In black: Referees comments and questions

In blue: authors responses

Referee #2:

The authors presented a study to detect oil slicks in Gulf of Guinea and analyze their distribution using synthetic aperture radar (SAR) data provided by Envisat mission. It identified 18,063 oil slicks in 3,644 SAR images, covering 17 exclusive economic zonesf the Gulf of Guinea. The authors have put a good effort into mapping oil slicks and creation of a large database of SAR imagery. However, the referee has some specific concerns about this data, which need to be addressed before considering the manuscript for publication.

RC2-1 : In line 140, the authors stated that the oil slicks categorization has been done based on morphological and textural criteria. The referee is wondering whether it is enough to consider only morphology and texture to divide the detected/located oil slicks into natural and anthropogenic? There should be some examples that can highlight the limitation of the used categorization criteria and detection approach.

The authors proceeded by 3 steps:

- categorization of the detected oil slicks performed according to an interpretation based on morphological and textural criteria
- multi-date analysis to assess repetitive slicks
- validation using auxiliary data (oil platforms locations, oil and gas fields, bathymetry, marine traffic, geological, etc)

These clarifications have been added to the article.

The authors improved the article by adding some examples of interpreted oil slicks.

RC2-2 : In line 156-157, the authors stated that they have used some auxiliary data for validation of their analysis. Details about the auxiliary information used alongside manual detection approach should be clearly stated.

Auxiliary data include oil platforms locations, oil and gas fields, available bathymetric, geological and structural data, marine traffic, wind and current field direction, etc.

These clarifications have been added to the article.

RC2-3 : In line 176, 'for each class X of oil slick among (s) seepage' should be replaced with 'for each class X of oil slick among (e) seepage'.

Thank you for the corrections. They have been integrated.

RC2-4 : In line 211, 'spill form ships' should be replaced with 'spill from ships'.

Thank you for the corrections. They have been integrated.

RC2-5 : In fig 7-9, please add a unit near to the color bar and its numerical values.

Similarly to the map of occurrences shown in fig. 3, there is no unit for density maps.

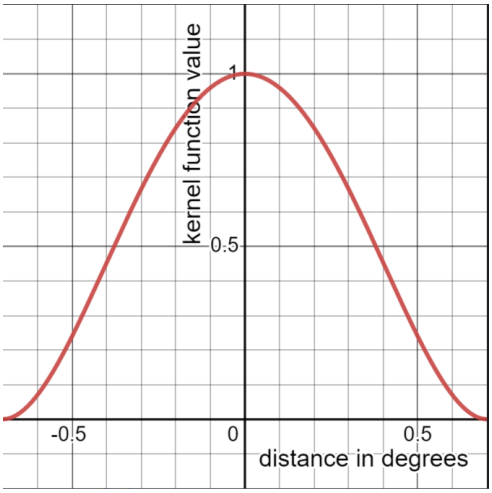
For each of the N slicks, a point has been designated as the source, forming a discrete dot map. In order to obtain a continuous density map, each source point of this dot map has been convoluted by a 2-D kernel function. The density map shown in fig .7, fig .8 and fig .9 is the sum of each of these N kernel functions.

The kernel function that has been used is:

$K(r)=(1-(r/0.7)^2)^2$ if $r<=0.7$

$K(r)=0$ if $r>0.7°$

where r is the euclidian distance to the source point in degrees



with a support [-0.7,0.7]

These clarifications have been added to the article.

RC2-6 : The authors only shared the spatial distribution map of the detected oil slicks that is only useful for visualization purposes. The geocoded map should be shared along with the geographic location and time stamps of verified oil spills. Furthermore, the processed SAR data should be openly available as a benchmark dataset to develop some good manual/automated oil spill detection approaches.

A set of georeferenced oil spills with considerable area including oil spills from ships and oil spills from platforms has been made available for modeling of oil slick drift and manual automated detection issues (https://doi.org/10.5281/zenodo.6907743). These oil spills are in shapefile format easily usable in a GIS with the date of the corresponding Envisat ASAR image.

As for the Envisat ASAR data, this is free data and available to everyone on the sites of the European Space Agency. It is indeed almost 400GB of data impossible to put online. The Envisat ASAR processing method has been explained in Najoui et al (2017, doi: 10.1109/TGRS.2017.2760516).

RC2-7 : The authors should share any additional material associated with the verified oil spills that would help to model the flow of the spill. The time stamps of verified oil spills can help in tracing the oceanic parameters and accessing imagery over the same area from other spaceborne sensors.

Please see response to RC2-6.