

Unlocking the potential for coastal innovation growth using Earth Observation data and cloud infrastructure

Eirini Politi, University College Cork (Ireland), eirini.politi@ucc.ie
Rory Scarrott, University College Cork (Ireland), r.scarrott@ucc.ie
Miguel Terra Homem, DEIMOS, (Portugal), miguel.terra@deimos.com.pt
Hervé Caumont, Terradue, (France), hervé.caumont@terradue.com
Nuno Grosso, DEIMOS, (Portugal), nuno.grosso@deimos.com.pt
Antoine Mangin, ACRI (France), antoine.mangin@acri-st.fr
Nuno Catarino, DEIMOS (Portugal), nuno.catarino@deimos.com.pt

Abstract

In the era of Big Data, satellite remote sensing plays a major role in marine and coastal research, by contributing large and long archives of datasets to the scientific community for a wide range of marine and coastal applications. Dating from the 1970s, the generation of polar-orbiting satellite data that cover the entire globe can be as frequent as every 12 hours. The availability of such satellite datasets, some of which now hold an open access status, has made feasible the development of large-scale marine projects, with examples including the European Space Agency (ESA) Climate Change Initiative (CCI) Ocean Colour, Sea Surface Temperature, Sea Ice and Sea Level projects. However, until recently, scientists had to deal with the daunting task of mining large datasets for suitable data, and often downloading EO information from various different sources. In addition, as the datasets increased in volume, the processing has become slower and demanding of better computing facilities. The European Commission (EC) H2020 Co-ReSyF (Coastal Waters Research Synergy Framework) project aims to tackle these issues, by developing a platform for combined data access, processing, visualisation and output in one place. The platform is based on cloud computing to maximise processing effort and task orchestration. Co-ReSyF will address issues faced by inexperienced and new EO researchers, and also target EO experts and downstream users, with main focus on enabling EO data access and processing for coastal and marine applications. Such a platform will revolutionise accessibility to Big EO Data, and help create a new era of EO data processing and exploitation in the coastal and marine environment.

Overview of the Co-ReSyF platform

The Co-ReSyF project kick-off in February 2016 and will implement a dedicated data access and processing infrastructure, with automated tools, methods and standards to support coastal water research applications that use Earth Observation (EO) data. The user-friendly interface will be accessible to inexperienced researchers in EO and coastal research, but also EO experts and algorithm developers.

Co-ReSyF platform facilities and tools, optimised for distributed processing, include EO data access catalogues, discovery and retrieval tools, as well as a number of (pre-)processing toolboxes for manipulating EO data (Fig. 1). Through a collaborative front-end, the Co-ReSyF platform users will be able to upload new algorithms, or use existing ones, compose and configure processing chains for easy deployment on the cloud infrastructure. Users will be able to accelerate the development of high-performing applications taking full advantage of the scalability of resources available in the cloud framework. Advanced users will be able to take full control of the processing chains and algorithms by having access to the cloud back-end, and to further optimize their applications for fast deployment for Big Data access and processing.

Development phases

The goal of the Co-ReSyF project is to develop and provide a service to the coastal and marine community that incorporates EO data and information into multi-disciplinary coastal research applications. This service, in the form of a cloud platform hosted in a distributed environment, will be developed in two major phases. The initial phase (2016-2018) is dedicated to platform evolution based on user feedback and consultations that will guide the definition of requirements. A series of early adopters will support and demonstrate the Co-ReSyF capabilities, and access the platform to develop new research applications in the coastal domain, and hence serve as beta-testers of the system. Towards the end of the project, the Co-ReSyF platform will be publicly released to the research community (second phase).

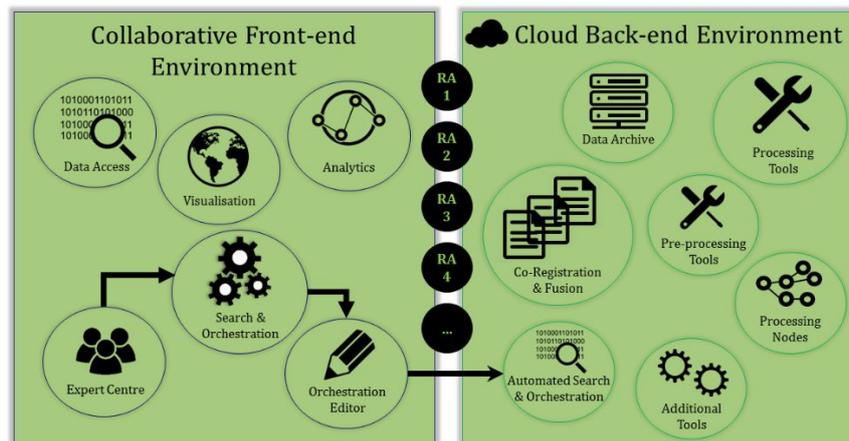


Figure 1: Co-ReSyF development and testing environment, including interdependence of platform components (RA denotes Research Applications).

Research Applications

Co-ReSyF aims to focus on the needs of the coastal waters research community and as a result, six main coastal research applications have been thus far identified, and are currently being developed by the project partners for integration in the system. These are:

- Coastal water bathymetry mapping
- Coastal water benthic classification
- Coastal water quality
- Marine vessel detection and oil spill detection
- Open water and coastal water altimetry
- Time series processing for hyper-temporal optical data analysis

These applications use a range of optical, thermal and Synthetic Aperture Radar (SAR) satellite data, and will be complemented by new applications developed later on by the platform early adopters and various users.

Conclusions

Co-ReSyF intends to eliminate many of the barriers related to the use of EO data, usually identified by inexperienced users. This will lead to a wider integration of EO datasets in a research context. Such an expansion will raise awareness to the potential of EO data, and encourage innovative thinking and development of new algorithms, EO products and services. Ultimately, the platform, when operational, aims to act as a facilitator for scientific knowledge generation and innovation growth, supporting the advancement of science and allowing ideas to be tested and explored at a scale not previously accessible to all researchers.

Funding acknowledgement

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 687289.