

Ocean Sci. Discuss., referee comment RC2
<https://doi.org/10.5194/os-2021-75-RC2>, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on os-2021-75

Gwenaëlle Gremion (Referee)

Referee comment on "There and back again, a journey of many pathways: conceptualising the marine organic carbon cycle" by Maike Iris Esther Scheffold and Inga Hense, Ocean Sci. Discuss., <https://doi.org/10.5194/os-2021-75-RC2>, 2021

Review prepared by Gwenaëlle Gremion

PostDoctoral fellow at the Université du Québec à Rimouski, Canada

for Scheffold & Hense, "There and back again, an organic carbon journey: mapping pathways and loops"

Summary:

The manuscript presents a conceptual visual-representation of the pathways of organic carbon through the ocean. The representation is made to be non-quantitative and aims to present all the pathways known without pointing out the most important ones known by the scientific community nowadays. It aims in the future to have a visual idea of the pathways of the carbon in the ocean inside which future research on new processes can be added up to achieve a full picture of what is happening in the ocean.

Decision:

I greatly appreciated the effort to provide to the literature an un-biased representation of pathways of organic carbon through the ocean, without any distinction of importance between them. However, to this point, some supplementary efforts need to be made to make this manuscript achieve its plain potential. Therefore I suggest a major rewriting before its publication.

On Ocean Science's specific questions:

Does the paper address relevant scientific questions within the scope of OS? **Yes**;
Does the paper present novel concepts, ideas, tools, or data? **Yes, if efforts are made to explain how it can be used for further research questions.**

Are substantial conclusions reached? **NA**

Are the scientific methods and assumptions valid and clearly outlined? **Yes**

Are the results sufficient to support the interpretations and conclusions? **NA**

Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? **Yes**

Do the authors give proper credit to related work and clearly indicate their own new/original contribution? **Yes**

Does the title clearly reflect the contents of the paper? **See comment below**

Does the abstract provide a concise and complete summary? **See comment below**

Is the overall presentation well structured and clear? **Yes**

Is the language fluent and precise? **Yes**

Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? **Mostly, See comment below**

Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? **Table 1 and 3 may be clarified.**

Are the number and quality of references appropriate? **Yes**

Is the amount and quality of supplementary material appropriate? **Yes**

Substantial comments:

***For the following comments, please consider that coming from a numerical model community, the word 'model' is generally associated with equations and numerical output in my mind. While the term 'model' can be used for many purposes to define a representation of reality, I suggest that you should present a '**visual-model**' in opposition to 'numerical-model', to avoid to any other biased modeler as me to look for equations and numerical outputs ***

Title :

While publishing in 'Ocean science', the term 'marine' can appear in the title. Following the first referee's comment, I suggest putting the title directly with the information about your work 'a visual-model for mapping...'

Abstract :

p1.Ln 3 : 'other related tasks' sound vague, so I suggest removing it.

p1.Ln 3 : you may use 'cycle' instead of 'pathways', as in the line right after you are adding 'processes and pathways' ?

p1.Ln 3 : 'qualitative-visual' model can be mentioned instead of qualitative model only.

Introduction : ***I understand from your answer to the first referee's comments that you already re-wrote the introduction. Meanwhile, find below my suggestions if they still apply in your new version. ***

The first paragraph (p1 Ln15 to 21) is difficult to follow without the table placed. I suggest starting with your current second paragraph (p2.Ln22 to 29) and eventually move/re-write this first paragraph with the last ones of the introduction where you talk about your work.

p2.Ln22 : Instead of 'marine ecosystems and the OC cycle', can it be reduced to 'marine OC cycle' directly ?

p2.Ln22 to 24 : Why do you focus only on particles on the surface ? You can generalize as 'An OC particle in the ocean can end up ...'

p2.Ln23 to 24 : I suggest to re-write to have only one sentence, e.g. ' Each pathways is unique in its sequence of processes, and there is a myriad of them' . As there are a myriad of pathways AND processes.

p2.Ln36 : I suggest to add 'vertical export flux' instead of only 'export flux'

In these two paragraphs (p2.Ln22 to Ln 37) some link to the feedbacks/conclusions made through those existing tools with the climate can be made, to reinforce the use of this visual-model for further use.

p2.Ln39-40: I suggest to temper what it is mentioned by providing generalities such as ' ..this destination is mainly considered by changing the particles' **properties (e.g. density, shape)**'. In this case some additional references may be required.

p2.Ln40-42: I would be glad if you have in hand a reference to add, that points out these facts.

Part 2 :

p3.Ln82 : I do not see the point to add the notion of coral reef here.

p3.Ln84 : I would have been glad to have already the information that table 1 will provide me with the dictionary of the nomenclature used in the following part. I suggest adding a sentence letting the reader know about Table 1 before moving to the explanation, as the sentence in p2. Ln84 does not sound clear to me.

p3.Ln85 : `(POC) **embedding** living and non-living OC **particles**`

p3.Ln85 : Thank you for the correction made following Referee's 1 comment regarding the size mentioned/used.

p4.Ln.121: `under the given hygiene conditions'; as we are already in an analogy, barely used in scientific writing, I suggest to restrain the other reference to current society behavior, as in a number of years when people will refer to this manuscript they may not be able to understand the reference to the current pandemic situation as easily as us today. I suggest deleting the allusion.

p5.Ln127-151 : Be sure that the words used here are consistent with the eventual re-swamp of the nomenclature (see my comments below about table 1). This paragraph is really hard to follow even if I greatly appreciate the effort to place a nice analogy for explanation.

p7.Ln154 : The repetition of `spatial, spaces, spatially' can be avoided (e.g. ` By defining four spatially bounded volumes with...').

p7.Ln155 : the reference to Table 1 is not informative and necessary.

p7.Ln163-164 : I am curious why these specific systems must be represented with these specific numbers of spaces ? Is it to be sure to consider the processes/pathways in these specific systems ? As there are no `numerical' rules for the conceptual model here, I am wondering why this information is here.

p7.Ln154-164 : I am wondering why the Atmosphere is not considered here as the LSS is

?

p10.Ln209 : It is confusing that 'pathway patterns' means closed loops. Why not use closed loops directly ?

Part 3 :

p17.Ln311 : Not only fish and mammals, but also reptiles (e.g. McClain CR, Nunnally C, Dixon R, Rouse GW, Benfield M (2019) Alligators in the abyss: The first experimental reptilian food fall in the deep ocean. PLoS ONE 14(12): e0225345. <https://doi.org/10.1371/journal.pone.0225345>) .

p18.Ln334 : 'biological**carbon**pump'

Table 1 :

For Initial position I do not get the meaning of 'Abstract' in the definition. Would 'Start position' will suffice ?

In the example part, I suggest putting in bold the terms to have an easier reading but to not use the example of the term defined above. It is confusing to have in the example of one term and example of the term above. One should be able to see the example only jumping from one line to another in the example column.

Process : In the example column you can add 'fish respiration'

Path segment : In the example column, you can delete the 'Processes line example', remove the 'path segment' and keep only 'OC remineralization (..)'.

Pathway : In the example column, I do not get why OC remineralization (presented above as Path segments) is now considered as a 'sequence of path segments'. Are the pathways defined as 1) how the carbon moves from one 'box' to another along processes, or 2) how the carbon moves in the conceptual space volumes ?

Space : This is not necessary for me to be defined here.

Closed loop/Open loop : To the current state I unfortunately do not get clearly the distinction between pathway or loop. There is no need for two pathway examples here, it leads to confusion between pathway and loop. You can stick only with 'surface remineralization loop' .

Process option : While I get that you want to define all the process options that we know, I suggest that the options should be already included in the 'conceptual' processes. By itself each process option is a process.

Pathway pattern : Similarly I get confused with the distinction.

Other proposition : To help the reading between the text of the manuscript and the table, you can refer as example to the same example available in the text such as for Path segment (mention the six critical path segment of the OC cycle (p5.Ln37-39)) ; for Open loop (mention the five ones (p7.Ln165)) ; and for Close loop (mention the 3 ones (p9.Ln202-206)).

Figure 1 :

To help to connect with the text, Is it possible to have a specific code in the legend and the figure for the loops and one for the path segments ?

The atmosphere term should be appearing as the long-term sediment one is appearing.

Figure 2 :

The atmosphere term should be appearing as the long-term sediment one is appearing.

For the nomenclature see one of the last comment made below for the link between Table 3 and Fig2.

Table 3:

I suggest deleting the repetition of the column name each time we are moving to another path segment and therefore place the column name as the first line before the first path Organic Carbon position change (A).

I suggest to either place in the center the name of the path to cut the reading among the table each time the path changes, and/or use a double line before and after the name of the path, similarly to help the eyes to see that we are moving to another path.

On the part of the table in p16, I do not see why we have again the path C, and why the path E is reduced only as a name in the first column ? I guess it is a typo and the following processes refer to path E following the infos available in Figure 2.

I suggest removing the column Process description as it is already well explained in the text and in figure 2, as well as the column Involved organisms. It will save space and help the reading. If you want to keep one among the two I suggest keeping the process description one.

However, an effort can be made to smooth again the nomenclature used between Figure 2 and Table 3 First column, to allow the reader to proceed to an easy retrieval of the processes (description or representation) between the Figure 2 and the Table 3.

Organic Carbon Position Change :

- Following Fig.2 it seems that the biotic direct transport is not writing in the process column while infos related to seem appearing in the other columns (?)

OC Remineralization (D) :

- Following Fig.2 it seems that the DOC consumer respiration is not writing in the process column

Editorial/Typo comments :

***Please discard the following comments if you already made the appropriate correction for them after your personal re-reading or after the corrections made following the first referee's comments. ***

p2.Ln49 : 'DOC' acronym has not been defined yet.

p2.Ln52 : As defined in the p2. Ln49, you can use the acronym

p3.Ln60 : Extra parenthesis

p3.Ln65 : Missing parenthesis

p5.Ln126 : Missing a dot at the end of the sentence.

p7.Ln167-176 + other parts in the text : To help the reading of acronyms, can you think about having the related space ones (SLS,WCS,USS) in italic and the one related to the loop in normal ?

p10 to 13 : 1) Can we have subtitles for each path segment you are talking about ? Like it is done clearly in Fig.2 (Path segment A, Path segment B, etc.) ? 2) Can we have just one sentence at the beginning referring to Figure 2 and Table 3 for this entire part, instead of having it mentioned everywhere ? It will make the text easier to read.

p11.Ln253 : Extra parenthesis

p18.Ln336 : 'e.g.' before via

----- Thank you -----