

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-400

Morane Clavel-Henry (Referee)

Referee comment on "ROMSPath v1.0: offline particle tracking for the Regional Ocean Modeling System (ROMS)" by Elias J. Hunter et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-400-RC1>, 2022

General Comment

In the following paragraphs, the editor(s) and the authors will find an assessment of the Manuscript of Geoscientific Model Development named "ROMSPath v1.0: Offline Particle Tracking for the Regional Ocean Modeling System (ROMS)".

To my general understanding, the manuscript presented an updated and upgraded version of an Offline Particle Tracking model and described the impact of the main code modifications on the simulations.

The Model Development presented in the manuscript has several consequences, with mainly an improvement of the OPT model precision. Overall, I have no general remarks on the contents and core of the manuscript. The scientific approach and applied methods are valid. I think the manuscript is well balanced and has a clear structure. Nonetheless, I need some quantitative explanations when comparing the simulations of different scenarios. Indeed, while the results of the manuscript mainly relied on visual explanations (maps of particle distributions), some metrics could be more informative and clear (see Specific comments). Additionally, in the Discussion, I expected that the study's results would be compared with existing publications. As for the manuscript format, I found it well written except for a few confusing sentences (See Technical comments). I would like the authors and the proofreading service to specifically care about the spacing mistakes (lack of space or double spaces) that were recurrent in the manuscript.

Specific comments

L.93-94: In that statement, I am curious about one thing: what about ROMS models that have a small spatial extent and, somehow, have a less pronounced curvilinearity; thus, potentially small errors in the coordinate interpolation? Would the performance of ROMSPath be still better than LTRANS? That is something I would have liked to see discussed as it has significant consequences for the choice of the software.

Figure 1: this figure should be put in a supplementary file. It is not a graph showing novelty and can be easily found on the website of ROMS.

L.114: Your hydrodynamic refinement ratio is 7:1. It is stated that a ratio higher than 5:1 can degrade the model performance (e.g., doi: 10.1016/j.pocean.2004.07.017 and within references). Was the hydrodynamic model verified on that point?

Table 1: 1) I need a rationale on why "2", "30", and "90" days transport duration and the particle number of "3285", "6000", and "32000" have been selected. 2) For the vertical experience (i.e., Vert. LTRANS and Vert. ROMSPath), I got confused. Please, indicate the depth range and also indicate that the release is made of evenly distributed points along a segment instead of "Line" (For example: Evenly distributed points between X and Y depths). As for "Point", please, indicate the coordinates instead of "point".

Section 3.3: I think that you should add in each section if you used both the parent and child hydrodynamic models (i.e., DOPPIO and SnailDel) to track particles or just one of the hydrodynamic models. See below)

- In line 286, you said you used the DOPPIO model for online tracking of particles (i.e., ROMSFloat). Did you also only use DOPPIO fields for particle tracking with LTRANS and ROMSPath?
- In sections 3.3.2 and 3.3.4, did you use DOPPIO and SnailDel, or just DOPPIO?

Sections 4.1 and 4.2: the main result (or global outcome) from the tests should be put on the first line of the paragraphs. In these two sections, I had an introduction of the figures instead of the main findings.

Section 4.1: the results from ROMSPath being closed to the online simulation ROMSfloat should be a valorised outcome of the manuscript. I expected a few comparisons with peer-reviewed studies that could have compared online and offline particle tracking simulations. Consider also my first comment (for L.93-94).

L.338-339: Is it relevant to write about a result when neither the methods nor supporting graphs are shown? It confused me because I am not sure what you refer to by this statement. I suggest removing these two sentences or to provide an annex with methods, results, and discussion.

L.352-354: Please, note that this is a non shown result that took half the paragraph of section 4.2. I think this result is interesting to have at least a supplementary figure and a short explanation of the method in 3.3.2.

Section 4.3.: 1) Considering the results relied only on visuals, I would have appreciated, in complementary, to have quantitative information such as a spatial aggregation index or the surface that contained 95% of particles at day X and per scenario. It would quantify the idea of "more horizontal dispersion"(L.366) and at least put some contrast between figures 6e and 6g. 2) Regarding the particles advected in the estuary with 'Nest/No Turb' but not with 'No Nest/No Turb', a small discussion would be welcomed. I don't know the surface of the Delaware Bay but I easily guess that the resolution of the Doppio is too coarse for capturing the water circulation as the SnailDel can do. Hence the importance to do particle tracking simulation using the parent and child grid of hydrodynamic models in intertidal zones.

Figure 6: Please, be considerate of colour-blinded people and avoid having green and red on the same graph.

Section 4.4: Here too, I would appreciate some elements of discussion including comparison with peer-reviewed studies. This is an interesting result, which, beyond including it as a Model development, can have consequences for particle modelling in shallow marine areas in the future.

Technical comments

L.16: "now", it looked like ROMSPath was already introduced before and this manuscript is going to present upgrades of the OPT. Please, remove.

L.18: "ROMSPath enables simulated particles to pass between nested ROMS grids, which are an increasingly popular tool to simulate" here, I think "tool" is not adequate for presenting the use of two ROMS grids. Maybe a "scheme" or a "module".

L.30: a reference about the use of OPT in search and rescue is needed (e.g., doi: 10.1016/j.oceaneng.2021.110098)

L.35: I am confused. You "limited" your approach to 4-dimensional hydrodynamic model output. It can suggest that more than 4 dimensions exist. Did you mean you "focused" your discussion on 4D instead of using fewer dimensions?

L.36: Please, add references.

L.37: I think it should be clearer that you are talking about online particle tracking. "at model run time" can be slightly confusing because both "hydrodynamics" fields and "particle trajectories" are from a model. In other words, at first read, it is not evident which type of model "at model run time" points to.

L.88: "Necessary". Please, remove. In the paragraph, it is not clear which "necessary" parameters are needed.

L.154: The formatting of Hunter and Visser's citations should be improved: "Hunter et al. (1993) and Visser (1997)".

L.157: "unrealistic particle clustering". Please, include a reference for your statement.

L.194: "as is the case 'here'", do you mean "in your simulation"?

L.260: "following equation 3.3.5 in Phillips (1966)".

L.291 and L.292: "two similar runs" and "at the same location". Please, remind your reader that your simulation parametrisations are similar to the previous test (section 3.3.1).

L.311-312: "at 1 meter below the sea surface" why did you not indicate that precise statement at l. 286 too?

L.312: What does the "NJ" abbreviation stand for, and why do you use an abbreviation

just once?

L.314: "released particles"

L.363: Please, remove "fairly".

L.364-365: "The addition of the nested SnailDel grid in 'Nest/No Turb' is revealing. This sentence sounds empty. Please modify or delete.

L.365: "similar" To what it was similar?

L.368-369: "The time-averaged, near-bottom currents at the mouth of Delaware Bay are into the Bay[...]". Please, reformulate.

L.390: Please, remove: "also"