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

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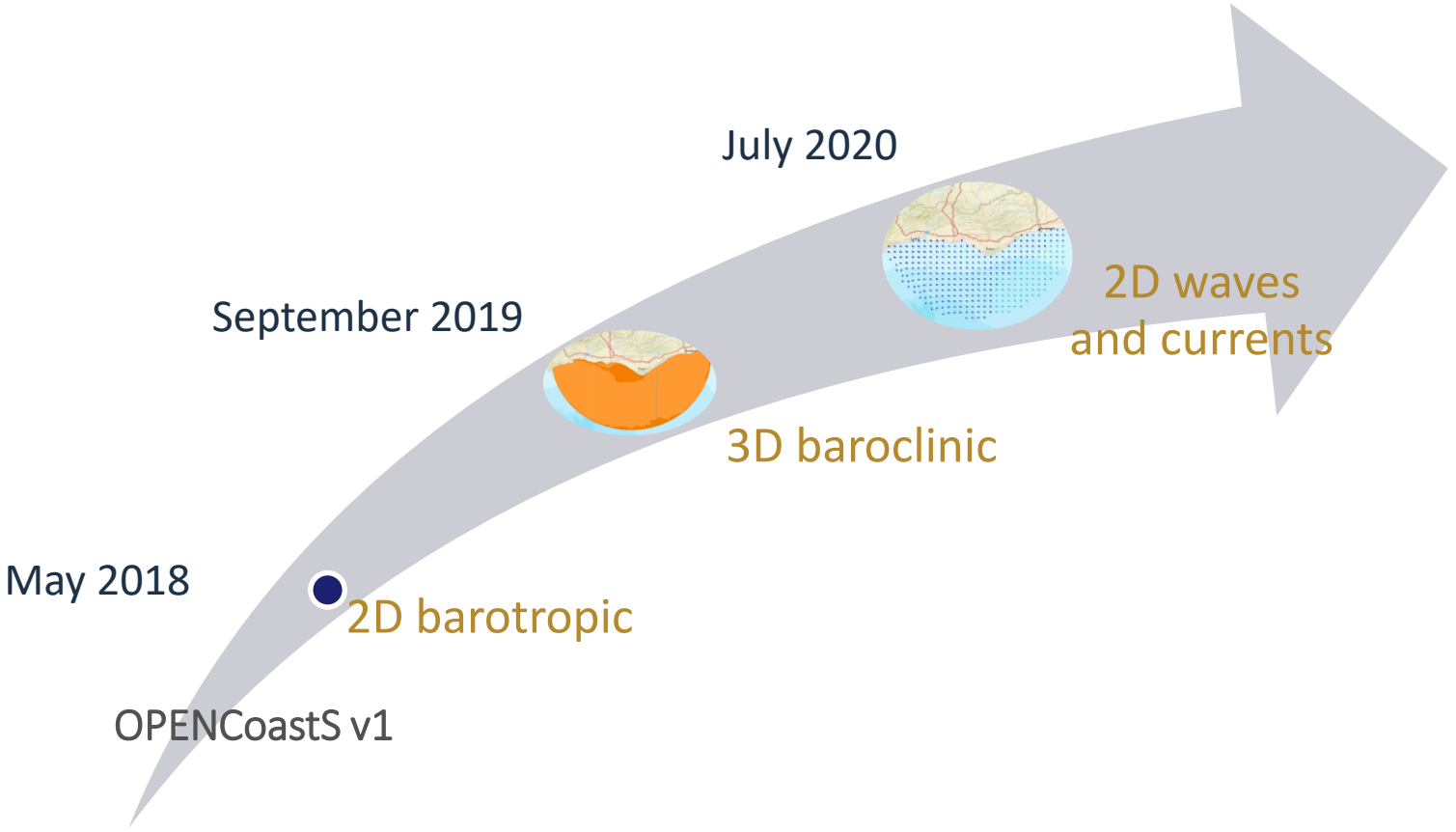
Forecast systems address societal needs

- 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

The OPENCoastS Service

- 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

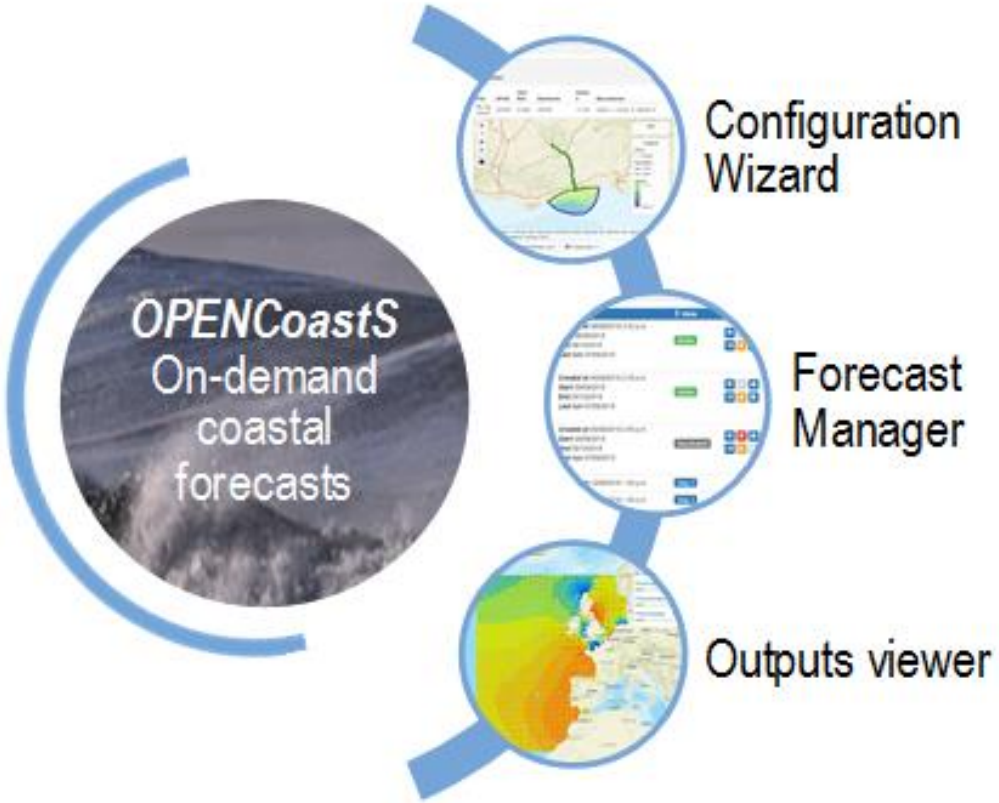
Progress and key results



OPENCoastS v3

- Open software
- Available at repository
- March 2021

The three components of the OPENCoastS' Web interface



- *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/

Deployment options and user contribution

OCEAN

FES2014
CMEMS (World+IBI)
PRISM2017
WaveWatch-NA

ATMOSPHERE

NOAA / GFS
METEO-FRANCE / ARPEGE

DATA

EMODnet Physics

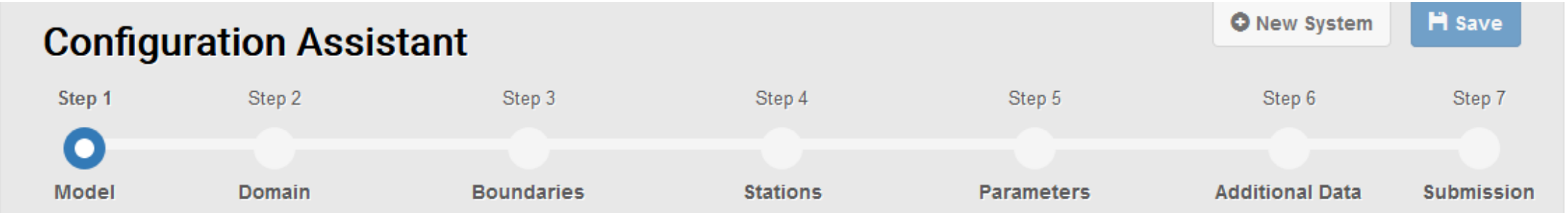
OPENCoastS
Coastal circulation on-demand forecast

WIFF

SCHISM

Computational grids
Parameters
River flow

Generating a forecast system: summary

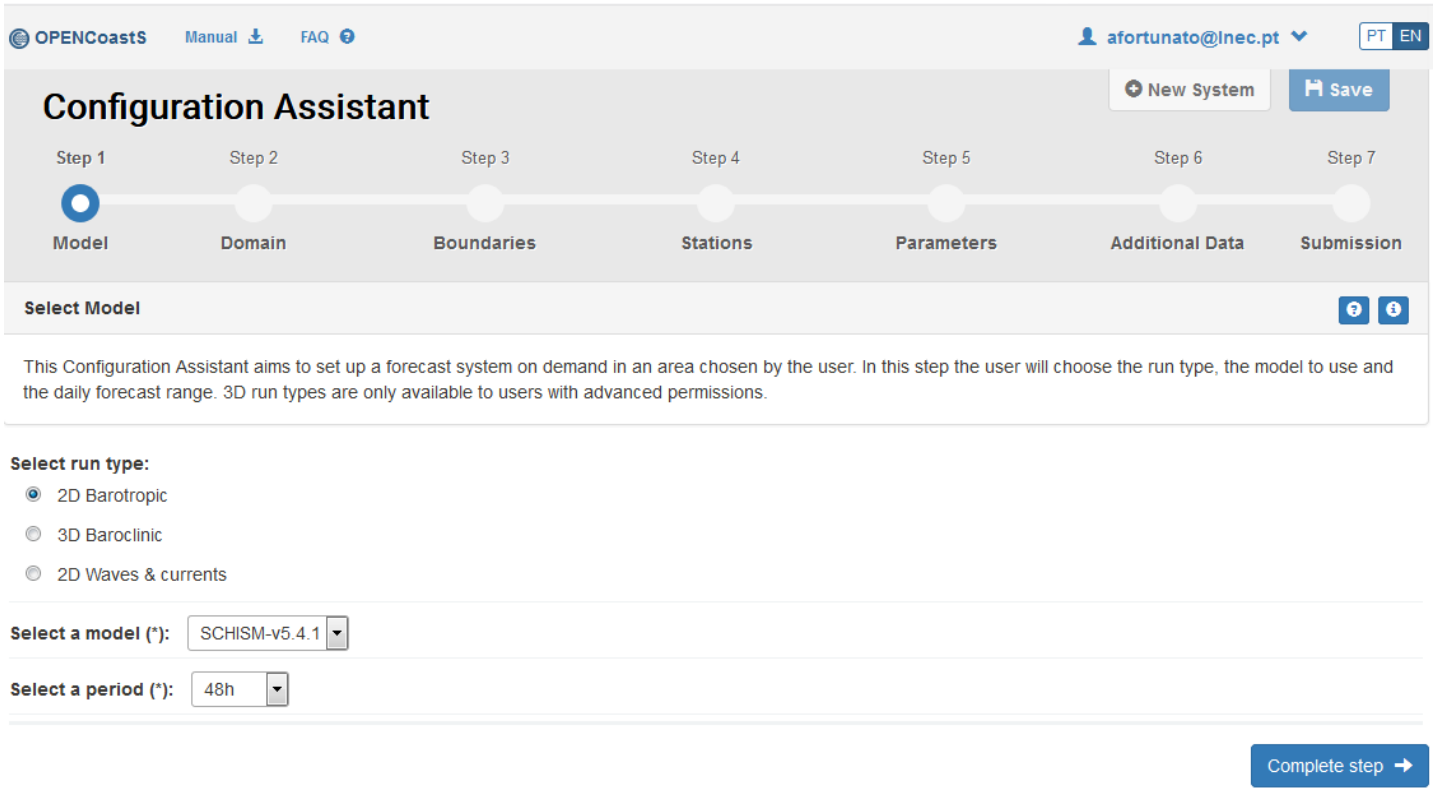


- Step 1: select the model configuration
- Step 2: upload and verify the grid
- Step 3: specify the boundary conditions
- Step 4: define the output stations
- Step 5: define the physical and numerical parameters
- Step 6: define the spatially-varying parameters
- Step 7: review and submit

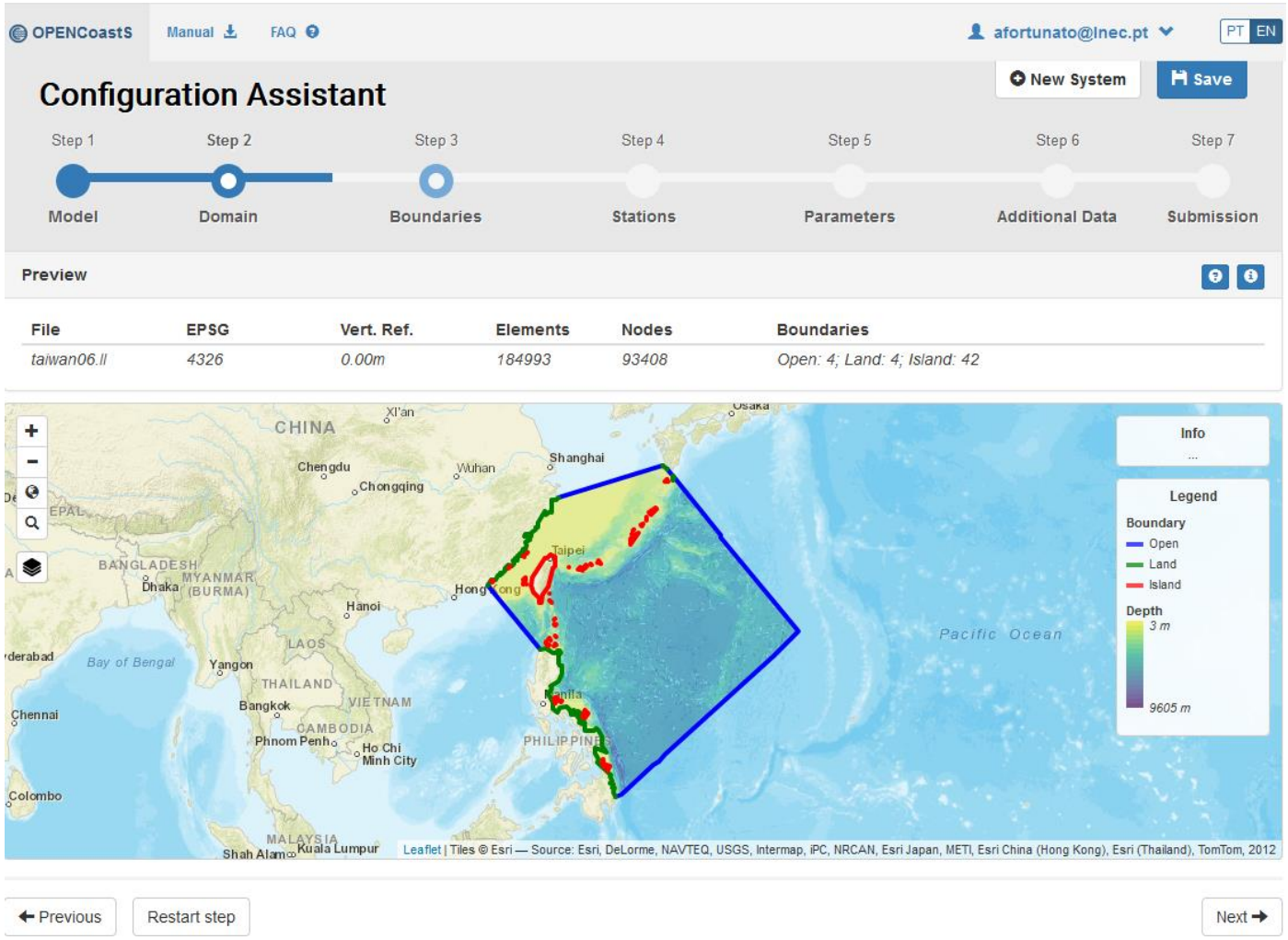
Step 1: select the model and the duration

- Three model configurations:
  - **2D barotropic**
  - 3D baroclinic
  - 2D waves & currents

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

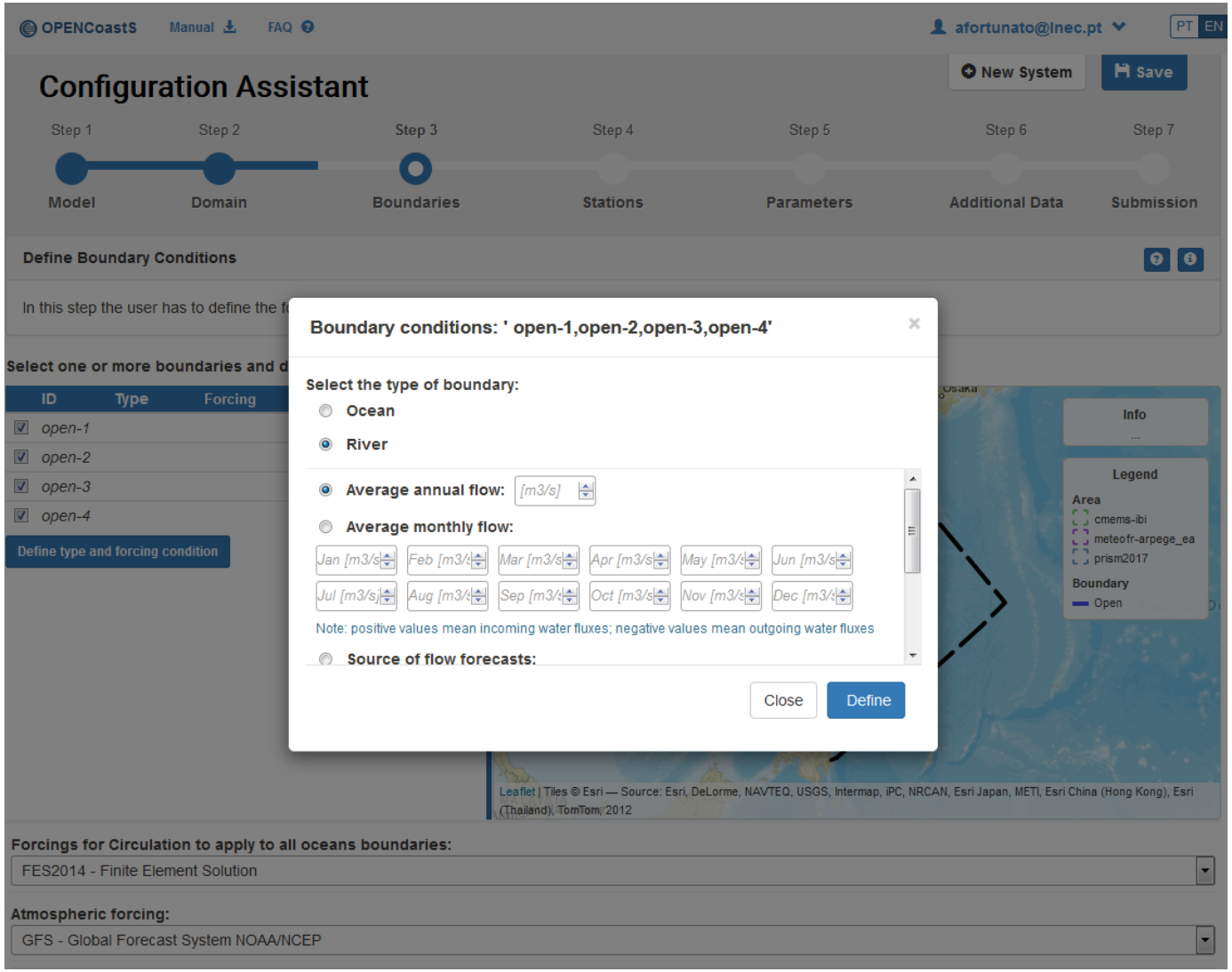


Step 2: upload and verify the grid



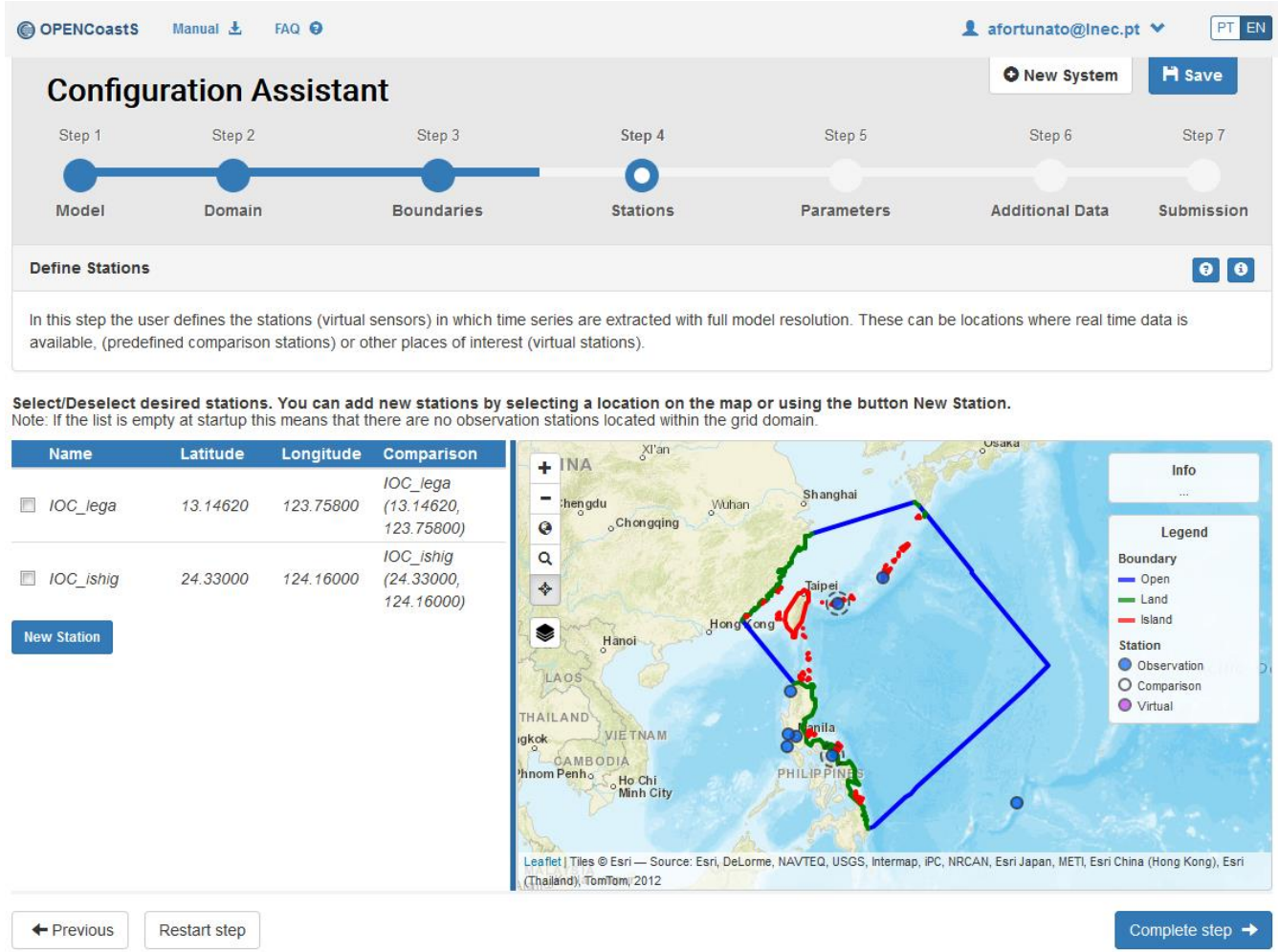
- Grid format: SCHISM / SELFE / ADCIRC
- All runs are made in geographical coordinates
- Grids can be provided in cartesian coordinates if you know the EPSG code
- Provide vertical reference to MSL

Step 3: specify the boundary conditions



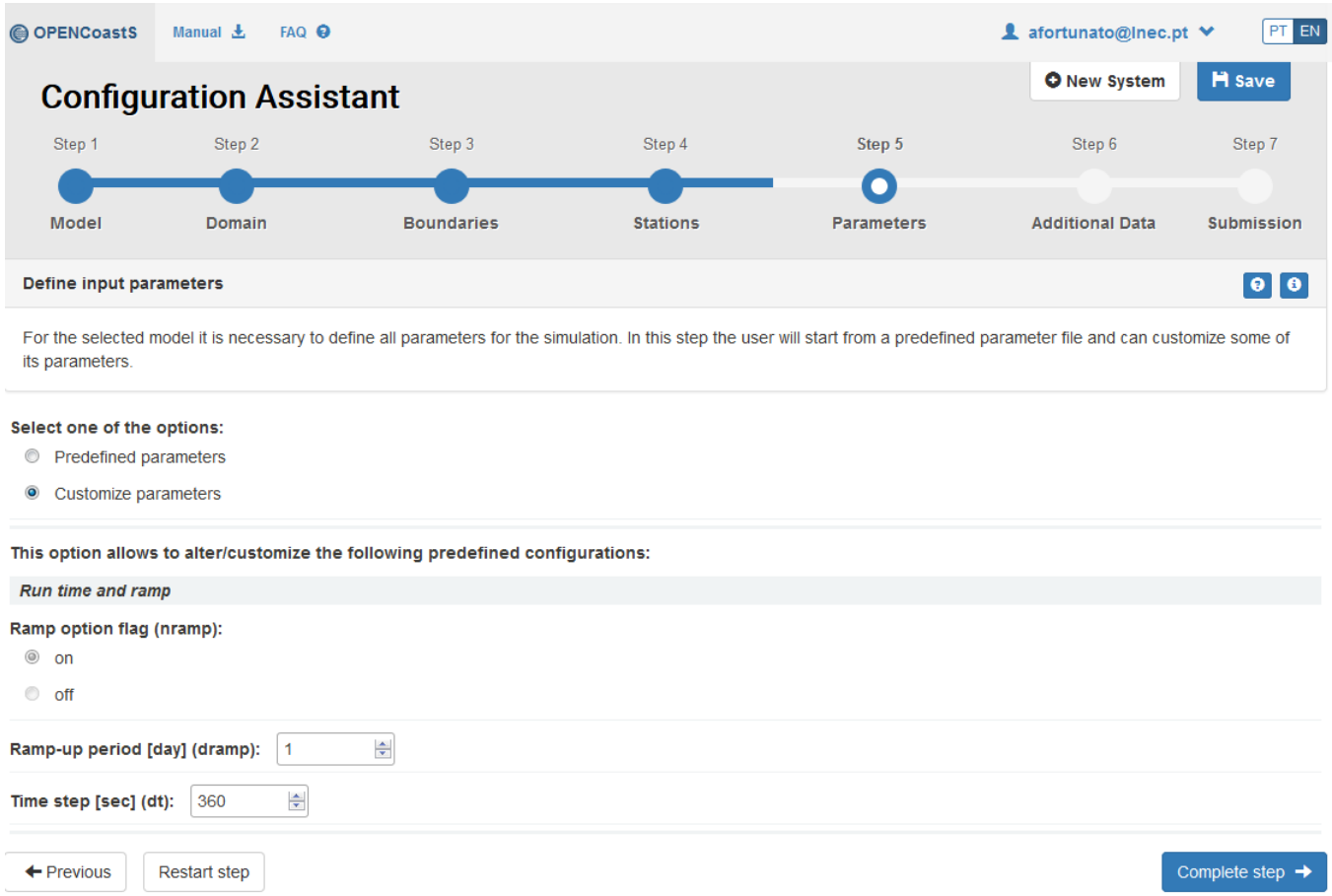
- Rivers:
  - Yearly or monthly discharges
  - Provide your own URL
- Ocean:
  - FES2014 (LEGOS)
  - CMEMS global
  - PRISM2017 (LNEC)
  - CMEMS IBI
- Atmosphere:
  - GFS (NOAA)
  - ARPEGE (METEO-FRANCE)

Step 4: define the output stations



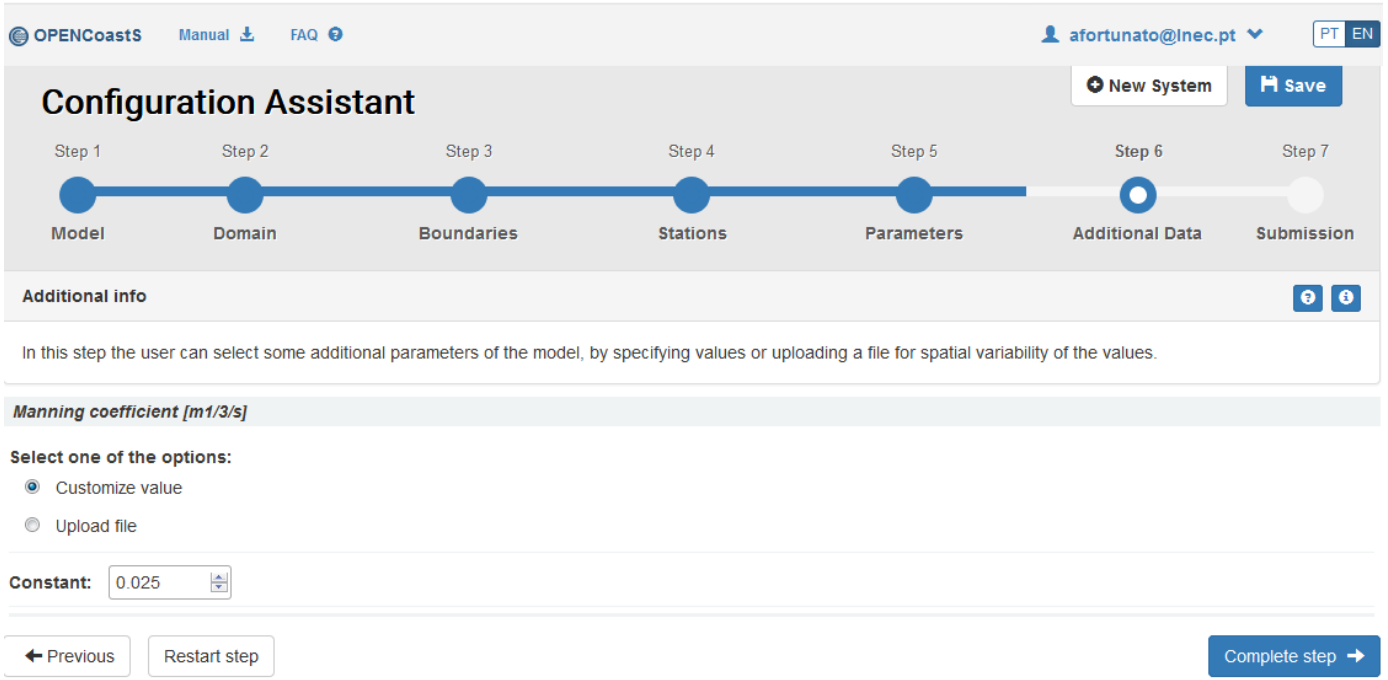
- EMODnet Physics tide gauges inside or close to the grid are proposed
- Other real or virtual stations can be added
- A limit of 5 stations per forecast is imposed

Step 5: physical and numerical parameters



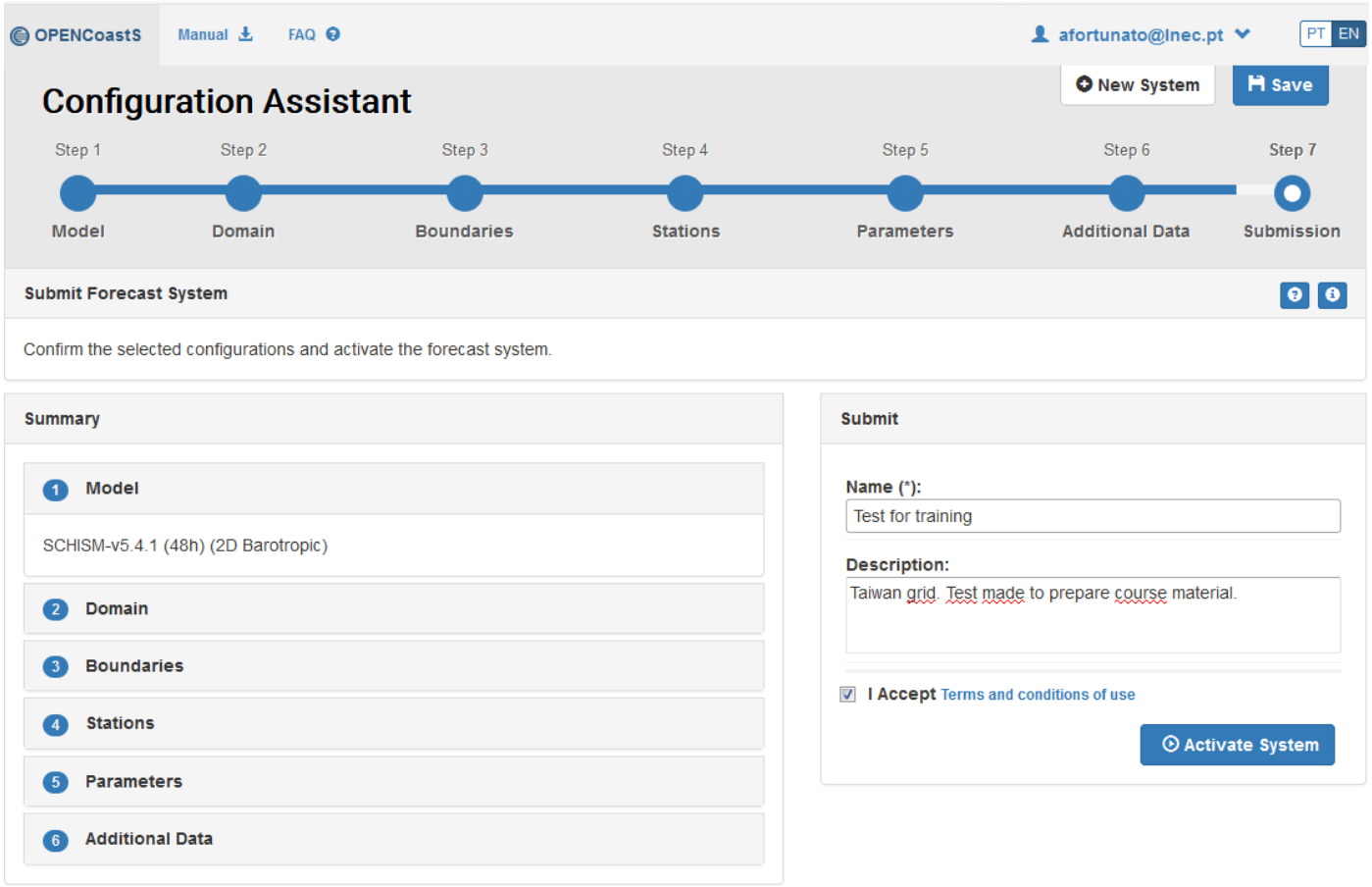
- Most parameters are fixed and predefined
- Customizable parameters are:
  - Warm-up period
  - Time step

Step 6: define the spatially-varying parameters



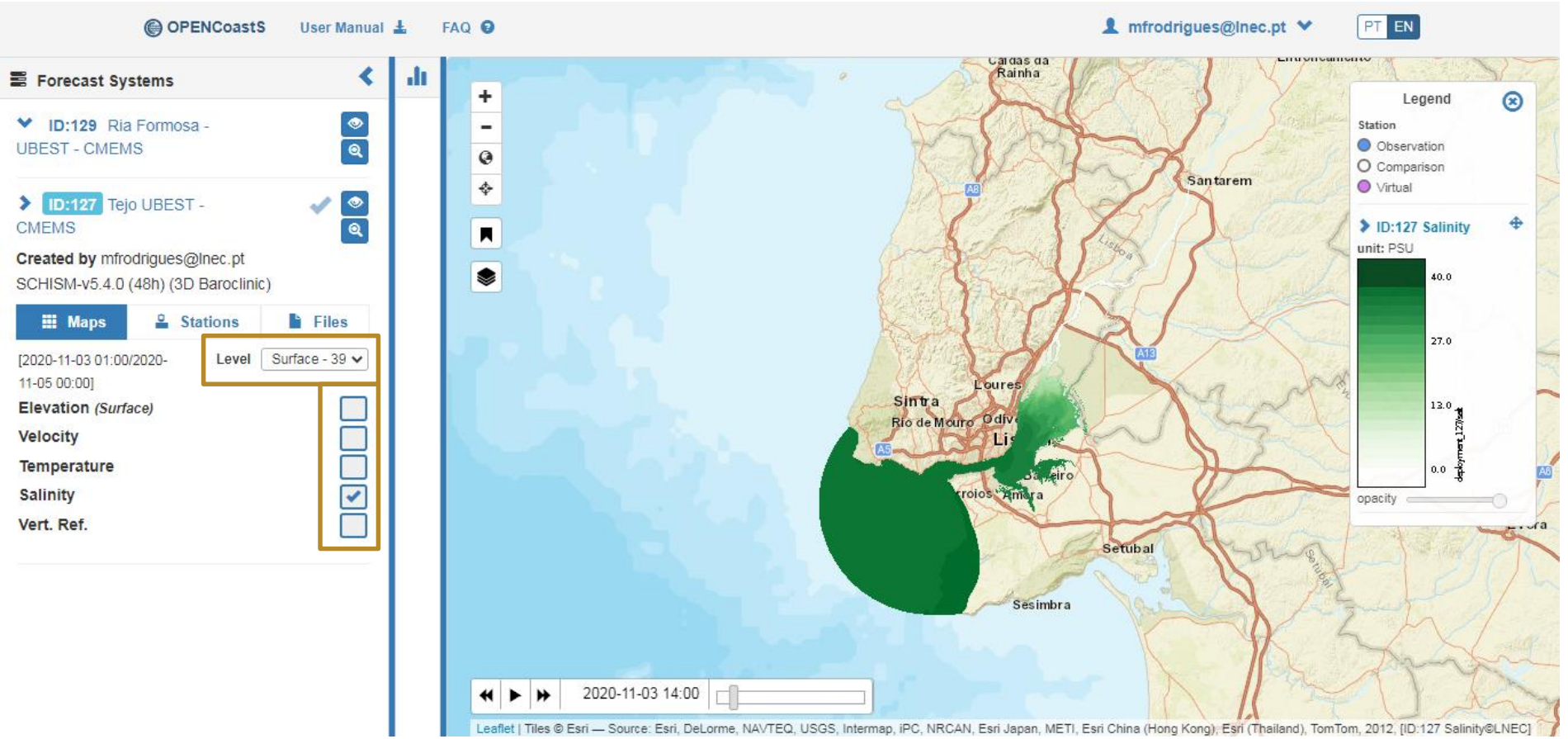
- In 2DH mode, only the Manning friction coefficient can vary in space

Step 7: review and submit



- 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

Outputs viewer



- Select variable
- Select vertical level (if 3D forecast)

Future plans beyond EOSC-hub

- 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!

Questions?

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

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