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Biogeosciences
Discussions

Interactive comment on "Application of a Lagrangian transport model to organo-mineral aggregates within the Nazaré canyon" *by* S. Pando et al.

Anonymous Referee #1

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General comments

This paper presents a novel approach to the study of particle transport in submarine canyons. The methodology presented here combines different modelling techniques aiming to simulate the most fundamental physical oceanographic processes affecting aggregates in the coastal areas. The authors put forward an impressive revision of the knowledge around submarine canyons and have a clear idea on the fundamental questions around the aggregate dynamics in these geological features. The work is mostly theoretical in nature, but it stands as an irreplaceable way to understand the dynamics in such complex systems, because the simulations integrate the main phys-

ical processes governing the dynamics of aggregates. As such, this approach can be used to interpret past (field) results, but it can also be used to advance a number of hypotheses to be test in future work. In addition, this methodology can be applied to set up field experiments. The paper is generally well written, although it needs clarification in some places. It is well structured, and the aims of the work are clearly explained and detailed. The work presented in this paper merits publication, for its potential as a study tool for the dynamics and fate of aggregates in coastal areas. Some comments and suggestions are advanced in an attempt to make the paper clearer and more solid. Authors are encouraged to consider the suggestions in a constructive way, and if they disagree with some observations, the reviewer expects positive feedback.

Specific Comments

Introduction

- This section is too extensive and some paragraphs are too big. This is, in part, because some ideas are repeated. The section will gain objectivity if properly trimmed; - A conceptual model for the fate of aggregates in submarine canyons is provided, but it is a little bit confusing. Authors should consider using bullets to summarize the main components/processes of this conceptual model; - Please set a paragraph to clearly state the objectives of the work. In the actual state of the paper the objectives are mixed up with some generic observations.

Material and methods

- This section is adequately organized and even though the modelling details are not given, the references provide the source for most model architecture and implementation details. For its importance in the paper, there is just one point that needs to be better explained, namely the residence time. As it is now (p.454, l.22), it is not obvious if the time is for all particles to leave the box or if it is a mean time. Please make this concept clear. - Different horizontal viscosities are advanced for each level and no explanation is provided for this choice. - Consider changing the name of this section to

"Methods"

Results

- I suggest authors to summarize the major results in section 3.1 in a table

Discussion

- I would like to see a clear justification or a hypothesis to why the aggregates with 2000 um show a distinct behaviour from the other size classes.

Conclusion - I suggest some changes in this section, namely, removing some generalist observations about the model, and the inclusion of specific conclusions regarding the dynamics of aggregates (i.e., what does the model results help to explain or clarify). - Suggestion of topics to address: more active areas/depths, relations between aggregate movements and energy, particle size behaviour, transport patterns...

Acknowledgements

- Following the trend of most open-access publication nowadays, I would suggest to authors to include in this section a brief mention of each author contribution to the work.

Figures

- Figures 3-5 and 8-10 must be significantly bigger in the final document. Otherwise the text in them will be impossible to read.

Technical Corrections p.448 l.5: please rephrase this sentence to avoid repetitions: "...patterns of the organo-mineral aggregates along the Nazaré canyon comparing three different classes of organo-mineral aggregates." l.8: "suspended matter is resuspended.." Suspended matter is, by definition, in the water column. As such, this observation must be changed to something like "deposited matter is resuspended.." l.9: This sentence starts in the same way as the previous: "The results showed..." Please change. Also, I suggest changing to present tense instead of past tense: "The

results show..." l.15: please change to "between the shelf and open ocean has been the focus.."

p.449 l.7: "Consequently" is more appropriate than "Hence" l.8: This sentence must be changed. The budget is by definition the balance of sinks and sources. "Global carbon budgets" for instance. l.13: "hydrodynamic processes interacting with the bottom topography..." Please explain. l.18: Please change to "circulation, for example, will..." and "will mostly concentrate organic material..." l.21: "the largest canyon in the Portuguese coast.."

p.450 l.15-20: please rephrase this sentence (is done... is done..) l.25: A new paragraph should start here

p.451 l18: This sentence (However...) is anecdotal and should be removed. l19: This sentence cannot start with 'hence' because it is not a logic following of the previous statement. Also, the sentence is confusing and too big. l23: the other way around: to assess if our numerical model agrees with the present conceptual model

p.452 l.4: "from the 500 m at the Nazaré beach.." this is confusing. l.7: correct "embraces. a.." l.8: suggestion: "starting at 50 m and extending to the depth of 2700 m.." l.11: This observation (The canyon cuts..) needs to be properly explained. How the rugged topography intensifies hydrodynamic processes? How is the tidal energy trapped? l.25: The first sentence of the first paragraph of subsection 2.2 must be rephrased.

p.454 l.22: "The residence time is the temporal interval..." (for example)

p.455 l.16: "15 days spin-up.." (no need for the quote) l.25: In this description it is not clear what are the box properties and the particle properties. Please make this clearer.

p.456 l.5: "was displaced" or "was placed/located"? l.12: The sentence starting with "the monitoring boxes.." is incomprehensible. This is the methodological section and this seems to be a result (some were escaping..). If not, what does this means? l.16:

"the followed nested levels.." or "the following nested levels"? p.20: change to "inside each box for the spring of 2009 is..."

p.457 l.1: change to "(due to transport)" l.11: The sentence starting here is confusing. I suggest to stick to the simulation day and not to the expression "and 28 days later.." l.26: I suggest "...by the model for an initial period of 22 days, the half-life of fresh phytodetritus (Thomsen et al., 2002), and.."

p.458 l.3: Please rephrase this sentence "The 4000 um size..." l.10: The first paragraph of this section belongs to the material and methods. l.15: Mean average of particles in the box? The concept of velocity must be clarified.

p.459 l.13: "longer displacements" should be changed. l.16: what is a "long displacement"? Long compared to what? l.18: The sentence "hence, at canyons head..." must be rephrased because it has a poor construction

p.460 l.2: "...canyon functions.." better expressed as "this section of the canyon is an area of deposition.." l.17: please change "the 2000 um ones.." to "aggregates with 2000 um systematically..." l.25: check this sentence "As our simulation..." because it needs some improvement.

p.461 l.16: Observed by whom?

Interactive comment on Biogeosciences Discuss., 10, 447, 2013.