Reviewer #3 (Robert Marsh)

The authors present an integrated system for tracking satellite-located sargassum subject to currents, waves and winds, with biomass further subject to growth limited by various environmental factors. While this is not entirely novel, the provision of an 'open-source customizable Lagrangian simulation framework' reliant on data available in the public domain, is of potential value to a growing international community concerned with understanding and predicting the proliferation of sargassum. Evaluation of the 31-day drift during July 2024 is rather limited, but more novel is the idealized analysis of basin-wide release (Figs. 6 and 7), revealing seasonality in spatial patterns of biomass gain and loss over 31 days, and the relative local influences of temperature, salinity and nitrate on growth, through July and October. The highly localized influence of low salinity (limiting growth) is a further novel finding.

We thank the reviewer, Prof Robert Marsh, for these kind and supportive comments.

While the manuscript is submitted to Biogeosciences, much of the manuscript covers description and testing of a new system, material equally appropriate to a more technical EGU journal such as Geoscientific Model Development. That being said, the biogeochemical interest here is in the explored sensitivity of simulated growth to three limiting factors. While these are essentially taken from the literature, there is merit in the application in a Lagrangian framework. Given the stated potential feedbacks between sargassum morphology and dynamics at lines 39-40 (varying raft thickness potentially subject to different Stokes drift in particular), there seems scope here to at least demonstrate how this alters sargassum dispersal by allowing mat thickness to vary with biomass (so experimenting with/without the feedback). Figure A1 provides a tantalizing prospect for such exploration, with up to 50% variation of the Stokes drift velocity in the upper 1 m where sargassum resides. With further experiments and analysis, some intriguing interplay of mat biology and dynamics could be revealed.

This is a good point by the reviewer, which was also brought up by reviewer 2. We have now added an analysis of the effect of windage and Stokes drift to the manuscript (section 3.1.2 and Figure 3 on lines 250-258 of the track-change pdf).

A more general comment concerns the considerable uncertainty regarding nutrients as a driver of sargassum growth, notwithstanding a simple reliance on nitrate (see specific comment below). A recent study (Zhou et al. 2026) presents evidence for a post-2021 shift from physical to ecological control (related to nutrient supply). In this new paradigm, sargassum is self-sustained through nutrient recycling local to the mats, supported by the evolving raft ecosystems. While this presents a fresh modelling challenge that I would not

expect the authors to fully embrace on revision, it is worthy of discussion and how nutrient recycling could be incorporated into the framework, at least for experimentation.

This is a very interesting point by the reviewer; we thank him for bringing this new paper to our attention! We have now added a paragraph to the end of the discussion highlighting that our growth model could for example be extended by making nutrient limitation not only a function of the oceanic concentration, but also of the raft's own nutrient content (lines 381-385 of the track-change pdf): "*For example, Zhou et al (2026) have very recently found that Sargassum rafts may be able to cycle their nutrients, so that they may self-sustain their growth to some extent. If more data on the efficiency of this cycling is available, it would (due to the Lagrangian approach) be relatively simple to change the model's nutrient growth factors to not only be a function of the oceanic nitrate and phosphate, but also the particle's own nitrogen and phosphorus content.*"

Specific Comments:

1. The title, 'A Lagrangian framework to simulate Sargassum transport and growth', is rather generic, and does not distinguish this study from similar previous studies; given the key findings summarized in the last two sentences of the Abstract, can the authors think of a more distinct title, emphasizing how this framework provides the fidelity to explore different transport processes and growth limitations?

We have now further sharpened the title to "A customisable and open-source Lagrangian framework to explore the sensitivity of *Sargassum* transport and growth to environmental conditions"

2. Line 125: 'Temperature limitation' rather than 'Temperate limitation'?

We thank the reviewer for spotting this type-o; now fixed in the revised manuscript.

3. Section 2.3: Specify here the wave data used in computing the Stokes drift (as noted in Table B2)

We have now also added wave data in the section (now renumbered to 2.1).

4. Line 184: Should the resolution here be 1/12 degree (rather than ½ degree)?

No, to keep the simulation manageable (and because more particles don't add much more information), we release every ½ degree only.

5. Line 227: Clarify that you release a particle at every gridpoint – I assume this is what is done

See point above; we only release particles every ½ degree. This is already sufficiently fine-grained for the plots in the manuscript – and keeps the computational time (now approximately 20 minutes per simulation) manageable.

6. Lines 289-290: The statement that phosphorus can be neglected as a limiting nutrient (citing Lapointe et al. 2021) seems a rather sweeping claim, given contrary evidence elsewhere in the literature; perhaps moderate this remark

This point was also raised by reviewer 2, and we agree that our remark was too strong. We have now extended our growth model to also include the effect of phosphate, and have adapted our manuscript accordingly (lines 170-174, 275-279, 320-322 and 370-371 of the track-change pdf).