

Biogeosciences Discuss., referee comment RC2
<https://doi.org/10.5194/bg-2021-236-RC2>, 2021
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Comment on bg-2021-236

Anonymous Referee #2

Referee comment on "Modeling submerged biofouled microplastics and their vertical trajectories" by Reint Fischer et al., Biogeosciences Discuss.,
<https://doi.org/10.5194/bg-2021-236-RC2>, 2021

The manuscript presents a modeling study of the vertical distribution and trajectory of microplastics at three oceanic regions characterized by contrasted biological and physical properties. The study builds on the work in Lobelle et al. (2021), including improved parameterizations for vertical mixing and biofilm loss terms. The study is a good contribution to gain insight into the mechanisms driving the vertical transport of microplastics in the ocean. The manuscript is well written, with a clear structure. Therefore, I support the publication of this work.

Some minor comments are given below:

The study is based on several model parameterizations and assumptions. The most important assumptions are discussed in Section 3.4 together with future potential developments. This section is quite pertinent, however, the model performance strongly depends on the calibration of a large number of parameters, a fact that may be further discussed or clarified :

- Parameters of mixing formulation: e.g. roughness scale, wave age, etc.
- Parameters of biofouling formulations: e.g. collision rate, growth rate, etc
- Would the combined use of a different plastic density and biofilm density change the results?
- How is the calibration/validation of NEMO-MEDUSA? Is it sensible to different parameterizations as well?

Kooi's model seems to depend on water physical parameters such as temperature, salinity, viscosity. Did this work consider the seasonal and spatial variability of these parameters or are they just affecting the biofouling parameters in NEMO-MEDUSA? If so, how do they affect the spatial differences of the vertical distribution of particles between the three regions?

Unless I am mistaken, the discussion of results from Appendix D is quite light. Given that the oscillatory behavior of microplastics has not been observed yet, it may be interesting

to elaborate on this scenario that may also represent a "realistic" situation.

Line 25: A new study published in Science (Weiss et al., 2021) reformulates the calculation of plastic fluxes and shows that there may not be this huge amount of "missing plastic".

Weiss, L., Ludwig, W., Heussner, S., Canals, M., Ghiglione, J.F., Estournel, C., Constant, M., Kerhervé, P. (2021). The missing ocean plastic sink: Gone with the rivers, *Science*, 373 (6550), 107-111