

Interactive comment on “Technical note: On the importance of a three-dimensional approach for modelling the transport of neustic microplastics” by Isabel Jalón-Rojas et al.

Anonymous Referee #3

Received and published: 9 April 2019

In this study, the authors propose a comparison of dispersal model outputs for the transport of buoyant marine debris in a semi-enclosed bay (Jervis Bay in Australia) under three frameworks: (i) a two-dimensional depth averaged advection scheme at the surface layer, (ii) a three-dimensional advection scheme with “weak” vertical mixing and (iii) a three-dimensional advection scheme with “strong” vertical mixing. Vertical mixing is formulated using a different vertical diffusivity parameter. Horizontal diffusivity is kept equal between frameworks, so the results are only affected by the inclusion of a third dimension and the effect of random walk vertical mixing. The authors present a series of interpretation of their numerical modelling results discussing distribution, connectivity and transport of Lagrangian particles.

C1

Overall this is a well written manuscript with a clear explanation of numerical modelling methods and the figures are very informative. I would recommend this study for publication in Ocean Science after a few minor revisions. Mainly I would be careful in the conclusion drawn by the authors. Since this is purely a numerical modelling study with no ground-truth data and validation of the model, the authors cannot conclude that a 3D approach is “providing more-accurate predictions”. What this study shows is that including a three-dimensional component to a dispersal model alters the connectivity between different marine compartment for marine debris transport in coastal areas.

An interesting result is how the “strong” vertical mixing scenario leaks particles offshore which could explain natural sorting of plastic debris in coastal environment. The authors should further discuss this as well as the relation between vertical mixing and characteristics of marine litter (type, size, buoyancy etc..). I don’t think the manuscript as well as the title should focus only on microplastics. Some findings of this study could apply for larger “young” object. Vertical diffusivity of marine debris likely changes with its characteristics, thus the comparison between “weak” and “strong” vertical mixing is an evidence of natural filtering for the transport of marine litter offshore. The authors should emphasize this point. Finally, the formulation and the amplitude of particle beaching is not clearly explained in the manuscript and nor is the influence of vertical advection (W velocity). The authors should provide more details on these aspects.

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2018-136>, 2019.

C2