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MAR2: "CRISIS MANAGEMENT SYSTEM FOR MARINE POLLUTION CAUSED BY OIL SPILLS"

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Abstract

Unfortunately, several accidents related to oil spills have produced catastrophes with a high impact in the marine environment as, for instance, the well-known Prestige vessel accident in the west northern of Spain in 2001, Erika vessel southern of Wales in 1996… but not all these kind of incidents are related to vessels, the most recent ones are linked to oil platforms as the PetroBras in Sao Paulo (Brasil) last April 2013, or Deep Water oil platform rented to British Petroleum in the Mexico gulf last 2012.

Although these accidents do not happen very often, their consequences in the ecosystems (fauna and flora), in the deep-sea floor, atmosphere and water pollution and their impact in the regional economies are quite important that, the Spanish Government, aware of Spain has almost 8.000 kilometres of coast, decided to promote and support different mechanisms to manage and control this kind of crisis.

In this context the MAR2 project was born, which overall objective is the implementation of a Crisis Management System for those marine pollution events caused by accidental and non-accidental oil spills.

The system will be able to run high resolution simulations of spills through the acquisition of real-time ocean-meteorological data, centralize and store all crisis-related information, manage the operational response and provide support the Crisis Manager Team facilitating the access and interaction with the relevant Marine Pollution Contingency Plans.

The MAR2 system will include both, a desktop version with full functionalities to be used in the Emergency Operations Centre, and mobile-device version optimized for facilitating the work of field operators in the spill. During the project lifecycle will be executed two trials: in the Port of Vigo and in the Port of Las Palmas (both in Spain) in order to perform training exercises that will allow the validation and calibration of MAR2.

The implementation of MAR2 will be useful for end users related to Public Administrations with responsibilities on the first responders on marine pollution accidents, industries, and in general all those entities which handle hydrocarbons in their facilities during their business activity within the maritime and port environment.

Keywords: Oil Spill, Decision Support System, Crisis Management, Marine Pollution, Contingency Plan.

DESCRIPTION OF THE SYSTEM

The system is broken down in different components or subsystems: the Integral Management System for Responding to Crises (SIGE), the System for the Management and Operation of Marine Pollution Contingency Plans, the High-Resolution Simulation System of oil spills (SIM), the Real-time Data Capture System (SIZ) and the Mobile Remote System (SRM).

The SIGE is responsible for displaying the whole information integrated in the system (real time data, results of forecast models, simulations of oil spills, etc) and assessing the level of emergency guiding the user in the decision-making process. The SIGE is complemented with other components that will facilitate collaboration and coordination of the personnel involved in the management team of the crisis: logbook, reports, agenda, digitized plans of contingency for online access, etc.

The Real-time Data Capture System (SIZ: Zonal Information System) is responsible for downloading and storing real-time ocean-meteorological information from sensors and buoys. It is also responsible for obtaining updated data from ocean-meteorological forecast models predictions available in the area of implementation. Once the predictions are downloaded, the system processes data to unify formats before being stored in the Thredds server.

In case of an accidental oil spill, these predictions will be used operationally as forcings for the SIM. The SIM is governed by a cutting-edge numerical model. We have developed a Langragian particle numerical model able to predict 2D advective transport. To estimate the turbulent diffusion, the Markovian models Random Walk or Random Flight will be applied depending on the hydrodynamic conditions in the implementation area. The model will be able to simulate one or more slicks through a set of particles (spillets) and predict the evolution of their trajectories and the variation in time of their physicochemical properties taking into account oil weathering processes in the marine environment (spreading, evaporation, emulsification, dispersion, dissolution, interaction with the coast, etc). The simulator will also be able to model different counter measurements for responding to the oil spill, thus helping and giving support to decision making processes during crises.

The Mobile Remote System (SRM) allows the remote access to the crisis information using a mobile device that will act as a collaborative tool in the management of information. Its main functionalities are: access to maps and other georeferenced items in the SIZ Thredds Server, management of tasks (reception, creation and update), access to and edit of the logbook, communication, and access to the crisis document repository. The communication between the desktop and mobile clients and the SIGE in the Emergency Operations Centre will use the HTTP protocol by means of web services and OGC standard protocols as interface for the map server. Sensitive information received or transmitted by the SRM will be encrypted.

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