Insights from the development of a downstream web-service to visualize ocean and meteorological forecast data at Iberian Atlantic beaches

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Introduction

Coastal modeling and observation, data management as well as the development of marine core and downstream services for intermediate and end-users, are critical components aligned with the EU's Blue Growth strategy. The marine knowledge value chain may focus on areas with special potential to foster a smart, sustainable and inclusive Europe, as for example, the coastal and maritime tourism, the biggest maritime sector in terms of gross value added and employment (ECORYS, 2013). This is particularly true in countries with favourable climate conditions and long coastlines like Spain and Portugal.

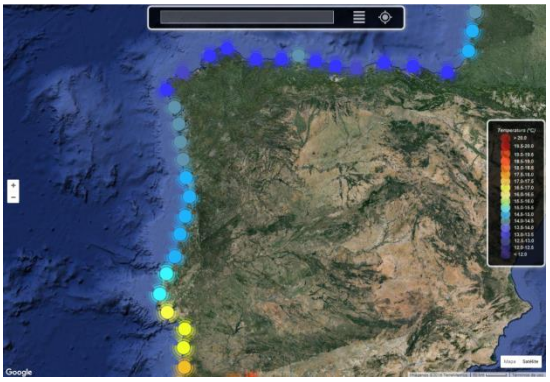

Fig. 1: Home page of the application playas.ieo.es

In 2013, the Instituto Español de Oceanografía (IEO) developed a maritime data downstream service (http://playas.ieo.es) particularly focused on providing sea surface temperature (SST) at Iberian Atlantic beaches, a parameter that, although basic for the scientific community, it was certainly rather unusual in those weather forecast reports to the wider public. Thus, although the web-service enhances the visualization of SST at more than one thousand beaches, it also provides 3-day forecast of a set of other meteo-ocean variables (air temperature, wind speed and direction, wave height, period and direction, and tides). The service is accompanied of a dedicated page in Facebook to spread marine knowledge directly related to SST. The main elements that compose this service and the experience gained during these years are described.

Methods

The main parameter of the web service is the SST. Data are obtained from a realistic high resolution (~1.3 km) configuration of a numerical ocean model, operated and mantained by IEO as part of the RAIA Ocean Observatory (http://www.marnaraia.org/). Supplementary details of the model configuration and validation can be found in Otero et al. (2009, 2013). In areas where the model configuration does not provide results or during out-of-service periods, data are obtained from the ~3 km ocean model configuration of the NorthEast Atlantic provided by Copernicus service (http://marine.copernicus.eu/) and operated by Puertos del Estado (http://www.puertos.es/).

Wave and meteorological data come, respectively, from regional configurations of the WW3 (Wave Watch III) and the WRF (Weather Research Forecast) models operated and maintained by MeteoGalicia (http://www.meteogalicia.es/). Data are easily accessible through an API service.

The downstream web-service has been programmed by using HTM5/JS/CSS technology and adapted for optimum visualization in mobile devices. When the end-user access to the application, SST data

interpolated at beach locations (stored in a JSON file) are visualized using an optimum colour scale. To facilitate the visualization, data are clustered in dependence with the zoom level. The data shown at this stage comes from daily-averaged outputs of the ocean models that were previously downloaded to IEO servers. However, if the user clicks over a specific beach, a table is opened to show hourly data and the forecast. Queries are performed directly by the client to THREDDS Data Servers and the API provided by MeteoGalicia. The aim is to provide data at 1 h of temporal resolution. In case of delay or failed connection, the data shown in the web service correspond with the daily-averaged outputs.

The web-service makes easy to search for the warmest (or the coldest) beach in the visualized area, which turns attractive to localize optimum bathing waters in areas with strong SST gradients like the *rías* (inlets in NW Spain).

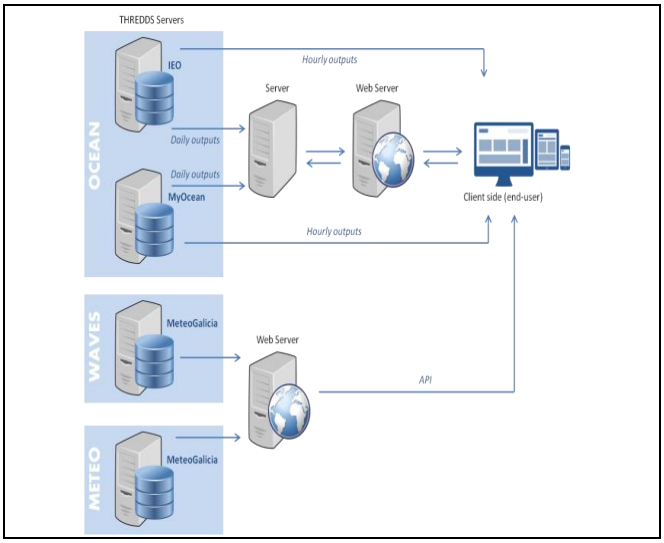

Fig. 2: Operation scheme.

Results and conclusions

The development of the application playas.ieo.es has been a good opportunity to test and improve different data services aligned with the current state-of-the-art in operational oceanography. Although this web app has been initially deployed as a Beta version and no particular advertisement and promotion have been done, from 2013 on, more than 30K users have accessed to the application, particularly during summer, when the service experiences an average of 140 daily connections. In addition, the App has a link to a Facebook page with curious or relevant information for the general public. Explanations about massive jellyfish occurrence, upwelling or local strong coastal currents are done by experts in a scientific dissemination effort. Currently, this downstream service is being used for Sondara Solucions, a small Spanish enterprise, to provide additional information in their smart beach products, becoming an example of those priorities drawn in the EU's Blue Growth strategy.

References

ECORYS, 2013. Study in support of policy measures for maritime and coastal tourism at EU level. Specific contract under FWC MARE/2012/06 -SC D1/2013/01-SI2.648530. Final Report. Client: DG Maritime Affairs & Fisheries. Rotterdam/Brussels, 15 September 2013. Available at: http://ec.europa.eu/maritimeaffairs/documentation/studies/documents/study-maritime-and-coastal-tourism_en.pdf

Otero, P., M. Ruiz-Villarreal and A. Peliz, 2009. River plume fronts off NW Iberia from satellite observations and model data. *ICES Journal of Marine Science*, 66, doi:10.1093/icesjms/fsp156

Otero, P., M. Ruiz-Villarreal, L. García-García, G. González-Nuevo and J.M. Cabanas, 2013. Coastal dynamics off Northwest Iberia during a stormy winter period. Oceans Dynamics 63(1), 115-129.