Ocean current needs for Downstream Applications

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Vincent Gouriou, Cedre France
The use of ocean currents for oil spill monitoring

Cedre, international experts in spill preparedness and response

- Spill & spill risks
  - 24 hour advisory service using modeling tools

- France
  - International

- Seas and oceans
  - Inland waters

- Oil
  - Chemicals
  - Litter
  - Microplastics
Oil spill modeling (transport and weathering)

Probable trajectory of the pollutants:

- to help the authorities to organize the response (clean up at sea / land)
- to update the observation strategy for the coming days
- 3-day forecast / 6-hour timestep

French operational capacity in oil spill drift forecast is based on Meteo France and Cedre expertise. Drift forecasts rely on a pollutant drift model, named MOTHY. Cedre and Meteo France have been working together for many years (since 1996) to develop and improve MOTHY. Cedre also use OILMAP model (RPS-ASA).
The use of ocean currents for oil spill monitoring

French Slick Drift Monitoring and Prediction Committee

which include Cedre, Ifremer, SHOM, METEO FRANCE, MRCC, French Navy

- Analyse the crisis situation and data using every output available from model
- Make operationnal recommendaions
- Produce a synthetic map for broadcasting
- Sometimes: relationships with other countries (Prestige: Spain / France)
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MOTHY : Météo-France Model

Deterministic mode

Example : Collision and oil spill off Corsica

On October 7th, 2018, a collision occurred between two ships, north of Cap Corse.

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**MOTHY**: Météo-France Model

**Backtrack mode / Hind-cast models**

Backtrack from a spill observation in the English Channel

Useful to identify the origin of the pollution

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## MOTHY Input data

<table>
<thead>
<tr>
<th>MOTHY</th>
<th>Winds</th>
<th>AROME</th>
<th>METEO-France</th>
<th>France</th>
<th>1.3 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winds</td>
<td>ARPEGE</td>
<td>METEO-France</td>
<td>Global</td>
<td>1/10°</td>
<td></td>
</tr>
<tr>
<td>Winds</td>
<td>IFS</td>
<td>European Centre for Medium-Range Weather Forecasts (ECMWF)</td>
<td>Global</td>
<td>1/8°</td>
<td></td>
</tr>
<tr>
<td>Winds</td>
<td>MERCATOR PSY4 (NEMO)</td>
<td>Mercator-ocean</td>
<td>Global</td>
<td>1/12°</td>
<td></td>
</tr>
<tr>
<td>Currents</td>
<td>MERCATOR IBI (NEMO)</td>
<td>Mercator-ocean/Puertos del Estado</td>
<td>France</td>
<td>1/36°</td>
<td></td>
</tr>
<tr>
<td>Currents</td>
<td>MFS (NEMO/WWIII)</td>
<td>MED-INGV-BOLOGNA-IT</td>
<td>Mediterranean sea</td>
<td>1/24°</td>
<td></td>
</tr>
</tbody>
</table>
The use of ocean currents for oil spill monitoring

OILMAP (RPS-ASA)

Deterministic model and weathering model

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OILMAP : (RPS-ASA)

Stochastic model
(combination of 500 runs)
## OILMAP Input data

<table>
<thead>
<tr>
<th>ASA OilMap/ASA ChemMap</th>
<th>Currents</th>
<th>COPERNICUS Marine Environment Monitoring Service</th>
<th>Iberia-Biscay_Irish Seas</th>
<th>3 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currents</td>
<td>Copernicus IBI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Currents</td>
<td>Copernicus Med Sea</td>
<td></td>
<td>Mediterranean sea</td>
<td>6-7 km</td>
</tr>
<tr>
<td>Currents</td>
<td>Copernicus NW ATL Shelf</td>
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<td>Northwest Atlantic Shelf</td>
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</tr>
<tr>
<td>Currents</td>
<td>Global HYCOM NCEP</td>
<td></td>
<td></td>
<td>7 km</td>
</tr>
<tr>
<td>Currents</td>
<td>Global HYCOM Navy</td>
<td></td>
<td>Global</td>
<td>8 km</td>
</tr>
<tr>
<td>Winds</td>
<td>GFS (NCEP)</td>
<td></td>
<td>Global</td>
<td>55 km</td>
</tr>
<tr>
<td>Winds</td>
<td>NAVGEM (Navy)</td>
<td></td>
<td>Global</td>
<td>55 km</td>
</tr>
</tbody>
</table>
Data Management – EDS (Environmental Data Server)

- Interoperability between layers of information
- Automatic collection, storage and dissemination of information
- Integration of ‘advanced’ content (e.g. model predictions)
- Integration with other layers or COP, content management, users admin
- Enables Information analysis (e.g. model skill assessment)
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Data Management – EDS VIEWER (Environmental Data Server)
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Comparative model study for oil spill drift forecast and weathering

We plan to carry out some tests in 2019:

- different oil spill models (MOTHY from Météo France, OILMAP from RPS-ASA, OSCAR from SINTEF etc ...) same current and wind datasets, compared to real oil spill observations -> in order to evaluate the reliability of oil spill drift models,

- compare different current and wind datasets into the same model in order to evaluate the reliability of wind and current models, we would use some datasets from Globcurrent products through the CMEMS portal.
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OILMAP (RPS-ASA)

Comparison of oil drift forecasts using 2 different current datasets (To + 48 hours)

COPERNICUS
NW Atlantic Shelf

COPERNICUS IBI

Oil drift forecast with COPERNICUS NW Atlantic Shelf

Oil drift forecast with COPERNICUS IBI
Operationnal Needs

- Access to current dataset
  - short delay
  - ocean input in a predefined format
  - Information about reliability of different datasets
  - « currents » is the most important parameter for Oilspill drifts
  - access to global winds dataset
- Integration of observation datasets into forecast datasets
- Integration of current vectors in WEBGIS viewer together with the pollutant drift forecast (WMS, WFS etc ...)

RECOMMENDATIONS