



## **Probabilistic risk mapping for oil spill in Barcelona harbor using CMEMS downscaling products (SAMOA)**

Pablo Cerralbo (1), Marc Mestres (1), Manel Grifoll (1), Javier Romo (2), Marcos Garcia-Sotillo (3), Manuel Espino (1), Enrique Álvarez-Fanjul (3), and Agustín Sánchez-Arcilla (1)

(1) Universitat Politècnica de Catalunya, Spain (pablo.cerralbo@upc.edu), (2) Barcelona Harbour, Spain, (3) Puertos del Estado, Spain

The capacity of port authorities to respond swiftly to oil spills is fundamental to limit their impact within the harbor's influence zone. Operational systems (OS) constitute a convenient tool to reinforce the short-term response capability and to improve the general port turn-out. SAMOA project, launched by Puertos del Estado (PdE), is the latest PdE initiative to promote the delivery of customized operational met-ocean information to the Spanish Port Authorities to improve their decision-making in issues related to harbor safety, environmental management and operations. Within this initiative, an advanced design of high-resolution coastal OS for the prediction of ocean circulation in restricted domains such as harbors and their adjacent coastal waters has been performed. These systems are today fully implemented (from January 2017) for 9 Spanish ports located in the Mediterranean, the Iberian Atlantic and the Canary Islands.

State-of-the-art contingency plans for oil spills are usually defined by two-step process: 1) classification of the typical and/or extreme meteo-oceanographic conditions in the area and, 2) set of model simulations trying to reproduce such conditions. This methodology implies some problems related to the adequate definition and characterization of the typical meteo-oceanographic scenarios (e.g., duration of typical wind events) and to their implementation in a nested modelling scheme (i.e. compatibility between the typical forcing scenario considered and the initial and boundary conditions provided by the external model). As a result, it is not clear whether the results obtained from such an approach are realistic and applicable from a practical point of view, or are instead simply numerical exercises, and alternative probabilistic approaches are called for.

In this contribution, we present the first steps undertaken to establish a new and different methodology when preparing harbor contingency plans. Taking into account the daily forecasts provided by SAMOA in Barcelona harbor since 2017, a set of 7-day long random simulations is used to study the oil spill trajectories, accumulation areas and residence times inside the harbor (using both eulerian and lagrangian approximations), their spatial structure and time variability. This strategy allow us to estimate the probabilistic approach for the water renewal and establish a more accurate zonification in terms of risk mapping, considering not only the most extreme and typical conditions but the entire spectrum of possible meteo-oceanographic patterns.