Ocean Pollution Bulletin

Bulletin on the Wakashio oil spill accident - Mauritius

DISCLAIMER - The information and views set out in this Bulletin are those of the authors (CMCC Foundation and cmcc srl) and do not necessarily reflect the official opinion of the governments of the area. CMCC Foundation and cmcc srl do not guarantee the accuracy of the data included in this study. Neither the CMCC Foundation, cmcc srl nor any person acting on the author's behalf may be held responsible for the use which may be made of the information contained therein.

Date of release: 23/08/2020

Contact point: Giovanni Coppini; email giovanni.coppini@cmcc.it; phone: +39 3923857919

Highlights

MEDSLIK-II model, forced with ECMWF and CMEMS products, was used to reproduce the Wakashio spill event and predict its development in the coming hours (29/08/2020 12:00 UTC).

Spill evolution forecast to the 29th of August 2020

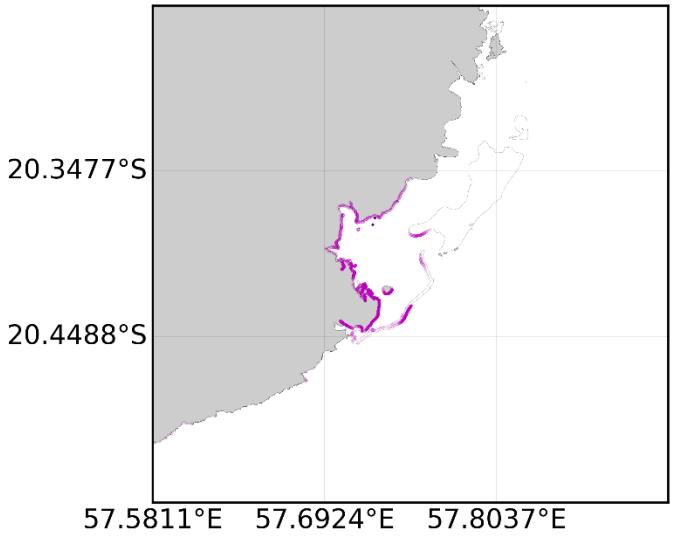
Field information, combined with satellite observations, indicate that the Wakashio spill came to a halt on the 16/08. The following spill evolution forecast assumes that further leakages did not take place at the wreck. The analysis is therefore focused on potential oil detachments from impacted areas and movements within and outside the reef.

In the next 24h (23/08 12:00 to 24/08 12:00), part of the beached oil found in the *Vieux Grand Port* and *Bois des Amourettes* areas could detach and travel south towards *Mahebourg*. After the 24th of August, dominant meteo-oceanographic conditions could potentially transport oil beached at the northern portion of the reef entrance towards southern parts of the embayment.

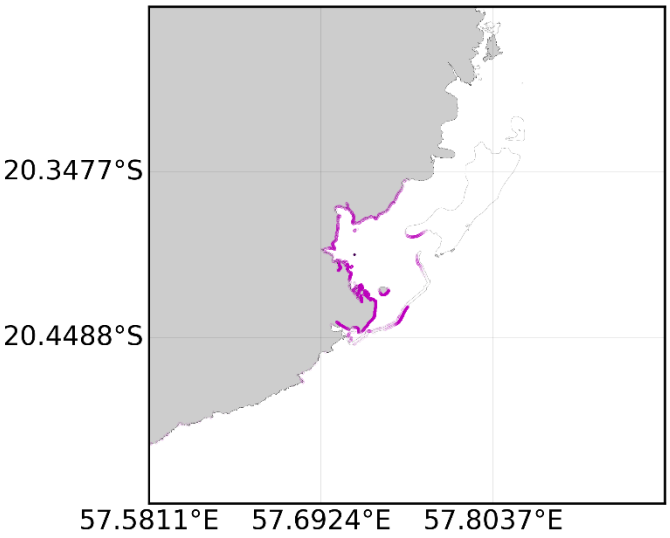
Oil beached at the reef, in the surroundings of the Wakashio wreck, is expected to remain beached for the next 72h (until 26/08 12:00 UTC). Changes in the meteo-oceanographic conditions starting on the 26th are expected to result in significant detachment and transport of beached oil, currently found on the reef, towards SW.

Uncertainties in the present report are expected as deployed booms are not taken into consideration and meteo-oceanographic models might not be capable to fully resolve the coastal dynamics.

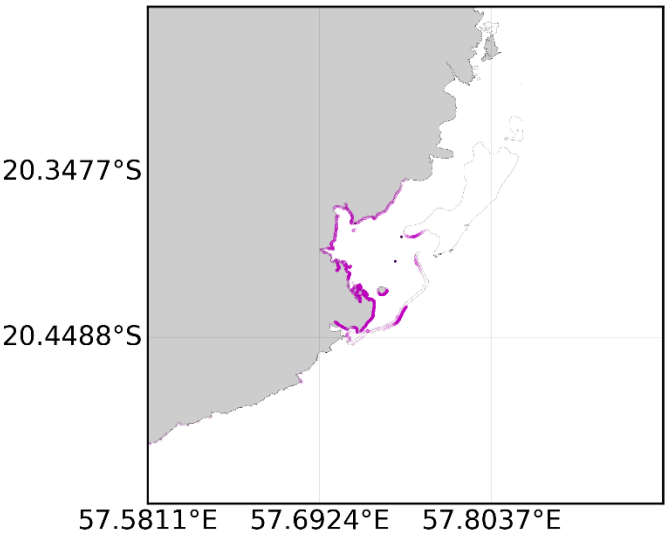
Modelled oil spill evolution between August 23rd and August 29th, 2020



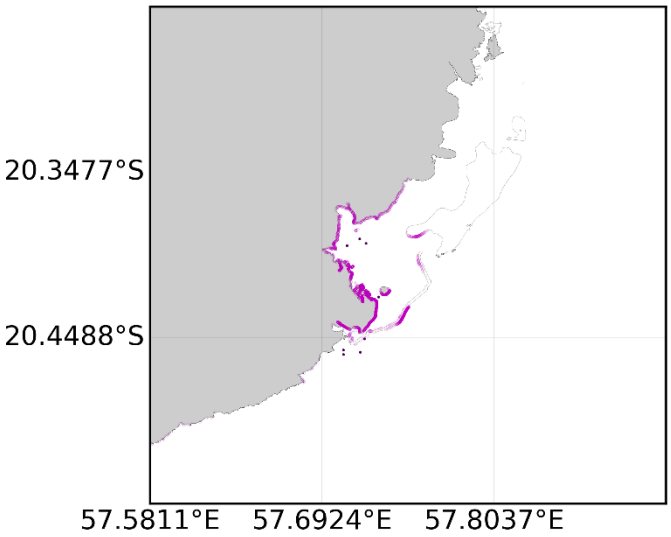
Surface oil concentration (colorscale) and beached oil (in purple) on the 23/08/2020 12:00



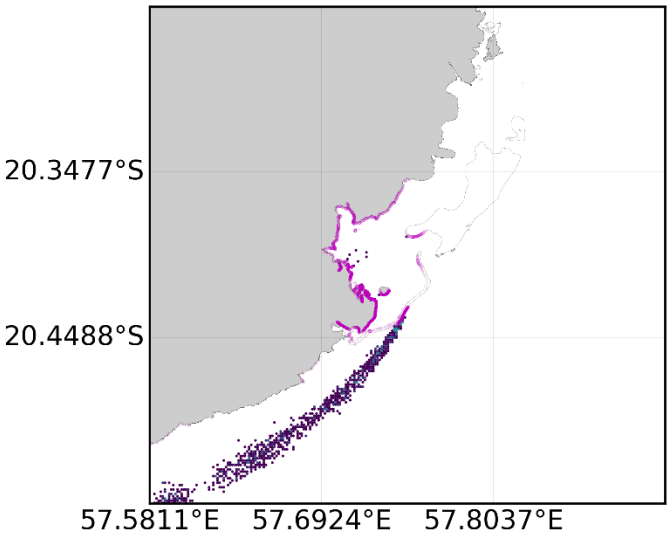
Surface oil concentration (colorscale) and beached oil (in purple) on the 24/08/2020 12:00



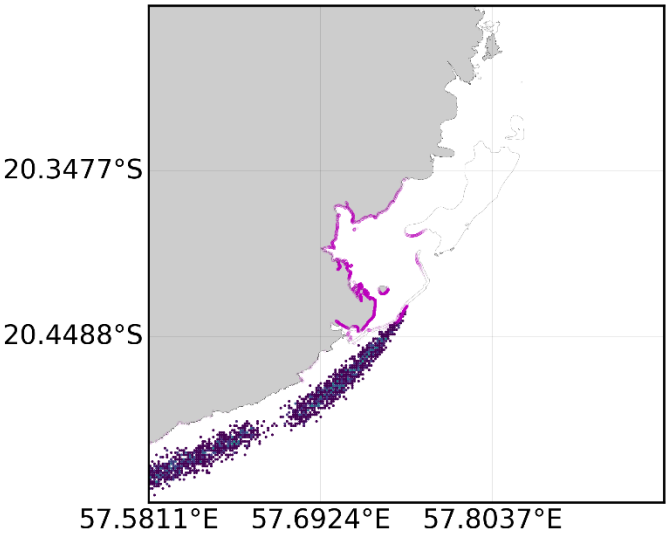
Surface oil concentration (colorscale) and beached oil (in purple) on the 25/08/2020 12:00



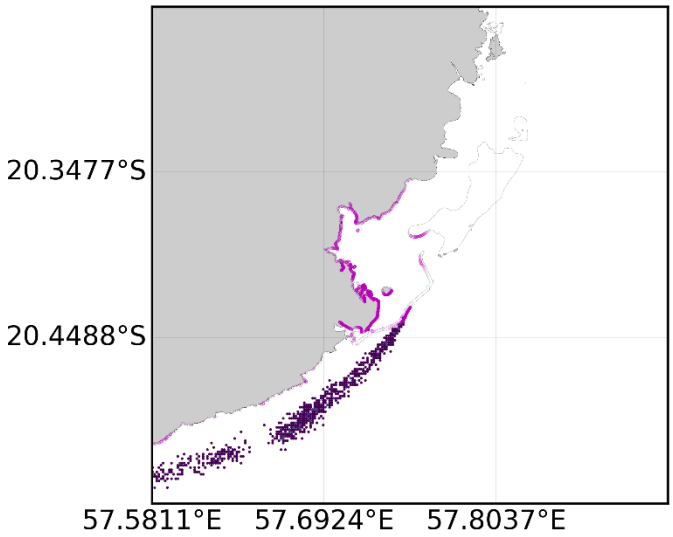
Surface oil concentration (colorscale) and beached oil (in purple) on the 26/08/2020 12:00



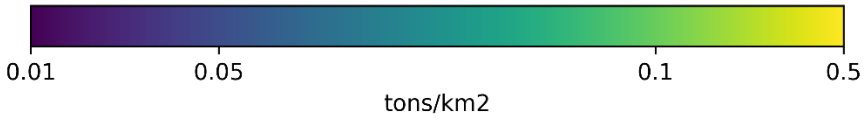
Surface oil concentration (colorscale) and beached oil (in purple) on the 27/08/2020 12:00



Surface oil concentration (colorscale) and beached oil (in purple) on the 28/08/2020 12:00



Surface oil concentration (colorscale) and beached oil (in purple) on the 29/08/2020 12:00



Surface oil concentration color scale (valid for all plots)

Oil spill scenario and forcing

Simulation starting date: 06/08/2020 12:00 UTC
Simulation length: 552 hours,
Duration of the spill:

- continuous (240h) for release points close to the wreck.

Spill rate: 4.2 tons/h
Type of oil: API=16.8 (Fuel oil),
Meteo-oceanographic forcing:

- CMEMS GLOBAL OCEAN 1/12° current fields for areas outside the coral reef
- ECMWF winds at a resolution of 1/10°

Wind correction coefficient: 3.5%
Stokes drift: not computed

Foreword

On the 25/07/2020, the Japanese bulk carrier *Wakashio* ran aground on a reef in Mauritius leaking between 800 and 1,200 tonnes of fuel oil. Remaining oil has been pumped out by salvage experts. Oil leakage was observed on the 06/08/2020 (Figure 1a) and ESA Sentinel 1,2 imagery for the 10/08/2020 (Figure 1b) indicates that the leakage persisted for at least two days.

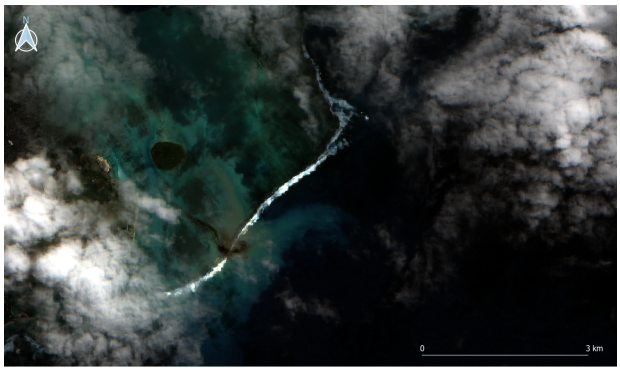


Figure 1a. ESA Sentinel 2 RGB image for the 06/08/2020 06:24 UTC. Image shows Wakashio spill at early stage.

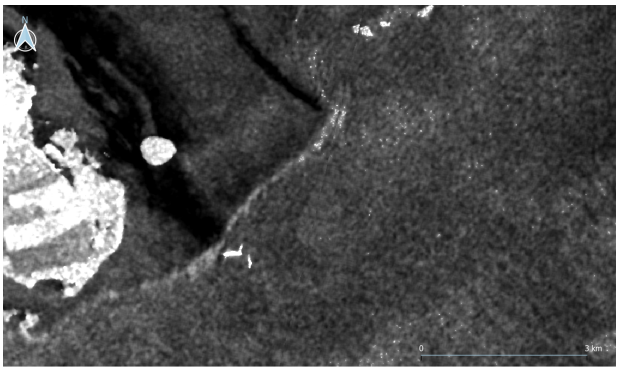


Figure 1b. ESA Sentinel 1 SAR image for the 10/08/2020 01:37 UTC. Image shows the Wakashio spill at an intermediate stage when oil had already reached coastal resources.

The grounding event took place in an area of complex coast morphology and bathymetry (Figure 2). Meteo-oceanographic conditions inside the reef are expected to differ from those found offshore. Extensive satellite monitoring of the spill event indicates that most of the leaked oil ended up in the coastal portion of the coral reef.

The oil spill trajectory and fate were simulated using the MEDSLIK-II oil spill model coupled with Copernicus Marine Service (CMEMS) oceanographic and ECMWF (provided by Aeronautica Militare Italiana) meteorological products. ESA Sentinel-1 SAR imagery for the 10/08/2020 01:37 (Figure 1b) and for 16/08/2020 01:37 were used to evaluate MEDSLIK-II results (i.e. position and shape) (see previous bulletins). Despite salvaging efforts, fuel oil leakage continued for days after the spill detection. The MV Wakashio broke into two on 15 August. The vessel still held around 90 tons of oil on board when it ruptured. An estimated 40 tons were removed on 15 August (MAURITIUS: MV Wakashio Oil Spill Flash Update No. 4 17 August 2020).

Given the complexity of the spill scenario, i.e. shipwreck on the reef, and also given the fact that CMEMS Global current fields do not cover the area inside the reef lagoon it has been chosen to simulate the oil spill within the lagoon only with the wind forcing. Oil spill simulation for areas outside the reef lagoon did rely on CMEMS fields. The amount of oil released in the simulation is fixed at 1000 tons and the released period is from 6th until 16th of August.

The spill evolution was simulated with MEDSLIK-II for the period between 06/08/2020 12:00 and the 29/08/2020 12:00 as a composition of two different sources consisting of two continuous spills (from 6th until 16th of August) originated at the vessel position representing the spill trajectory *inside* and *outside* the reef.

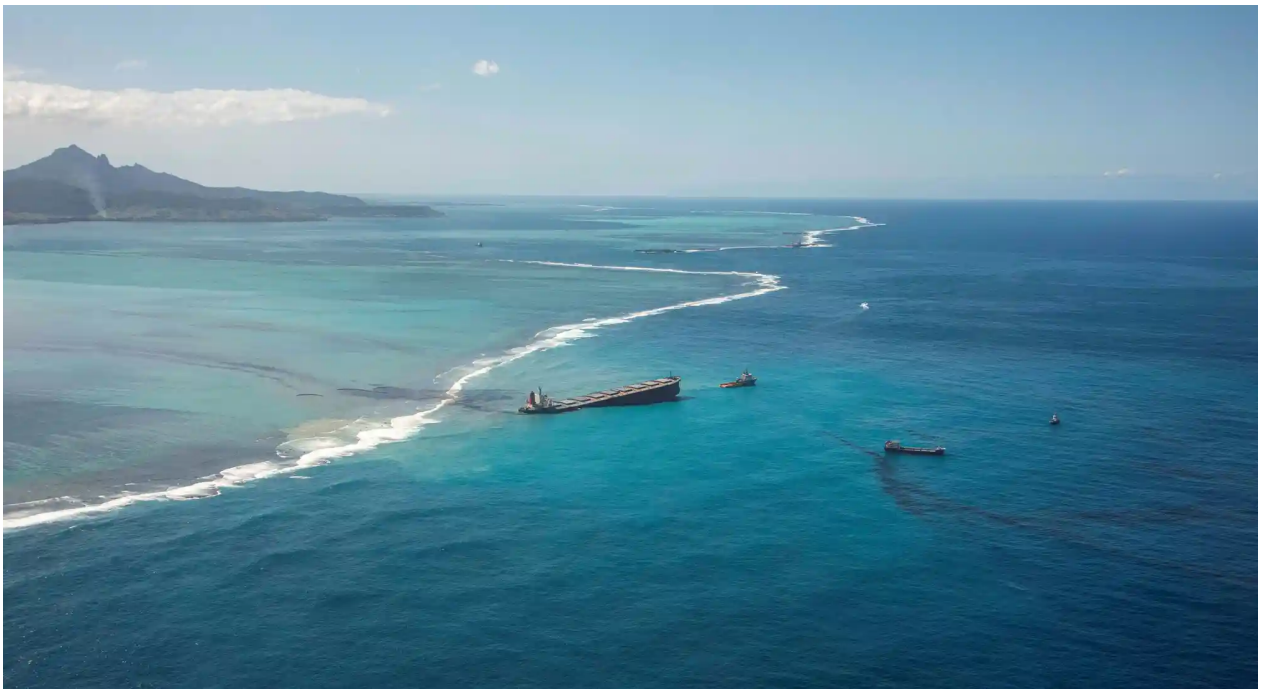
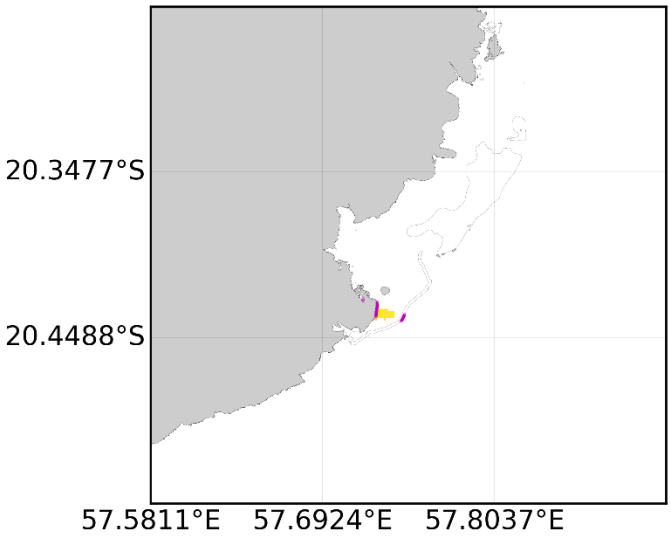
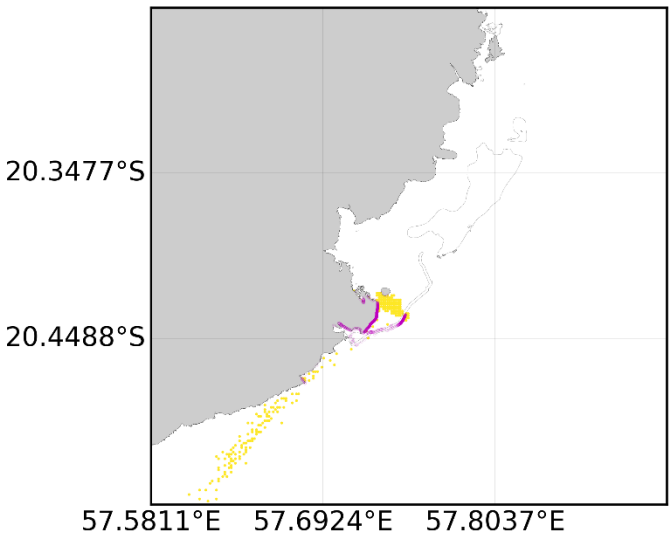


Figure 2. MV Wakashio at Rivière des Créoles in south-east Mauritius. Photograph: French Army command/Reuters

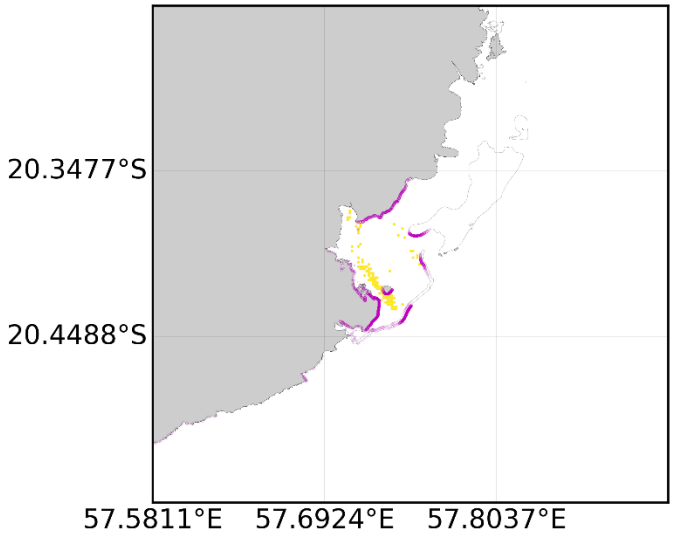
Numerical oil spill modelling supporting the description of the oil spill evolution and impacts (oil spill hindcast from the 6th to the 16th of August 2020)



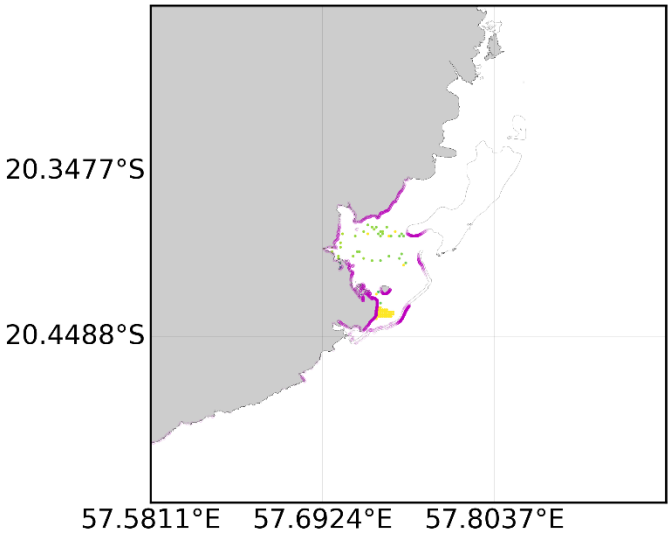
Surface oil concentration (colorscale) and beached oil (in purple) on the 07/08/2020 12:00



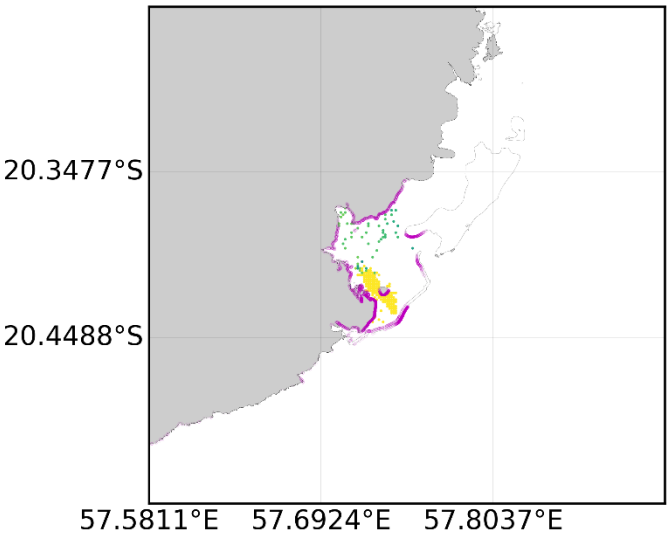
Surface oil concentration (colorscale) and beached oil (in purple) on the 08/08/2020 12:00



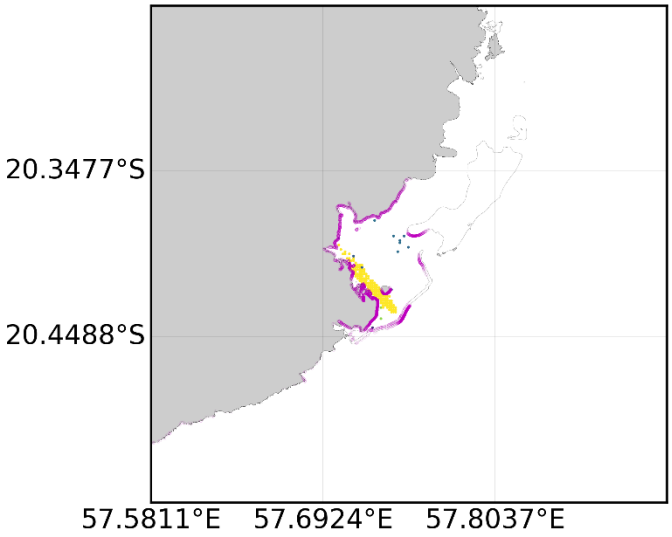
Surface oil concentration (colorscale) and beached oil (in purple) on the 09/08/2020 12:00



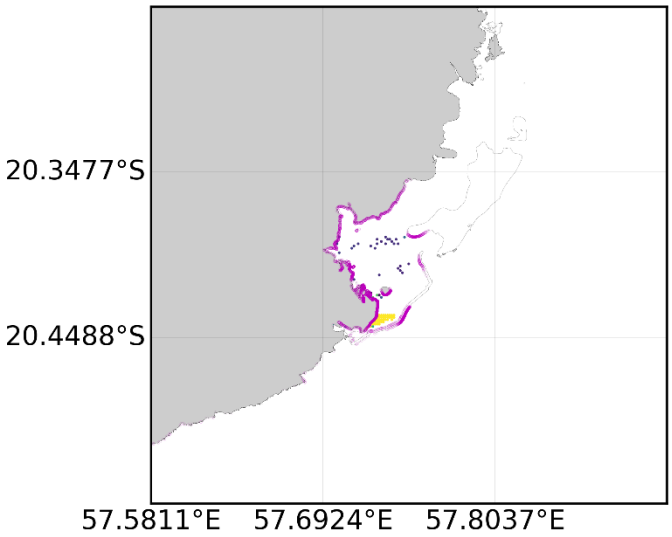
Surface oil concentration (colorscale) and beached oil (in purple) on the 10/08/2020 12:00



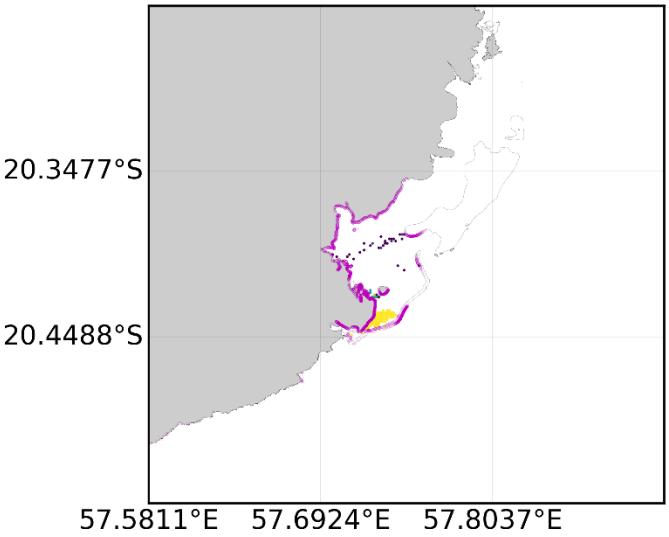
Surface oil concentration (colorscale) and beached oil (in purple) on the 11/08/2020 12:00



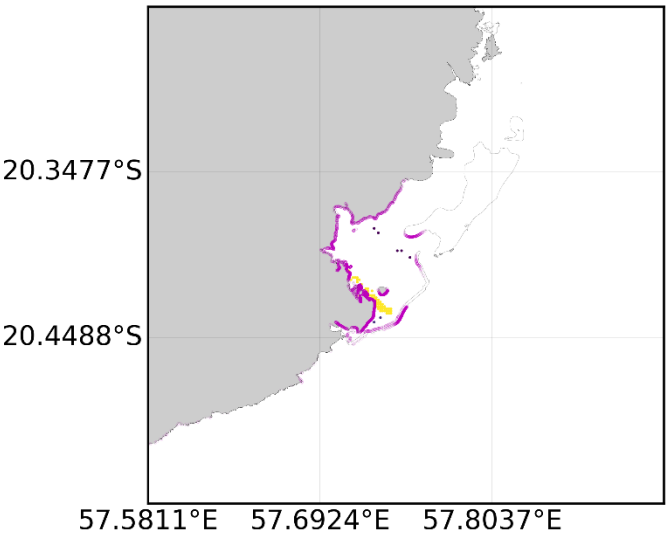
Surface oil concentration (colorscale) and beached oil (in purple) on the 12/08/2020 12:00



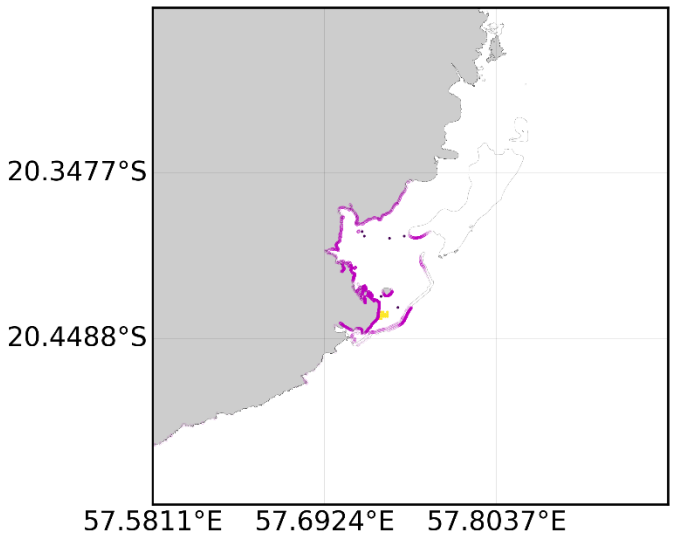
Surface oil concentration (colorscale) and beached oil (in purple) on the 13/08/2020 12:00



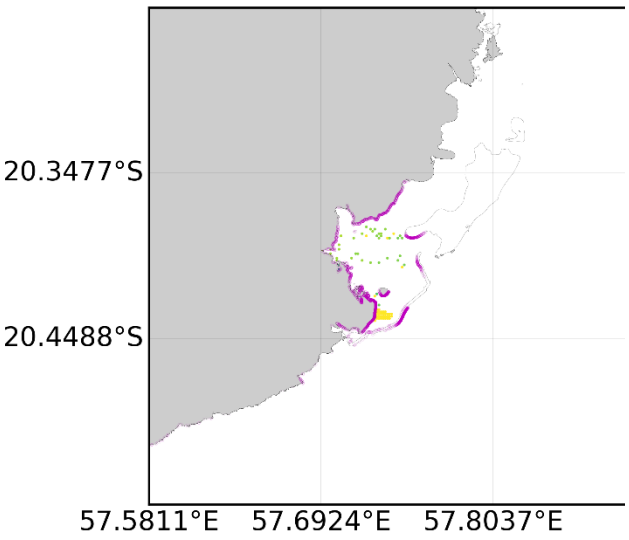
Surface oil concentration (colorscale) and beached oil (in purple) on the 14/08/2020 12:00



Surface oil concentration (colorscale) and beached oil (in purple) on the 15/08/2020 12:00

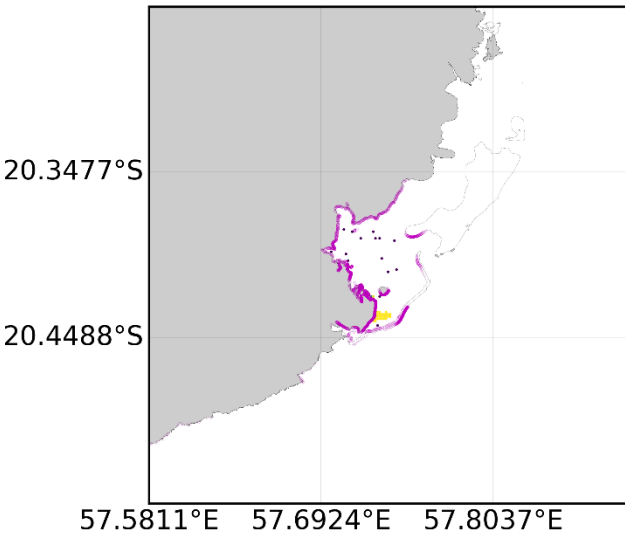


Surface oil concentration (colorscale) and beached oil (in purple) on the 16/08/2020 12:00

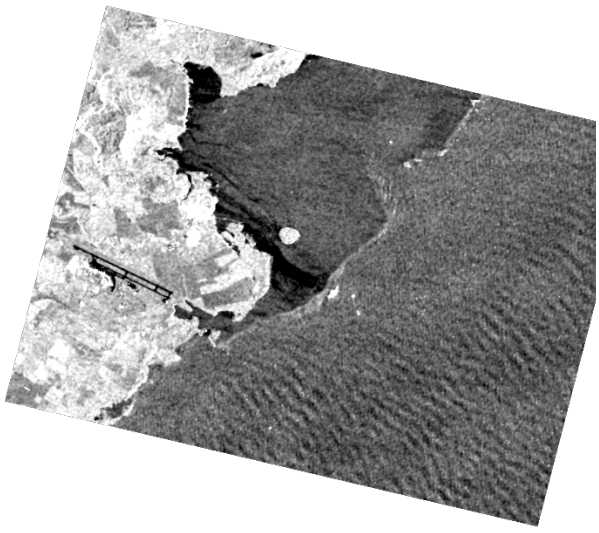


MEDSLIK-II surface oil concentration
10/08/2020 00:00 UTC

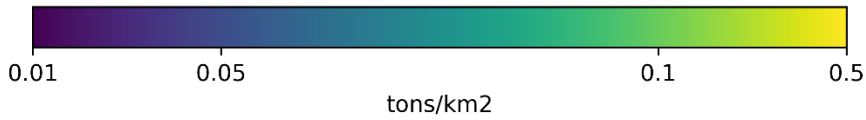
Sentinel-1 SAR
10/08/2020 01:37 UTC
MEDSLIK-II oil spill initial conditions



MEDSLIK-II surface oil concentration
16/08/2020 00:00 UTC



Sentinel-1 SAR
16/08/2020 01:37 UTC



Surface oil concentration color scale (valid for all plots)

For the first two days (06/08 to 08/08), the oil spill moved westwards inside the reef, impacting the Pointe D'Esny and Blue Bay areas. In the following 24h (08/08 to 09/08), the spill changed in direction towards N-NW impacting the reef at the northern and southern sides of the reef entrance, and *Vieux Grand Port* and *Bois des Amourettes* areas. Beached oil in the surroundings of *Mahebourg* were also observed. Outside the reef, SW oriented currents transported the oil offshore in the same direction.

Between the 09/08 and 10/08, oil leaked from the Wakashio wreck started moving westwards, impacting the *Pointe D'Esny* area. Beached oil, previously found in the *Vieux Grand Port* and *Bois des Amourettes* areas, detached from the coastline and travelled S-SW impacting inner areas of the embayment, i.e. *Riviere des Creoles* and *Petit Bel Air*. From the 9th to the 16th, the meteo-oceanographic conditions did not favor oil transport outside the reef.

Sentinel-1 SAR imagery for 10/08/2020 01:37 UTC shows a NW oriented spill, with potentially impacted areas in the inner and northern parts of the embayment. MEDSLIK-II outputs for the 09/08/2020 12:00 UTC show a similar pattern. Outputs for the 10/08/2020 00:00 UTC no longer matched satellite observations.

Changes in the meteo-oceanographic conditions inside the reef between the 10/08 and 12/08 moved the oil NW, further impacting inner parts of the embayment (i.e. *Vieux Grand Port, Riviere des Creolles* and *Bois des Amourettes* areas) and the *Mahebourg* area.

Between the 12 and 14/08, oil leaked from the Wakashio wreck moved westwards impacting the *Pointe D'Esny* and *Blue Bay* areas. Parts of the beached oil found inside the embayment detached from the coastline, moving SW potentially reaching the southern parts of the embayment (e.g. *Mahebourg* and *Petit Bel Air*).

On the 14/08 the spill direction went through another change in direction returning to the NW pattern travelling to inner parts of the embayment and impacting its southern coastline. NW conditions lasted till the 15th, when finally changed to westward transport of the oil until the 16th when the Wakashio spill came to halt.

Sentinel-2 SAR imagery for 16/08/2020 01:37 UTC shows a NW oriented spill, located very close to the southern part of the embayment. MEDSLIK-II outputs for the 15/08/2020 12:00 UTC show a similar pattern. Outputs for the 16/08/2020 00:00 UTC no longer matched satellite observations showing a west oriented flow.