

Comments by Michael Behrenfeld.

C1: This is a well written and interesting manuscript evaluating annual cycles in phytoplankton biomass for a near-shore region with a long time series of high temporal resolution measurements. Results of the analysis show early onset of the annual blooming period, with initiation occurring at annual minimum light levels and accumulation rates for biomass being well explained (given uncertainties in the data) by rates of change in phytoplankton division. This latter finding is a particularly noteworthy demonstration of a fundamental element of the Disturbance-Recovery Hypothesis. The authors clearly have a thorough grasp of the recent literature on phytoplankton blooms and I have only a few minor comments to convey.

AR: We thank a lot Michael Behrenfeld for the positive assessment of our work and for taking the time to review it. We address below all his comments.

C2: On line 31, the citation for the CDH should include Gran & Braarud, T. (1935) "A quantitative study on the phytoplankton of the Bay of Fundy and the Gulf of Maine (including observations on hydrography, chemistry and morbidity). Journal of the Biological Board of Canada, 1, 219–467", as this is the origin of the hypothesis.

AR: Thanks for indicating this reference. We have included it.

C3: Remove 'the' in line 36 so it now reads, "...possible if mixed layer..."

AR: We have removed this 'the'.

C4: Lines 54-56: as 1 – 3 are written as a list following a colon, do not capitalize the first word following each number, add a comma after each of the first two questions, and don't capitalize 'and' before the third question.

AR: We have made these modifications.

C5: In the first paragraph of Materials and Methods, it might be worth noting that measured time series of phytoplankton and environmental conditions are inevitably influenced by advective processes and that no attempt has been made to correct for advection, with some discussion of this issue provided in the Discussion section.

AR: We have included as suggested this issue in relation to advection in the first paragraph of the Material and Methods and added some new discussion. Additionally, we also mention that "our study location belongs to an area where strong winds and tidal currents mix and homogenize the environment, allowing only intermittent stratification in summer (Pingree and Griffiths, 1978; Van Leeuwen et al., 2015). The Stonehaven site is often taken to be representative of this area of the Scottish coastal North Sea, identified as a distinct hydrodynamic region (Van Leeuwen et al., 2015). Nevertheless, advective processes such as the mentioned southward coastal flow (Holt and Proctor, 2008; León et al., 2018) could still create some heterogeneity in the region."

C6: In the third paragraph of Materials and Methods, I was curious why the authors chose to estimate incident PAR from records of sunshine duration from a station 27 km away from the sampling site rather than using satellite PAR data? I doubt the two approaches would yield any significant difference in results, but I was curious.

AR: Although there was not a strong reason, we preferred in situ observational data for the small spatial scale of the studied coastal area, considering that 27 km was relatively close to Stonehaven. As we were interested on the main seasonal pattern, especially in winter, we thought that this would not affect our results. As suspected, both approaches yield similar results (see figure below).

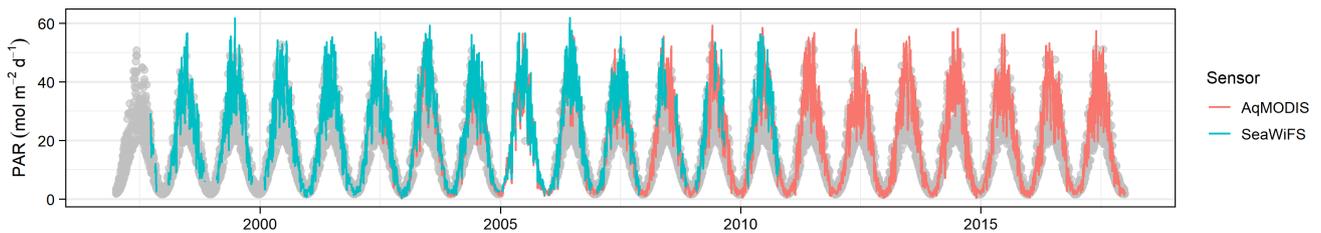


Fig 1. Changes in PAR measured in situ at the Dyce meteorological station (gray dots) or estimated based on satellite observations from a $0.25^\circ \times 0.25^\circ$ bin centered at longitude = $02^\circ 7' 30'' W$ and latitude = $57^\circ 7' 30'' N$ (red and blue lines for Aqua-MODIS and SeaWiFS sensors, respectively). A 7-day running average has been applied to PAR based on satellite data.

C7: Line 83: delete 'occurs' at the end of the sentence.

AR: We have deleted this 'occurs'.

C8: Line 104: rather than just saying 'other variables', why not explicitly state the variables?

AR: We now explicitly state the variables.

C9: Lines 187-188: Can you reword this to be more clear? In particular, I found "...at same time distance..." confusing.

AR: We have changed this sentence to: "Thus, r cannot just depend on μ since mean seasonal PAR levels (and probably the associated μ) are similar around the same number of days before and after the winter solstice"

C10: Line 196: Change to, "Such a relationship..."

AR: We have made this change.

C11: Lines 214-217: Here the authors are commenting on potential explanations for phytoplankton group successions within the overall bulk properties of the community. Might I recommend taking a look at the following two recent manuscripts that discuss this issue in detail: "Behrenfeld, M.J., Halsey, K.H., Boss, E.S., Karp-Boss, L., Milligan, A.J., Peers, G. Thoughts on the evolution and ecological niche of diatoms. Ecol. Monogr. e01457, 2021" and "Behrenfeld, M.J., Boss, E.S., Halsey, K.H. Phytoplankton community structuring and succession in a competition-neutral resource landscape. ISME Comm. 1(1), pp.1-8, 2021"

AR: Thank you very much for recommending us these references. They are very nice papers, full of interesting ideas. We have included these references in the manuscript.

C12: Line 229: change "incorporates" to "incorporate"

AR: *We have made this change.*

C13: Supplemental Note 1, line 16: Change “phytoplankton was sampled” to “phytoplankton were sampled”

AR: *We have made this change.*

References:

Holt, J. and Proctor, R.: *The seasonal circulation and volume transport on the northwest European continental shelf: A fine-resolution model study*, *J. Geophys. Res. Oceans*, 113, doi: 10.1029/2006JC004034, 2008.

León, P., Walsham, P., Bresnan, E., Hartman, S. E., Hughes, S., Mackenzie, K., and Webster, L.: *Seasonal variability of the carbonate system and coccolithophore *Emiliana huxleyi* at a Scottish Coastal Observatory monitoring site*, *Estuar. Coast. Shelf Sci.*, 202, 302-314, doi: 10.1016/j.ecss.2018.01.011, 2018.

Pingree, R. D. and Griffiths, D. K.: *Tidal fronts on the shelf seas around the British Isles*, *J. Geophys. Res. Oceans*, 83, 4615-4622, doi: 10.1029/JC083iC09p04615, 1978.

van Leeuwen, S., Tett, P., Mills, D., and van der Molen, J.: *Stratified and nonstratified areas in the North Sea: Long-term variability and biological and policy implications*, *J. Geophys. Res. Oceans*, 120, 4670-4686, doi: 10.1002/2014JC010485, 2015.