

Geosci. Model Dev. Discuss., author comment AC2
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Reply on RC2

Elias J. Hunter et al.

Author 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-AC2>, 2022

Referee 2,

Thank you for your comments on our manuscript titled "ROMSPath v1.0: Offline Particle Tracking for the Regional Ocean Modeling System (ROMS)". We appreciate the positive response to our work and the useful criticism below. We will address these point-by-point. Reviewer comments are in bold.

Line 101: Include a comparative analysis of the number of particles that run aground in order to support this claim.

Results will be in section 4.1. For the cases of the LTRANS OTP vs ROMSPath OTP. 34% of the LTRANS particles are identified as passing through a "Land" grid cell at least once. . As opposed to ROMSPath which is <0.01%

Lines 284-286, 291, 312: How was this specific method chosen? Was there sensitivity to using starting positions in different parts of the domain, for example? Were these based on dynamics or patterns observed in previous analyses?

This is copied from a reply to Dr. Clavel-Henry. Referee #1

There are three sets of conditions listed in table 1. A) A 2-day run with 3285 particles. B) A 30-day run with 6000 Particles. C) A 90 day run with 32000 particles.

Case A is used to illustrate the vertical clustering issue with LTRANS relative to ROMSPath. 3285 is the number of particles evenly distributed throughout the water depth of the initialization point. While the simulation was run longer, 2 days is sufficient to illustrate the clustering issues. While the clustering is easily identifiable after 6 hours, the added time simply highlights the point.

Case B is used for a number of cases, in sections 3.3.3 and 3.3.4. Most related to nesting. 30 days was chosen as it was sufficient time to particles to enter and leave the snaildel domain. 6000 particles was used as a starting point for these runs, to minimize computational time while maintaining a coherent patch for analysis. With more particles

added if needed. 6000 particles proved sufficient for coherent particle patches after 30 days.

The run time for Case C was increased to 90 days to allow for the possibility of particles traversing leaving the shelf. The number of particles in Case C was increased to 32000 due to the 90 day run time, as a decrease in coherence as the footprint of the particles is expected as time increase. Previous work suggested particle numbers in the 20k-30k range would suffice. 32000 was chosen for computational reasons unique to our computing cluster.

This information will be added to the revised manuscript

Line 329: What does it mean that "The ROMSPath OTP output is always closest to the ROMS floats output"? Is this at each time, on average, or also for each particle trajectory? Please specify and quantify this distinction.

We will clarify this in the text. See Below

Line 340, Figure 4: Include additional quantitative support to summarize this comparison, such as dispersion, offshore transport, and trajectory of the center of mass.

Center of mass is shown in panels 4a and 4b, An additional figure quantitatively summarizing the primary result will be added and is attached. Following Simons et al, 2012. We calculated particle density distributions (PDD) for each model over time. Then the correlation coefficient between PDD's. i.e. ROMSfloats to ROMSPath and ROMSfloats to LTRANS. The LTRANS correlation coefficient drops below .7 in 10 days. The ROMSPath stays above .9 for 25 days and stays above or around .7 for the remainder.

Simons, R. D., et al. (2013). "Model sensitivity and robustness in the estimation of larval transport: A study of particle tracking parameters." Journal of Marine Systems 119-120: 19-29.

Line 393-394: It is hard to see from this figure that the particles tended to be closer to shore. Is there a statistic you can use for comparison, such as the mean distance from shore between the two, or the mean water depth of particles to test the significance of this observation?

The center of mass of the simulation with stokes drift is approximating 9 km to the northwest (320 degrees) of the simulation without stokes drift. Additionally, in the Stokes case, 57% of the particles were in depths less than 50m, compared to 38% of the simulation without stokes drift.

Line 405: Where is the improvement in "efficiency" with ROMSPath relative to LTRANS demonstrated in the results section? Also, is the improved "accuracy" in relation to the native ROMS result? These two points should be clarified in the text of this summary.

Although measurements of efficiency depend on a number of factors, ROMSPath compute time for the simulations shown in Figure 4 were at least 20% faster than LTRANS. Under certain configurations ROMSPath was 400% faster than LTRANS

There are 2 comments I will respond to separately.

Thank you,

Eli Hunter

Please also note the supplement to this comment:

<https://gmd.copernicus.org/preprints/gmd-2021-400/gmd-2021-400-AC2-supplement.pdf>