

Interactive comment on “Drivers of the spatial phytoplankton gradient in estuarine-coastal systems: generic implications of a case study in a Dutch tidal bay” by Long Jiang et al.

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This is a well-written, multi-disciplinary manuscript addressing the distribution of phytoplankton and primary productivity in a Dutch estuary. The three approaches (observational, modeling, remote sensing) provide a strong basis for describing phytoplankton distributions and the causes of the patterns. The literature synthesis at the end of the manuscript sets the results of this manuscript in global context. Overall, a strong addition to the estuarine literature.

I suggest that the authors address a few issues that I think are missing: 1. Light limitation of phytoplankton growth is common in estuaries and often occurs in turbid, nutrient-

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rich, low-salinity waters with no vertical stratification. No data are presented on salinity or density in this manuscript, and the authors simply state that there is no stratification, citing another paper. They could be right, and water depth may limit vertical mixing. However, my experience suggests that vertical stratification in spring under high river flow conditions initiates the spring bloom. Even if there are no CTD data available to calculate vertical variations in density, the authors should at least mention the possibility that the low salinity areas with high nutrients and turbidity may be light-limited regions of the estuary.

2. I am surprised that there are no data presented on salinity, temperature, river discharge, and river nutrient concentrations. The authors nicely show that advective inputs of shelf nutrients and phytoplankton is likely to be small, but never explore the role of river inputs. This could be a whole other paper, but they could at least mention that riverine inputs, both freshwater and nutrients, are likely driving the spring bloom. They could do additional model runs with half of the river discharge or half of the river N concentrations, but this might be more work than reasonable. I suspect that vertical stratification in the inner half of the estuary allows algal biomass to accumulate following high winter-spring river discharge. What would the model show if freshwater flow and/or river nutrient concentrations were halved? Can any of the temporal variations in the spring bloom be related to river flow?

3. I made a few minor grammatical or wording suggestions to the pdf of the text and for improvements in the figures that will be easy to address. This isn't a long manuscript, and the above two issues can probably be addressed briefly in 1-2 pages.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2020-40/bg-2020-40-RC1-supplement.pdf>

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