

Interactive comment on “The Arctic picoeukaryote *Micromonas pusilla* benefits from Ocean Acidification under constant and dynamic light” **by Emily White et al.**

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Abstract: Good

Introduction: Good overview of a scattered field.

Figures + legends: Good.

Materials & Methods: "well as with macronutrients in Redfield proportions (containing 100 $\mu\text{mol L}^{-1}$ of nitrate and silicate, and 6.2 $\mu\text{mol L}^{-1}$ phosphate)."

The goal is to understand what *Micromonas* might do in a changing Arctic ocean. So how does 100 $\mu\text{M NO}_3^-$ and 6.2 $\mu\text{M PO}_4^{3-}$ compare to natural levels?

C1

We live in an imperfect world, but responses to an increase in pCO_2 (or to fluctuating light) might be very different under a situation of luxury accumulation of excess protein, vs. nutrient limits on protein accumulation etc. Just dimly remembering that 80 $\mu\text{M NO}_3^-$ is about the equivalent of the Pearl River Delta, so.... pretty high?

I know we face compromises in culture work at getting enough biovolume in a reasonable culture volume, but these points might influence/alter/limit the findings?

In contrast the fluctuating light regime is nicely justified in terms of realistic approximations of the environment.

Eqn. 3 would benefit from an additional set of parentheses around the denominator terms to clarify the order of operations.

Eqn. 4 should use σ_{PSII} , otherwise you are not accounting for any non-photochemical down-regulation of σ_{PSII} under illumination. If I entered the equation incorrectly in Xu et al. 2017, I apologize, my papers have been filled with equations typos lately.

Line 195: Do these dyes enter cells, or stay outside? or both? I am recently learning that superoxide radical has a very short diffusion length, whereas H_2O_2 can move a fair ways.

Results: Line 245 The indicator dyes show the standing pool of reactive oxygen, which is the outcome of production rate - detoxification rate. Picky point, but it is possible the effects result from changes in detoxification, rather than production. Also, standing pool of a ROS species is not necessarily the same as oxidative stress...

Lines 285 etc. increased τ under fluctuating light, compared to decreased flow to POC & growth strongly suggests an induction of dissipative electron transport capacity under fluctuating light, leading to 'dumping' of electrons under the high light periods.

Consider that you actually have all the data to estimate the Oxborough proxy for PSII I-1 (based upon F_0/σ_{PSII}). It is far from perfect, but, if you estimated it, and mul-

C2

multiplied by your e^- PSII-1 s^{-1} , you could get e^- I-1 s^{-1} . Then you can compare electron generation rate with growth rate or with POC accumulation and get an electron quotient for growth. I bet it increases under fluctuating light.

This is perhaps a more defined restatement of your lines 292 etc.

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