Answer to Reviewer

We would like to thank the reviewer for his/her comments and suggestions. In the following, we provide our responses to each point raised.

1. The beaching parametrization could be further clarified.

- **What shoreline interaction threshold was used?**
- **The justification for using a high beaching factor is reasonable, but it would be helpful to state the typical range of beaching factors to give readers without prior context a basis for comparison.**

Both these considerations have been further clarified in the new version of the manuscript. Elevated probabilities indicate a high retention potential typical of rocky, vegetated, or geomorphologically complex shorelines (e.g., 80%), while reduced coefficients are associated with gently sloping, sandy beaches that favor particle re-entrainment into the water (e.g. 20−30%). The shoreline interaction threshold for which beaching can occur was set at 3m below surface.

2. The discussion of residence time could also be further clarified.

- **My understanding is that the boundaries of the outer region go to the edge of the model domain. The revised manuscript says that particles that exit the domain are not included in the residence time calculation. If so, only particles that exit the outer region into the intermediate region are included in the residence time calculation, which could lead to a significant bias in the residence time results for the outer region.**
- **From the drawing in figure 1, the water-covered area in the outer region appears to be substantially larger than in the inner region. The different areas of the regions could impact the residence times. It would be helpful for the authors to briefly comment on the impact of region size on the residence times.**
- **Error bars on figure 7 would be helpful to understanding the variability in the residence times.**

Thanks. This is a great question. We changed the three areas to be almost the same size (65 km2), and the outer region is now distant from the domain boundary (see new Fig.1). The new residence times have been calculated and shown in Fig.7, along with the error bars as indicated. The results do not change quantitatively, except in the outer region, where the residence times values were reduced as expected. These results indicate that residence times are weakly sensitive to the exact size of the regions and mainly depend on their spatial location within the domain.

3. Along with the previous reviewers, I think that a brief comment on how Coriolis affects the Ría with references would help readers unfamiliar with the area to understand the publication.

A brief comment and references have been added in the first paragraph of section 3 referencing Otto1975, Chase1975, Roson1997, as well as a reference to Gilcoto2007 when commenting Fig 3.

4. The discussion of figure 5 should remind readers that the number of particles released is correlated with the river discharge.

This has now been added to the discussion on figure 5 to remind the reader about this point.

5. The time lag discussion is very interesting. This suggestion is very much up to the authors, but it may be helpful to put the results in a map so that readers can quickly understand where the time lags are the highest. Alternatively, the beaches could be renumbered based on proximity to the river mouth.

Thanks for your suggestion. We could not think of a proper way of showing the time lag distribution on a map in the time given. However, as suggested, the beaches have been renumbered based on proximity to the river mouth. Consequently, note that Table 1 has also been reordered, as well as some references to concrete beaches along the text.

6. The discussion of the limitations of the study is very useful. One additional consideration that may be worth mentioning is wind mixing of microplastics, since high wind conditions would lead to strong windage effects in the model but may mix microplastics down into the water column (e.g., Kukulka et al, 2012).

We have now added this consideration and the suggested reference in the Conclusions.

7. The authors note that their findings significantly deviate from Cloux et. al. 2022 due to a difference in particle release position. It would be helpful if the authors explicitly stated how their findings differed from Cloux et. al. 2022, so that readers unfamiliar with the prior work can understand the comment.

A brief explanation of the main differences between the presented work and the results of Cloux et al. (2022) has now been added to the Conclusions.

REFERENCES

Chase, J. (1975). Wind-driven circulation in a Spanish estuary. *Estuarine and Coastal Marine Science*, *3*(3), 303-310.

Gilcoto, M., Pardo, P. C., Álvarez-Salgado, X. A., & Pérez, F. F. (2007). Exchange fluxes between the Ría de Vigo and the shelf: A bidirectional flow forced by remote wind. *Journal of Geophysical Research: Oceans*, *112*(C6).

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Rosón, G., Álvarez-Salgado, X. A., & Pérez, F. F. (1997). A non-stationary box model to determine residual fluxes in a partially mixed estuary, based on both thermohaline properties: application to the Ria de Arousa (NW Spain). *Estuarine, Coastal and Shelf Science*, *44*(3), 249-262.