

### **Overall comment:**

This article aims at studying a model system for motile spherical plankton that takes into account the torque force induced by the fluid inertia (a force that was only recently derived by Candelier et al. 2022). When the assumption of small Stokes number is applied in such a setting, the model greatly simplifies and becomes a special case of the Kessler (1986) model of gyrotaxis. This implies that its dynamic is coincident with the one already known. In fact the gyrotactic model has been studied in the past with the same techniques here adopted, i.e. Voronoi distribution and preferential concentration. It is such special limit that is investigated here by the authors.

The coincidence between the present and the existing classical gyrotactic model has been pointed out by both the previous reviewers, which also requested for a more accurate justification of the limit (small Stokes numbers) addressed in this study.

In their rebuttal letter the authors acknowledge the de facto identity between the present model and Kessler's one. However, they make the point that the physical mechanisms at their origin are different, and that they might have different biological implications. Furthermore, the assumption of the small Stokes is discussed and supported in a quantitative way.

In my view these exchanges with the reviewers and the resulting revised manuscript, highlight a scientific discussion that deserves to be published, as it goes beyond the mere topic of the originality of the model.

I am therefore favourable to the publication of this manuscript, with the following minor modifications.

### **Authors' reply:**

We appreciate the referee's valuable evaluation of our work and we are pleased to learn that the referee considers our paper publishable. Our reply to the referee's comments is listed below. Any new and/or reformulated pieces of text are highlighted in red in the revised manuscript.

### **Comment #1:**

1) In order to remove any ambiguity, still present in the revised manuscript, concerning the link between this model and the one of Kessler, I suggest to amend the following sentences:

Around line 90 "This is analogous to the gyrotactic effect induced by bottom-heaviness, which is typically expressed as ... (Kessler,1986)."

"analogous" -> identical to

Line 137 "As discussed earlier, the fluid inertial torque on a settling swimmer induces an effect similar to gyrotaxis mechanism."

"similar to" -> equivalent to, coincident with

Line 158 : "This is analogous to the effect of bottom-heaviness (Kessler,1986), which also drives swimmers to orientate upward with a time scale  $\Psi$  dependent on the offset of the center of gravity with the center of hydrodynamic forces."

"analogous to" - > the same as

line 180 : "This observation is similar to Durham et al.(2013) where the maximal preferential

sampling is also reached when  $\Psi \approx 1$ .  
“is similar to “ -> clearly agrees with

**Authors' reply:**

We thank the referee for pointing out the issues that should be amended. We have addressed the referee's comments to ensure the connection between our and Kessler's models is correctly stated.

**Comment #2:**

2) It is obvious that the complete model Eq. (1)-(2) would deserve a future study. I suggest that this is mentioned in the conclusions of the manuscript.

**Authors' reply:**

We have addressed the referee's comment by adding a paragraph in the section of conclusions to discuss the necessity of considering the full dynamics of swimmers in future studies.