

Author's Response for RC1

This study aims to investigate the main surface and sub-surface characteristics of several mesoscale eddies observed during eight Seaglider missions in the vicinity of Perth submarine canyon. Although the topics and the applied methodology are promising, the paper reports several unclear or incomplete reasoning (sometimes caused by English mistakes and/or confused phrasing). The results are intriguing but at times appear superficially presented, which may challenge the reader's understanding. Additionally, I have concerns regarding the methodology used for eddy tracking, especially without further clarification from the authors on their rationale for this approach. After a careful review of the paper, it presents as an interesting scientific work; however, it lacks the necessary attention to formal writing and presentation quality. Overall, it seems that different sections of the manuscript may have been written by various authors involved in the study, leading to inconsistencies in style. Despite this, the figures and statistical analyses are impressive, and their discussion is clear and well articulated. Therefore, I believe that this study will likely be a significant contribution after a careful (major) revision and clarification. I also suggest the grammar and the syntax to be better checked and verified to meet the high quality standards required for publication in Ocean Science. Specific comments/suggestions are listed in the attached document. Were a revised manuscript to be sent for another round of reviews, I would take part with pleasure.

Response: We sincerely thank the reviewer for their thoughtful feedback and constructive comments. We acknowledge the concerns regarding inconsistencies in writing style, unclear phrasing, and the methodology for eddy tracking. These have been rectified in the revised paper. The Nencioli et al. (2010) algorithm as it has been used by the UWA research group with good outcomes (Bitencourt et al., 2024; Cosoli, et al., 2020; Kodithuwakku 2024). It should also be noted that the emphasis of the paper is on the vertical structure of the eddies as sampled through ocean gliders. The eddy detection algorithm was used only demonstrate eddy activity within the Perth canyon, basically to construct Figure 1b. As it does not influence the results/discussion we have removed it from the revised version of the manuscript.

In the revised manuscript, we have improved the grammar, syntax, and overall presentation ensuring a more coherent and professional narrative. We appreciate the positive feedback on the figures and statistical analyses, and we will ensure consistency in style and tone throughout the manuscript. We are

grateful for the reviewer's time, and we are confident that the revisions will strengthen the manuscript. A point-by-point response to the specific comments are provided with the revised manuscript.

ABSTRACT

The abstract maybe promises more than you actually find in the manuscript but it works fine. The studied region and the methodology is of huge interest for the oceanographic community and the paper seems exciting. So I was disappointed finding the manuscript a bit hurried.

Response: Thank you for the reviewer's suggestion. We have revised the abstract substantially and believe that the revised abstract address the shortcomings.

Lines 8-10: Check and improve sentences

Response: The sentence has been revised in accordance with the comment.

INTRODUCTION

Lines 26-32: Check syntax and grammar

Response: The sentences have been revised in accordance with the comment.

Lines 54-55: Please improve this sentence

Response: The sentence has been deleted as it does not add any additional information.

Figure 1: Eddy tracks often looks very "geometric", with sharp unrealistic changes in direction. I wonder if a different, more robust tracking algorithm can be used to verify (and eventually solve, if necessary) this issue.

Response: As per general comment – we have omitted Figure 1b and Nencioli method completely.

Table 1: In caption, I would prefer to read "Adapted from ..."

Response: The caption has been revised in accordance with the comment.

DATA AND METHODS

Lines 122-126: In the first sentence I cannot get completely the meaning of your text (the word format is a typo or a verb is missing?). In the second one, I think that L3 is repeated more time than necessary. I suggest to improve product description rephrasing both sentences without repeating L3 several times.

Response: We have revised the whole section for better clarity and reading.

Lines 128-133: Please reorganize this paragraph. I suggest to avoid repetitions and check the phrasing -NASA satellites, for example, do not distribute observations, but acquire. Data are not “applied” in SeaDAS but maybe “processed” and so on.

Response: We have revised the whole section for better clarity and reading.

Lines 137-139: Is this safe? Any reference or sensitivity test about this scaling?

Response: The scaling used in lines 137-139 is supported by sensitivity test results undertaken by Kodithuwakku (2024) an optimal resolution of 0.05° (5.5 km) is effective for detecting eddy features. However, this comment is irrelevant as eddy detection has been removed from the manuscript.

Line 141: I suggest to replace “see below” with “see section xxxx”, and “corresponding” with “co-located”.

Response: The sentences have been revised in accordance with the comment.

Line 144: you already provided the symbol, you can use it avoiding to repeat relative vorticity

Response: The sentence has been revised with symbol in accordance with the comment.

Line 152: As mentioned above, I wonder if the tracking algorithm proposed by Nencioli et al. (2010) is still the best option for your purposes, also considering that it was not developed for altimetry products. Three eddy detection and tracking methods (i.e., the Okubo–Weiss, vector-geometry, and winding-angle) algorithms can be usually applied for eddy identification and tracking with different

performances as showed, for example, by Xing and Yang, 2021 (DOI: 10.1175/JTECH-D-20-0020.1). Then, several advanced techniques have been presented in the last two decades, also taking advantage of deep learning. In such a context, I would like you motivate your choice about Nencioli et al. (2010).

Response: As mentioned above we have omitted Figure 1b and no longer require eddy tracking. The emphasis of the paper is on the vertical structure of the eddies.

Lines 155-156: Cannot understand. Please rephrase.

Response: The sentence has been revised in accordance with the comment.

Lines 156-159: Please avoid repetitions, for example merging the two sentences.

Response: The sentences have been merged to avoid repetition as per the comment.

Line 170: “fitted”, I would prefer “equipped”

Response: The sentence has been revised in accordance with the comment.

Line 173: “In this study”, I suggest to go to line 174 and start here a new paragraph.

Response: A new paragraph has been started from line 174 as per the comment.

Lines 181-182: I suggest to move this up, to line 174 – "In this study, we analysed temperature, salinity, depth, and chlorophyll-a fluorescence observations collected during eight Seaglider missions carried out between October 2010 and January 2017 (Table 2), to study the vertical characteristics of mesoscale eddies”.

Response: The sentence has been moved to line 174 as per the comment.

Table 2: "Glider mission ID and total deployment period" sounds better for column 3

Response: The column title has been revised as per the comment.

RESULTS

Line 189: KE was already defined in the previous section. If this represents the same parameter you can just use the acronym

Response: The sentence has been revised with acronym in accordance with the comment.

Lines 203-204: What do you mean? Should not?

Response: The phrase "This indicated that the Coriolis force was important in the eddy dynamics" was meant to highlight that the calculated Rossby numbers reflect the dominance of the Coriolis force in both cyclonic and anticyclonic eddies. The sentences have been updated for clarity.

Line 204: "was characterized BY ..." ?

Response: The sentence has been revised in accordance with the comment.

Line 204: I suggest to avoid confusion using SSC and SCC - are they the same parameter? can you make a choice, or avoid acronym for SSC if not used anywhere than in the data section?

Response: The sentences have been revised to use 'Sea Surface Chlorophyll' (SSC) while avoiding the use of SCC.

Figure 2: Can you improve the caption?

First sentence is very confusing and repetitive. Additionally, I cannot read the term "Prime" anywhere in the figure. For prime you mean the letter (not term) with the apostrophe?

Response: The caption has been revised as per the comment. The term "prime" has been clarified to indicate the letter with an apostrophe, aligning with the figure labelling.

Lines 217-218: "(For further ... (2010))" - This is not necessary here in my opinion. You clearly mentioned it in the text. Again, I am not persuaded of using this tracking algorithm.

Response: The figure 1b has been removed.

Figure 3: Please improve caption, especially in the first two sentences.

Response: The caption has been revised in accordance with the comment.

Lines 243-246: Please check this sentence: a comma or a pronoun is missing to clearly understand its

meaning.

Response: The sentence has been revised by separating the ideas into two sentences and ensuring proper punctuation.

Line 251: “maximum” or “maxima” ? Also, please go through the text to homogenize formats, deciding if units must be attached or separate from numeric values.

Response: The term "maximum" has been held as it refers to a single peak value rather than multiple peaks. Also, the format has been updated with units separated from numeric values where appropriate.

Lines 253-256: Please, improve style in this important paragraph.

Response: The sentences has been revised in accordance with the comment.

Line 257: Can you use a better term then "encompassing" here?

Response: The term "encompassing" has been replaced with "including" to enhance clarity.

Lines 263 and 266: I suggest to avoid repeating similarly if possible.

Response: The repetition of "similarly" has been avoided by restructuring the sentences.

Lines 269-271: Missing verb or wrong syntax. Please, improve.

Response: The sentences has been revised in accordance with the comment.

Line 272: I don't get the meaning of this sentence. Please improve!

Response: The sentences has been revised in accordance with the comment.

Lines 295-296: Respect to what ????

Response: The sentence has been revised to clarify that the observed characteristics are relative to the surrounding waters.

Lines 302-303: Please, improve this sentence. Verb, comma or pronoun is missing.

Response: The sentences has been revised in accordance with the comment.

Figure 7: As for previous figures, please improve caption!

Response: Figure 7 differs from the previous figures in content, so the caption has been kept as it is to maintain clarity.

Line 344: better “from 18 to 21 March 2015”

Response: The sentences has been revised in accordance with the comment.

Lines 359-361: Please improve this sentence.

Response: The sentences has been revised in accordance with the comment.

Lines 362-364: Please improve.

Response: The sentences has been refined to enhance the clarity.

Line 373: better “from 17 to 19 Nov 2016”

Response: The sentences has been revised in accordance with the comment.

Lines 388-389: Please check this sentence

Response: The sentence has been revised to improve clarity.

DISCUSSION

Lines 400-401: Please, use commas!

Response: The sentence has been revised in accordance with the comment.

Line 410: “over the period” reads better.

Response: The sentence has been revised in accordance with the comment.

Lines 431-434: Please, improve these sentences.

Response: The sentences have been revised in accordance with the comment.

Lines 445-446: Please improve, for example “The expected lower chlorophyll concentrations within anticyclonic eddies were not observed”.

Response: The sentence has been revised in accordance with the comment.

Line 451: Please use “to” or “with”

Response: The sentence has been revised in accordance with the comment.

Lines 486-487: I suggest to rephrase as "ranged from ... to ..., and from ... to ..."

Response: The sentence has been revised in accordance with the comment.