Ocean Pollution Bulletin

Bulletin on the Wakashio oil spill accident - Mauritius

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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.

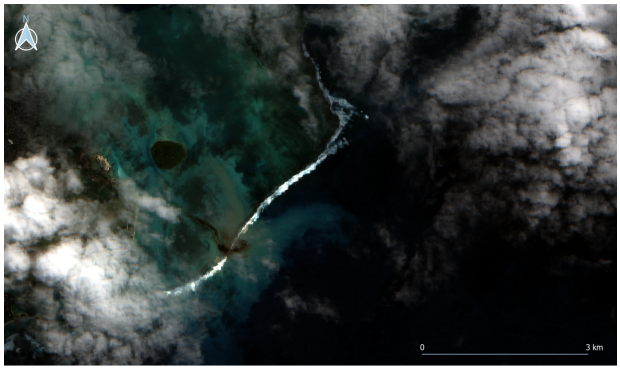


Figure 1a. ESA Sentinel 2 RGB image for the 06/08/2020 06:24 UTC. Image shows Wakashio spill at early stage.

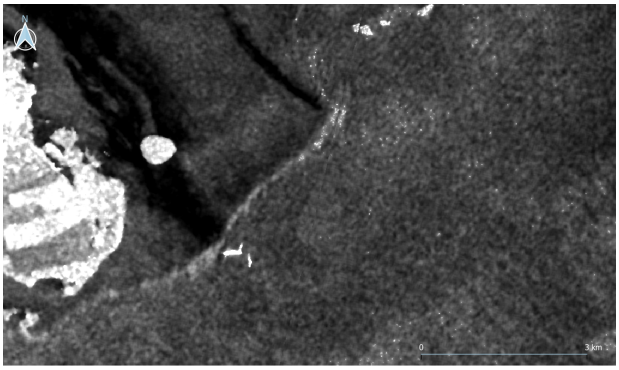


Figure 1b. ESA Sentinel 1 SAR image for the 10/08/2020 01:37 UTC. Image shows the Wakashio spill at an intermediate stage when oil had already reached coastal resources.

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 meteorological products. ESA Sentinel-1 SAR imagery for the 10/08/2020 01:37 (Figure 1b) was used to define MEDSLIK-II initial spill conditions (i.e. position and shape). Despite salvaging efforts, fuel oil leakage continued for days after the spill detection. Up-to-date press information indicates that 30m^3 of oil are still in the ship.

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 spill evolution was simulated with MEDSLIK-II for the period between 10/08/2020 02:00 and the 21/08/2020 23:00 as a composition of three different sources:

- satellite-detected oil spill (10/08/2020 01:37 UTC)
- two continuous spills originated at the vessel position representing the spill trajectory *inside* and *outside* the reef.

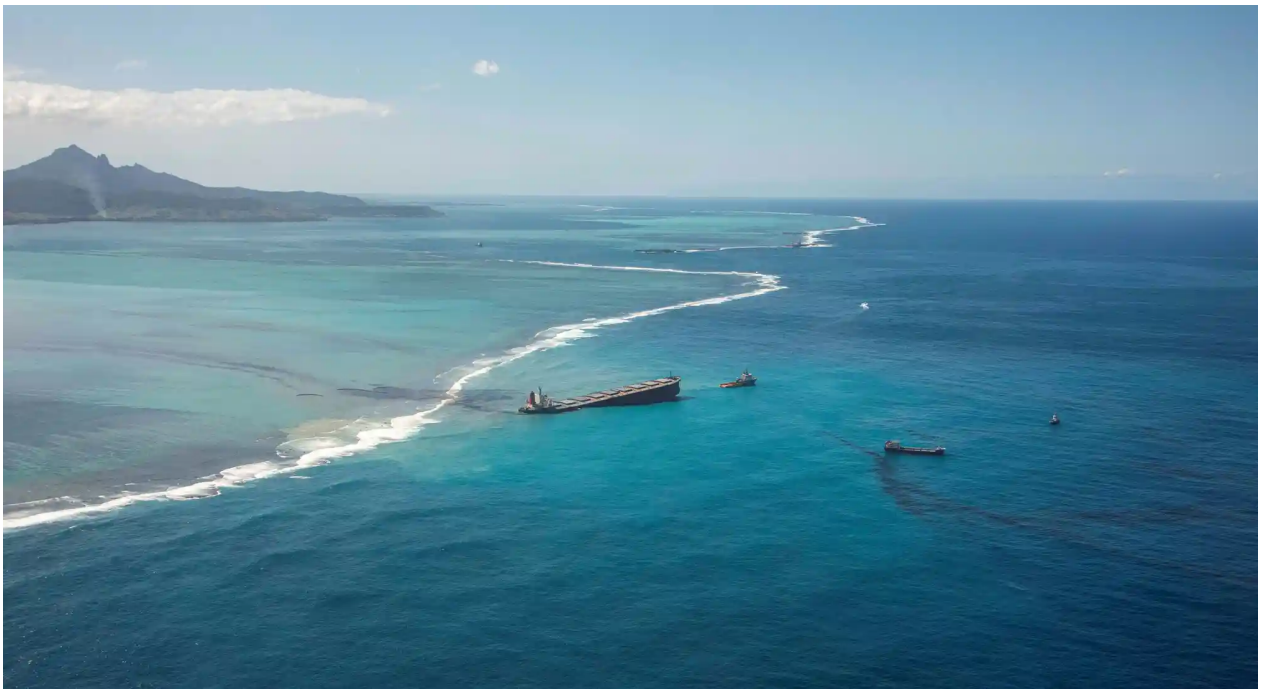


Figure 2. MV Wakashio at Rivière des Créoles in south-east Mauritius. Photograph: French Army command/Reuters

Oil spill scenario and forcing

Simulation starting date: 10/08/2020 02:00 UTC
Simulation length: 285 hours,
Duration of the spill:

- instantaneous for satellite-detected source
- continuous (285h) for release points close to the wreck.

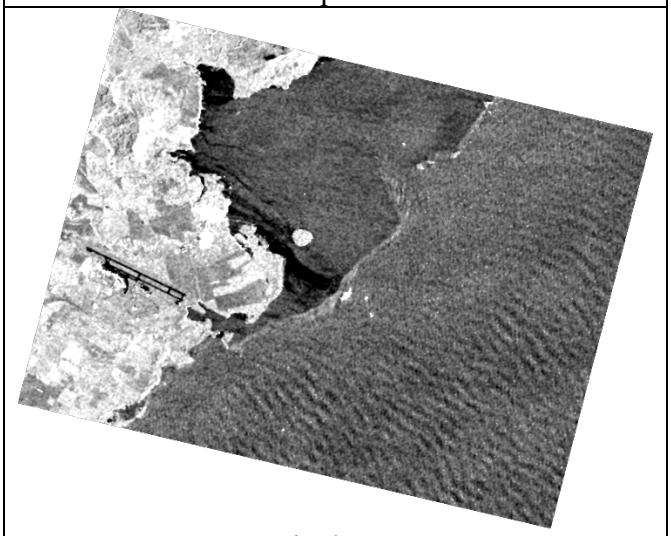
Type of oil: API=16.8 (Fuel oil),
Meteo-oceanographic forcings:

- 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

Reference satellite imagery

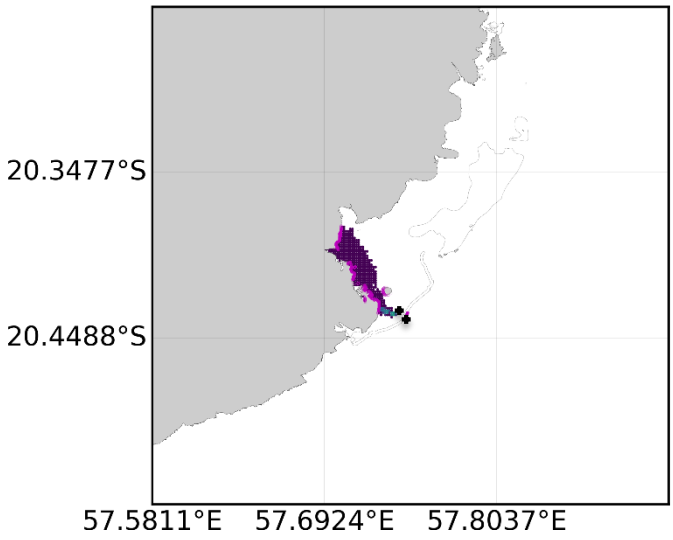
Sentinel-1 SAR
10/08/2020 01:37 UTC
MEDSLIK-II oil spill initial conditions



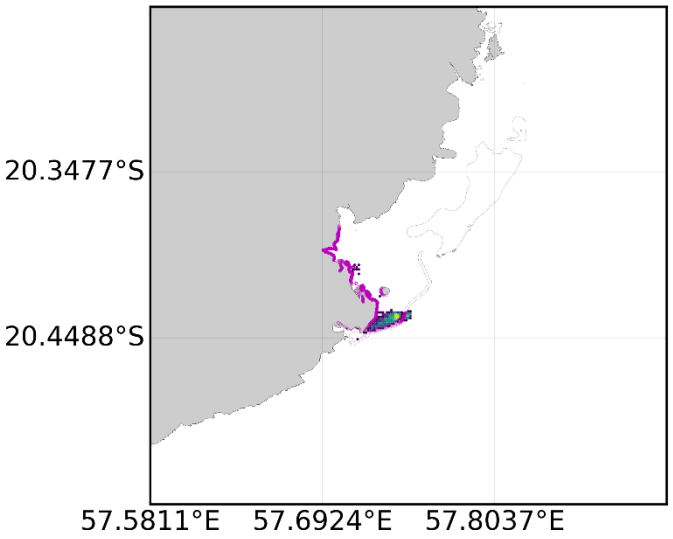
Sentinel-1 SAR
16/08/2020 01:37 UTC

Figure 3 Sentinel-1 SAR imagery employed in the analysis

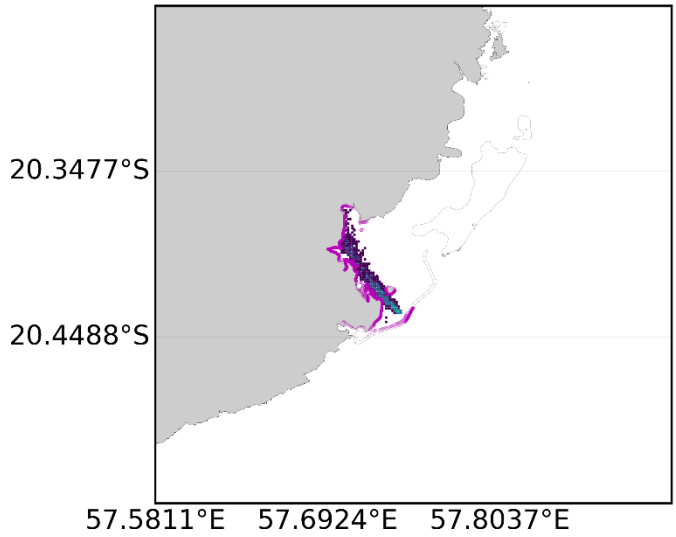
Modelled oil spill evolution between August 10th and August 21st, 2020



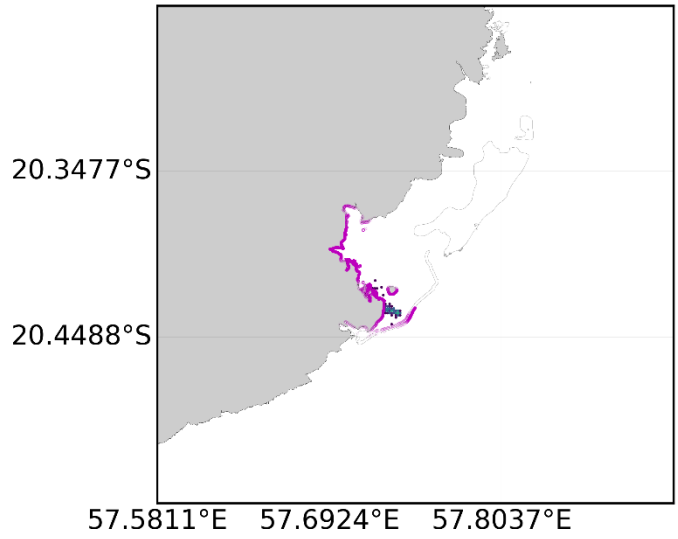
Oil spill initial condition (10/08/2020 03:00). Black crosses mark spill origins.



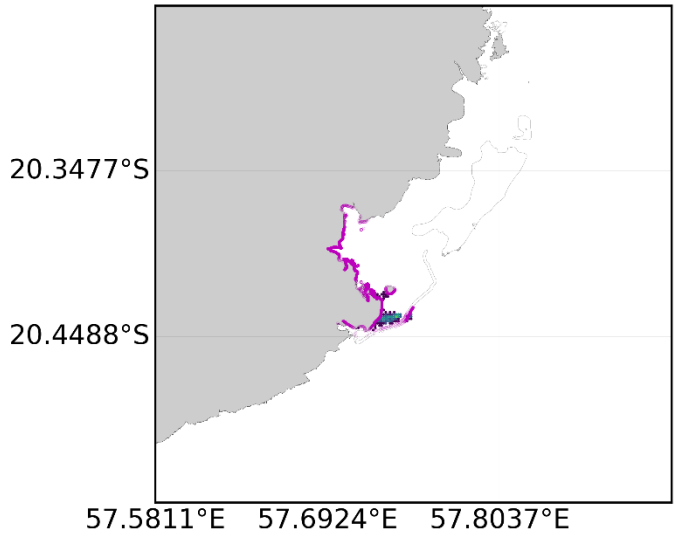
Surface oil concentration (colorscale) and beached oil (in purple) on the 11/08/2020 03:00



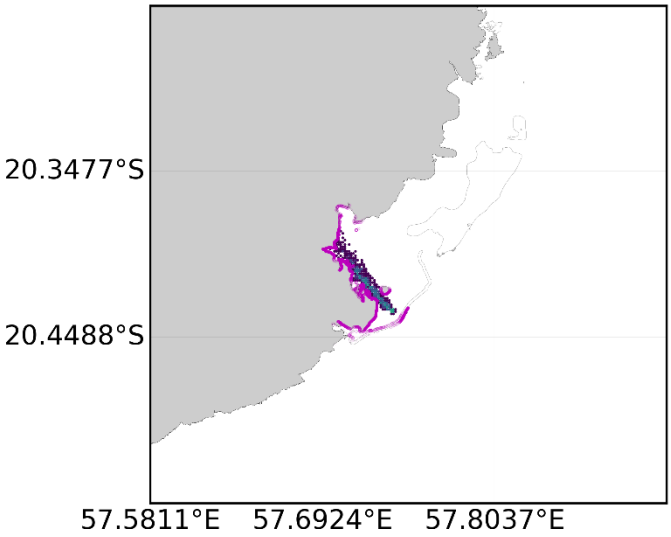
Surface oil concentration (colorscale) and beached oil (in purple) on the 12/08/2020 03:00



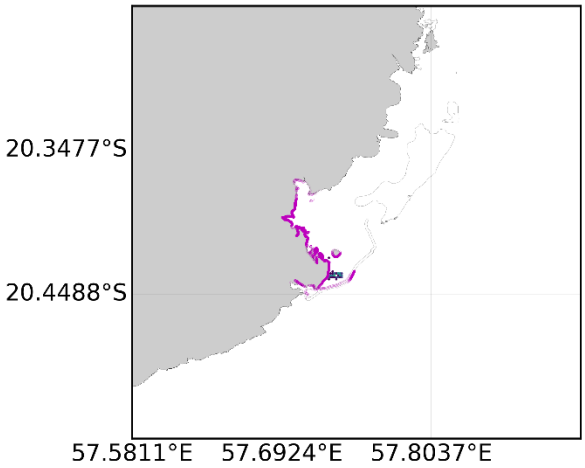
Surface oil concentration (colorscale) and beached oil (in purple) on the 13/08/2020 03:00



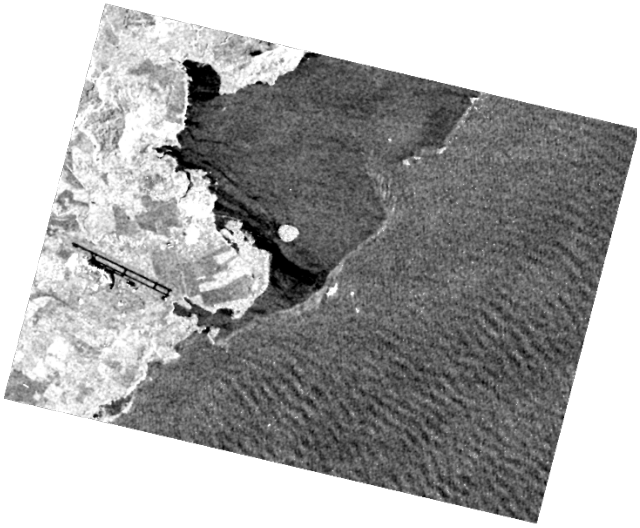
Surface oil concentration (colorscale) and beached oil (in purple) on the 14/08/2020 03:00



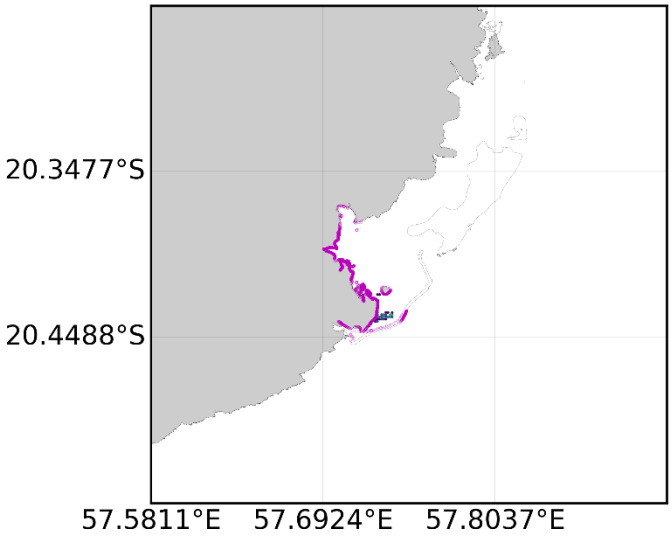
Surface oil concentration (colorscale) and beached oil (in purple) on the 15/08/2020 03:00



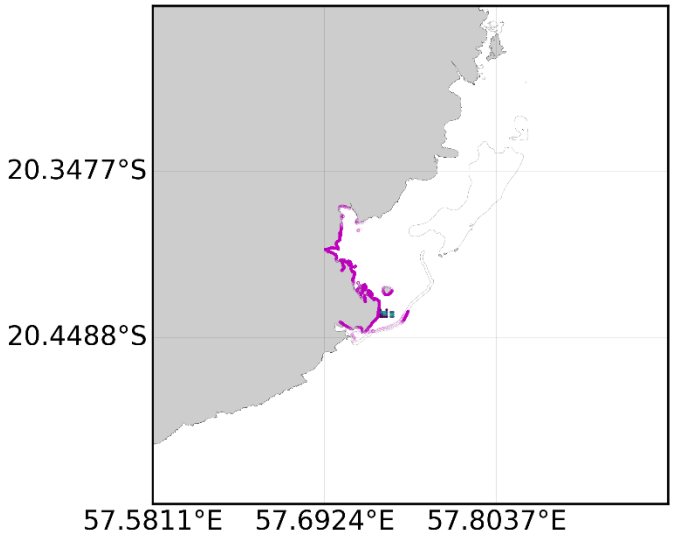
Surface oil concentration (colorscale) and beached oil (in purple) on the 16/08/2020 02:00



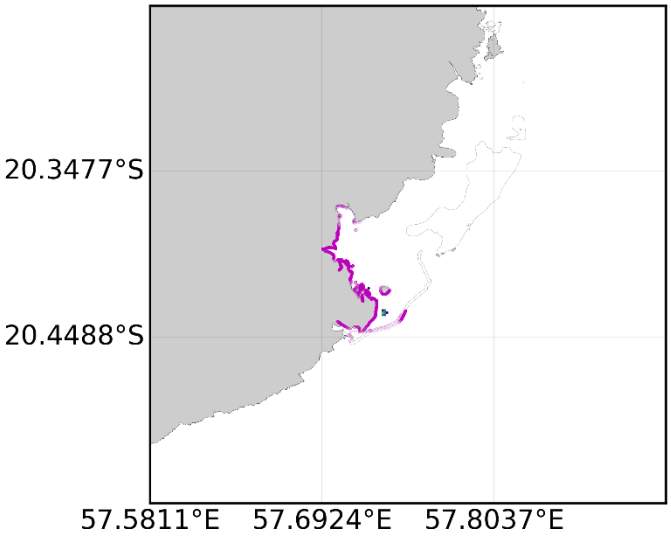
ESA Sentinel 1 SAR image for the 16/08/2020 01:37 UTC.



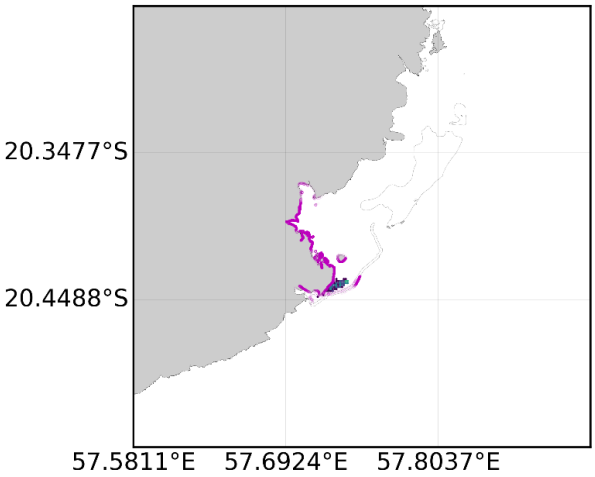
Surface oil concentration (colorscale) and beached oil (in purple) on the 17/08/2020 03:00



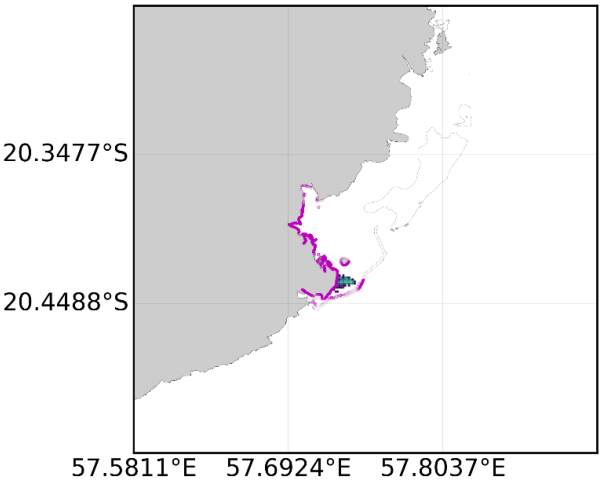
Surface oil concentration (colorscale) and beached oil (in purple) on the 18/08/2020 03:00



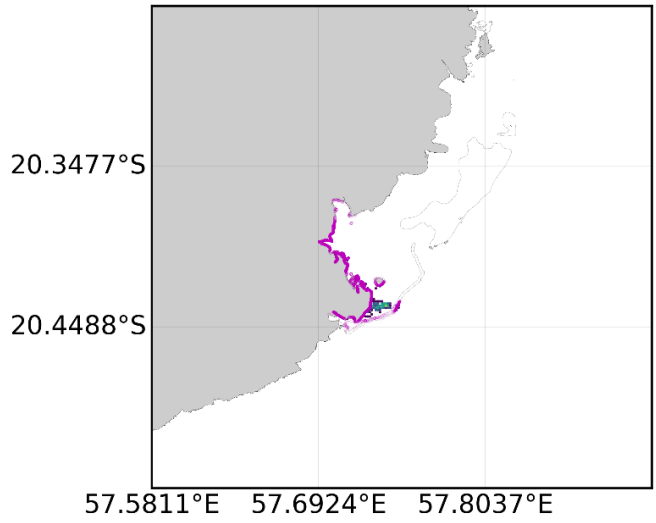
Surface oil concentration (colorscale) and beached oil (in purple) on the 19/08/2020 03:00



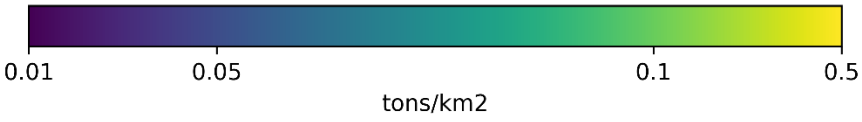
Surface oil concentration (colorscale) and beached oil (in purple) on the 20/08/2020 03:00



Surface oil concentration (colorscale) and beached oil (in purple) on the 21/08/2020 03:00



Surface oil concentration (colorscale) and beached oil (in purple) on the 21/08/2020 23:00



Surface oil concentration color scale (valid for all plots)

Conclusion

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 (21/08/2020 23:00 UTC).

Spill evolution between the 10th and 16th of August 2020
The simulation reproducing past spill development between the 10th and the 16th of August indicates, through comparisons with satellite imagery, that MEDSLIK-II simulations are reasonable. Most of the spill remained close to coastal areas and inside the reef. Uncertainties in oil detection and oil spill modelling are significant and field data is necessary to confirm the bulletin results.

Spill evolution forecast to the 21st of August 2020
MEDSLIK-II forecast indicates that the spill behavior is likely to remain as previously simulated. The spill, on the 21st, will remain close to the southern coastline of the embayment and in the Blue Bay. Uncertainties in the forecast concern the current fields inside the embayment and the spill rate from the Wakashio shipwreck.