EMODnet Sea-basin Checkpoints
Tender no MARE/2016/05

EMODNET Oil Platform Leak Bulletin

Date: 11/05/2016

The European Marine Observation and Data Network (EMODnet) is financed by the European Union under Regulation (EU) No. 1255/2011 of the European Parliament and of the Council of 30 November 2011 establishing a Programme to support the further development of an Integrated Maritime Policy.

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Executive Summary

The EMODNET Oil Platform Leak Bulletin contains the forecast/scenario information on the fate and transport of oil leaks emanating from the DG Mare:

At 8:15 CET this morning (10/05/2016), following an unknown incident, the captain of an oil tanker (located at LAT: 47,330945; LON: -4,366687) sent a mayday reporting that the ship was breaking in several parts. By 10:00 CET the ship had released all of its 8,000 tons of heavy fuel oil n°6.

The first part of this bulletin presents the methodology and the environmental conditions (bathymetry, seabed substrate, wind and current data) used to forecast the oil spill behaviour. The oil spill scenario is set up in OSCAR (Oil Spill Contingency and Response), a model developed by SINTEF for simulating oil spill fate at sea and operated by CLS under license.
Then, oil spill results are provided in the second part in terms of mean concentration in the water column and oil surface thickness. This forecast will help oil spill management and set up of mitigation plans (activation of specialized ships dedicated to pollution missions for example).

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1. General environmental description of the affected area

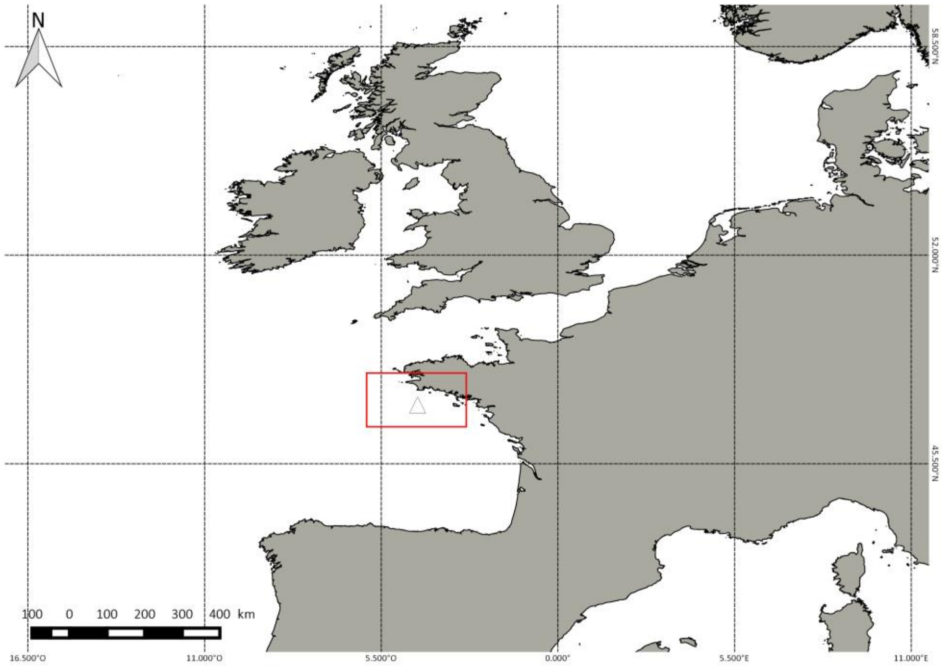

Figure 1: Location of the oil spill

The oil spill is affecting an area situated in the Exclusive Economic Zone of France and in the corresponding Large Marine Ecosystem (LME) of the Celtic Biscay shelf.

The Celtic Biscay shelf is mainly under the influence of the Shelf-Slope-Front (SSF) that extends along the shelf break/upper continental slope from the Bay of Biscay around the British Isles up to the Faroe-Shetland Channel where it joins the North Atlantic Current Front. The SSF, however does not appear continuous, suggesting that the Shelf edge Current is likely not always continuous. The area is a moderatly productive ecosystem (150-300 $gCm^{-2}yr^{-1}$). The living marine resources in the area include a wide range of organisms and traditionally, the LME has been a region of intense fishing activity. The most important fish caught in its shelf water include various pelagic fish species, as well as cod and hake. Human activities in the coastal areas also include aquaculture and farming.

Population densities at the coastal edges of the Celtic-Biscay Shelf LME are increasing and OSPAR estimates that 47.2 million people live in the catchment areas draining into the Bay of Biscay and Iberian coastal waters.

The release site is situated south of a moderate ship traffic area that contains routes joining the main maritime axe which crosses through the English Channel.

2. Methodology and oil spill scenario

3.1 Oil spill scenario parameters

The parameters related to the release were given by DG-MARE in the input data form and are summarized in the Table 1. Those parameters will be used as inputs in OSCAR.

Table 1 : Release information and time window.

Location:	
Release point 1	
Geographic Latitude	47.330945
Geographic Longitude	-4.366687
Water depth:	
m	114.9
Time window for blowout event:	
Earliest date for blowout event	2016-05-10 | 07:15 UTC
Release duration - minutes	105
Oil volume release rate:	
tonnes	8000
Release on the surface:	
	YES

Environmental input data

The datasets used for input in the OSCAR oil spill model include bathymetry, sea bed substrate, wind and current forecast and temperature and salinity profiles. They are presented in this section.

Bathymetry and model grid

The bathymetry necessary for input was extracted from EMODnet database. (Figure 2). The model bathymetry grid is presented in the figure below:

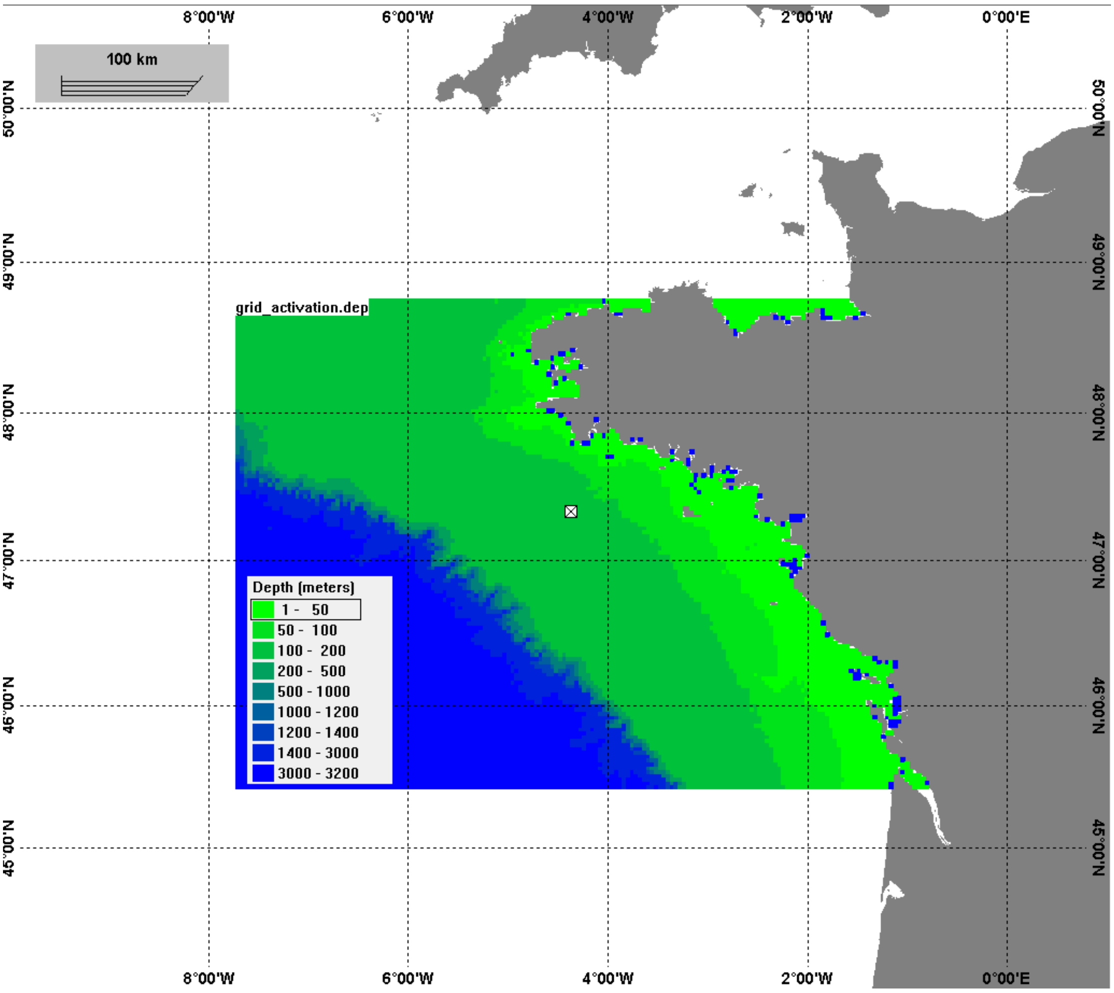

Figure 2: Grid map and EMODnet bathymetry used in the simulation. The white marker represents the release site

Sea bed substrate

Sea bed susbrates are extracted from EMODnet database. The region presents a large variety of substrates but muddy sand is largely present offshore (especially aroun the release site). The coastal area is mainly composed of coarse sediments and sandy mud as presented in Figure 3.

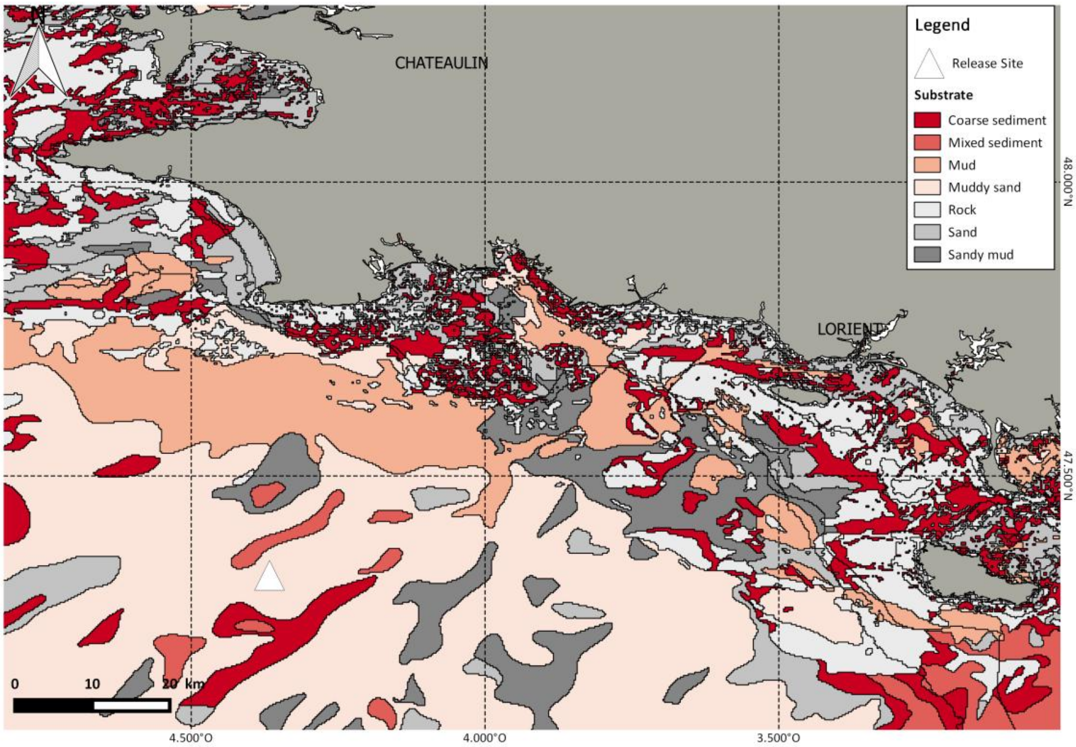

Figure 3: Sea bed substrate in the region of the oil spil

Currents and Winds

The currents used in the simulation are extracted from the Global Ocean 1/12° Physics Analysis and Forecast of Mercator Ocean. The product is provided on a regular grid with 1/12° resolution and hourly time step. Considering the high influence of tides in the area of interest, a tide component from CLS tides products is added to the currents grid. Tides are provided on a regular grid with 1/8° resolution and 1 h time step and have been interpolated to the current grid before importing in OSCAR. Data covers the period between 2016-05-10 | 07:00 UTC to 2016-05-15 | 16:00 UTC. A snapshot of the current field at the release time is presented in Figure 5.

Wind data was imported from the NCEP NOAA – Analysis and Forecast in the period between 2016-05-10 | 07:00 UTC and 2016-05-15 | 07:00 UTC. The wind-data extracted have a 1/8° degrees resolution and a 3-hour time step. A snapshot from the imported wind field is presented in Figure 4.

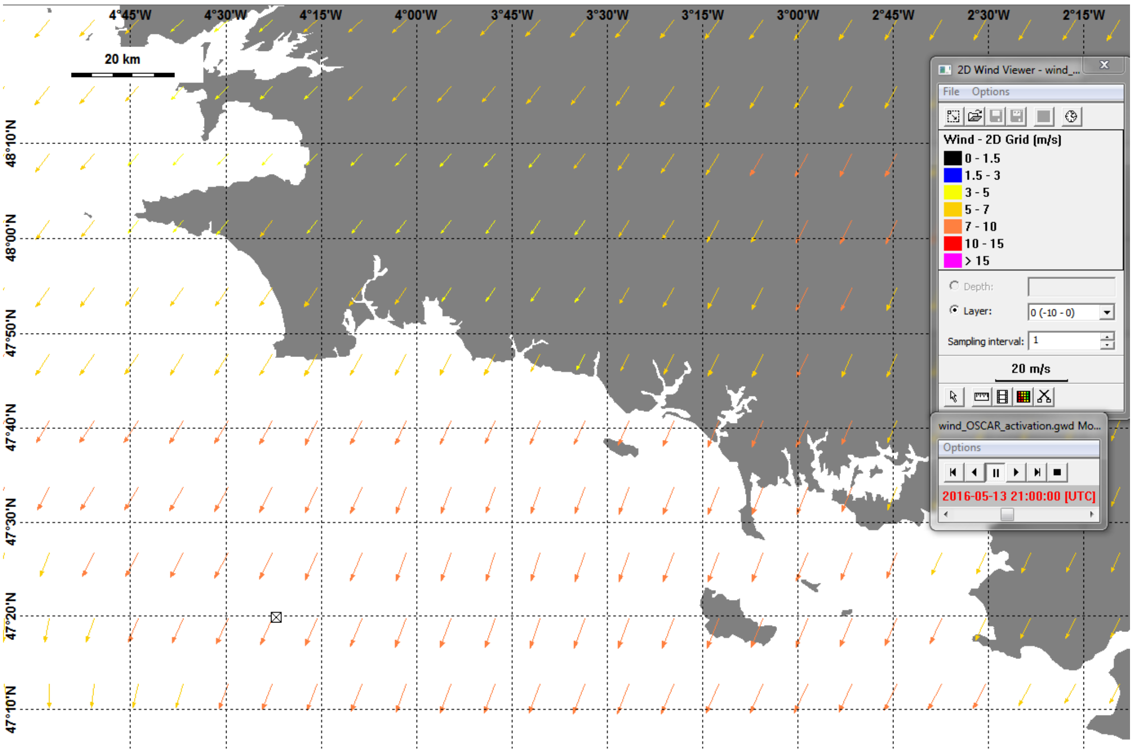

Figure 4: Snapshot of NCEP wind data imported in OSCAR for May, 13th 2016

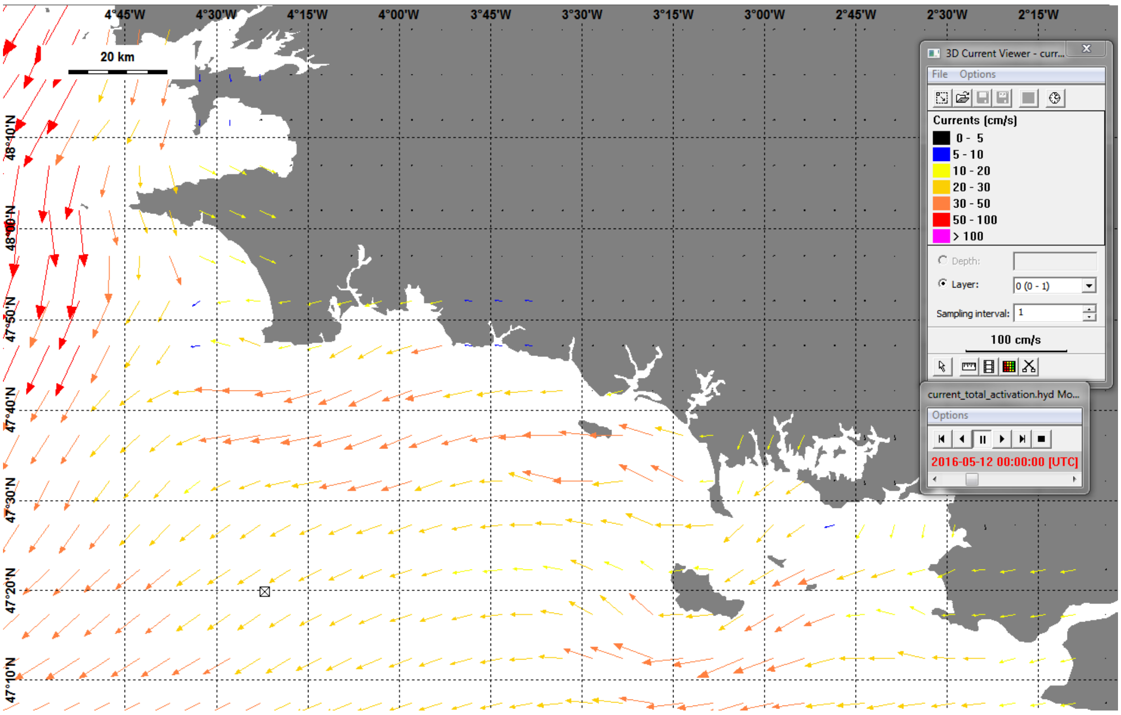

Figure 5: Snapshot of current field (current from Copernicus and tide from AVISO) for May, 12th 2016

3. Oil slick behaviour

A detailed analyze of the oil slick evolution is proposed in this section in order to help oil spill management. Figure 6 summarizes the oil spill behavior at the surface for the next 5 days.

During the first three days, the oil slick mostly remains contained around the release site. From that moment on, the oil slick spreads toward South-West under the influence of land breeze. Indeed, the current regime in the region during the simulation time is mostly driven by the tidal component. As the release occurred during the neap tide period, the current regime doesn't present a dominant tendency that could influence greatly the oil slick behaviour.

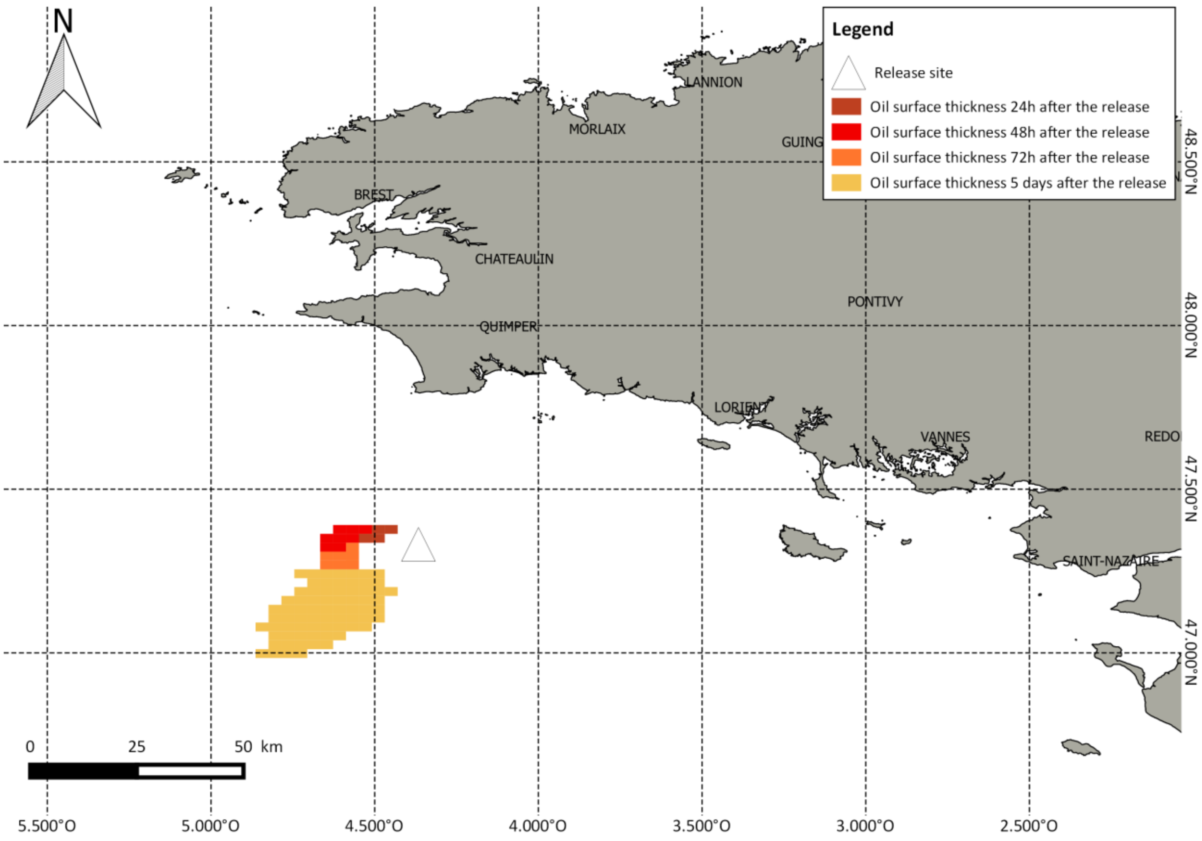

Figure 6: Chronological spreading of the surface oil spill

The detailed forecast is presented below in terms of surface oil thickness and mean concentration in the water column.

As it will be presented, the oil slick mainly remains on the surface, far from the shoreline. As a result, no sediment deposition or concentration along the shoreline can be observed 5 days after the release.

24-hour forecast

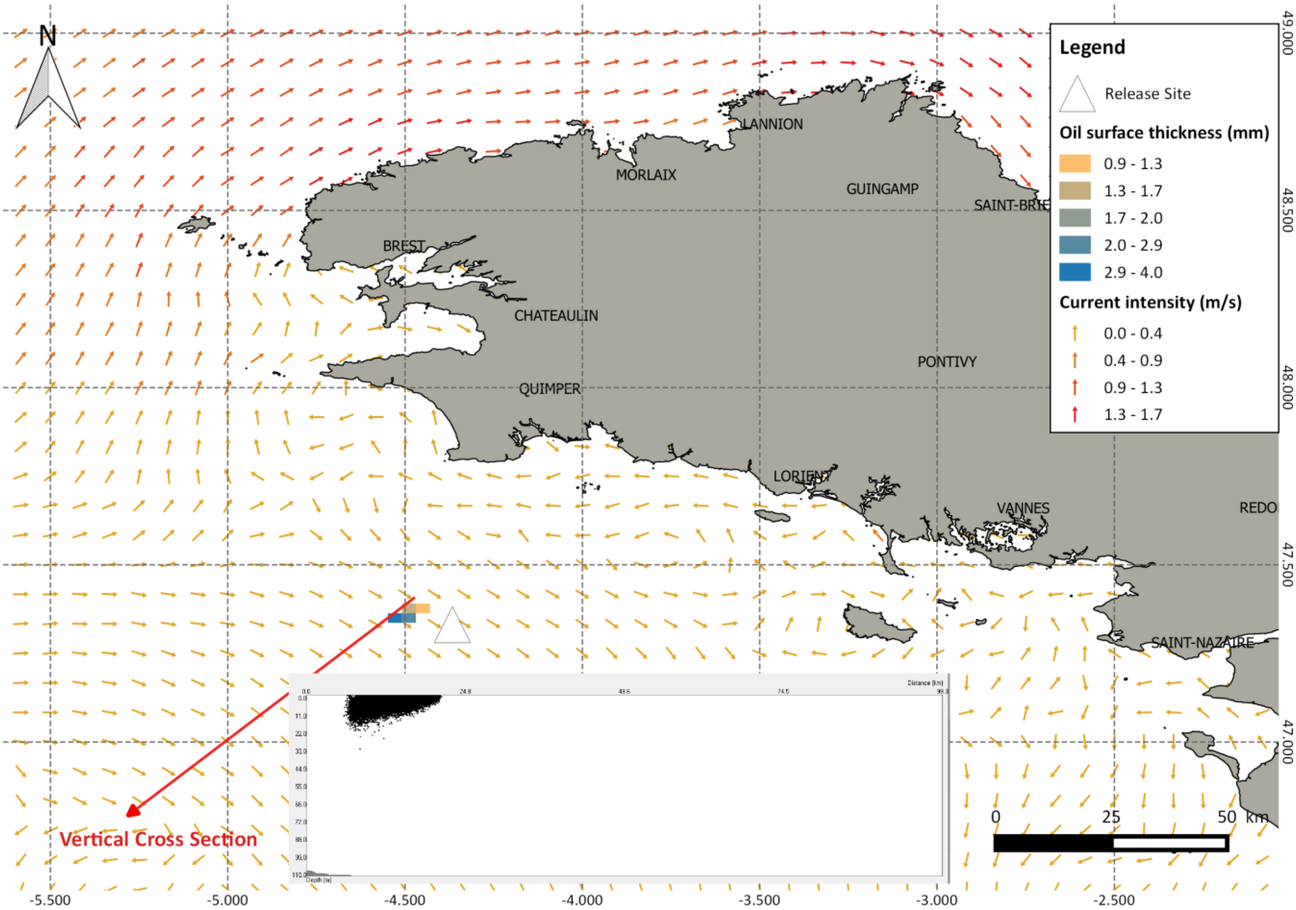

Figure 7: Maximum thickness of oil on the surface 24h after the release

The above figure presents a vertical cross section with the repartition of submerged particles. It may be noticed that it presents the bathymetry (nearly not visible in this section) along the vertical cross section and **all of the submerged particles emitted** (not only along this section).

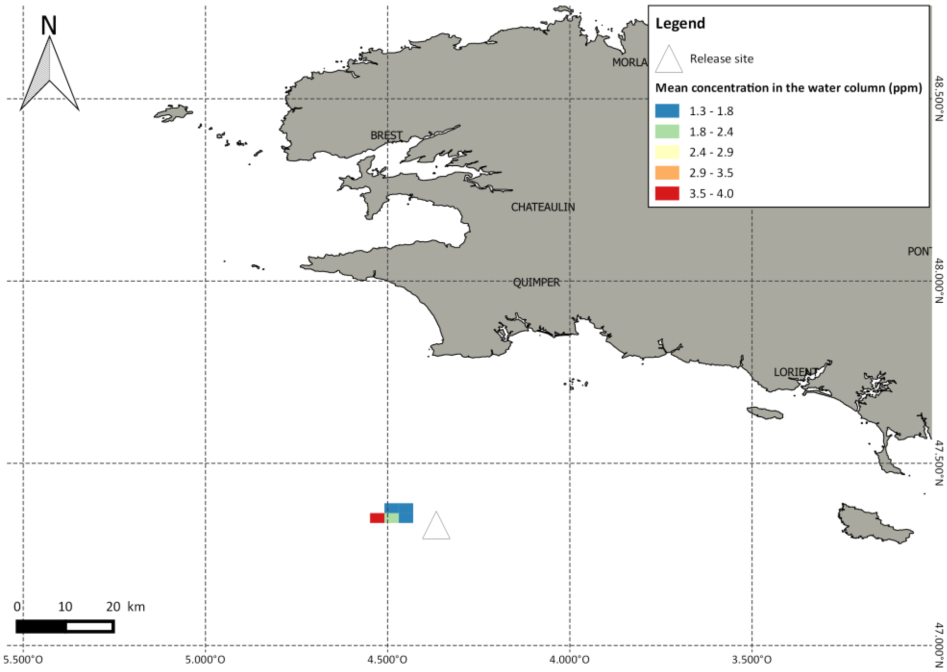

Figure 8: Mean concentration in the water column 24h after the release

48-hour forecast

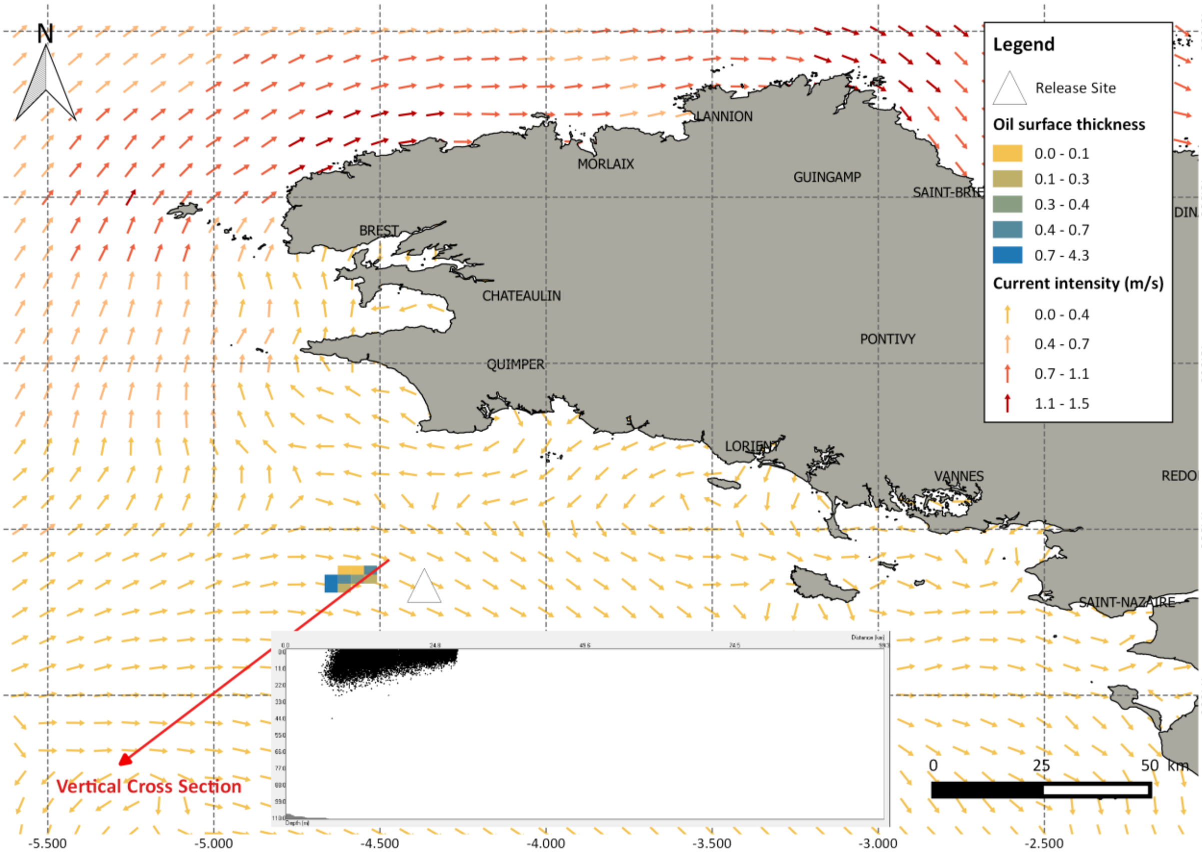

Figure 9: Maximum thickness of oil on the surface 48h after the release

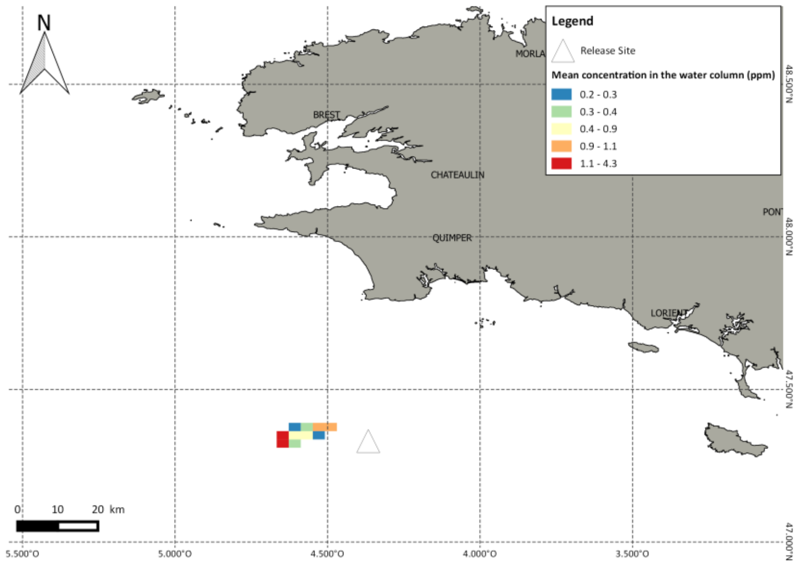

Figure 10: Mean concentration in the water colum 48 h after the release

72-hour forecast

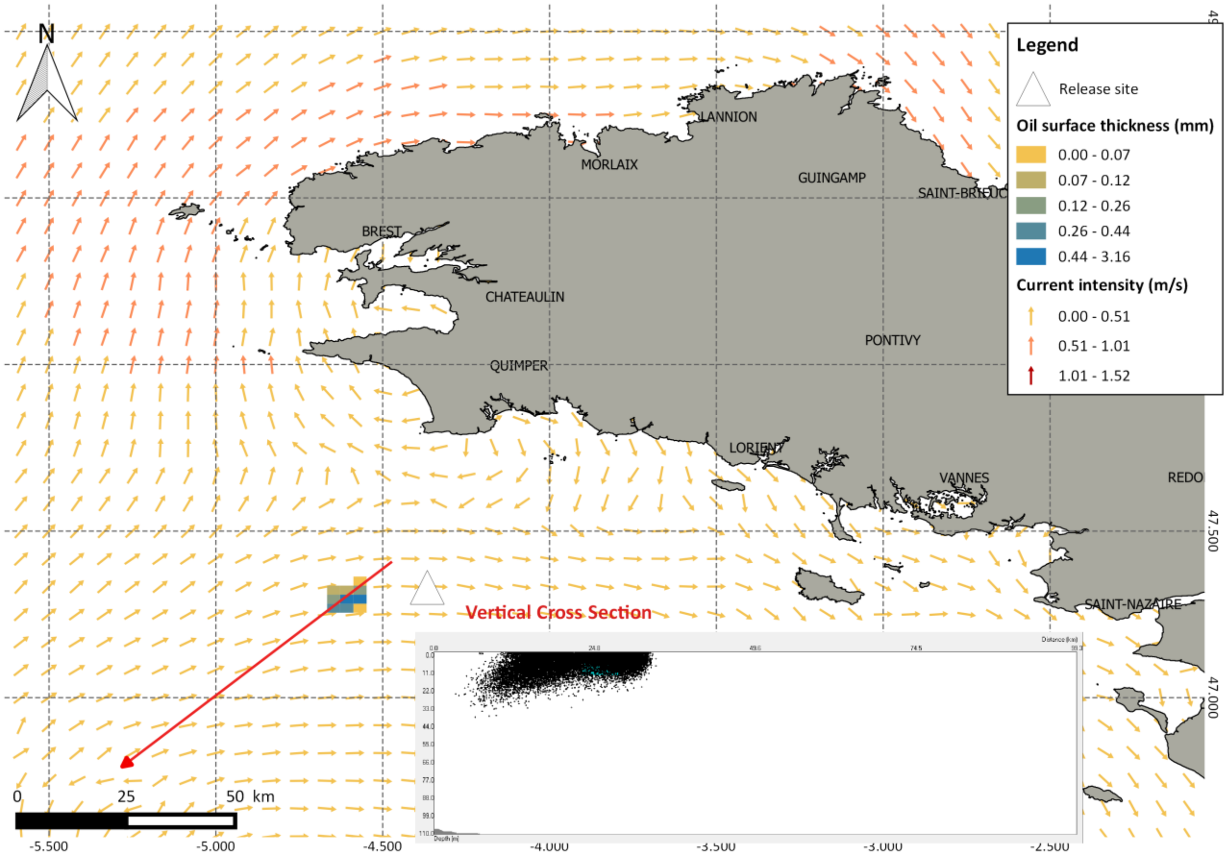

Figure 11: Maximum thickness of oil on the surface 72h after the release

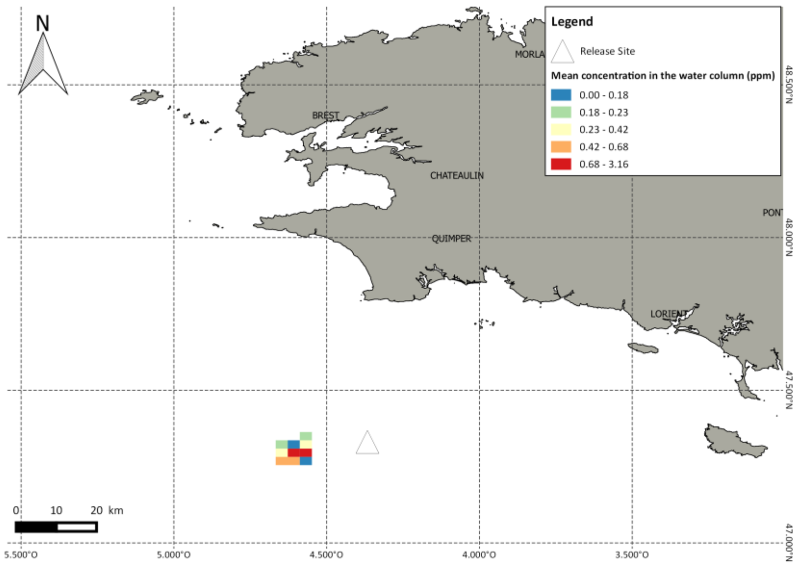

Figure 12: Mean concentration in the water column 72h after the release

5-day forecast

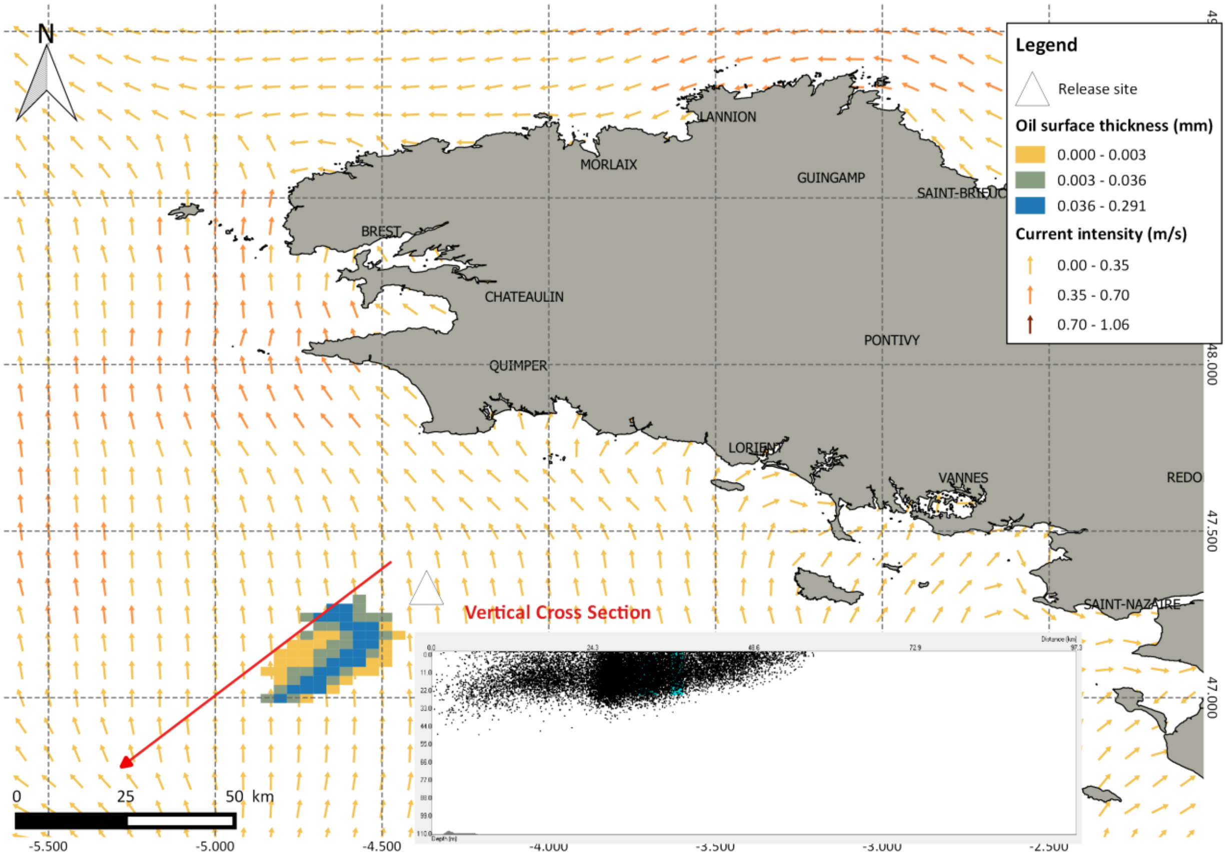

Figure 13: Maximum thickness of oil on the surface 5 days after the release

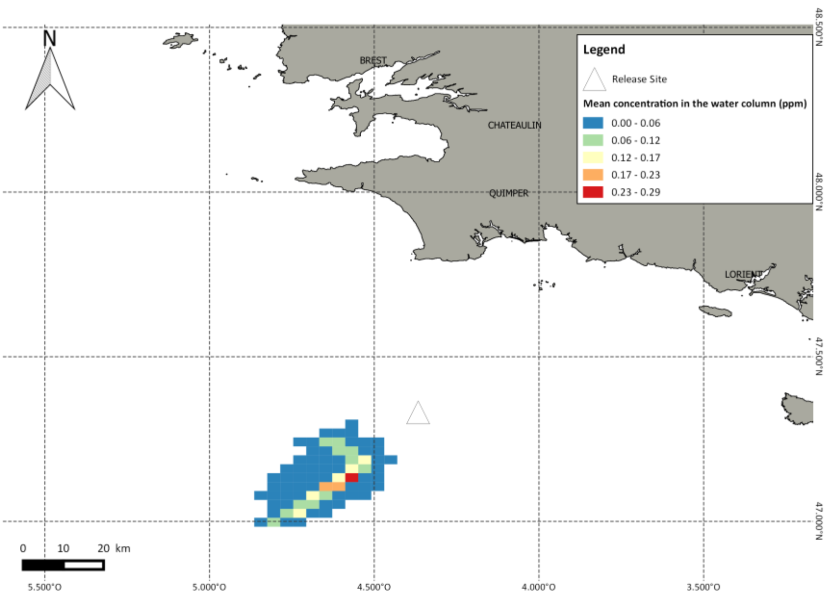

Figure 14: Mean concentration in the water column 5 days after the release

Mass balance for this simulation is presented in percentage in Figure 15. During the first three days, the oil slick mainly remains at the surface, and only a small percentage (< 1%) is evaporated. 80 hours after the beginning of the release, the slick starts to be dispersed and spreads reaching a maximum area of 4500 km² as presented in Figure 16. During the 5 first days of simulation, the oil slick doesn't reach the sea floor and no impact will be noted on the sea bed substrate.

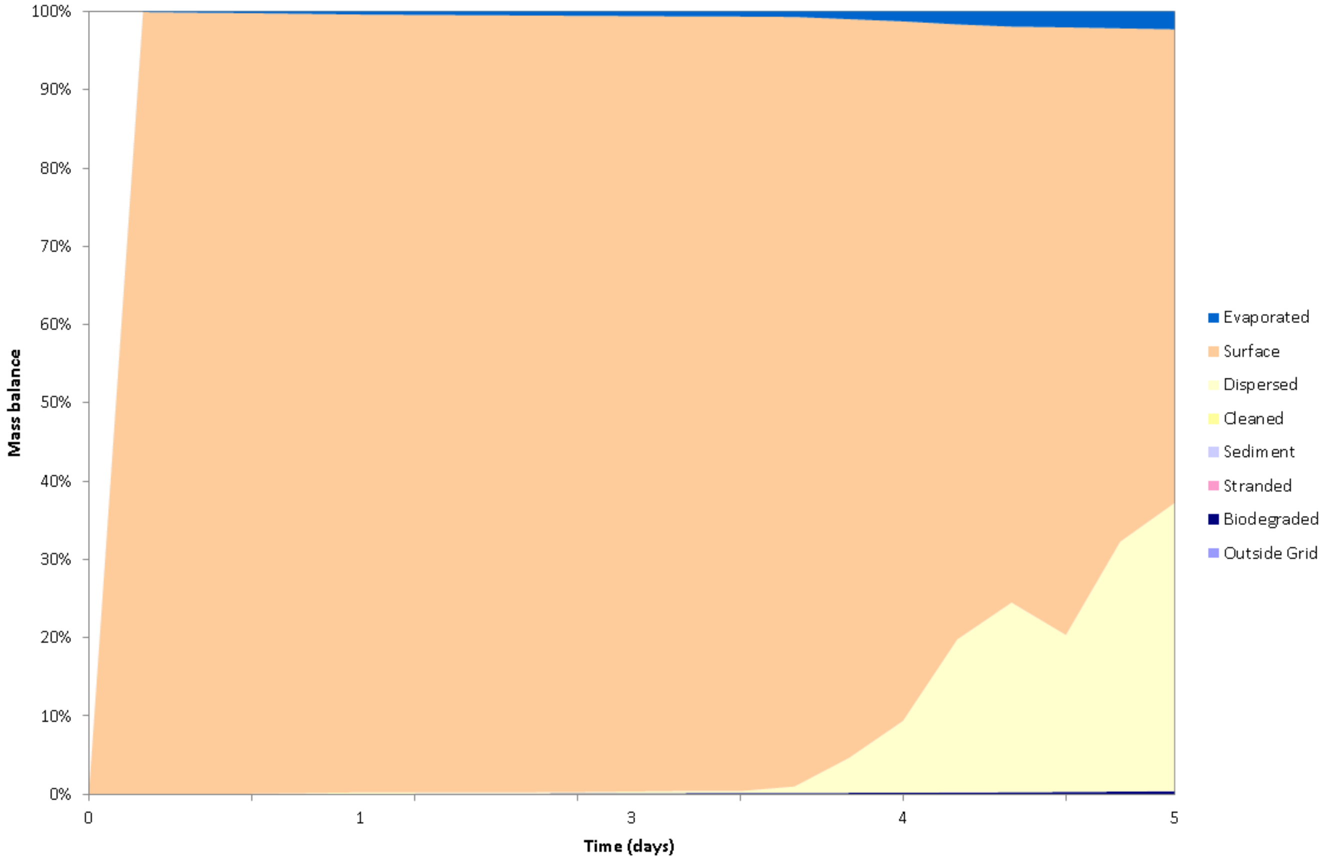

Figure 15: Mass balance in percentage for the simulation

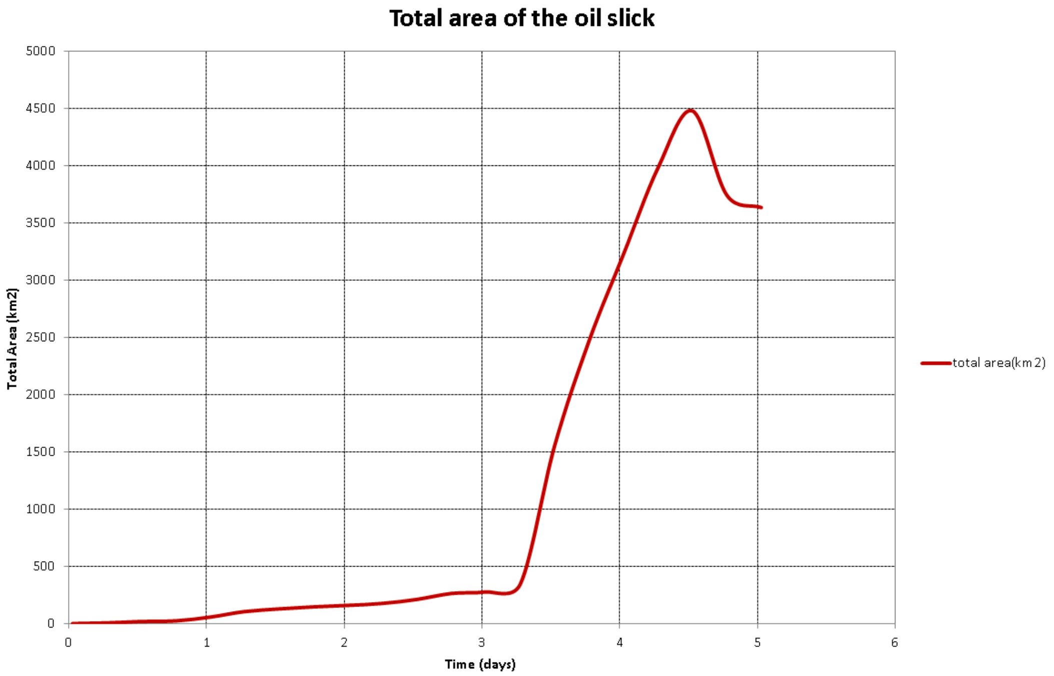

Figure 16: Evolution of the exposed area

4. Dataset used

Data Index	Dataset	Data provider	Data originator
CH4_Input1	Global Ocean 1/12° Ohysics Analysis and Forecast Daily	Copernicus Marine Environment Monitoring Service	Mercator Ocean
CH4_Input47	Global Tide – Fes2012	AVISO	Collecte Localisation Satellite
CH4_Input22	US Coastal Relief Model	National Environmental Satellite, Data, and Information Service	NOAA / National Geophysical Data Center
CH4_Input18	Global Forecast System	NCEP/NOAA	NCEP/NOAA
CH4_Input25	Digital Terrain Model	EMODnet Bathymetry	EMODnet Bathymetry
CH4_Input26	OSPAR Threatened and/or declining habitats	EMODnet Seabed Habitats	Join Nature Conservation Comittee
CH4_Input32	Large Marine Ecosystems of the World	NOAA Fisheries Service	NOAA National Marine Fisheries Service