We would like to thank Referee #1 for the interest in our work and the effort spent on reviewing our manuscript. The insightful comments are highly appreciated. In this interactive discussion, we address the general comments; a new version of the manuscript will be submitted with the final revision.

Comment 1. What is the spatial and temporal resolution of POM? What is more or less the size of the first sigma layer for the 2D approach and how does it compare to the mentioned 5m layer thickness (page 2, line 7)? Assuming the layer is narrow(<5m), do the results differ if you average over the first two or three surface near layers? How does the 2D layer thickness compare to the average particle depth from the 3D approaches (0.7 and 2.5 m, page 3, line 17/18)?

The spatial resolution of POM is 500 m around the bay and the temporal resolution is 0.12 s. All the model details are described in the mentioned reference Sun et al. (2017), but we will include more details in the revised version.

The model uses a total of 21 sigma layers, so the depth represented by a given sigma layer changes significantly over the space as a function of bottom depth. This can be observed in Figure 1 for the fifth and twelfth sigma layers (depths higher than 20 m has not been detailed for a clearer representation inside the bay). We can see that the 5m surface layer thickness is represented by the layers 1-5 near the mouth while it is represented by layers 1-12 in the inner bay. So, we cannot average a given number of layers to represent the 0-5m layer thickness, especially if we also take into account the outer bay. In this paper, we are comparing the 3D approach with the typical 2DH approach used in many previous papers that considers particles floating in surface water and only uses surface currents. The only realistic way to represent the surface waters in the 2D approach for a shallow system as Jervis Bay is using the first layer. However, in the revised version, we can better describe depths/layer thickness for the 2D and 3D approaches and discuss the differences with the typical setups for deep ocean models.

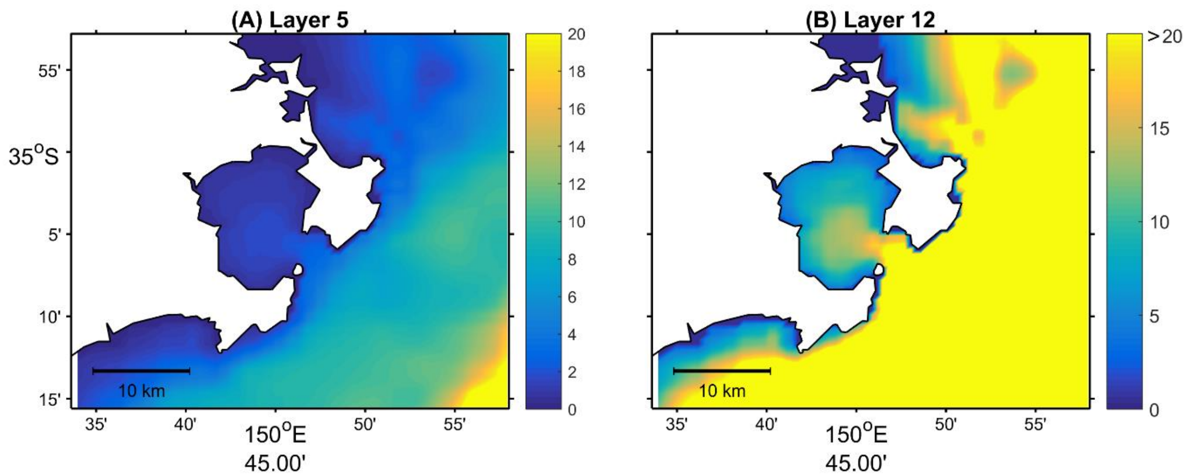


Figure 1. Depths at sigma layers 5 (A) and 12 (B).

Comment 2. On page 3, line 4 it is written that your aim is not to discuss typical patterns of the microplastic transport and sinking in Jervis Bay. To which extent are your findings transferable to other regions? Do you think that under certain circumstances a2D approach could be sufficient?

We agree that we can be more specific. In the revised version, we will precise that our study focuses on coastal shallow waters when relevant. For example, the mentioned statement will be modified as (bold): "*the aim of this work is not to discuss the typical patterns of microplastics transport and sinking in Jervis*

*Bay; it is a case study to explore the implications of a 2D approach on the simulation accuracy of neustic-microplastics transport **in coastal shallow waters***"

We already discussed under which main circumstances our findings would be transferable and a 3D approach would be recommended: stratified systems, high turbulence, under upwelling and downwelling conditions, when simulating non-buoyant particles.

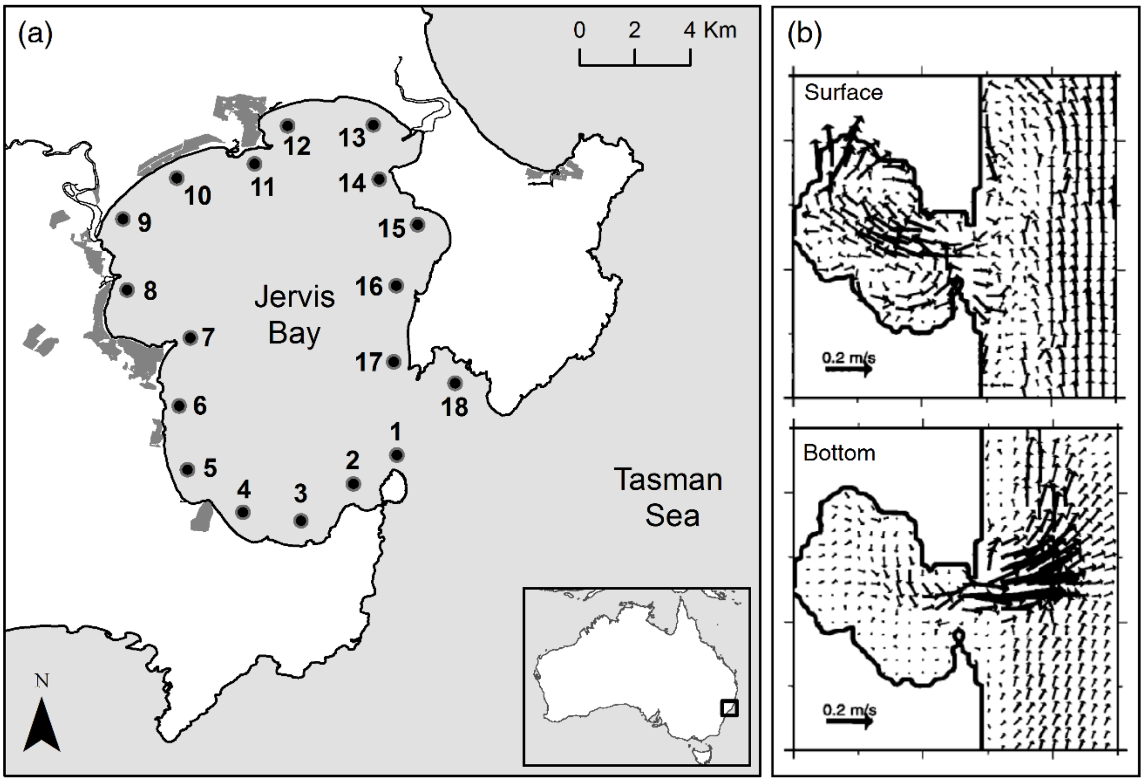
However, we will elongate this discussion and give more details in the revised version:

- We can discuss that our results are transferable to other stratified coastal systems such as estuaries characterized by a density circulation.

- Even if our study focuses on coastal shallow water, surface oceanic water are also characterized by vertical current shear (e.g. wind and wave-driven Ekman flow, density-driven processes, Lund et al., 2015; Lanotte et al., 2016) that could influence the trajectories and final fate of microplastics. Only a 3D approach can consider vertical current shear. A 2D approach could be sufficient when vertical current shear is negligible.

Comment 3. How are the hydrodynamic conditions inside the Bay? Is it possible to find different periods with different hydrodynamic conditions (stratified, mixed) to generalize more the findings?

The hydrodynamic conditions inside the bay were described in page 3: "*During this simulation period, Jervis Bay was characterized by its typical circulation pattern: clockwise and anticlockwise circulation in the northern and southern regions, respectively. The flow exchange through the entrance was highly stratified, with near-surface inflow on the southern side and deeper outflow on the northern side*". In the revised version, we will include a subplot showing the hydrodynamic conditions in surface and bottom waters:



This is thus the typical circulation of the bay. Conditions can change (coastal trapped waves, upwelling, cooling events) but all these processes are baroclinic (e.g. Wang and Symonds, 1999; Sun et al., 2017; Liao and Wang, 2018), so the 2D approach is not suitable in coastal systems such as Jervis Bay. However, the bay is much more stratified at the mouth than in the inner bay. The 2D and 3D approaches are compared for these different regions and differences discussed. However, we could put more emphasis on the revised version. Our conclusions are transferable as articulated in the previous question.

Comment 4. Do you have information about the turbulence from POM? How does it compare to the vertical diffusivity coefficients used for the transport model?

The model uses the turbulence closure scheme described by Mellor and Yamada (1982) for vertical mixing coefficients, which is a time variable. The transport model uses the typical constant diffusivity coefficients typically uses in the literature because our objective is not evaluating the real conditions of Jervis Bay but the potential range of conditions that can occur in these environments. We could include more details about POM in the manuscript if required.

Comment 5. The density, the size, the shape and the buoyancy of the particles do not go into the study. Can you discuss this point in how far this influences the results? Microplastics contains a large variety of substances and shapes?

The objective of this technical note is to compare the 2D and 3D approaches just for low-dense positive-buoyant neustic microplastics. The motivation is that previous works only modelled the transport of this type of microplastics using a 2D approach. As discussed in the manuscript, our results suggest that "*the vertical movement of particles induced by other physical processes, such as **particle sinking (in the case of non-buoyant particles)**, upwelling and downwelling, could also affect the horizontal transport of microplastics, even in a higher degree, and a 3D approach could be mandatory*" (page 6, lines 29-32). So we already mentioned that we expect that buoyancy has even a higher impact on microplastics trajectories, but we cannot give more details at this point.

However, we also pointed that "*Further progress on microplastics modelling requires thus the development of three-dimensional models that consider the particle sinking, which in turn depends on particle physical properties (density, size, shape, Chubarenko et al., 2016)*" (page 6, lines 33,34). And this is effectively what we have done. Based on the conclusions of this technical note, we have developed a 3D model that considers the influence of these three physical properties, but also of biofilm properties and other physical processes such as washing off from the beach. The model description and the discussion of the relative impact of each property/process are the objectives of another manuscript that has been recently accepted with minor revision and we expect that will be published just after this technical note (Jalon-Rojas et al. A 3D numerical model to Track Marine Plastic Debris (TrackMPD): Sensitivity of microplastics trajectories and fates to particle dynamical properties and physical processes, Marine Pollution Bulletin).

Comment 6. Waves are not mentioned. Do you have an idea of its impact and how it compares to the demonstrated differences of a 2D and the 3D approaches?

The impact of waves on microplastics transport is a different subject of study (which we intend to conduct in near future). However, when we discuss the transferability of our results, we can also mention that waves enhance vertical mixing (e.g. Deepwell, and Stastna, 2016) and may also impact the vertical displacement of particles near the surface.

Comment 7. Page 6, line 1: How do you justify your statement that a 3D approach can improve the accuracy? You see from your study the different outcomes of the different setups, but not how they compare to reality. Particle physical properties (page 5, line 35) are not taken into account.

We acknowledge that the lack of observations is a shortcoming of this study. Future work is in progress to apply for funding to conduct field work in Jervis Bay in order to validate the 3D model prediction. This study compares the two approaches by considering the 3D approach “as a reference solution” (page 2, line 12), closer to real conditions, and we evaluated the potential consequences of using a 2D approach, the typical approach used in previous studies. We will modify this statement in the revised version by emphasizing the assumptions of this work. As discussed in Comment 5, we expect that the 3d approach will be even more important for negative-buoyant particles and this result has motivated a new study that will be published very soon.

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