

## ***Interactive comment on “A New Characterization of the Upper Waters of the central Gulf of México based on Water Mass Hydrographic and Biogeochemical Characteristics” by Gabriela Yareli Cervantes-Diaz et al.***

### **Anonymous Referee #2**

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In the manuscript “A New Characterization of the Upper Waters of the Central Gulf of Mexico based on Water Mass Hydrographic and Biogeochemical Characteristics” the authors present a new classification of water masses based on data collected in 5 cruises over a period of 6 years. This is an interesting exercise in water mass classification, using a valuable data set that spans different seasons and years, and includes physical and biogeochemical data.

Before addressing the substance of the paper, I have two recommendations for subsequent revisions:

C1

- The use of English needs to be improved substantially. Some sentences were quite honestly difficult to understand at all, others lacked a subject, or were grammatically incorrect. As an example, the authors keep using “in this manuscript” as if it were a subject. I am surprised that none of the co-authors took the time to read and improve the grammar.

- Editing: this reads more as a dissertation/report chapter than a review paper. As an example, do three lines of text merit a whole sub-section (line 226-229)? Do we really need 3 subsections (e.g. 2.2.1, 4.1.2 etc)? On top of addressing content concerns, the authors need to edit the manuscript substantially for style.

Content-related concerns. Major issues:

- The authors’ statement that data is not available at this time, when some data is from 2010, makes me think there is simply no plan to make them available at all. Given BG’s policy regarding data sharing, I find this problematic. I leave it to the editors to evaluate whether papers can be published on BG without releasing the data used to sustain their conclusions.

- The authors need to make a better job of justifying the need for a new classification of water masses and how this work resolves issues that previous classifications could not address otherwise. What were those issues and why couldn’t other classifications work? I suggest a table that summarizes the water masses proposed by previous authors to help in the comparison. In particular, the authors rely heavily on a paper by Portela et al. Those should definitely be referenced more clearly here.

- I’m not convinced about the definition of FISW, a water mass whose salinity changes depending on river runoff and precipitation, and time of year. Does it really qualify as a water mass? How far from the area of formation can it be found other than due to eddy transport? For how long/far does it maintain the same characteristics? Another reviewer mentioned this in their comments and I fully agree with their opinion.

C2

- The authors mention initially that their data is collected from the Mexican side of the GoM. I would like to see a justification for how they extended their results to waters on the US side, or otherwise clarify throughout the manuscript that this applies only to the area covered during their cruises (i.e. the Mexican section of the GoM).

- The authors' new classification is based on T, S, DO. I'd like to see clarification on how NO<sub>3</sub> and DIC add additional value to the definition of the water masses. Otherwise, I would recommend that the authors streamline this paper, focusing on T, S, DO and the definition of the water masses, and save the DIC, NO<sub>3</sub> discussion for a separate work. DIC in particular did not seem to add anything relevant.

Small comments: - I suggest adding a table that summarizes the five cruises and that lists years, seasons, etc. as it will be useful to reference back to it during the discussion of the results.

- Every instance of "in this manuscript/in this work" immediately followed by a verb needs to be changed to "this manuscript/this work" or "in this manuscript/work we" etc.

- The affiliations for the authors should be in order of appearance, e.g. for Jose Martin Hernandez-Ayon the affiliations should be numbers 1,2, not 1,5.

- On multiple occasions there is an "H" preceding a number. Why? This does not seem to be related to the parameter (e.g. sometimes potential density values are preceded by H, sometimes they aren't. Likewise for temperature or DO).

- Line 52: the windy "nortes" season. Are these northerly winds? Please explain for those unfamiliar.

- Several times throughout the text: do not use "approx.", write the full word.

- Line 117: consider rephrasing (and improve English). DO shows high variability. Do you mean a range more than 200  $\mu\text{mol/kg}$ ? This is not possible based on the legend in figure 1b (this scale shows around 125  $\mu\text{mol/kg}$  between the minimum and maximum). Is the scale incorrect?

C3

Line 178-180: this line is difficult to understand.

Line 213-214: This so-called Gulf Common Water. This actually means "this supposed Gulf Common Water". So is it GCW or not? If it is, then do not use "so-called".

Lines 226, 231: the text jumps from section 2.2.4 to 2.4. Where is section 2.3? Again, thoroughly revise text to make it more article style and less dissertation style.

Line 273: Isn't this section 3, not 2?

Line 335: why does it need to be better defined? Please elaborate further.

Lines 345-347: Hard to understand sentence. Why not describe the results of the frequency analysis a bit more and why not show the figure?

Section 3.4: I suggest eliminating this section and focusing on the core results, i.e. the classifications of the water masses. Otherwise, the authors need to better argue for the added value that these parameters bring to help define the water masses.

Line 379: There has been no mention of the TACW since the introduction. In lines 274-278 it was not listed as a relevant pattern. The TACW is only mentioned here. How relevant is it overall?

Line 402: Is this for the central and western GoM in general or is this the central and western Mexican GoM?

Line 423: This is a concluding remark that is not supported by the preceding paragraphs. Either, move this sentence further down in the text to after the next couple of paragraphs, or simply delete it.

Lines 526-533: move this to the conclusions or remove altogether to shorten length of manuscript.

Line 539: "reaching down to 90 m in spite." In spite of what? This sentence does not make sense.

C4

Lines 787-790: this reference corresponds to a doctoral thesis written in French 15 years ago. Was there no publication in a peer reviewed journal ever published? Is this reference available to the general public and is there no other reference that would be more adequate and readily available?

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