



## Puertos del Estado Data Center

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The Data Center is the core facility to deal with all the operational oceanographic services provided by Puertos del Estado to the Spanish ports and to the society. The center activity started in the mid 1980's and evolved in time according to growth and new requirements of Puertos del Estado systems. As a result of this evolution, keeping in touch with the latest developments and new technologies, the data center today is a complex and multilayer system of systems, processing tasks ranging from data acquisition and quality-control to storage, dissemination and visualization.

Puertos del Estado (Spanish State Port Agency) has the role of coordinating and supporting the activities of the main harbours in Spain. Amongst their legal competences is the study of physical environment in coastal areas, extending and improving monitoring and forecasting capabilities over the whole Spanish waters, Mediterranean and Atlantic, but also covering more extensive regional domains (Northeastern Atlantic waters, Western Med Basin and Macaronesian area). The work is mainly focused on ocean monitoring and operational forecasting systems. The monitoring service is based on permanent stations providing real-time in situ data, being the most important buoy, tide-gauge and HF radar networks. By means of the forecasting services a comprehensive description of the ocean state for the coming days is performed daily, at different scales, from the open ocean to the harbor waters and for the most important physical parameters: waves, sea level and ocean circulation. Additionally, Puertos del Estado develops a fruitful collaboration in many international and national projects and associations (CMEMS IBI INSTAC and IBI MFC, MONGOOS, IBIROOS, EUROGOOS...) that has permitted to provide but, to incorporate also, data from other institutions. Within this context, the main role of the Data Center is to retrieve, process, preserve, and disseminate all the information obtained by the aforementioned services.

Puertos del Estado Data Center can be visualized as a multilayer system of systems, where each layer accomplishes specific tasks independently, but, at the same time, the information is shared between adjacent layers, creating an interconnected structure. The first layer is responsible for the acquisition of data, observed and forecasted. For the observations, the main goal is to guarantee the continuity and stability of the data flow in order to provide a realistic real-time input. Diversity of sources, data formats and transmission methods, made this a challenging task. For model's part, high computational resources are required to assure the operational services. The next layer is devoted to data assessment, to control the quality of data in two modes of operation, real-time and delayed mode. This quality control system is sophisticated and in continuous evolution. Archive layer is based on two methodologies, relational databases, mainly used for observed data but also for some model data, and netCDF repositories - OpenDAP, used for HF radar and model outputs. Last layer, devoted to visualization, is offered through 'Portus', a cutting-edge web application to visualize observations and forecasts. Another application for mobile devices, iMar, shows a simplified view of the same data.