

Round 2 - Review prepared by Gwenaëlle Gremion

PostDoctoral fellow at the Université du Québec à Rimouski, Canada

for Scheffold & Hense, “**There and back again, a journey of many pathways: conceptualising the marine organic carbon cycle**”

Summary: Please Refer to <https://doi.org/10.5194/os-2021-75-RC2>

Decision:

I acknowledge the work done since the first version of the manuscript, which greatly improves the value of the work presented. Some substantial suggestions follow, but I am in support of the manuscript moving forward for publication after consideration of some of the comments.

Substantial comments:

Abstract :

p1.Ln 3 : Suggestion : ‘with sophisticated ****tools and **** mainly ****by**** quantitative methods [..]. ‘

p1. Ln 6 : What are the significance of ‘core structure’ and ‘sub-concept’ ?

p1. Ln 8 -10 : I suggest combining the two sentences such as e.g. ‘ In response, we propose a (visual) concept that defines pathway patterns who are defined by mapping, comparing...based on a consequent literature review’ .

p1. Ln 10: To be consistent it should be a closed-loop ‘pathway’ as ‘patterns’ is used later for defining rDOC and remineralization. But as it is the abstract I suggest sticking to open and close loops only.

p1. Ln12 : As it is really technical in terms of vocabulary, every word used has a meaning, I suggest writing ‘loops’ instead of ‘basic structures’.

p1. Ln13: I suggest adding ‘carbon’ before ‘pools’ and I am not sure of the meaning behind ‘agent’ at this stage.

p1. Ln 15 : Do we want to stay large and talk to OC cycle, or do we want to specify ‘marine OC cycle’ in this explanation ?

p1. Ln 16: As before: What is the significance/definition of ‘core structure’ ?

p1. Ln 17 : Are we sure ‘basic’ is needed here (and in the following sentence). I suggest reducing the wording as much as possible to avoid confusion.

Introduction :

It is a nice improvement of the first version of the manuscript.

p1.Ln 22 : Suggestion : ‘..OC dynamics ****along them **** is an essential and ****relevant**** focus on ocean research.’ Instead of ‘OC dynamics resulting from the multiplicity of these pathways and the human influence on them is an essential and very productive focus of ocean research’. As I am not sure the human influence is the main topic of this paper, and as I do not see how a focus can be productive.

p1. Ln 24-27 : I am not sure I understand the sentence. Is it the comprehensive observations and the sophisticated numerical models who improved the carbon budgets ? Maybe consider a rephrasing of the sentence.

p2. Ln 29 : At this stage the definition of higher-level structures, core mechanisms is not intuitive. I suggest sticking with what will be used after (Pathways and sequence of processes).

p2. Ln 29 - 31 : Suggestion : ‘ ..of the OC cycle, the studies focus only on the description of pathways related to the interest of the research’’. Instead of ‘... OC cycle, these concepts have a relatively narrow focus and consider a selection of pathways.’

p2 . Ln 31-34 : Similarly as comment for p1. Ln 24-27 , the utilization and referencing of the example make it hard to understand. Is it an enumeration, or one sentence only ? Maybe consider a rephrasing of the sentence.

p2. Ln 43 : Suggestion : ‘ useful’ instead of ‘plausible’ ?

p2. Ln 48 : Why do we have ‘graphics’ twice in the sentence ?

p2. Ln 50 - 53 : Suggestion : ‘ For example, Steinberg and Landry (2017), Cavan et al. (2019), Anderson and Ducklow (2001) and Boscolo-Galazzo et al. (2018), while aiming to represent the same pathways do not use the same visual representation leading to inconsistencies. As the aim of such studies is not to create congruent conceptual representations of the OC cycle, their visualizations are still useful tools to highlight their research focus in an overarching picture. ‘

p2. Ln 57 : Suggestion : ‘ Non-congruent graphics within the scientific literature to represent a same concept do not exploit the full potential’

p2. Ln 58 : Do we want to stay large and talk to OC cycle, or do we want to specify ‘marine OC cycle’ in this explanation ?

p3. Ln 65 : Do we want to stay large and talk to OC cycle, or do we want to specify ‘marine OC cycle’ in this explanation ?

p3. Ln 68 : I suggest removing core to avoid confusion on the definition associated with ‘core similarity’ that may not be clear at that stage of the manuscript.

p3. Ln 73 : Do we want to stay large and talk to OC cycle, or do we want to specify ‘marine OC cycle’ in this explanation ?

p3. Ln 71-75 : I really appreciate this paragraph. It is well structured and gets straight to the objectives of this study. It is a nice addition to the first version of the manuscript.

p3. Ln77and 78, 79 : I suggest removing core to avoid confusion on the definition associate with ‘core similarity’ that may not be clear at that stage of the manuscript.

Part 2 :

I greatly appreciate the modifications made for this part regarding the first version of the manuscript.

Table 1 :

Space : To highlight that you are considering ‘Atmosphère’, ‘Ocean’ and ‘Sediment’ I suggest to list all your 5 spaces in the example column. Suggestion : Atmosphere Space (AS), Ocean spaces (e.g. Surface layer space (SLS) and Water column space (WCS)) ; Sediment spaces (e.g. Upper (USS) and Lower (LSS) sediment spaces). ‘

Initial position : Suggestion for the Example column, to use the same wording : .. in the ** Surface Layer Space** instead of surface space.

For me the terms ‘pool’ , even intuitive, should be described as well as agent (not as intuitive) that you use several times in the abstract and Introduction.

My understanding is that ‘pathway patterns’ and ‘sub-patterns’ are the same thing. I suggest removing the ‘sub-pattern’ wording here and in the following text to avoid any confusion in the wording.

I do not think the first line of the table with the Mapped example pathways in the base pathway concept is informative, it leads more to confusion in my point of view.

Part 3 :

p4. Ln 114-115 : This sentence is not useful or can be merged with the first one.

p4. Ln 115-116 : Maybe you can try to have a logical order when listing the spaces : up to down (Atmosphere - surface - sediment) or down to up (sediment - surface - atmosphere) .

p4. Ln 117 - 118 : This sentence is really hard to understand as a lot of things are mentioned with no clear definition or point of difference : ‘base pathway’, ‘mapped pathways’, ‘core structures’, ‘core patterns of OC pathways’. It is really hard to get the nuance among the notions. Maybe the ‘base’ pathway concept can be named as ‘litterature-based-pathway-concept’, ‘mapped pathways’ which are the ones you are describing can be named simply ‘OC pathways’, and I do not get the sense and distinction of core structures/patterns.

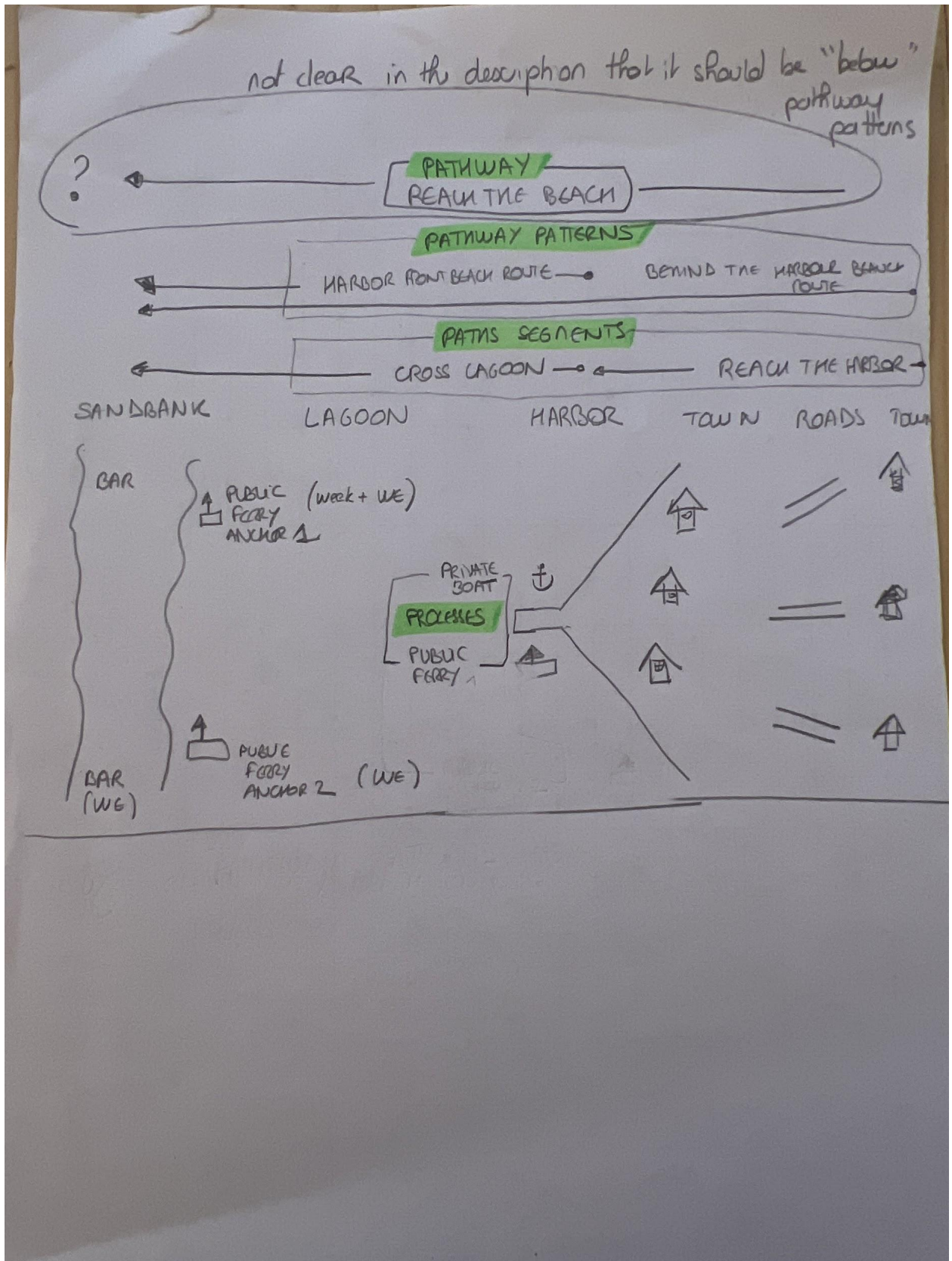
p6. Ln 123 : Following my previous comment, you can use the appropriate appellation ‘ To explain how to compare and condensed litterature-based-pathway-concept and define’

p6. Ln 123 : Once more, what is the ‘core patterns’ meaning ?

p6. Ln 140 : I do not get the meaning of the 'entire-city-beach route'. Following your explanation it should be named 'harbor front beach route' otherwise I do not get why the harbor front beach route is a subordinate of the entire-city-beach route' as it is the same thing.. ?

p6 Ln 144 : Please be consistent in the wording. What route is referring to here ? Path segments or Pathway patterns ?

p6. Ln123-147 : From the explanation you provide, I drew a schematic (Schematic 1). But it seems that the term 'pathways' is not properly placed in my schematic. Maybe it is my understanding wrong, or maybe something is misleading in the explanation. I'll let you have a second look on the text to be sure.



Schematic 1 : Understanding of the analogy with the terminology mentioned in the Text.

p8. Ln188 : For consistency with my comment about Table 1. 'sub-patterns' should be replaced by 'pathways'.

p8. Ln 221 : At the end of the sentence, Are we sure the wording is sub-pathway patterns and not 'pathway patterns' ?

p9. Ln 229 : for consistency it should be 'pathways' and not 'sub-patterns' (See comment on Table 1).

p7. Ln 160 : As you already said in Sect 2 this, I recommend using wording such as ' As previously mentioned, the path segments... ' .

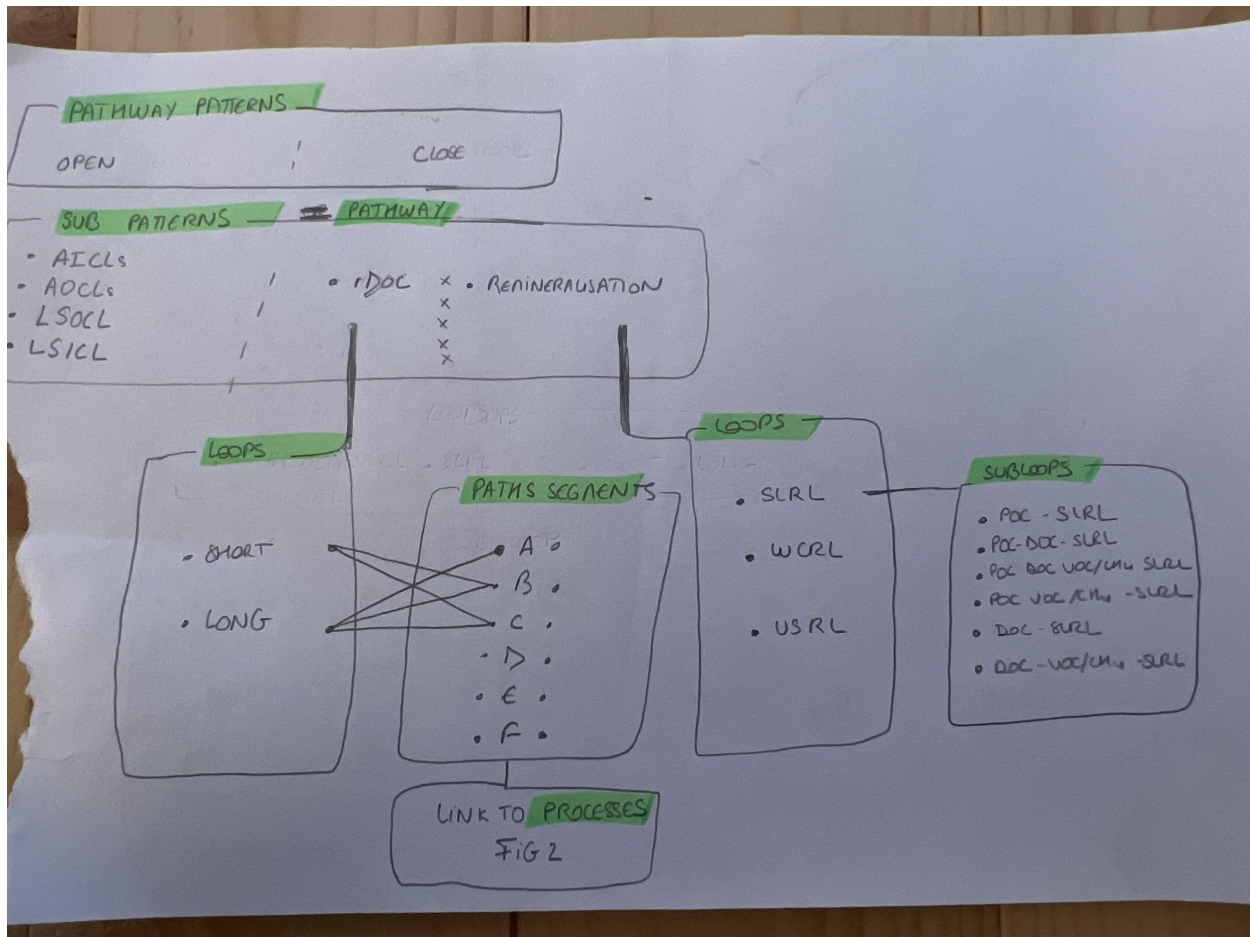
p10 Ln235 to p16 Ln 330 : For consistency with the italic used to characterize pathway and path segments, can we place the processes in italic in the text too ?

p12 Ln. 253 : 'A of (r) DOC in 2) ' . Does the '2' refer to Fig.2 ?

p15 Ln. 287 : I suggest the reading of this paper to add a reference here :Goldthwait, S., Yen, J., Brown, J., and Alldredge, A.: Quantification of marine snow fragmentation by swimming euphausiids, *Limnol. Oceanogr.*, 49, 940–952, <https://doi.org/10.4319/lo.2004.49.4.0940>, 2004

p15 Ln. 294 : The wording here may be misleading. 'sub-patterns' should be pathways, and POC-DOC remineralisation 'sub-loops' ?

p16 Ln. 325 : Instead of sub-pattern, shouldn't it be 'sub-loop' ? (See my schematic 2).



Schematic 2 : Schematic made following explanations and my understanding of the text.

p16 Ln.327 and 329 : Does the term ‘sub-patterns’ refer here to the pathways or to the sub-loops previously mentioned and called-sub-patterns before ?

p16 Ln. 330 : Does the term ‘patterns’ refer here to pathway patterns, or the previous term sub-patterns that are confusing (see previous comment) ?

Figure 1 :

- For consistency it should be ‘pathways’ and not ‘sub-patterns’ (See comment on Table 1) in the legend.

Table 2 :

Uniformize the term ‘sub-pattern/Pathways’ (See previous comments on that point).

Table 3 : It is a great improvement of the first table 3 proposed in the first version, congratulations !

-May I suggest to remove the repetition of the column names (Process, loop syntax, etc.) for each Path segment. The reader may refer to the first one if s/he needs a reminder. Therefore I suggest to place the column names above the first path segments to be clear these names apply for the entire long-table.

-I am wondering if we do not have the same information twice with Fig 2 and Table 3 ? Do we want to keep both, or do we want to choose one of them ? Just a thought.

Discussion :

Entire discussion : To avoid the repetition of the main reference Giering and Humphrey 2020, maybe in the second paragraph of the discussion you can make a statement that mentions that in the following analysis the description of BCP used as reference is based on Giering and Humphrey 2020 ? With this statement the reader will know that further assumption will refer to their work and you would not have to mention it in every paragraph ?

p17 Ln 342 : This sentence is a repetition of the previous paragraph. It should be reswamp if you want to keep the information that relates with your example (F [SLS]).

p17 Ln 351 and 352, 353, 357, 358 , 360: As mentioned before, sub-patterns should be removed and sub-loop should be used (See my schematic 2).

p17 Ln 354 and 358 : Does 'loop' refer to the sub-loop ? If yes please use consistent wording.

p17 Ln346 to 363 : It is not really clear when reading the text and having the Figure 3 under the eyes how the number of loops is determined. In p17 Ln. 348 It is mentioned 'to close the loop' inducing that there is one loop in the panel (a) is misleading of what it is stated at p17 Ln 354 when ' only two loops of the superordinate loops of panels (a)'. Is it possible to have the number of loops associated with the pathway patterns mentioned in the Figure 3 legend ? Similarly, the loops are not easy to see on the Figure pannels, and when the author refers in the text to seven loops or six loops form panels (c) and (d) it is misleading with the numbering of pathway patterns mentioned in the Figure. I suggest either talking only of pathway patterns numbers in the text to fit with the legend of the Figure, or to switch the legend of the figure with the numbering of loops to fit with the text.

Figure 3 :

- The space (SLS) and (WCS) can be placed once on the left side of the figure.
- The term 'Processes' can be placed in bold above biota-induced and physical
- The term 'loops' can be placed in bold above the various loops specified

Supplementary material A :

I really acknowledge the work placed in the construction of this huge diagram, I know the work it asked for and how difficult it is to synthesize it. However, it may be scary at first look. It may look like the electrical scheme of the space shuttle for someone who would like to read/use it, and I would like to provide some ideas to maybe improve the visibility of this work, as I was not able to review it properly due to its complexity and difficult visibility. However, as it is a supplementary material I do not see it as a mandatory requirement for publication of this work if you want to keep it that way.

- First Review the arrow legends, as some are placed below the arrows and are sometime difficult to read (e.g. Coastal in the sediment part 'Consumed macrophytes' below the black arrow) ;

- Some of the text are missing space between words (e.g. Coastal ‘Carnivoresand detritivores’)
- Some of the arrow descriptions are similar, maybe you can manage to have the same infos placed where the arrows merge ? (e.g. Coastal, Sinking of resting stages).
- Why don't you use boxes for Fecal pellets, bacteria and Virus ?
- As you refer to ‘benthic carnivores’, what imply ‘Benthos’ ?
- Why only referring to mammals ? You may refer to the upper trophic levels to be as general as possible ?
- Shouldn't ‘Pahotrophy’ be Phagotrophy ?
- Physical Transport is written numerous times (with some typo (Physical)), but it is already linked to blue arrows that are mentioned in the legend as physical-induced, so maybe there is no need to write it down ?
- Does ‘Autigenic’ shouldn't be Authigenic ?
- Is it possible to have this huge diagramm ‘interactive’ ? Is it possible to have in the legend the SLRL loop display for example, and when someone click on it is only the SLRL arrows and boxes and infos that appear for a better visualization?

Supplementary material B:

- In the box 6, as Pathway pattern abbreviation has already been described in box 4 you can either use the full wording or the abbreviation only but not both, it is confusing.

Editorial/Typo comments :

p8 Ln 189 : Do not use italic for and between the two sub-patterns/pathways.

p10. Ln 232 : Do not use italic for and between the two sub-patterns/pathways.

Legend Figure 1 : “loop” when talking about srDOCL and LrDOCL shouldn't be plural ?

Legend Table 2 : “loop” when talking about srDOCL and LrDOCL shouldn't be plural ?

p12 Ln. 249 : Even if it is the beginning of the sentence, I suggest to force the r of (R)DOC to be in lowercase.

p12 Ln 253 : The path segment A should be placed in parenthesis.

p12 Ln 258 : The path segments A and E should be placed in parenthesis.

p12 Ln259 + all the manuscript+Figures/Tables : Shouldn't be ‘(r) DOC’ instead of rDOC ? Maybe I am confusing the meaning, but please review all the manuscripts and supplementary material if the wording with and without parenthesis means the same thing. If not please mention somewhere the difference between the two ways of writing it.

p12 Ln 267 : The path segment A should be placed in parenthesis.

p12 Ln 272-273 : The path segments A and E should be placed in parenthesis.

p12 Ln 277 : The path segment D should be placed in parenthesis.

p15 Ln 281 : The path segment D should be placed in parenthesis.

p16 Ln 303 : The path segment D should be placed in parenthesis.

p17 Ln 348 : The path segment E should be placed in parenthesis.

p17 Ln 351 and 354 : The path segment E should be placed in parenthesis.

Figure 3 :

- I wonder if the figure 3 would be better if seen as landscape instead of portrait within the page ?

p19 Ln385 : The path segment E should be placed in parenthesis.

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