

Geosci. Model Dev. Discuss., author comment AC3
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Reply on RC2 Continuation

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.,
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Continuation,

Lines 377-379: Comment on the implications, and how this compares across particle tracking models (note, this relates to the previous comment re: Line 340). For example, is there evidence to suggest that the increased dispersion apparent with including small scale hydrodynamics through nesting and turbulent parameterizations in ROMSPath simulations improves the accuracy of this model compared to other formulations?

A detailed skill assessment of ROMSPath is outside the scope of this study. Hence we were unable to measure the accuracy of the dispersion compared to observations. It is common practice for OTP models to include parameterizations for horizontal and vertical turbulence, (Van Sebille et al. (2018), North et al (2008)) and not novel to ROMSPath. Support for nested grids, however, is novel. The addition of the refinement grid increased dispersion in our simulations by 30% in simulations with no turbulence parameterized. And by ~10% for simulations with turbulence parameterized. Thus including the refinement grid impacts horizontal dispersion in a significant way. And should be considered in cases when smaller scale features are common, such as near the mouth of an estuary. We note this in the manuscript revision.

van Sebille, E., et al. (2018). "Lagrangian ocean analysis: Fundamentals and practices." Ocean Modelling 121: 49-75.

North, E., et al. (2008). "Vertical swimming behavior influences the dispersal of simulated oyster larvae in a coupled particle-tracking and hydrodynamic model of Chesapeake Bay." Marine Ecology Progress Series 359: 99-115.

Summary (i.e. Line 403): Can the authors comment on the results and features of ROMSPath in the context of other OPT applications (e.g. Lines 39-41), and in the context of previous works?

Given the context of the manuscript (a description improvements/new features, to an existing OTP) the summary focuses on highlighting those differences i.e. LTRANS vs ROMSPath. We will include a few notes on the features ROMSPath provides as compared to OTP models more broadly. Such as nested grid support, advection on the eta/xi grid,

and the inclusion of Stokes drift.

We will also comment on a few studies directly comparing online vs offline particle tracking for the same model run. e.g. Wagner et al. (2019) and Cassiani et al (2016). And comments on the importance of stokes drift. (Monismith and Fong(2004)) and (Pareja Roman et al. 2019)

Cassiani, M., et al. (2016). "The offline Lagrangian particle model FLEXPART–NorESM/CAM (v1): model description and comparisons with the online NorESM transport scheme and with the reference FLEXPART model." *Geoscientific Model Development* 9(11): 4029-4048.

Wagner, P., et al. (2019). "Can Lagrangian Tracking Simulate Tracer Spreading in a High-Resolution Ocean General Circulation Model?" *Journal of Physical Oceanography* 49(5): 1141-1157.

Monismith, S. G. and D. A. Fong (2004). "A note on the potential transport of scalars and organisms by surface waves." *Limnology and Oceanography* 49(4): 1214-1217.

Pareja-Roman, L. F., et al. (2019). "Effects of Locally Generated Wind Waves on the Momentum Budget and Subtidal Exchange in a Coastal Plain Estuary." *Journal of Geophysical Research: Oceans* 124(2): 1005-1028.

Thank you,

Eli Hunter