



EGUsphere, referee comment RC1

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## Comment on egusphere-2022-947

Anonymous Referee #1

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Referee comment on "Reallocation of elemental content and macromolecules in the coccolithophore *Emiliana huxleyi* to acclimate to climate change" by Yong Zhang et al., EGU Sphere, <https://doi.org/10.5194/egusphere-2022-947-RC1>, 2022

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Dr Zhang and colleagues evaluate the interactive effect of changes on multiple environmental drivers (namely phosphorous concentration,  $p\text{CO}_2$  and light intensity) on the elemental and macromolecule content of the model coccolithophore species *Emiliana huxleyi*. Authors identify that multiple stressors interact on the physiological response of *E. huxleyi* and that underlying mechanisms are complex. For example, authors identify that reduced phosphorus availability results in a reduction of both particulate organic nitrogen and protein contents under low light intensity, but not under high light intensity. Interestingly, reduced phosphorus concentration in combination with ocean acidification result in an increase in both POC and carbohydrate contents only under high light conditions. A large body of evidence indicate that coccolithophores are sensitive to projected changes in oceanic conditions driven by ongoing human-induced climate change, such as ocean acidification and changes in nutrient supply, mixed layer depth and light intensity. Given their abundance and fundamental role in the biological and carbonate counter pumps, changes in coccolithophore performance will most likely have impacts in the oceanic carbon cycle and marine ecosystems. Therefore, there is an urgent need of studies such as the one presented here to evaluate how multiple environmental drivers affect key marine organism in order to predict how ongoing environmental change will impact marine ecosystems. The paper is clearly written, the figures are appropriate and the findings interesting and useful for the scientific community. Therefore, I recommend acceptance of this manuscript after the comments listed below have been addressed.

Lines 84-85. The sentence "These ocean changes expose phytoplankton cells within the UML to multiple drivers," is vague. Do authors mean that environmental changes in the UML will expose phytoplankton cells to physiological stress? Please clarify.

Line 109. Authors could dedicate a sentence or two to the importance/relevance of multi-stressor experiments highlighting that numerous environmental factors will simultaneously change in the future ocean and therefore, this kind of experiments are needed to evaluate the response of different organisms to ongoing environmental change.

Line 149. The specialized reader would appreciate an SEM picture of the coccosphere and or coccoliths either in the main text or as supplementary material.

Line 151. could authors mention the date when this strain was isolated?

Line 510 Coccolithophores play a complex role in the carbon cycle through production and export of organic carbon to depth but also through the carbonate counter pump (releasing CO<sub>2</sub> during the calcification process). Authors should clarify this in the text.

Line 530. Could authors explain (or speculate) about the metabolic process behind the relationship between low light intensity and nitrate uptake reduction?