Interactive comment on “Ocean acidification mediates photosynthetic response to UV radiation and temperature increase in the diatom Phaeodactylum tricornutum” by Y. Li et al.

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Reviewer: Abstract: "The ratio of repair to UV-induced damage showed inverse relationship with increased NPQ, showing higher values under the ocean acidification condition against UV-B, reflecting that the increased pCO2 and lowered pH counteracted UV-B induced harm." This sentence is confusing and from the abstract, I am not sure the meaning. I found this sentence confusing, and I did not understand it in the abstract alone. Perhaps: "The ratio of repair to UV-induced damage decreased as the induction of NPQ increased, so the cells induced NPQ as repair fell behind damage. The ratio of repair to UV-induced damage was higher under the ocean acidification..."
condition in cells exposed to UV-B, showing that the increased pCO2 and lowered pH counteracted UV-B induced harm."

Response: We agree with the reviewer in that, “The ratio of repair to UV-induced damage decreased as the induction of NPQ increased, reflecting induction of NPQ when repair dropped behind the damage. The ratio of repair to UV-induced damage was higher under the ocean acidification condition in cells exposed to UV-B, showing that the increased pCO2 and lowered pH counteracted UV-B induced harm.” We have revised the abstract and discussion accordingly.

Reviewer: Phaeodactylum has multiple cell morphologies. Did the authors track the morphological state of the cultures they studied? +/- frustules?

Response: Yes, we examined its morphology under the microscope, and it was seen that the cells’ morphology was unaffected under the OA condition. As a matter of fact, this species has no or mostly undetectable frustule (Lewin, G. C. et al.: Observations on Phaeodactylum tricornutum, J. Gen. Microbiol., 18, 418-426, 1958), so we did not check on this.

Reviewer: Intro - fine. Materials & Methods: Growth light of 70 umol photons m-2 s-1; was this measured with a 4pi integrating sphere sensor or a flat sensor?

Response: It was measured using a flat sensor (cosine response), with the light coming from above. We added the information of the cosine response in Section 2.3.1, line 165.

Reviewer: PAR: UVA: UVB ratio: How was this chosen? Is it based upon values from a particular location?

Response: Yes, the levels of UV-A or UV-B were based on local noontime irradiances (April, 2009; Xiamen, China).

Reviewer: Results: "In order to determine the potential “protecting” role of excess energy dissipation via non-photochemical quenching (NPQ), the variations of the ratio
of repair (r) to damage (k)-r/k," I think better to write: "In order to determine the potential “protecting” role of excess energy dissipation via non-photochemical quenching (NPQ), the variations of the ratio of repair (r) to damage (k), (r/k),

Response: Corrected as suggested.

Reviewer: P. 7206 & 7207; Very similar equations are used to describe loss of photo-chemistry under excess irradiance and recovery after the stress, but in one case the equation a, b, c are described as ‘adjustment parameters’ and in the second case they are described as rate constants. In the second case, I do not think that a, b, c are all rate constants; I think c is a rate constant, a is an intercept and b is scaling factor? Also, I think the authors should spell out how a, b, c relate to r & k, which are the rate constants from the underlying model. I think that during the recovery period, 'k' falls to near zero?

Response: Both a, b, c are “adjustment parameters” in the two equations. To estimate reduction of photochemistry under the elevated irradiance, the model y=a+b*exp(-c*t) was used, and the equation y=r/(r+k)+k/(r+k)*exp(-(r+k)*t) was used to calculate the r and k according to Heraud and Beardall (2000), therefore, by combining the two equations, we obtained the following: a= r/(r+k), b=k/(r+k), c=r+k, to calculate the r and k. During the recovery period under the low light, since 'k' should have been close to zero, the ΦPSII recovered almost to the value prior to the exposure under solar simulator.

Reviewer: P.7211 ‘stimulative’ effects of UVA, not 'simulative' (typo)

Response: Corrected to “stimulative”.

Reviewer: Figure 1: How many times were the treatments replicated? Also, on my screen there is a problem with the triangle symbols - the bottom of the triangle is a white stripe.

Response: During the experiments, three replicates (representing triplicate cultures)
were carried out for each treatment. About the triangle symbols, in the fig.1, fig.2, fig.5, half solid triangles was used.

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