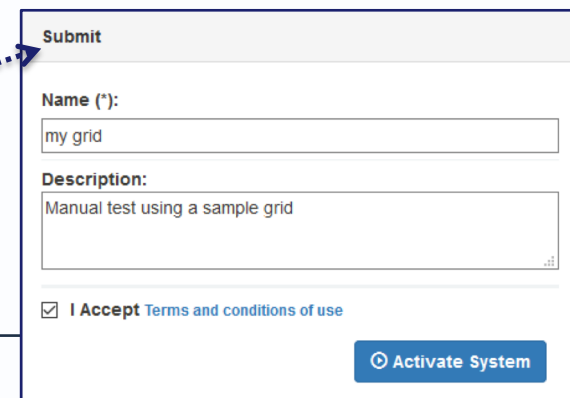
**Summary**

1 Model

2 Domain

File	EPSG	Vert. Ref.	Elements	Nodes	Boundaries
66_hg rd.gr3	20790	0.00m	20448	11142	Open: 1; Land: 3; Island: 0

Map visualization showing a domain boundary (green line) and depth (color scale) over a geographical area.



**Submit**

Name (\*): my grid

Description: Manual test using a sample grid

I Accept Terms and conditions of use

**Activate System**

OPENCoastS User Manual [User Manual](#) [anabela.pacheco.oliveira@gmail.com](#) PT EN

Forecast Systems Extension requests New System

Forecasts management

ID	Model	Name	Dates	State
79	SCHISM, v5.4.0 (48h)	my youtube forecast	Created at 06/09/2018 3:42 p.m. Start 06/09/2018 End 06/10/2018 Last run 07/09/2018	Active
<i>this is the forecast I created for the demo.</i>				
77	SCHISM, v5.4.0 (48h)	teste_prep_imum2	Created at 05/09/2018 2:35 p.m. Start 05/09/2018 End 05/10/2018 Last run 07/09/2018	Active
<i>tejo fes+gfs</i>				
76	SCHISM, v5.4.0 (48h)	teste_prep_imum	Created at 05/09/2018 2:05 p.m. Start 05/09/2018 End 05/10/2018 Last run 07/09/2018	Deactivated
<i>obidos com prism+gfs</i>				
58	SCHISM, v5.4.0 (48h)	teste de carga2	Created at 10/08/2018 1:53 p.m.	Step 3
57	SCHISM, v5.4.0 (48h)	teste de carga1	Created at 10/08/2018 1:53 p.m.	Step 3

● 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

● Many states are possible:

- “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

● Return to C.Assist. to continue to setup my forecast

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

- Innovative platform to generate on-demand ocean forecasts is publicly available ([opencoasts.ncg.ingrid.pt](https://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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