

Biogeosciences Discuss., referee comment RC1
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Comment on bg-2021-236

Anonymous Referee #1

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-RC1>, 2021

General Comments

This paper presents valuable contributions to the field of plastic modeling. Specifically, it helps address specific knowledge gaps in the vertical distribution of microplastics by focusing on biofouling, though it also includes other vertical mechanisms. This work goes even further to investigate global and seasonal variations that can impact biofilm growth vertical transport. Overall, the paper is clear and well-written, and I only recommend minor revisions before publication.

Specific Comments

The integration time step is stated to be 60 seconds around line 95. Did you examine the sensitivity of the model to this choice for time step? Is there some other justification?

There is discussion on initial density around line 100 to justify the model choice of 920 kg/m^3 , but this only mentions comparison to particles with lower density (down to 30 kg/m^3). Do you know what would happen for particles closer to the density of water but still positively buoyant such as HDPE?

Around line 180 "We define the biofilm density as 1170 , although the use of a denser biofilm does not change our results." What about less dense than 1170 kg/m^3 ? Why would very heavy diatoms be floating at the surface? Is there a justification for that?

Figures 4 and 5: It might be good in the caption to explain more about the white bar removed section from around 400 m to 2000 m . What would be going on in this region? A continuation of the behavior from 0 to 400 m ?

Though Section 3.4 does a good job addressing the model assumptions, I think it would help to address a few other assumptions. This model relies on the assumption of defouling, which has only been observed in one study, and oscillations have never been experimentally observed. Additionally, this model assumes any biofilm attachment will be significantly denser than the water density. It may be worth addressing this assumption also.

Technical Corrections

Line 5: Phrase "for the physics" is awkward

Line 10: "when the processes affecting the settling velocity of the particle and the motion of the ocean are in equilibrium" it is not clear what this line means

Line 225: "our simulations only include vertical motion (advection and mixing) in order to isolate localised biological and physical effects on vertical particle displacement" this is confusing

Line 235: "This seems contrasting" is awkward, maybe "this is in contrast with the findings..."

Line 305: "hence G_{grow} is the dominant down to the MLD" I think a word is missing here, dominant term?