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Biogeosciences
Discussions

# *Interactive comment on* "Ocean acidification and nutrient limitation synergistically reduce growth and photosynthetic performances of a green tide alga *Ulva linza*" *by* Guang Gao et al.

**Guang Gao et al.**

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Comments: The authors investigated the combined effects of ocean acidification and nutrient limitation on physiological performances, including growth, photosynthetic oxygen evolution, PSII fluorescence parameters, nitrogen assimilation, in a green tide alga, and found that ocean acidification did not affect growth and photosynthesis under the nutrient replete condition but reduced them when nutrient was limited. Nitrogen assimilation was stimulated by ocean acidification when nutrient was replete. The experiments were reasonably performed and the results were clearly presented. This study is of interest, indicating the interactive effects of global and local stressors on a green



tide alga. But there are still some points to be revised before it could be published in Biogeosciences.

Response: We appreciate these comments very much and revised the manuscript based on the reviewer's comments.

Special revisions

1. Why were different cultivation periods used for sporeling and adult thalli? Are these periods enough for algal acclimation to ocean acidification?

Response: The cultures had been finished before the thalli became reproductive as the aim of this study focused on the growth and photosynthesis. Different cultivation periods were used because the periods were different for sporeling and adult to become reproductive. These cultivation periods are enough for Ulva linza's acclimation to ocean acidification (Eggert, 2012; Gao et al., 2016). This information has been added to lines 147-151.

Eggert A. Seaweed responses to temperature. In: Wiencke C, Bischof K, editors. Seaweed biology. Berlin: Springer; 2012. pp.47-66.

Gao G, Liu Y, Li X, et al. An ocean acidification acclimatised green tide alga is robust to changes of seawater carbon chemistry but vulnerable to light stress. PloS one, 2016, 11(12): e0169040.

2. Please clarify the culture density used in this study and to what extent pH fluctuated during the culture period. How to maintain a stable pH in the cultures?

Response: The culture density was less than 0.1 g L-1 and the pH fluctuation was less than 0.03 units. Low culture density and aeration with ambient and CO2-enriched air contributed to the stable pH in the cultures. This information has been added to lines 142-145.

3. Why was the light density of 300 photons m-2 s-1 used for the cultures since lower

levels were used for the previous studies as mentioned in the text. Is the one used in this study close to ambient sunlight?

Response: The samples were collected in March 2017 and the light density of 300 photons m-2 s-1 used for the cultures was close to the ambient light level at the sample collecting site. This information has been added to lines 134-136.

Minor revisions

Line 113 change $\mu$mol to $\mu$mol photons m-2 s-1

Response: Corrected.

Line 123 add a space after 106.1

Response: Corrected.

Line 156 change weight to mass

Response: Corrected.

Line 329 delete activity and be consistent for using NRA or NR activity throughout the text.

Response: Corrected.

Figure 3 change FW to FM in Y axes legend

Response: Corrected.

Figure 7 I doubt there is a significant difference between HC and LC for the treatment of HNLP

Response: No, there is no significant difference between HC and LC for the treatment of HNLP. We apologize for this mistake and it has been corrected.

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