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Title: "Oil spill drift and the right choice of modelling tool"

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Abstract

When an oil spill occurs, it is essential to determine and anticipate slick drift and behaviour (physico-chemical evolution) in order to support decision-making by the incident commander who will direct vessels at sea and prepare resilience for shoreline sites. Today many slick forecast models exist that each use a broad range of metocean data.

The objective of this study was to test and compare different models, drawing upon several scenarios, in order to analyse the performances and limits of each of them via an operational approach (content and presentation, results and user-friendliness). This study, funded by the French Navy (CEPPOL), TotalEnergies and UFIP, was carried out with support from and on behalf of France's drift committee[1]: Cedre, Météo-France, SHOM and Ifremer. Several partners were involved in the tests and exercises throughout the project, in particular the Norwegian Meteorological Institute (met.no), the company CLS, the Euro-Mediterranean Center on Climate Change (CMCC), the Royal Belgian Institute of Natural Sciences (IRSNB), the DHI group, the company eOdyn, RPS, SAT-OCEAN...

After conducting a review of existing models and testing and comparing 11 institutional and commercial models in 2019 and 2020 based on 5 scenarios (including the sinking of the Grande America and the Ulysse/CSL Virginia collision), 8 of these models were used during two exercises conducted in 2021. The first exercise was held in French Guiana in May and the second in the Mediterranean in June.

[1] *When a significant maritime pollution incident occurs, an observation analysis and slick drift forecasting **committee** can be activated by the maritime prefect. This committee studies the evolution of the spill in space and time, in order to provide the maritime authorities with relevant data useful for strategic decision-making. Led by Cedre, this committee is composed of representatives of Météo-France, Ifremer and SHOM (and where relevant of any other competent national or foreign organisation).*

For each of the exercises, 5 buoys representing oil slicks were deployed at two different locations: one inshore and the other further offshore. In the absence of slick observations, the buoys' positions were used to refit the model on a daily basis for several days.

Numerous phenomena can complicate modelling (e.g. opposing current systems, vortexes, variable winds, physico-chemical evolution of the product). To overcome these difficulties, we identified the main factors influencing drift, then conducted tests to parameterize them as best possible (coupling of metocean models, integration of wind factor, vertical and horizontal dispersion, Coriolis effect....).

We tested numerous sources of metocean data with different couplings. These data, with different resolutions, were from both public and private sources; certain data were known and approved, while others were more experimental. Assimilation tests for buoy drift (speed and direction) in the models were also performed.

The various tests and exercises offered better knowledge of how the models function (similarities, differences, configuration) and helped to improve some of the models (integration of field observations).

This study highlighted the importance of having accurate input data, in particular on the shape of the initial slick. We improved techniques for exploiting aerial and satellite observation data acquired during an oil discharge or spill, used to launch or fit the models.

The integration and results visualisation times were reduced thanks to a joint map-based visualisation platform specially developed to allow drift committee members to compare and analyse the results.

The exercises with all the partners helped to improve communication, information sharing and joint results analysis, as well as consolidating the network and relations with modellers and partners (both in France and internationally).

In general terms, feedback has highlighted the importance of using different oil transport models so that experts can compare several modelling outputs, visualise the main trends and discuss their relevance.

The oral presentation will provide insight into these three years of study through several concrete examples taken from the tests and exercises.