FROM THE DEEP OCEAN TO THE ESTUARINE INTERTIDAL AREAS: AN OPERATIONAL FRAMEWORK FOR THE PORTUGUESE EXCLUSIVE ECONOMIC ZONE

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1. Introduction

Two thirds of the Portuguese population lives in coastal areas and its main cities are located close to the coast. Its capital, Lisbon is located by the Tagus estuary, the largest estuary in Portugal and one of the largest in Europe. The economical importance of the coast including port activities, fisheries and tourism justify the need for accurate coastal predictions.

Portugal is a coastal nation surrounded by the Atlantic Ocean with nearly 2000 km of coast including the continental territory and two archipelagos, the Madeira and the Azores Islands. In addition, Portugal has the 3rd largest Exclusive Economic Zone (EEZ) of the EU and the 10th largest EEZ in the world with 1,727.408 km², which would extend to 3,877,408 km2 if the continental shelf extension claim is approved.

2. Modelling the current Portuguese EEZ

In order to provide answers to such a vast area, the Lusitania model covering the whole Portuguese EEZ is being developed to provide operationally open boundary conditions to the existing operational models running on a daily basis for the continental coast, Madeira and Azores Islands. These models are already providing boundary conditions to more refined coastal applications that require higher resolution results to answer local management issues as bathing water quality, outfall monitoring, etc.

The models are governed by an automatic running tool (ART) that control the preprocessing, running and results distribution. This tool also links and synchronizes the different models. All the models run the Mohid Water Modeling System (www.mohid.com) - an open source modeling software developed since 1985 mainly at the Instituto Superior Técnico. Mohid is a fully 3D water modelling system that computes in addition to the hydrodynamic processes other processes related to water quality, atmosphere, water discharges, oil dispersion, etc... This numerical tool has been applied to several coastal and estuarine areas and has shown its ability to simulate successfully very different spatial scales from large coastal areas to estuaries and coastal structures.

Through an offline downscaling approach based in high frequency model outputs, the ocean large scale processes are brought to the coastal models. This operational modelling philosophy allowed us to produce local realistic forecasts that integrate the large ocean processes to more reliable meteorological conditions and other local forcings as rivers, outfalls, etc. These modelling techniques and tools are generic so they could be applied in any location within the study area or to any modelled area.

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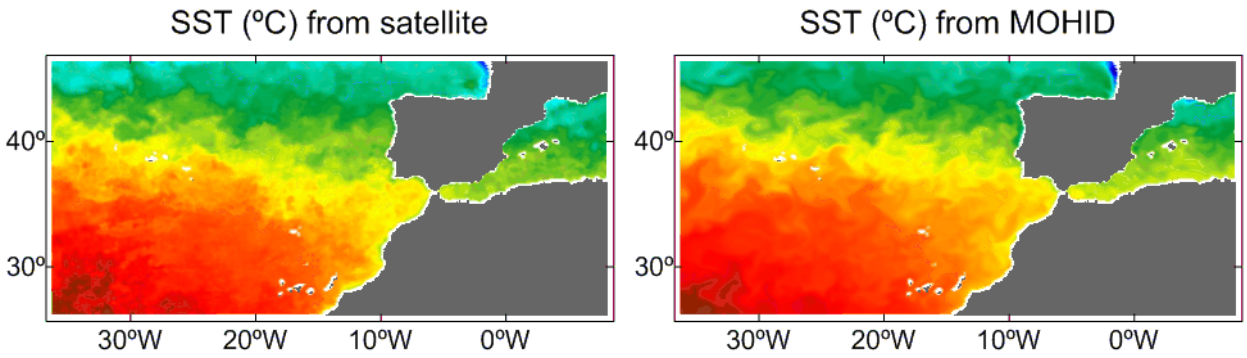

Figure 1. Surface temperature comparison between the remote sensing microwave OI SST (NASA) (left) and the Lusitania model results (right) for the 2nd of February 2012.

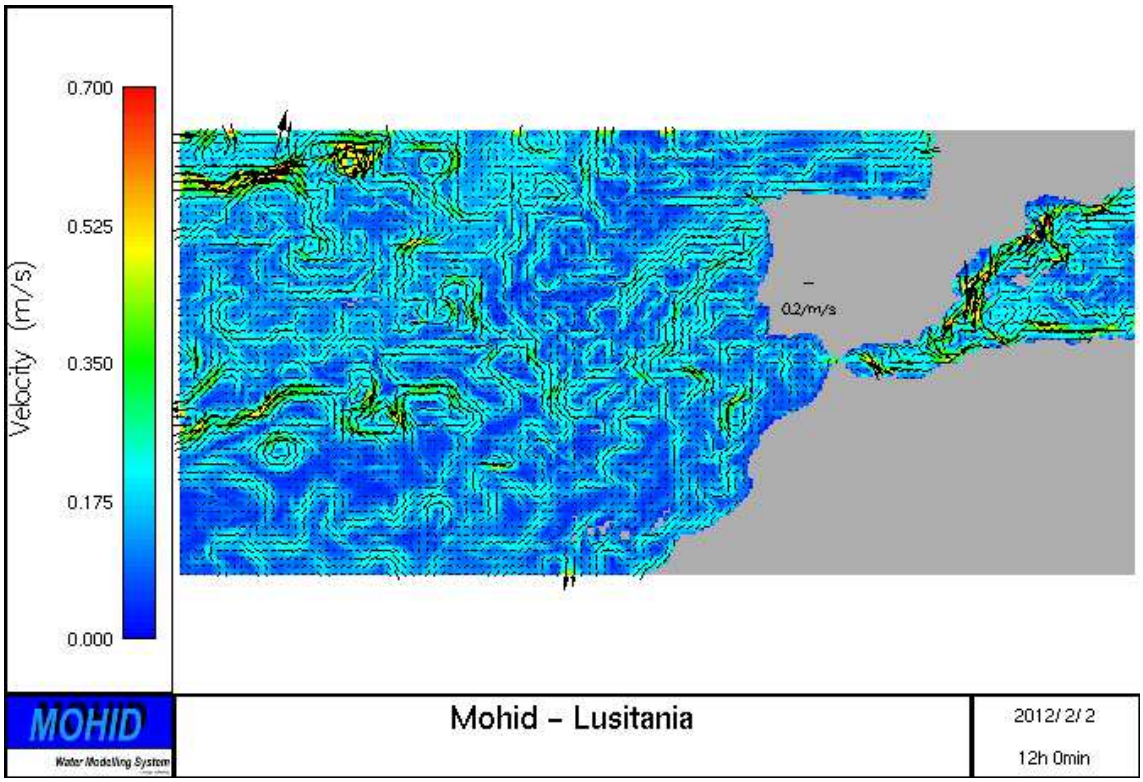

Figure 2. Daily average surface currents from the Lusitania model for the 2nd of February 2012.