Ocean Science Discussions

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# Comment on os-2021-109

Anonymous Referee #2

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Referee comment on "Clustering analysis of the *Sargassum* transport process: application to beaching prediction in the Lesser Antilles" by Didier Bernard et al., Ocean Sci. Discuss., https://doi.org/10.5194/os-2021-109-RC2, 2022

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**Review of manuscript: Clustering analysis of the *Sargassum* transport process: application to stranding prediction in the Lesser Antilles by Bernard *et al***

1. General comments

The authors present a very interesting framework and method to better understand the ocean dynamics behind the strandings of *Sargassum* in the Lesser Antilles and to estimate their occurrence. The methodology presented is quite complex as well. A better explanation of the methodology is necessary, especially for the oceanographic audience of this journal to adequately follow and understand this interesting study. Section 2 I believe can be improved by making it easier for the reader to follow, especially the non-experts in these clustering methods. The technical details necessary for the reader to follow the study should be clearly described and the other details can be added as a section in supplementary material. A schematic of the method is given in fig. 2 for Section 2.7, but maybe a schematic for sections 2.5 and 2.6 could help too. In the discussion, I found that some comment on the impact (if any) of considering processes other than windage (e.g. presence of nutrients, sinking of *Sargassum*, waves?) could have on an even better understanding of the *Sargassum* strandings, was missing.

2. Specific comments

L23: “Strandings were also be observed in Africa (Széchy et al., 2012).” Why mention the occurrence of strandings in Africa? Any connection with the Caribbean strandings? Did the *Sargassum* strandings also cause natural hazards on the African coast?

L61: “MODIS AFAI satellite images”, please define/describe

L66-68: Could be useful to include some references of the methodology here.

L69: A general definition of predictive modelling is missing in the introduction for the readers which do not know about this method and how it compares with a conventional forecast. For example could be included here (Line 69).

L75-76: "To optimize the final partitioning, an additional metric based on the Kullback Leiber divergence (Kulback and Leibler, 1951, Biabiany et al., 2020) will be included" : quite specific on the methodology, for readers not familiarised with this method it could be hard to follow in this point in the introduction. More general details can be given, or this point can be moved to the methods section.

L82-83: "This ocean region corresponds to the CA and TA1 boxes in Johns (2020)", maybe say approximately corresponds, as not exactly the same. The LA3 region goes further south and LA2 and LA3 go until -55Ë□E, whales region TA1 till -50Ë□E. Most importantly, why choose the study regions to correspond to CA and TA1 boxes from Johns (2020)?

L96-96: From what I understand this dataset was not used before to simulate *Sargassum* trajectories, but was it used in any other Lagrangian study? Any validation studies done on the velocity outputs of this dataset?

L101: "Comparison between HYCOM and Mercator results" Do you mean the results from the *Sargassum* trajectories or a comparison of the velocity outputs of these datasets?

Section 2.3: Whats is the spatial and temporal resolution of the ERA-5 wind dataset?

L128: "Ward's method for HAC" Please explain and add reference.

L129-130: "with its own expertise on the input data" What do you mean by these? Please provide further explanations. Also, the new method name is not specified at all in section 2.5.1, and it will help for the reader to better follow the methodology. This section is only 5 lines long, more details on the process of the clustering methods could be given.

L132: "L2 clustering methods…" Please explain L2 in this context.

L133: “gatherings of different physical situations”. What do you mean by this? Maybe give an example of physical situations for this particular study scenario. You refer to this in the next phrase as “biases”. Is there then a tendency towards a specific physical situation?

L134: “spatial variability” : At what scales?

L139-L140: “The analyzed daily fields include a total of 14 279 meshes (4 282 meshes in LA1, 3 407 meshes in LA2 and 4 536 meshes in LA3). The remainder corresponds to land areas.” What do you refer to here with meshes? The land areas then correspond to *Sargassum* strandings? For clarity, these details could be described in a dataset section better, rather than in the middle of the methods description.

L141-142: “The second step was to group the information carried by the daily current velocity fields conditionally to the three given zones into histograms.” More details on histograms, for example binning, velocity data from HYCOM and Mercator?

L158: “optimal matching methods” Please explain and add some references.

L158: “dividing the population” what do you refer to exactly here by population? Population of strandings or backward sequences?

L160-162: Please give further details (maybe as supplementary material?) and add more references.

L186-L187: “was experimented on the first 120 days…”. Was experimented to…? Recall aim of doing these tests. Also why 120 days and during this period of time? Could results vary a lot if done during the northern hemisphere Summer months instead?

L190: Can maybe start section 3.1 giving some context on why this analysis is done.

L191: “90% of them remain below 0.65 m/s”. For both models exactly same?

L193: Figure 3 distributions how are they calculated? With histograms? Kernel Density Estimator or something else applied to obtain this “smooth” distribution curves?

L194-L195: 5 times greater for both models?

L207-208: what are the implications of these differences?

L272-L273: "The monthly evolution of observed stranding days on the Guadeloupe coasts, the monthly evolution of Sargassum abundance over the Central Atlantic region (SaWS, https://optics.marine.usf.edu/projects/SaWS.html)" I imagine it should be: "Guadeloupe coasts and the monthly evolution…", to make clear you talking about two datasets. The observed stranding dataset is mentioned in the dataset section (section 2.4), but not the *Sargassum* abundance over the Central Atlantic region.

3. Technical corrections

Please write Sargassum in italics, like it is done in other studies like for example Johns *et al*., (2020), as you are writing its scientific name, and even if it is just the genus in this case.

L10: "including windage effect": gives the impression the HYCOM and Mercator datasets already include the windage effect, when you actually added separately. Please improve phrasing.

L20: "LA received…" to "The LA received…"

L23: "…were also be observed…" to "…were also observed…"

L46: Improve sentence, e.g. "… multi-year reanalysis of wind and current, and numerical models, both the role of subsurface nutrient supply and surface current transport were estimated."

L50: "Sargassum Watch System SaWS" to "Sargassum Watch System (SaWS)"

L83: "in Johns (2020)" *et al.* missing.

L92: Please define the abbreviations HYCOM and NCODA (HYCOM defined in abstract but

not in the main text)

L94: Please define 12Z fields.

L94-95: “u and v components” to “zonal (u) and meridional (v) velocity components”

L101-102: “Comparison…in the focused region” to “A comparison.. in the study region.”

L107: “Sargassum raft transport”, maybe trajectories instead of transport is more appropriate?

L112-113: “The region analyzed in the present work corresponds to the CA - TA1 region defined in Johns et al. (2020)” already mentioned in L82-83, is it necessary to repeat here?

L116-117: “This period includes 730 observational days with 110 days of observed strandings.” , phrasing not clear do you mean that out of the total 730 days of data, only 110 days included observations of *Sargassum* strandings?

L137: “above Barbados island” to “above the island of Barbados”

L142: “The similarity of the most similar fields is estimated per pair..” Improve phrasing. What do you refer to exactly? Per pair of *Sargassum* meshes?

L148: “The SaMk index” to “The Silhouette (SaMk) index”

L151: Define all variables of equation 2!

L153-154: Improve phrasing.

L156: “January 2020” to “January 2019”

L165-L166: " surface currents with windage effects (Mercator, HYCOM and ERA-5)" to " surface currents (Mercator and HYCOM) with windage effects (ERA-5)"

L186-L187: "The proposed tree in Fig. 2…". Move to new line, to separate it from the phrase explaining the terms in equation (4)

L191: "do not exceed 2.57 m/s". Maybe better to say the maximum is 2.57 m/s, if not it sounds like 2.57 m/s is a key velocity value that should not be exceeded for some reason.

L193-L194: add at end to which model it each value corresponds to e.g. ".. for HYCOM and Mercator, respectively."

L205: "Globally, at sea, the current.." Is it necessary to specify at sea? What do you exactly mean with at sea here, open ocean?

L210: "into three magnitude groups of 45Ë□" to "into three magnitude groups of 45Ë□ intervals"?

L215: Improve phrasing, gives the impression you used equation (1) to perform the clustering.

L244: "Table 3 shows results" to "Table 3 shows the results"

L297: "remain with probabilities" add probabilities of… Help the reader follow better your study, recalling details.

L317: Improve  wording of Section 4.2 title, for example can simply remove "hazard"

L320: "retroflexion" to "retroflection"

L345 "The first peak of strandings, in March and seems.." to "The first peak of strandings, in March, seems.."

L373: Write as K-Means, and also in L217, write method in the same way.

4. Figures and tables

Figure 2: Describe BASE abbreviation as in L175.

Figures 4, 9 and 10: x-axis tick labels not clear, please improve.

Table 1: Header mean to Mean

Table 5: Caption mention what n and % refer to exactly.

Please also note the supplement to this comment:
https://os.copernicus.org/preprints/os-2021-109/os-2021-109-RC2-supplement.pdf