

Interactive comment on “Enhancement of photosynthetic carbon assimilation efficiency of phytoplankton assemblage in the future coastal ocean” by J.-H. Kim et al.

Anonymous Referee #3

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Table 1, 2, Figures 2,3

The authors have photosynthetic parameters from both fluorescence-based rETR rapid light curves, and from PI curves using ^{14}C . I see that the measures were conducted on different days, for logistical reasons.

But could they actually plot the data extracted from the two different approaches? I am not sure how to handle the time offsets, but perhaps a plot of the key parameters vs. time, with a curve fit to see if the patterns differ?

More substantively:

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"The relative electron transport rate (rETR) was calculated as $rETR = \Phi_{PSII} \times \text{irradiance}$. The absorption factor and relative fraction of PSII were not applied to the ETR calculation to avoid ambiguous problems (Ryan et al., 2009)."

Although widely used, the $rETR = \Phi_{PSII} \times \text{irradiance}$ is not calibrated. The P_{max} values from this estimator are a (rough) proxy for electron transport from PSII centres. The measure is not calibrated for the number of PSII centres, nor for the fraction of incident irradiance allocated to PSII. There is no cross section (σ_{PSII}) factor in the estimation, and no factor for the number of PSII centres present.

Therefore, the P_{max} values from these curves are not useful for comparisons across treatments, because σ_{PSII} and the number of PSII could change, with or without corresponding changes in Φ_{PSII} .

So the comparison to the PI curves from ^{14}C measures needs to be more cautious. Discussions of light use efficiency can possibly be based upon the ^{14}C measures, but the only generally comparable parameter that is extractable from the rETR curves is E_k , which is the boundary light between light limitation of PSII electron transport, and light saturation of PSII electron transport.

So I would like to see plots of E_k from the rETR and from the ^{14}C curves, to see how they differ.

Any discussion of P_{max} derived from rETR must be very cautious. It is not calibrated, and is relevant only on a basis of electron transport per PSII, and even then, the units are relative, not absolute.

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