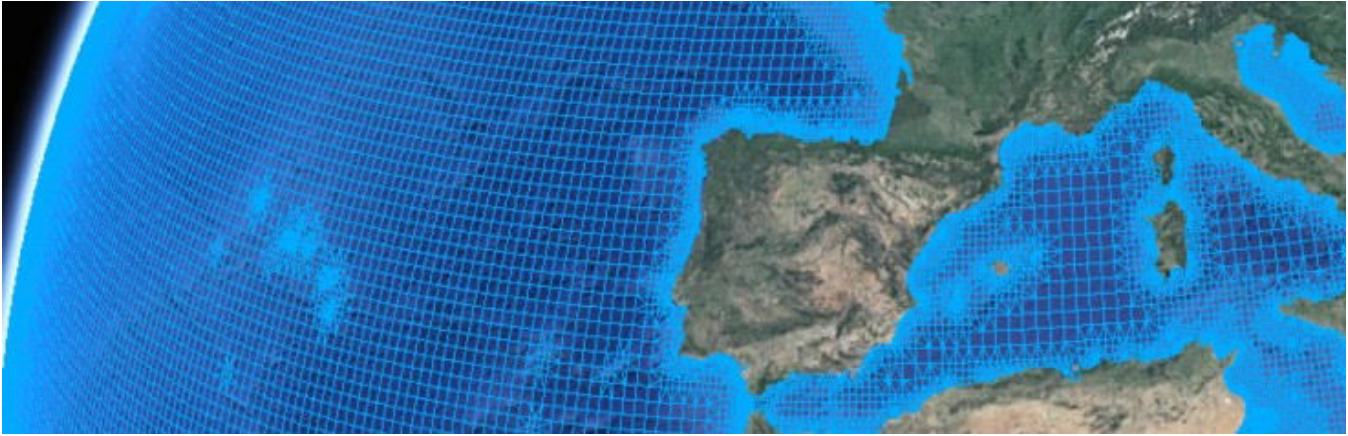


DEL063 - Continuous Integration of Models and Data



Continuous integration aims to improve the quality of software by continuously testing and validating software. In context of hydro- and morphodynamic model development, testing and validating typically involves model/data comparisons for various parameter settings, i.e. calibration. If either the model code changes, or additional measurement data become available, ideally the model is recalibrated and validated against data. But also if neither the model code nor that available data changes, recalibration and validation might be necessary. Calibration and validation is specific for a certain period of time, area and required amount of detail. For example, a global model, calibrated and validated on a worldwide dataset, might very well deviate significantly from reality in a particular location or at a particular moment in time. Global models should be used with care for local purposes.

The project DEL063 - Continuous Integration of Models and Data aims at the development of a standardized calibration and validation framework for hydro- and morphodynamic models that allows for continuous calibration and validation of these models at particular datasets for particular purposes. The project focuses on global operational models. An interactive web-based shell is developed through which operational global models can be validated and calibrated against user-defined data. The interactive shell also allows for user-defined queries on the operational model forecasts.

Global operational modeling

Deltares joined the worldwide tendency to provide services instead of stand-alone software packages. A recent example is the GLObal Storm Surge Information System (GLOSSIS) that provides global 10-day operational flood forecasts every 6 hours based on a global Delf3D FM model in a FEWS framework. Currently, GLOSSIS provides hourly global data maps and 10-min data time series at predefined locations free of charge. In addition, customers can subscribe to a paid data service to obtain customized data packages every 6 hours (currently in pilot phase). GLOSSIS is launched with the explicit purpose of providing a solid basis for operational forecast systems that can be expanded as customer demand increases.

A possible expansion of GLOSSIS is interactivity. In an interactive system, customers have the ability to interact with the system by providing additional input. In the case of GLOSSIS, customers might provide the system with their own local datasets in order to validate or calibrate the model output locally. As a global model is always optimized on a global scale, locally the model results might still deviate significantly. Providing local data to the model system has multiple benefits for both customers and Deltares: 1) the local model error can be quantified, 2) the model error can be locally corrected, and 3) the global model can be optimized.

The transition of GLOSSIS towards an interactive global operational model system is subject to this project.

Interaction in global operational models is an unexplored area in the field of numerical modelling. Therefore, it is the intention to initiate the transition towards an interactive global operational model system one step at the time. Each step pursues added value to the operational system that can be deployed operationally against minimal investment. Customer feedback should guide development to the next steps and explore the potential user base as to closely tie technical advances to customer demand.

Potential users

The potential user base of interactive global operational model systems is yet unknown. An explicit objective of the development process is to explore the potential user base. Nevertheless, the potential user base can roughly be characterised as high-demand users (i.e. high resolution and/or frequency, SLA) with infrequent or changing data requirements.

For low-demand customers (i.e. low resolution and/or frequency, no SLA) or interested users without specific purpose for the data provided, the existing free data services (i.e. providing graphs of time series through www.globalfloodforecast.com) are likely sufficient. High-demand customers with high-frequency, but constant data requirements can benefit from the paid subscription. But for high-demand customers with infrequent or changing data, neither the free data service nor the paid subscription likely fit their needs and an interactive global operational model system can be of added value.

High-demand customers with infrequent or changing data requirements can be end-users, like contractors with irregular operating times and location, or business-to-business users and resellers, like rapid-response or search-and-rescue service providers that operate on a global scale. Nowadays, these include the big tech companies (e.g. Google, Facebook, Amazon) that increasingly provide societal data services in areas struck by disaster and/or conflict. Amongst others, one could think about search-and-rescue, oil spills, but also navigation optimization.

The service will be provided as a public service. Public services should be cost-effective, but not necessarily profitable. Minimum revenue should be generated to prevent the service to be loss-making. The service should be scriptable to allow third-parties to build commercial services upon the public service.

Partners

- Deltares
- Van Oord Dredging
- Microsoft

Activity

2018 Q1

- Aligned project plans with FEWS/GLOSSIS developments for 2018.
- Designed interactive shell.
- \$10.000 computational credit on Microsoft Azure from AI for Earth Grant.

2018 Q2

- Started development of interactive shell.
- Extra 12.000 euro cash contribution from Van Oord.