Dear Dr Nathan Putman, we thank you for your helpful comments and suggestions.

Your two last remarks dealing with the integration of *Sargassum* abundance in the decision support system and your suggested reference *"Trinanes et al. (2021)"* were very useful to strengthen and improve the predictive model. The predictive model originally based on circulation/wind/past-beachings was modified with a new module based on satellite observations which produces the weekly probability to reach the maximum observed cumulative floating algae density in an area of 100 km radius offshore Guadeloupe.

1. Throughout the text: *"Sargassum"* is the genus name of the pelagic, brown algae discussed. Accordingly, it should be italicized wherever used.

Our answer:

Following your suggestion, *"Sargassum"* will be italicized in the revised manuscript.

2. Lines 79-80: Citing Putman et al. 2018 (already cited elsewhere) would be appropriate here as they model the % of *Sargassum* that follows these routes.

Our answer:

Following your suggestion "Putman et al. 2018" will be cited here.

After the sentence (L79): *"The North Equatorial Current (NEC), the Guiana Current (GC), the eddies and the retroflection front of the North Brazil Current (NBC) are the main contributors of this transport."*.

The following sentence will be added:

"Putman et al. (2018) modeled the percentage of Sargassum that follow these routes."

3. Lines 91-96: I am confused what HYCOM output you are using. What is reported here (GOMu0.04/expt_90.1m000 version) appears to only extend from latitude 18N to 32N and is thus outside of the area of this study. Can you please clarify? Did you run your own HYCOM at 1/25 degree resolution? The Global Analysis of HYCOM uses a grid of 0.04 degree longitude and 0.08 degree latitude, is this what you actually used?

Our answer:

This was a mistake, we will correct it in the revised manuscript. The right version of HYCOM output used here is the HYCOM GLBy0.08 which has a grid resolution of 0.08 degree in longitude and 0.04 degree in latitude. To perform the present study, the native HYCOM fields have been preliminarily interpolated on the Mercator uniform lon/lat 0.08-degree grid with a bilinear method.

Line 91-96 :

"2.1 HYCOM surface current dataset

"*Fine scale surface current data from the 1/25-degree HYCOM + NCODA Gulf of Mexico analysis model (GOMu0.04/expt_90.1m000 version, Hogan et al, 2014; Helber et al., 2013; Cummings and Smedstad, 2013; Cummings, 2005) between 1st January 2019 (i.e., available data starting date) and 31 December 2020 were analyzed. Daily 12Z fields giving the u and v components of the current at 50 cm depth were used. These fine* *resolution current data were not used in previous studies dealing with Sargassum hazard (Putman et al., 2018; Johns et al., 2020).”*

will be replaced by:

“2.1 HYCOM surface current dataset

Daily 12Z surface current components from the 41-layer HYCOM + NCODA global 1/12-degree analysis (HYCOM GLBy0.08 version), were examined. The HYCOM surface forcing including 10-m wind velocities are extracted from Climate Forecast System Version 2 (CFSv2). The Navy Coupled Ocean Data Assimilation (NCODA) system is used to assimilate available observational data: satellite altimeter sea surface height, satellite and in-situ sea surface temperature, temperature vertical profiles and salinity vertical profiles (Cummings, 2005; Cummings and Smedstad, 2013; Helber et al., 2013). The Bathymetry used is the GEBCO8 (Becker et al., 2009) with 30 arc second of resolution. The HYCOM GLBy0.08 grid resolution is 0.08 degree in longitude and 0.04 degree in latitude. To perform the present study, the native HYCOM fields have been preliminarily interpolated on the Mercator uniform lon/lat 0.08-degree grid with a bilinear method.”.

4. Line 101-103: See also, Putman NF & He R (2013) Tracking the long-distance dispersal of marine organisms: sensitivity to ocean model resolution. Journal of the Royal Society Interface, 10:20120979

Our answer: We thank you for this suggestion.

5. Line 104: I am confused, what is the basis for assuming the “optimal factors of Cw = 0.01”? Surely this is not the case based on data from Johns et al. 2020, which showed no evidence that a windage factor of 1% was appropriate for *Sargassum*. They simply picked the “reasonable” value that has been used in the earlier publication Putman et al. 2018. The value of 1% was chosen by Putman et al. 2018 to test the sensitivity of model predictions to windage and did not claim that it was optimal (or even somewhat correct). Work since that point has been conducted which seems to suggest that the situation is somewhat more complicated, see Putman et al. 2020 (already cited elsewhere) and Johnson, D.R., Franks, J.S., Oxenford, H.A. and Cox, S.A.L., 2020. Pelagic *Sargassum* Prediction and Marine Connectivity in the Tropical Atlantic. Gulf and Caribbean Research, 31(1), pp.GCFI20-GCFI30. Whether the best windage value is 0, 0.5%, 1%, 3% or something else likely depends on the oceanographic region and the ocean circulation model and wind product used.

Our answer:

We agree with this remark, the part Lines 104-108:

“*Surface wind influences the transport of floating seaweed rafts, with an optimal factor of C_W = 0.01, which corresponds to the drag coefficient or windage, following Johns et al. (2020). A first clustering (KMS-L2) on Mercator analysis without windage had been proposed by Bernard et al. (2019). Berline et al. (2017), Putman et al. (2018) and Johns et al. (2020) have shown that the windage improves the Lagrangian simulations of Sargassum rafts transport in the Caribbean region. The windage was included in the present surface current clustering.*”

will be replaced by:

“Surface wind influences the transport of floating seaweed rafts and a drag or windage coefficient must be added to the surface currents. The value of C_W = 0.01 *was used by Putman et al. (2018), Johns et al. (2020) and Berline et al. (2020). The use of other windage values should be investigated in a further study.”*

6. Line 112: I think that “Putman et al. (2016)” should be “Putman et al. (2018)”

Our answer:

"Putman et al. (2016)" will be corrected to *"Putman et al. (2018)"*

7. Line 206: change to "current speed differences are relatively small…"

Our answer:

Line 206: *"current speed differences are small"*

will be replaced by

"current speed differences are relatively small"

8. Line 334: change to "…due to the North Equatorial Current…"

Our answer:

Line 334: *"The last identified factor is related to surface currents present in the North Atlantic region due to the North Current and the associated gyre circulation."*

will be replaced by

"*The last identified factor is related to surface currents present in the North Atlantic region due to the North Equatorial Current and the associated gyre circulation.*"

9. Lines 360-361: Another issue may be that ocean current patterns may be highly important for "non-beaching" events (e.g., the currents are directed so that material doesn't reach the island), but for Sargassum to beach there needs to be Sargassum present. Thus, currents might be in a state to transport material to the island, but if there is no Sargassum present, there can be no beaching. Am I correct that this predictive model is based only on circulation/wind and not Sargassum abundance/coverage/distribution?

Our answer :

Following your suggestion,

To improve the predictive model originally based on circulation/wind/past-beachings the module A producing the monthly probability of beaching was replaced by a new module based on satellite observations which produces the weekly probability to reach the maximum observed cumulative floating algae density in an area of 100 km radius offshore Guadeloupe.

Moreover, to strengthen the performance evaluation, the testing period was extended from the first four months of 2021 (i.e., from January 2021 to April 2021) to the full year of 2021 including seasonal variations of the offshore *Sargassum* abundance.

The performance evaluation of the classifier was also extended by adding three temporal uncertainty ranges around the decision day, respectively: +/-1 day, +/-2 days, +/-3 days. While the classifier may reproduce 61.5% of the observed beachings in 2021 with an accuracy lower than one day (this value reached 41.7% with the old module A and the limited testing period of four months), this recall score reaches 74.4% at +/-3 days accuracy.

The following section will be added in the "Datasets and method" section:

"2.5 Satellite-based offshore abundance of Sargassum

Sargassum satellite observations were included in the present decision support system. To quantify the abundance of Sargassum in an area of 100 km radius offshore Guadeloupe, the 7-day Floating Algae (FA) density fields *derived from the Alternative Floating Algae Index (Wang and Hu, 2016) were analyzed. As described by Trinanes et al. (2021), the 7-day Floating Algae (FA) density fields are accumulated on 7 days and have a 0.1° resolution. Due to optical complexity in nearshore waters, the FA density fields are masked with missing values within 30 km from shoreline (Trinanes et al. 2021). The cumulative FA density values were summed in the area 30-100 km offshore Guadeloupe (Fig. 1) then weekly averaged during the two years 2019 and 2020."*

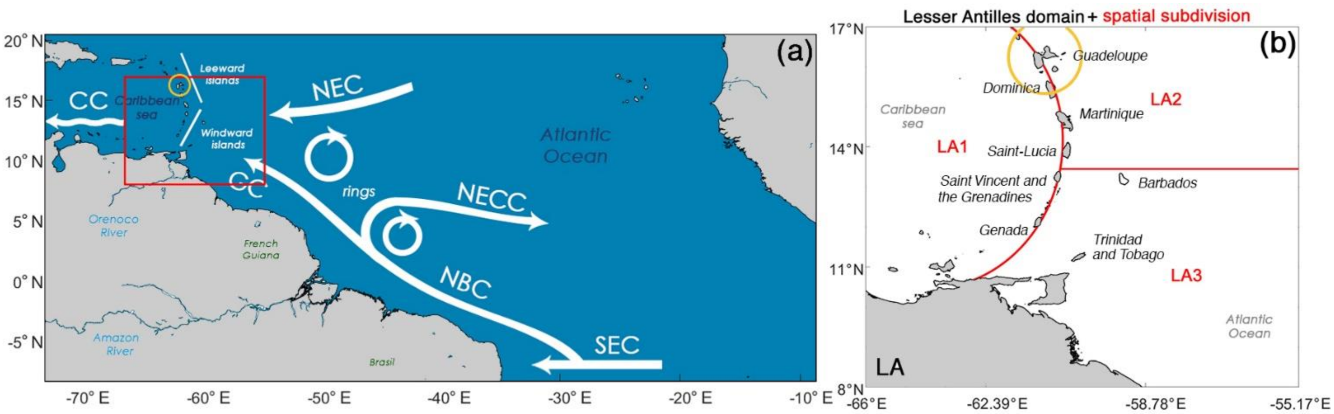
In the "Decision support system" section, the following sentence (L.168):

"Module A takes as input the month of the selected day and returns the associated monthly probability (frequency) of stranding;"

Will be replaced by:

"Module A takes as input the week number of the selected day and returns the associated weekly probability to reach the maximum offshore abundance of Sargassum (based on observational FA density values during the two years 2019 and 2020)."

The figs 1, 2, 11, 12 and 15 will be modified as follows.



"Figure 1: (a) Main oceanic currents occurring and interacting in the central Atlantic and the Lesser Antilles regions; Caribbean Current (CC), North Equatorial current (NEC), North Brazil current (NBC), North equatorial Counter Current (NECC), South Equatorial current (SEC). Lesser Antilles domain (LA): the red rectangle corresponds to the study area (55-66° W, 8-17° N); (b) Spatial subdivision of the study area into three sub-areas: LA1 (i.e., Caribbean Sea), LA2 (i.e., North Tropical Atlantic above Barbados (13.2° N)) and LA3 (i.e., North Tropical Atlantic below 13.2° N). The yellow circle corresponds to the 100 km offshore Guadeloupe area in which the satellite-based Sargassum abundance is analysed."

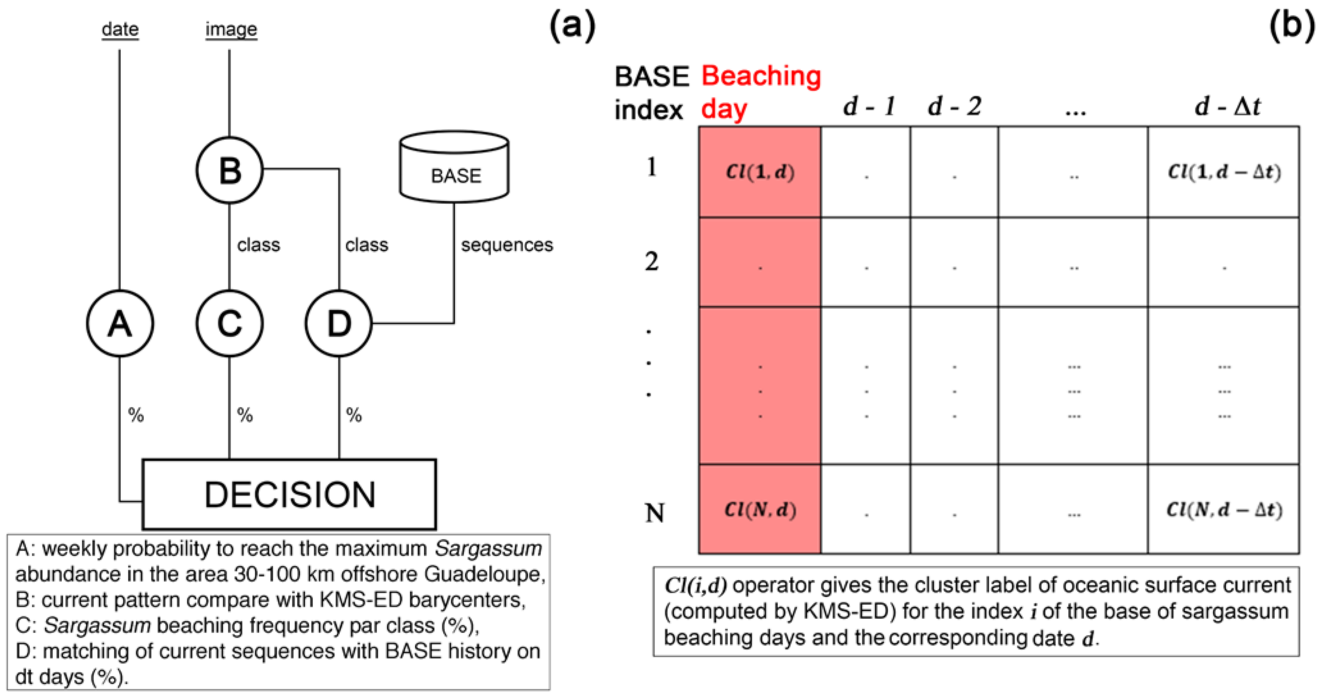


Figure 2: (a) Scheme of the decision tree classifier to predict *Sargassum* stranding probability. (b) Combination base of oceanic currents clusters labels obtained by KMS-ED from each stranding day to Δt days before.

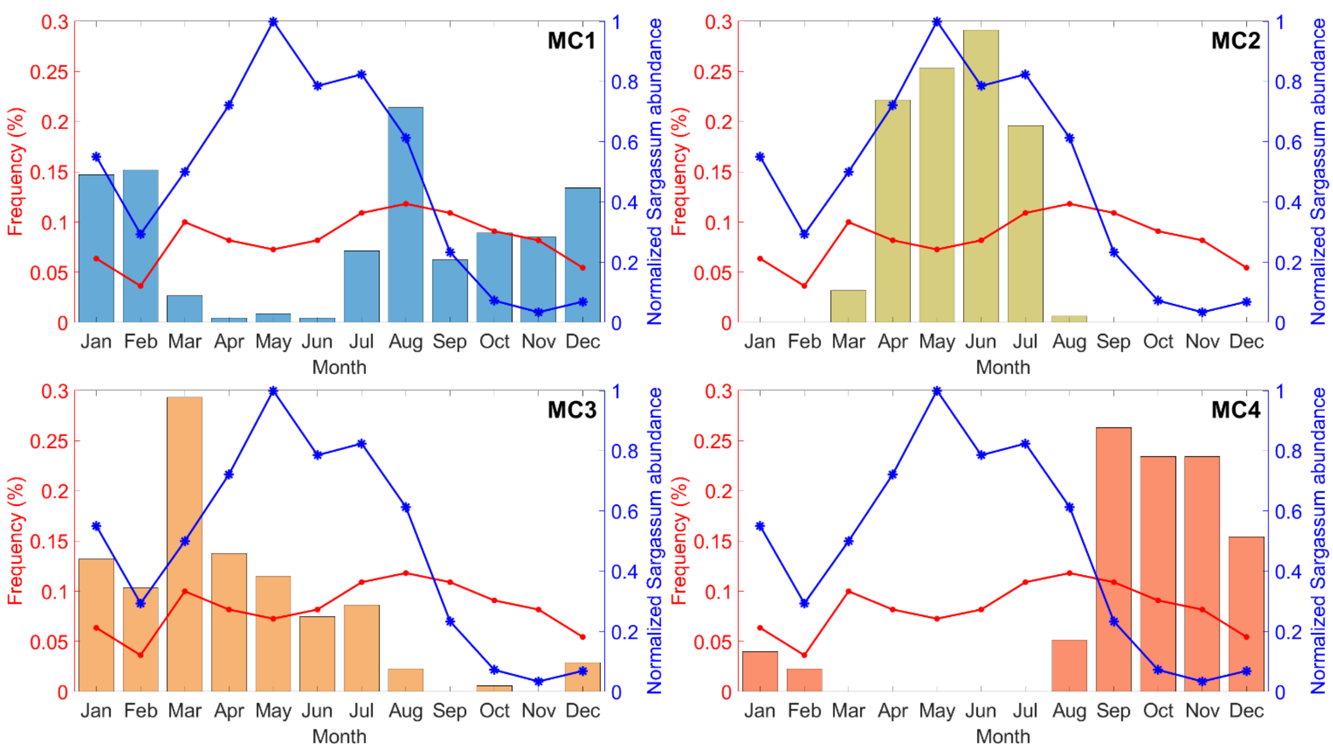


Figure 11: Monthly distribution of cluster occurrence from Mercator outputs, from 2019 to 2020, in the Lesser Antilles (55-66°W, 8-17°N): MC1 (a), MC2 (b), MC3 (c) and MC4 (d). The red line shows the monthly distribution

of Sargassum strandings on the coasts of Guadeloupe during the same period. The blue line indicates the monthly evolution of Sargassum abundance in the area 30-100 km offshore Guadeloupe normalized on the maximum value.

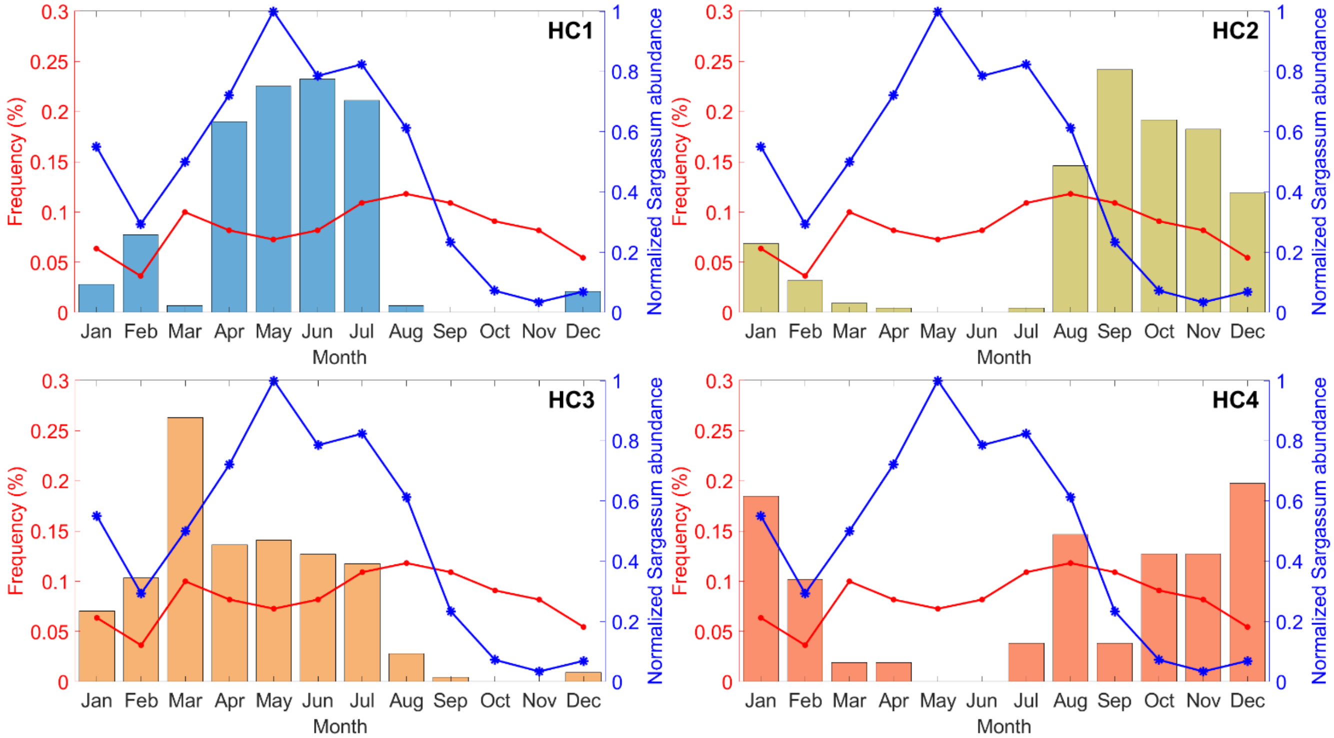


Figure 12: Monthly distribution of cluster occurrence from HYCOM outputs, from 2019 to 2020, in the Lesser Antilles (55-66°W, 8-17°N): HC1 (a), HC2 (b), HC3 (c) and HC4 (d). The red line shows the monthly distribution of Sargassum strandings on the coasts of Guadeloupe during the same period. The blue line indicates the monthly evolution of Sargassum abundance in the area 30-100 km offshore Guadeloupe normalized on the maximum value.

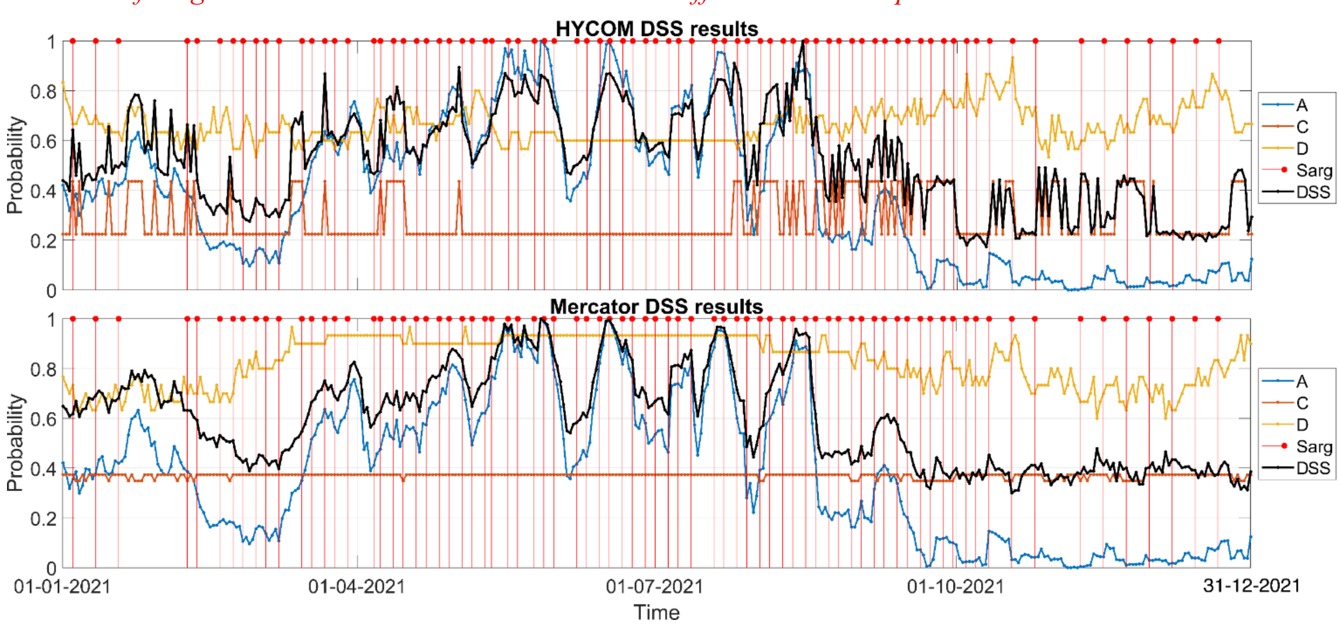


Figure 15: Decision Support System (DSS) results: probability of beaching obtained per module. Weekly probability to reach the maximum *Sargassum* abundance in the area 30-100 km offshore Guadeloupe for module A (blue line), stranding frequency per cluster for module C (orange line), match percentage for module D (yellow

line), DSS Decision (black line). Day of observed beaching on Guadeloupe coasts (red dots): HYCOM (a) and Mercator (b).

Table 6 will be modified as follows.

Time range around D (day)	**Datasets**	**TP (recall %)**	**TN (recall %)**	**FP (ratio %)**	**FN (ratio%)**	**Accuracy (ratio %)**
0	**HYCOM**	48 (61.5%)	152 (53.1%)	134 (36.8%)	30 (8.2%)	200 (54.9%)
	Mercator	44 (56.4%)	141 (49.3%)	145 (39.8%)	34 (9.3%)	185 (50.8%)
+/- 1	**HYCOM**	53 (67.9%)	170 (59.4%)	(-)	(-)	(-)
	Mercator	47 (60.3%)	142 (49.6%)	(-)	(-)	(-)
+/- 2	**HYCOM**	54 (69.2%)	184 (64.3%)	(-)	(-)	(-)
	Mercator	47 (60.3%)	146 (51%)	(-)	(-)	(-)
+/- 3	**HYCOM**	58 (74.4%)	193 (67.5%)	(-)	(-)	(-)
	Mercator	47 (60.3%)	150 (52.4%)	(-)	(-)	(-)

Table 6: Decision tree performance (with TP: True Positive, TN: True Negative, FP: False Positive, FN: False Negative, (-): same as above).

10. Lines 400-406: You may wish to draw reader's attention to the fact that there is considerable interest in monitoring and predicting coastal inundation by *Sargassum*. For instance, you may note how your smaller-scale study's goals might enhance the region-wide efforts such as the *Sargassum* Inundation Reports (SIR) discussed here:

Trinanes J, Putman NF, Goni G, Hu C, Wang M (2021) Monitoring pelagic *Sargassum* inundation potential for coastal communities. Journal of Operational Oceanography 14, in press (published online).

Our answer:

Thank you for this useful suggestion. "Trinanes et al. (2021)" will be added to the references.

The following part will be added in the Introduction section (Line 65):

"Trinanes et al. (2021) presented the Sargassum Inundation Reports (SIR), a product based on satellite observations to weekly predict Sargassum coastal inundation potential throughout the Caribbean Sea region, the Gulf of Mexico, and extending to the east coast of Florida and the Bahamas. As described by Trinanes et al. (2021), the SIR algorithm uses the Floating Algae density values within 50 km of each coastal pixel to predict three inundation potential levels (low, medium, and high). This algorithm does not include ocean currents, winds, and waves which may modify the movement of Sargassum.

The following sentence will be added in the Conclusion Line 406:

"As the Sargassum Inundation Reports (Trinanes et al. (2021)), the present small-scale Sargassum beaching predictive model may contribute to the region-wide efforts to help coastal communities managing this hazard."