

# Review of Emma Bent: “Exchanges between the Ross Sea and the Antarctic Circumpolar Current happen at the Pacific-Antarctic ridge”

Reviewer: Markus Reinert

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## My impression of the article:

*The article is very well written, it is nice to read and easy to understand. With its logical and clear structure, the paper guides the scientific reader to an interesting result. Language and typesetting of the article are on a high level.*

## Main results of the article:

*The article presents a numerical study of the water exchange between the Ross Sea and the Antarctic Circumpolar Current (ACC). By analyzing the trajectories of particles virtually released in the Ross Sea, the author shows that the main exchange occurs above the Pacific–Antarctic ridge. The exchange of water is more efficient at the surface than at depth. There is no strong seasonality of the water exchange. The author concludes that geostrophic flow is the main driver of the water exchange.*

## A) Overall content:

1. Is the overall purpose of the study and/or central question clear?
  - *Yes, the purpose of the study is clearly presented in the Introduction.*
  - *One new question is raised in the Discussion (“Ekman transport or geostrophic flow”), which should have been mentioned in the Introduction, too.*
2. Does the interpretation of the findings answer the overall question of the paper?
  - *Yes, the important question concerning the mechanisms responsible for water exchange is answered clearly.*
  - *The Introduction also mentions the hypothesis of an “increase in transport”. However, the paper is about the transport mechanism in general, not about an increasing transport. So this question is left unanswered, but that is merely an issue of one particular word, not of the article itself.*
3. Is every paragraph and sentence in the paper relevant to the overall question?
  - *Yes, every paragraph is necessary.*
  - *The only sentence I consider irrelevant is the third sentence of the Results section, which states an tautology: “This shows us that initially 100% of the particles are located in the Ross Sea.” This sentence could be removed or merged with the following sentence.*

4. Are there portions of the text that could be omitted?
  - *No, generally all portions of the text are necessary.*
  - *An exception is the formulation “We can see that” in the second paragraph of the Results section.*
5. Is the overall organization of the paper clear and effective?
  - *Yes, the paper is well organized. It has a classical structure of Introduction–Method–Results–Discussion–Conclusion, which is well suited for this article.*
  - *For a little suggestion, see my answer to question A1.*

## **B) Individual sections:**

1. Does the title adequately represent the content of the paper?
  - *Yes, the title clearly states the main result of the paper. I consider it well chosen.*
2. Does the abstract clearly and concisely summarize the paper and state the main results? Does it contain all needed information (context, need, task, object, findings and conclusion)?
  - *Yes, the abstract summarizes the paper clearly; it contains all necessary information and no unnecessary information.*
  - *As requested by some papers, the abstract does not use the first person (I/we); however, this hides the contribution of the author: sentence 2 starts with “recent studies” and the next sentence is formulated in a passive voice, which sounds like it belongs also to “recent studies”. Suggestion: start sentence 3 with “In the here presented study, the transport has been studied ...” or something similar (or use the active voice if permitted by the journal).*
3. Does the introduction provide enough context to the readers? Does it state the need for the work? Does it state clearly what has been done to address it?
  - *Yes, the situation is explained clearly and raises interest for the scientific question. The objective and methods are introduced briefly to prepare the reader for the following parts of the paper.*
  - *My suggestions for small improvements are given at questions A1 and A2.*
4. Does this paper put the progress it reports in the context of existing published work? Is there adequate referencing and introductory discussion?
  - *Yes, many papers of different authors are referenced.*
  - *In the Introduction, references proving the importance and interest of the phenomenon are given.*
  - *In the Discussion, the obtained results are compared to other publications.*
  - *Also the hypotheses made by the author are supported by references.*
5. Are the material and methods used in the study clearly explained? Can you point out what is special, unexpected, or different in the approach compared to existing published work? Does it contain too many technical details?
  - *Yes, the methods are clear.*
  - *What is special about this study, is that they use two experiments at different depths to compare transport in the upper layer with that in an intermediate layer. This approach actually gives interesting results by showing a clear difference between the two levels.*

- *Another novelty is that the author finds that they have to modify the usual definition of the southern ACC boundary; the formulation “more north than usual” at the end of the second paragraph in “Method” only becomes clear in the last paragraph in “Method”, so it would be good to add “as explained later” or similar, so that the reader is not left in suspense.*
  - *All and only those technical details are included, which are needed to understand the study and which are helpful for the informed reader.*
6. Is the results sections clearly and concisely written? Are there logical and smooth transitions between sections, subsections and between paragraphs
- *The Results are brief and concise, all interpretations are in the Discussion.*
  - *The transition between Method and Results is good; also the transition between the first and second paragraph of the Results section is clear. There is no obvious transition between the second and third paragraph, but that is not a problem, since the first sentence of the third paragraph makes it clear that a different idea is discussed.*
  - *In the caption of both figures it is stated that the “panels have different y-axis”, which is a very good and valuable comment that helps the reader to understand the figure more easily.*
  - *In the last paragraph and the caption of Figure 4, the word “probability density function” is used, although a histogram is shown. The correct terminology is used later in the Discussion.*
  - *The monthly histograms at the bottom of Figure 4 are only mentioned in the Discussion, but should be mentioned in the Results section, too.*
7. Does the conclusion clearly state the most important outcome of the work? Does it address the questions stated in the Introduction? Does the conclusion just summarize the results or does it interpret the findings and explain what they mean?
- *The Conclusion clearly states the most important outcome of the work and addresses the questions of the Introduction.*
  - *The only exceptions to this are given in my answer to questions A1 and A2.*
  - *In the Discussion, the results are summarized, interpreted and compared to the literature. Furthermore, the meaning of the results is explained clearly.*
  - *In each of the last two paragraphs of the Discussion, one could try to put the key result of this paragraph into its first sentence*
  - *I suggest to avoid the word “discrepancies” in this context in the Conclusion (second paragraph), because the word sounds like “contradiction” to me. I suggest to use a formulation like “open questions”.*
8. Are the interpretations and conclusions adequately supported by the evidence presented? That is, are the assumptions valid, is the methodology sound, is the evidence adequate, and do the conclusions logically follow?
- *Yes, there is a logical flow between ideas.*
  - *The methods seem sound to me.*
  - *The evidence is clearly and convincingly presented.*
  - *To make the evidence even better, it is necessary to simulate more particle releases at different locations. The author wisely anticipates this possible point of criticism in the Conclusion.*

- In the Conclusion, the phrase “we could use salinity as a diagnostic” could profit from a more detailed explanation of what the author has in mind.
9. Are all parts of the text, references, graphics and tables necessary for the new results and main points to be understood?
    - Yes, all parts of the text are well chosen to support the key message.
    - Figure 1 is useful for readers who are not specialists of the Southern Ocean, but could be omitted if space is tight.
    - Figures 2, 3, 4 are clearly necessary since they transport the key messages.
    - Every reference is cited at least once in the text. The title of every reference seems to fit into the subject of the article. I thus conclude that all references are necessary.
    - Octopus could be made a reference instead of a footnote.
    - The reference “The southern ocean in the earth system” by Rintoul lacks a publisher.
  10. Are the graphics and tables clear and their captions self-explanatory?
    - The figures are clear, their size is appropriate, their resolution is good.
    - The captions contain useful hints for the reader like “All panels have different y-axis.”
    - The labels in Figure 2 are very nice and helpful.
    - The captions explain the figures, thus each figure with its caption is self-explanatory. The key messages of the figures are often stated only in the full text and not explicitly in the caption. That is probably because the key messages are quite long.
    - It is not evident and thus slightly confusing why Figure 4 uses four different colors, when one would be enough.

### C) Sentences and Wording:

1. Can you find grammatical mistakes?
  - Abstract: “freshening trend in **the** years” (“the” missing)
  - Abstract: “Numerical particles ... and **were** advected” (“were” missing); it should be “were” and not “have been”, because “were advected” is also used in the following sentence.
  - Introduction: “the surface waters of the southeast Pacific (...) have cooled and freshened” (no comma in front of “have”)
  - Introduction: The following sentence sounds poetical but is grammatically incorrect to my knowledge: “North of the Ross Sea flows the ACC”. Correct is “The ACC flows north of the Ross Sea” (although less cohesive).
  - Method: “Our study region representing the Ross Sea is closed” (no comma)
  - Method: no space before a colon (“:”)
  - Discussion: “Thanks to two releases” – I would not use “thanks” in this context; better: “due to” or just “with” or “by taking”. The author uses “thanks to” correctly in the Acknowledgments.
  - Discussion: “Whereas in the 50-m run, ...” – this phrase lacks a verb.  
Suggestion: “In the 50-m run, however, ...”
  - Discussion: better use “highlight” instead of “enlight”

- *Discussion: “latitude (140°W)” – it is longitude.*
  - *Conclusion: write “Firstly” and “Secondly” instead of “First” and “Second”, to be consistent with “Lastly”.*
2. Can you point to sentences that loose you (too long/complex) and do you have suggestions for improvement?
    - *Method: The following sentence could be made clearer by extending it with the words in bold: “We conduct two experiments with 12 releases of 10 000 particles **each**, 1 **release** per month ...”.*
    - *In the second paragraph of the Discussion, the first sentence should separate more clearly the observation from its explanation. Suggestion: “... than the 255-m run; that is due to ...”*
  3. Are generally the action in verbs, characters in subjects and subjects near verbs? Can you find counter-examples? Can you point out misused nominalizations?
    - *Yes, actors are generally in subjects and actions are in verbs close to the subject.*
    - *Introduction: I would write “increased transport” instead of “increase in transport”.*
  4. Is the writing cohesive? Does it flow well? Is the part of the sentence that links to the previous sentence at the beginning or the end?
    - *Yes, sentences are linked well with the linking part at the beginning.*
    - *The writing is cohesive and flows well.*
  5. Are the paragraphs coherent? Do the first and last sentences of paragraphs match? Can you find counter-examples?
    - *Yes, paragraphs are coherent.*
    - *The third paragraph of the Introduction travels a bit far from its subject by saying that the ACC is the strongest current in the world, but it gets back to its initial sentence at the end.*
  6. Is there an abusive use of passive voice?
    - *No, there is no abusive use of passive voice in the main part of the paper.*
    - *Depending on the requirements of the journal, the passive voice could be avoided in the Abstract, see my answer to question B2.*
  7. Can you find a lot of useless words/phrases?
    - *No, not a lot, only those mentioned at questions A3 and A4.*
  8. Can you find complex words that could be replaced by simpler ones?
    - *Abstract/Introduction: I consider the term “concomitant” difficult; suggestion: “together with” or “accompanied by”.*
    - *Method: I find the expression “uneven vertical levels” not completely clear for readers who are not familiar with the particular model. If it conveys the same meaning, I suggest to write “vertical levels of non-uniform depths”.*
  9. Can you find too complex subjects?
    - *No, my reading was not disrupted by subjects that are too complex.*
  10. Can you find inadequately used adverbs/repetition/excessive hedging?
    - *Repetition was only used to make helpful connections between sentences and thus to increase readability.*
    - *The author hedges his results a bit at the end of the Discussion:*

- “Our results similarly **suggest** that ... **are expected** to affect”
- “This **suggests** that bathymetry ...”.

The author should say directly what they conclude from their observations, just like they do it later in the Conclusion: “We therefore **conclude** that bathymetry **must** play an **important** role ...”

11. Is the use of tenses (past/present/future) adequate?

- Yes, the use of tenses is generally adequate.
- In the Method section, past tense might be more suitable than present:
  - “To test our hypothesis, we **carried** out ...”
  - “We **conducted** two experiments with 12 releases ...”
- In the following two sentences, the perfect tense should be replaced by simple past:
  - Introduction: “On the other hand ... have shown ...” (showed)
  - Discussion: “The importance of bathymetry ... has been discussed by Thompson and Sallée ...” (was discussed)
- In the Conclusion, instead of “we would carry”, I think it is better to write “we will carry” (to describe a plan) or “one could carry” (to make a suggestion).

## D) Other comments:

I like how the citation style denotes the year in brackets in normal text but separated by a comma if the whole citation is already in brackets. This avoids double brackets – good style.

I suggest the author to have a look at the LaTeX package “siunitx”, which is very helpful for typesetting units in a LaTeX document. It ensures that the value is not separated from the unit and it correctly puts a space before a percentage sign.

I suggest to use the LaTeX package “csquotes” to typeset nicer quotation marks.