



## A SCHISM-powered web platform to generate ocean forecast systems: concept, usage and future of OPENCoastS

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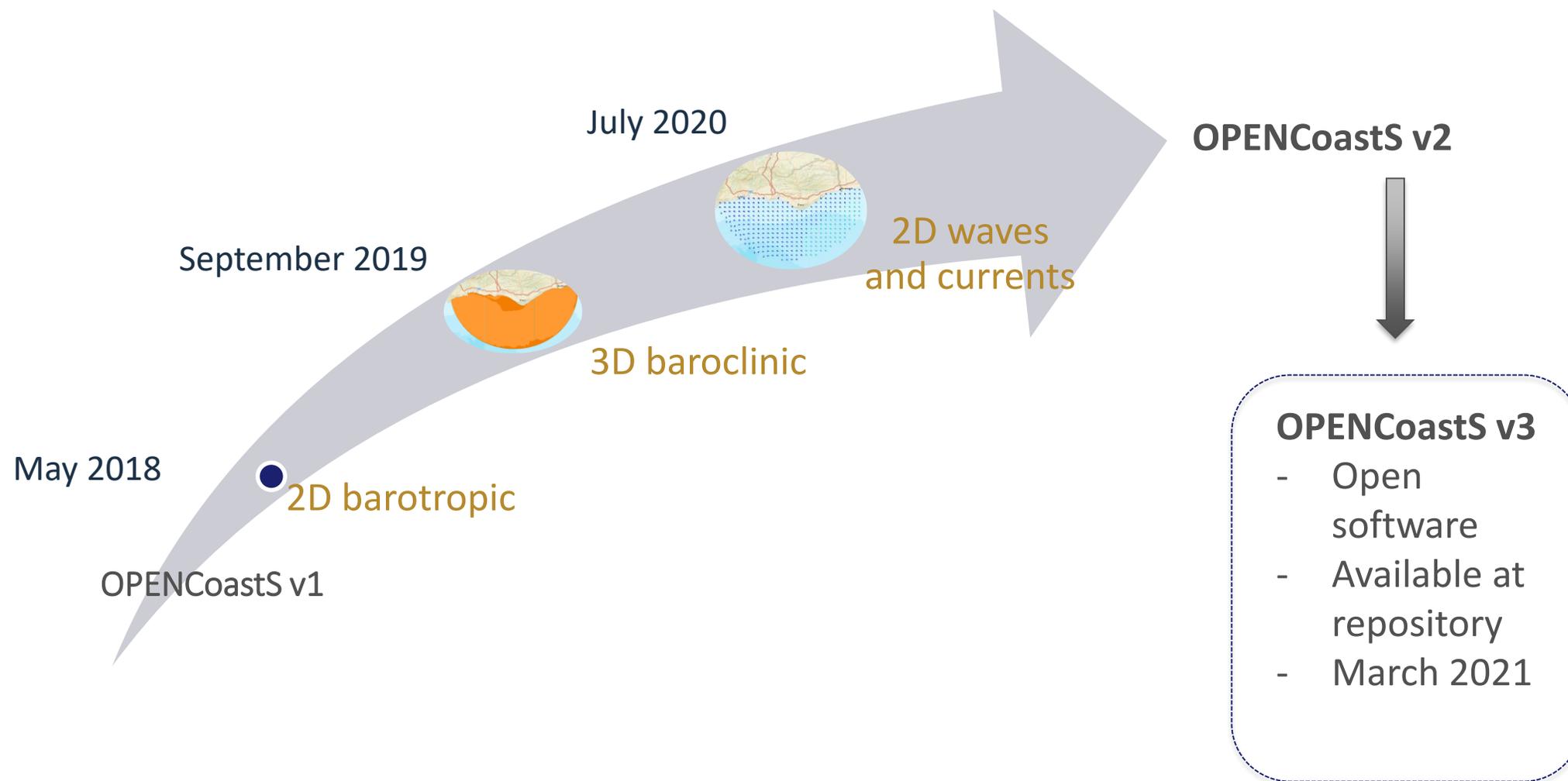
## Forecast systems address societal needs

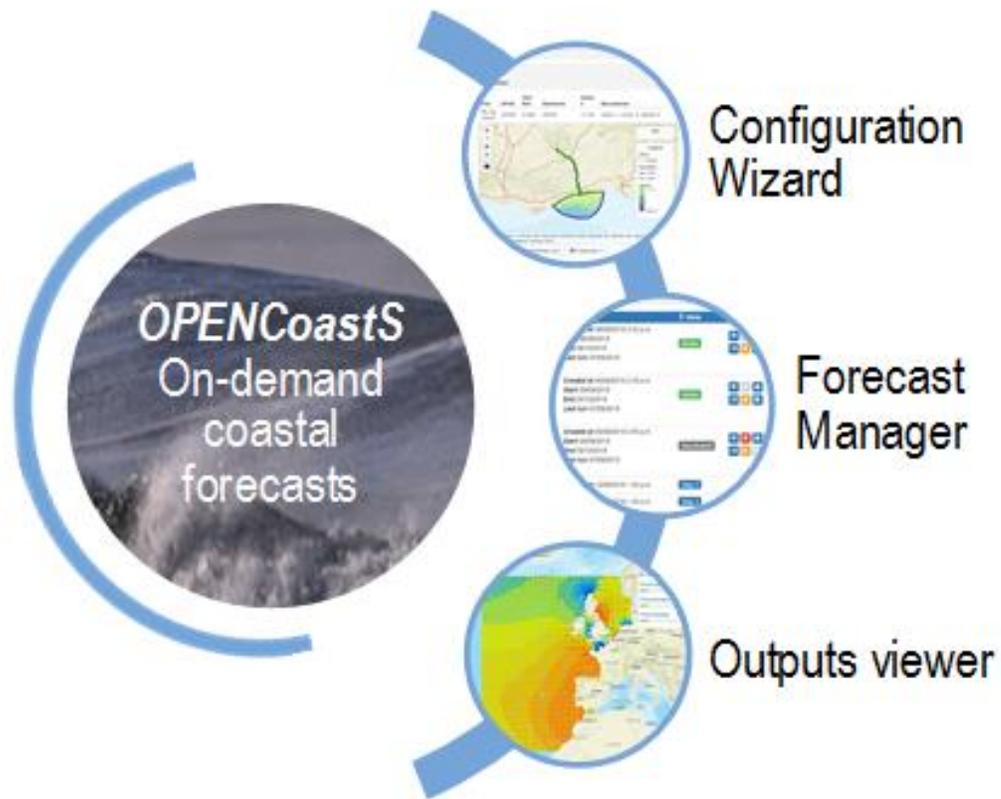


- Coastal forecasts are useful to support the daily and long-term management of water bodies
  - predict destructive events
  - anticipate contamination events
  - support emergency actions
  - support water economy daily tasks and leisure & recreation
  - ...
- Expensive to generate and maintain



- Implements and runs forecast systems for a coastal site chosen by the user, through a user-friendly web interface
- Generates daily forecasts of water levels, wave parameters, 2D or 3D velocities, and 3D salinities and temperatures for 48 hours, using SCHISM
- Flexible in its configuration (physics, forcings, parameters,...)
- Integrated with EOSC services





- *Builds a forecast deployment step by step*

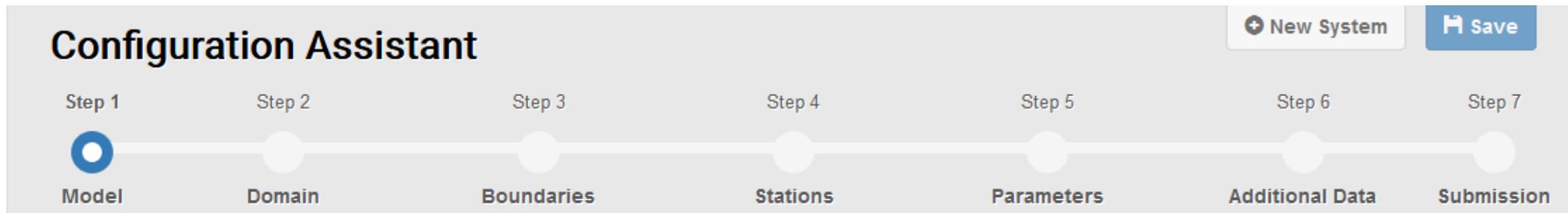
- *Allows the user interact with his forecasts: check status, check details, clone it, pause/restart it, delete it,...*

- *Visualize results in a webGIS*
- *Adding stations on the fly*
- *Saving time series and model outputs in your PC*
- *Compare time series from several deployments*
- *Download model results*

Access:

<https://opencoasts.ncg.ingrid.pt/>



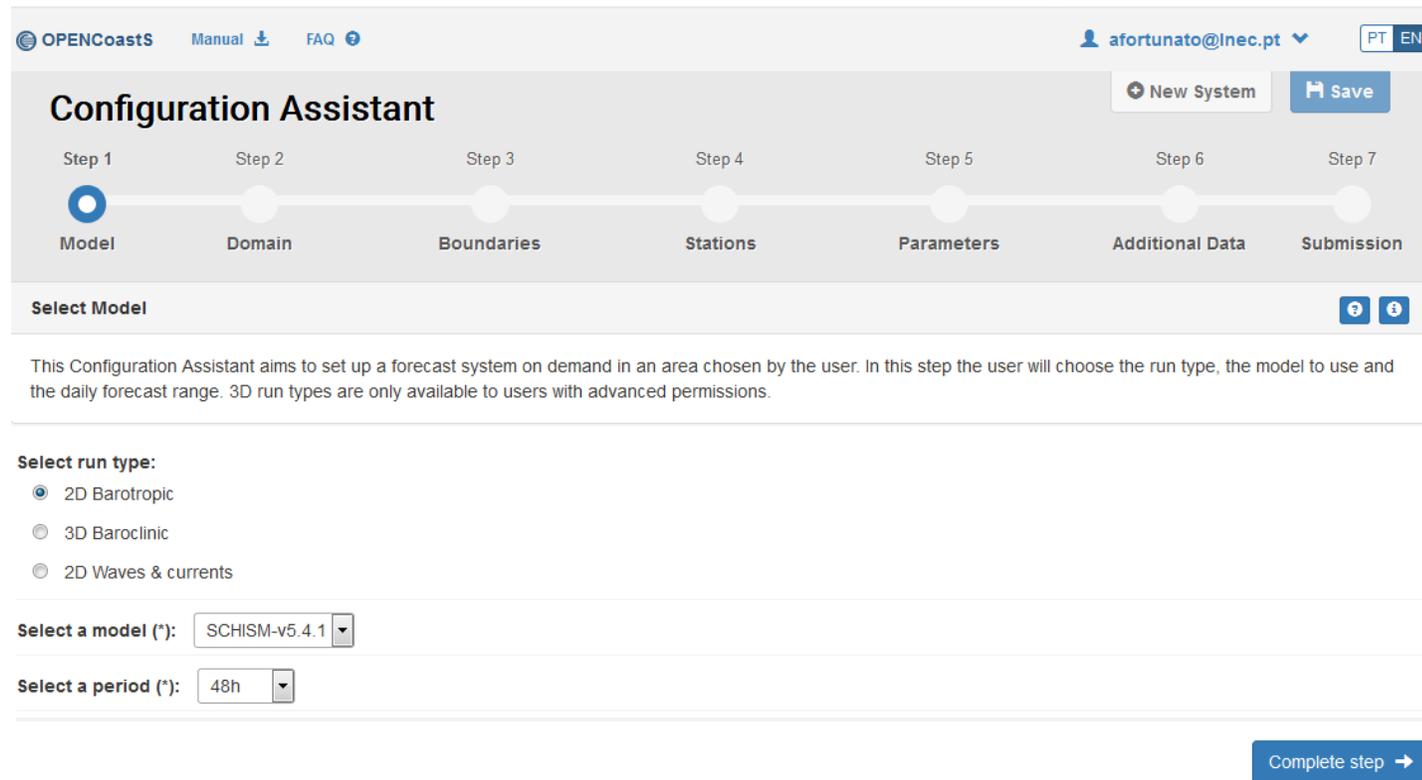


- Step 1: select the model configuration
- Step 2: upload and verify the grid
- Step 3: specify the boundary conditions
- Step 4: define the output stations
- Step 5: define the physical and numerical parameters
- Step 6: define the spatially-varying parameters
- Step 7: review and submit

Three model configurations:

- 2D barotropic
- 3D baroclinic
- 2D waves & currents

Only one model version (5.4.1) and duration (48 hours)



The screenshot shows the 'Configuration Assistant' interface for OPENCoastS. At the top, there are navigation links for 'Manual' and 'FAQ', and a user profile 'afortunato@inec.pt'. The main area features a progress bar with seven steps: Step 1 (Model), Step 2 (Domain), Step 3 (Boundaries), Step 4 (Stations), Step 5 (Parameters), Step 6 (Additional Data), and Step 7 (Submission). Step 1 is currently active. Below the progress bar, the 'Select Model' section is visible, with a description: 'This Configuration Assistant aims to set up a forecast system on demand in an area chosen by the user. In this step the user will choose the run type, the model to use and the daily forecast range. 3D run types are only available to users with advanced permissions.' Under 'Select run type:', three radio buttons are present: '2D Barotropic' (selected), '3D Baroclinic', and '2D Waves & currents'. Below this, there are two dropdown menus: 'Select a model (\*)' set to 'SCHISM-v5.4.1' and 'Select a period (\*)' set to '48h'. A 'Complete step' button is located at the bottom right of the form.

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## Configuration Assistant

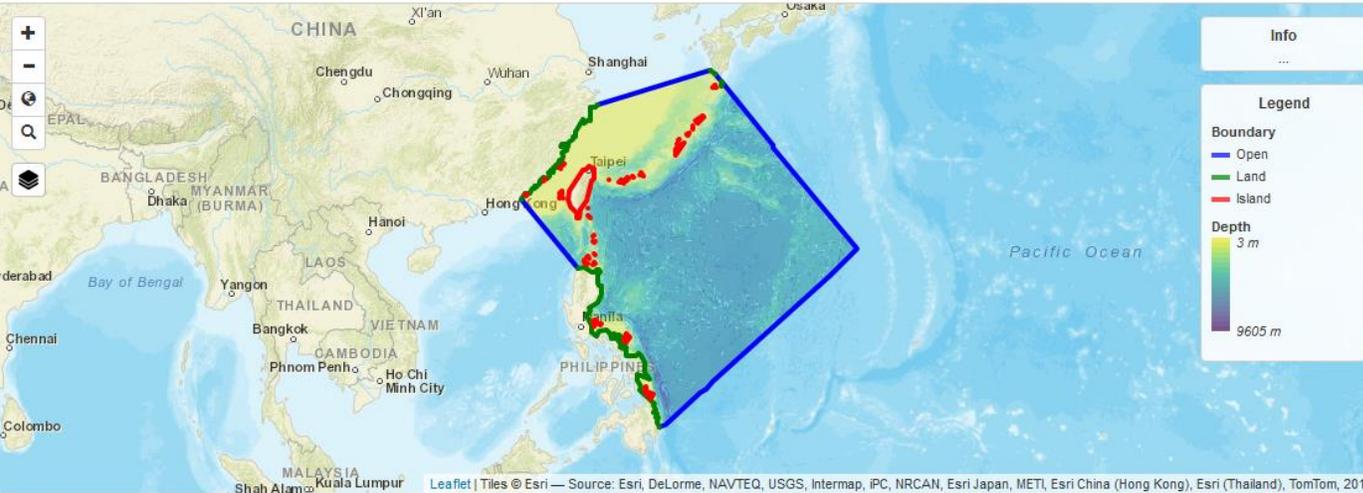
+ New System Save

Step 1 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7

Model Domain **Boundaries** Stations Parameters Additional Data Submission

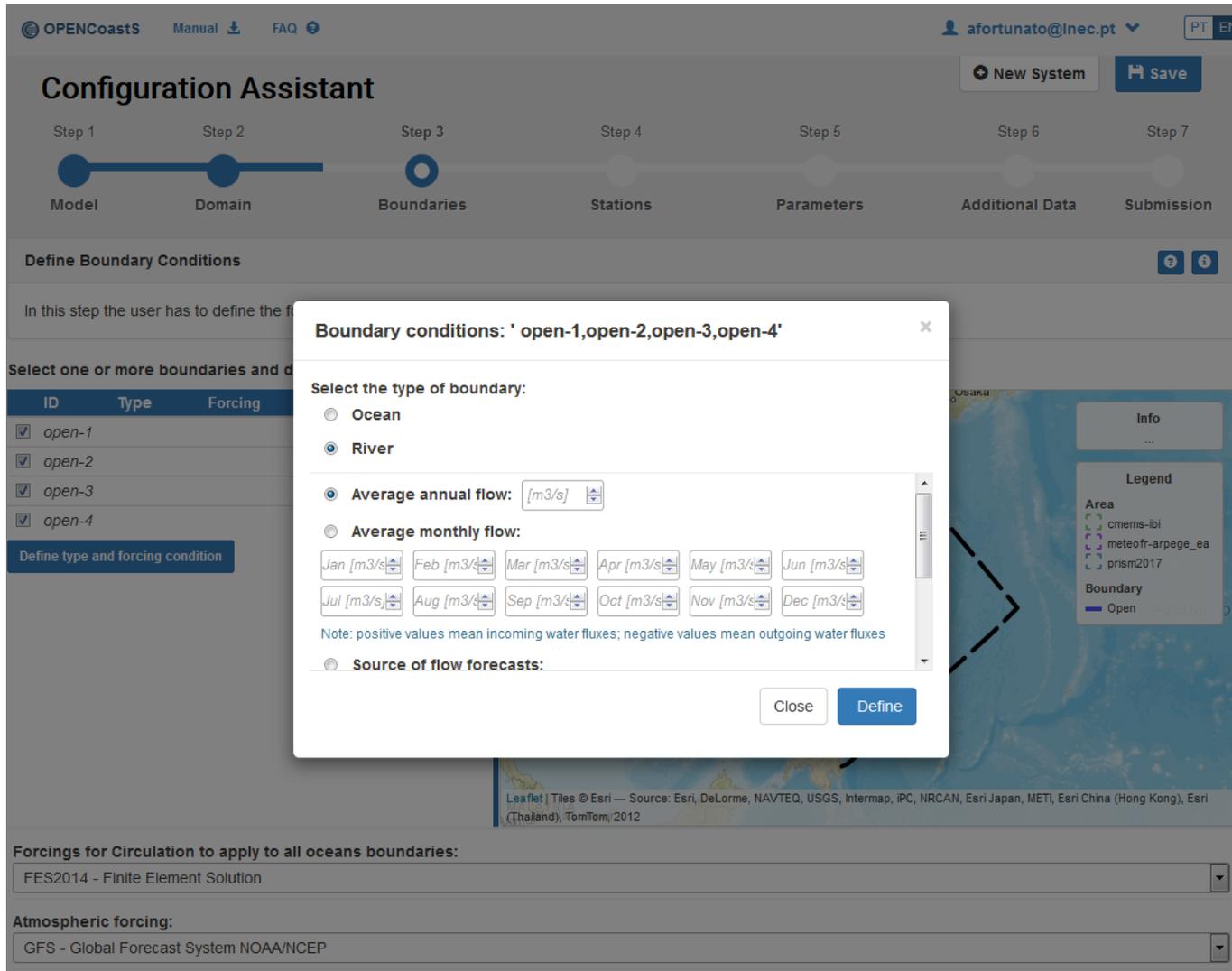
Preview

File	EPSG	Vert. Ref.	Elements	Nodes	Boundaries
taiwan06.ll	4326	0.00m	184993	93408	Open: 4; Land: 4; Island: 42



← Previous Restart step Next →

- Grid format: SCHISM / SELFE / ADCIRC
- All runs are made in geographical coordinates
- Grids can be provided in cartesian coordinates if you know the EPSG code
- Provide vertical reference to MSL



**Configuration Assistant**

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

**Define Boundary Conditions**

In this step the user has to define the following boundaries:

ID	Type	Forcing
<input checked="" type="checkbox"/>	open-1	
<input checked="" type="checkbox"/>	open-2	
<input checked="" type="checkbox"/>	open-3	
<input checked="" type="checkbox"/>	open-4	

Define type and forcing condition

**Boundary conditions: ' open-1,open-2,open-3,open-4'**

Select the type of boundary:

- Ocean
- River
  - Average annual flow: [m3/s]
  - Average monthly flow:
 

Jan [m3/s]	Feb [m3/s]	Mar [m3/s]	Apr [m3/s]	May [m3/s]	Jun [m3/s]
Jul [m3/s]	Aug [m3/s]	Sep [m3/s]	Oct [m3/s]	Nov [m3/s]	Dec [m3/s]
- Source of flow forecasts:

Note: positive values mean incoming water fluxes; negative values mean outgoing water fluxes

Close Define

**Forcings for Circulation to apply to all oceans boundaries:**  
FES2014 - Finite Element Solution

**Atmospheric forcing:**  
GFS - Global Forecast System NOAA/NCEP

- Rivers:
  - Yearly or monthly discharges
  - Provide your own URL
- Ocean:
  - FES2014 (LEGOS)
  - CMEMS global
  - PRISM2017 (LNEC)
  - CMEMS IBI
- Atmosphere:
  - GFS (NOAA)
  - ARPEGE (METEO-FRANCE)

# Step 4: define the output stations

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## Configuration Assistant

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

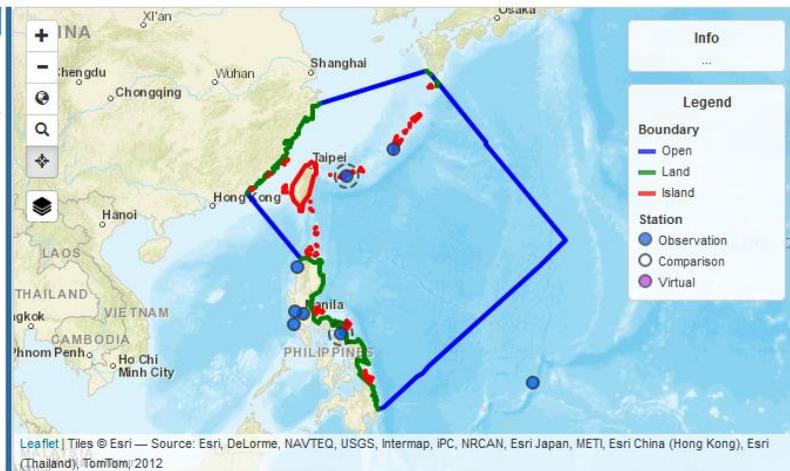
**Define Stations**

In this step the user defines the stations (virtual sensors) in which time series are extracted with full model resolution. These can be locations where real time data is available, (predefined comparison stations) or other places of interest (virtual stations).

Select/Deselect desired stations. You can add new stations by selecting a location on the map or using the button New Station.  
Note: If the list is empty at startup this means that there are no observation stations located within the grid domain.

Name	Latitude	Longitude	Comparison
<input type="checkbox"/> IOC_lega	13.14620	123.75800	IOC_lega (13.14620, 123.75800)
<input type="checkbox"/> IOC_ishig	24.33000	124.16000	IOC_ishig (24.33000, 124.16000)

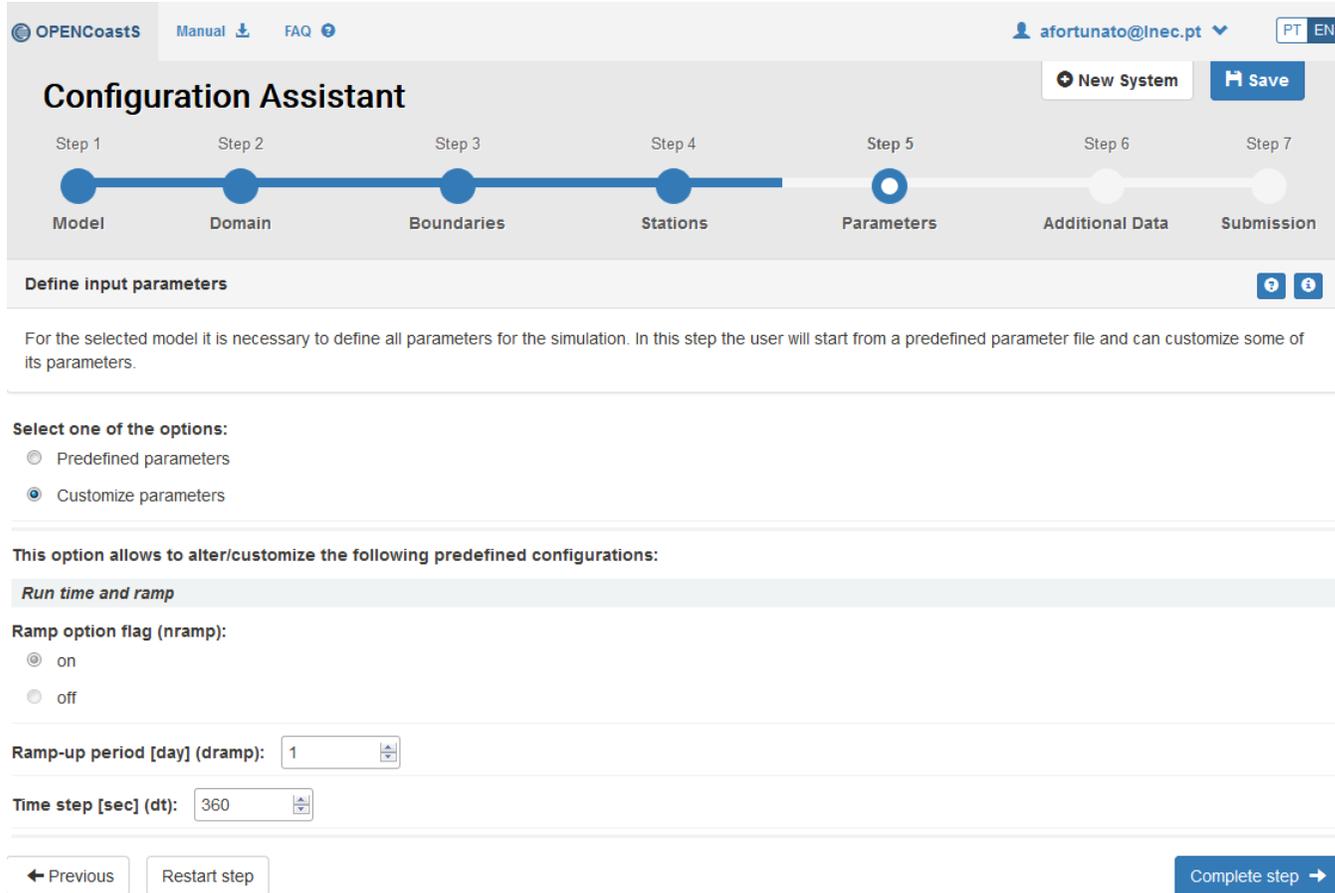
**New Station**



Legend:  
Boundary: Open (blue), Land (green), Island (red)  
Station: Observation (blue), Comparison (white), Virtual (purple)

← Previous Restart step Complete step →

- ◉ EMODnet Physics tide gauges inside or close to the grid are proposed
- ◉ Other real or virtual stations can be added
- ◉ A limit of 5 stations per forecast is imposed



Configuration Assistant

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

Define input parameters

For the selected model it is necessary to define all parameters for the simulation. In this step the user will start from a predefined parameter file and can customize some of its parameters.

Select one of the options:

- Predefined parameters
- Customize parameters

This option allows to alter/customize the following predefined configurations:

**Run time and ramp**

Ramp option flag (nramp):

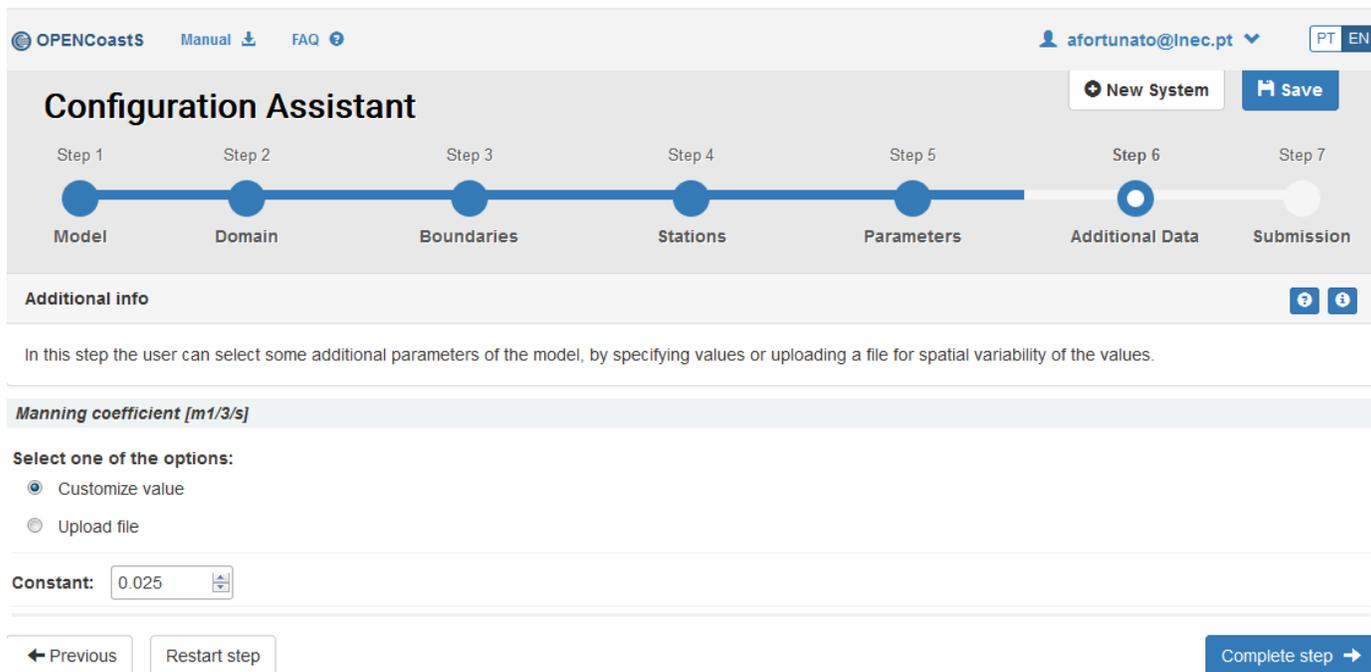
- on
- off

Ramp-up period [day] (dramp): 1

Time step [sec] (dt): 360

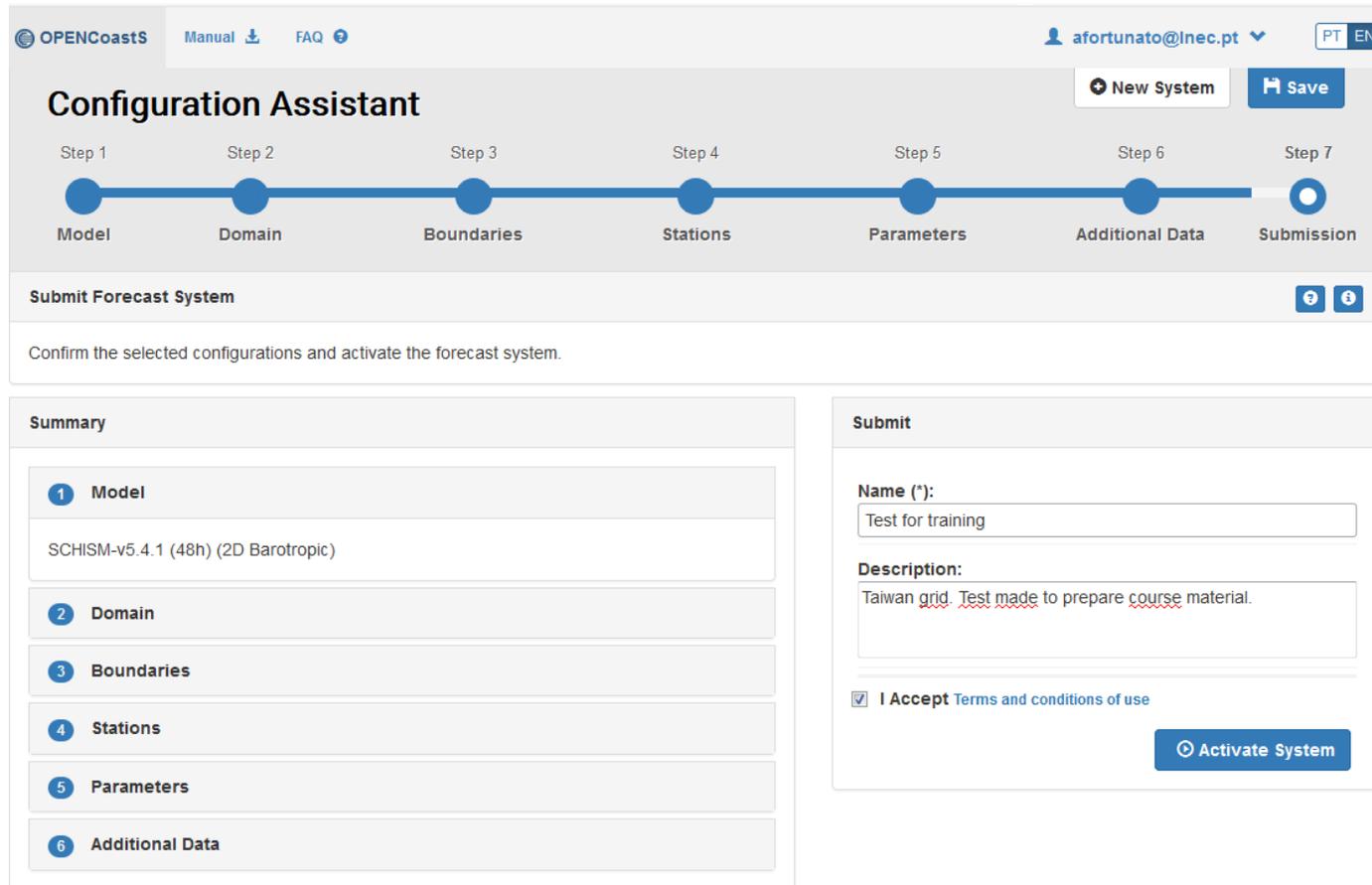
← Previous Restart step Complete step →

- Most parameters are fixed and predefined
- Customizable parameters are:
  - Warm-up period
  - Time step



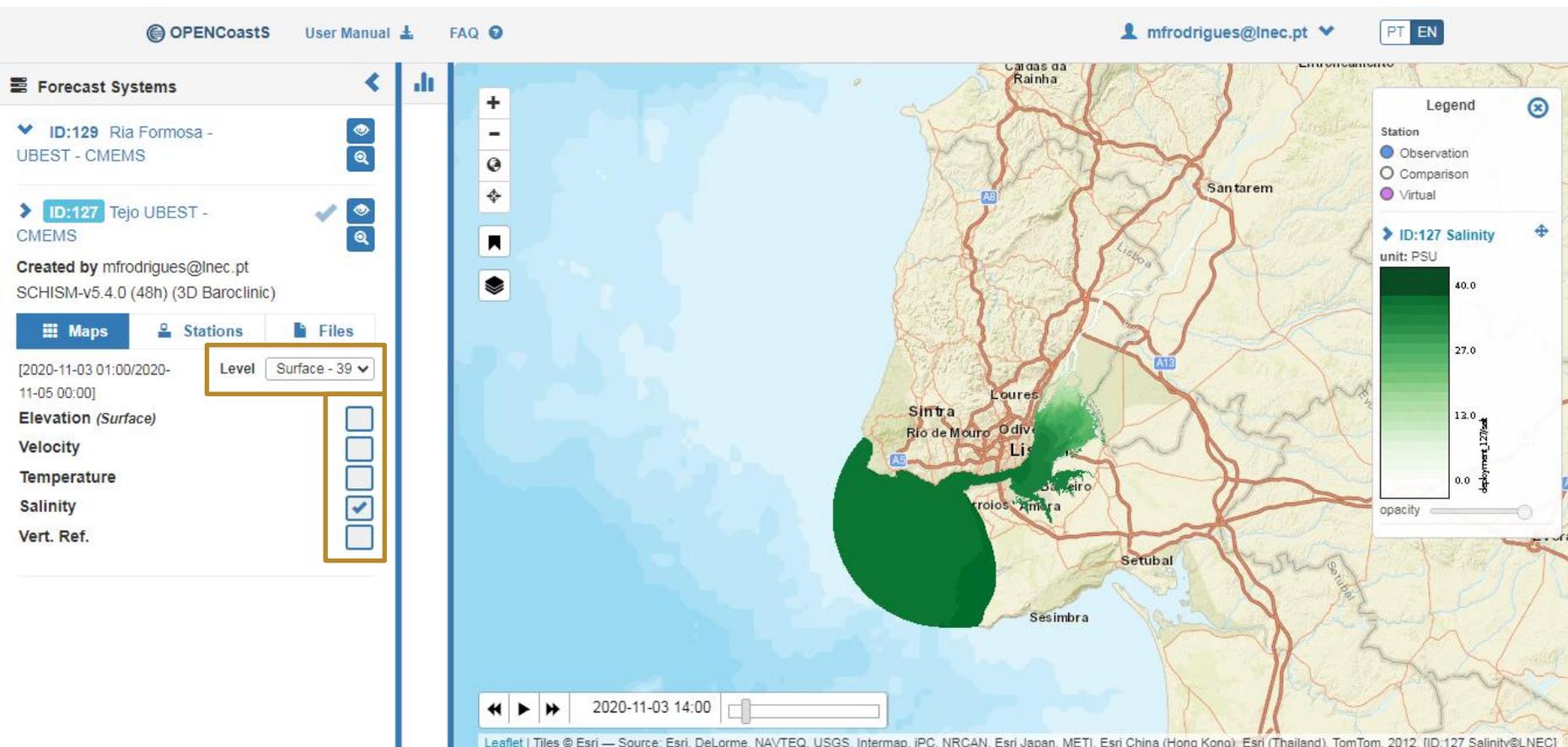
The screenshot shows the 'Configuration Assistant' interface for OPENCoastS. At the top, there are navigation links for 'Manual' and 'FAQ', and a user profile 'afortunato@inec.pt'. The main area features a progress bar with seven steps: Step 1 (Model), Step 2 (Domain), Step 3 (Boundaries), Step 4 (Stations), Step 5 (Parameters), Step 6 (Additional Data), and Step 7 (Submission). Step 6 is currently active. Below the progress bar, there is an 'Additional info' section with a description: 'In this step the user can select some additional parameters of the model, by specifying values or uploading a file for spatial variability of the values.' The 'Manning coefficient [m<sup>1/3</sup>/s]' section offers two options: 'Customize value' (selected) and 'Upload file'. A 'Constant' input field is set to '0.025'. At the bottom, there are buttons for 'Previous', 'Restart step', and 'Complete step'.

- In 2DH mode, only the Manning friction coefficient can vary in space



The screenshot shows the 'Configuration Assistant' interface for 'Submit Forecast System'. At the top, there are navigation links for 'Manual' and 'FAQ', a user profile 'afortunato@inec.pt', and language options 'PT' and 'EN'. A progress bar indicates seven steps: Step 1 (Model), Step 2 (Domain), Step 3 (Boundaries), Step 4 (Stations), Step 5 (Parameters), Step 6 (Additional Data), and Step 7 (Submission), with Step 7 being the active step. Below the progress bar, there are buttons for 'New System' and 'Save'. The main content area is titled 'Submit Forecast System' and contains a confirmation message: 'Confirm the selected configurations and activate the forecast system.' Below this, there are two panels: 'Summary' and 'Submit'. The 'Summary' panel lists the configuration details for each step: 1 Model (SCHISM-v5.4.1 (48h) (2D Barotropic)), 2 Domain, 3 Boundaries, 4 Stations, 5 Parameters, and 6 Additional Data. The 'Submit' panel contains a 'Name (\*)' field with the value 'Test for training', a 'Description' field with the text 'Taiwan grid. Test made to prepare course material.', a checked checkbox for 'I Accept Terms and conditions of use', and an 'Activate System' button.

- Review previous choices, name your forecast and activate
- Your forecasts will run within the next 24 hours. You will receive an email when the first simulation is done



○ Select variable

○ Select vertical level (if 3D forecast)

- Continue to expand OPENCoastS features
  - H2020 EGI-ACE
    - Hindcast
    - Water quality
  - H2020 EOSC-Synergy – EO data
  - Nationally-funded projects
    - 3D waves and currents circulation
    - New model: Xbeach
    - morphodynamics
- Build the OPENCoastS development community
  - Improve documentation for shared software
  - Help others to build OPENCoastS instances
  - Co-develop & share service new features
- Reach out to user communities
  - On-demand, premium user support (building grids, supporting deployment improvements, support dedicated OPENCoastS instances)
  - Dedicated, hands-on training events for specific communities

**Thank you  
for your attention!**

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*Questions?*



**EOOSC-hub**

## Further information

- **Project webpage:**  
<http://opencoasts.lnec.pt>
- **OPENCoastS webpage:**  
<https://opencoasts.ncg.ingrid.pt>
- **Key publication:**  
A. Oliveira et al., 2020. OPENCoastS: an open-access service for the automatic generation of coastal forecast systems, *Environmental Modelling & Software*, [doi.org/10.1016/j.envsoft.2019.104585](https://doi.org/10.1016/j.envsoft.2019.104585)

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