

Interactive comment on “Effects of ultraviolet radiation on photosynthetic performance and N₂ fixation in *Trichodesmium erythraeum* IMS 101” by Xiaoni Cai et al.

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General Comments: Also the ecological consequences in a climate change context must be highlighted in the discussion section as well as including future research that would be necessary to confirm and/or deepen the consequences of the studied effects in C and N cycle on the ocean (see *Trichodesmium* ecological role as C and N source in the ocean, Berger et al., 2012).

Response: we added discussion in Line 510-511: “future research that would be necessary to confirm and/or deepen the consequences of UV effects in carbon and nitrogen cycle in the ocean.”

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Specific Comments

Comments:Introduction The general objective of your investigation is not sufficiently justified, it would be better to connect your work with the need to investigate about the topics that are not explored yet (i.e., UVR effects on N2 fixation) and emphasize the importance of your results in the context of climate change. For example: Because of the importance of Trichodesmium in the input of carbon and nitrogen on oligotrophic oceans, and the lack of studies about the impact of enhanced UVR on the C and N fixation, is that we design experiments : : : : : : : : : :.. In particular, we evaluated the role of UVR in decreasing: : : : : : The UVR doses we used represent realistic values in a current scenario (or future scenario of climatic change by the year : : : : : : : : : :)

Response: we added texts in new line78-80: “Because of the importance of Trichodesmium in the input of carbon and nitrogen on oligotrophic oceans, and the lack of studies about the impact of enhanced UVR on the C and N fixation, is that we design the experiments.”

Comments: Material and Methods 1.-Line 87: I would replace “Estrategy Work” by “Experimental Design”, and start explaining the experiments regarding the study0s objective. For example, “The experiments to evaluate: : : : : : : : : :.were carried on..... as follows:”

Responses: We replace “study strategy” by “experimental design”. And added texts in line 88-90: “The experiments to evaluate how UVR affects photosynthesis and N2 fixation of Trichodesmium were carried on indoor and outdoor as follows:”

2.-Line 154: The specific growth rate is only calculated for days 8 to 11 and 12 to 16. What happened from days 1 to 7 is not shown, nor justified the reasons for that. If your study only assesed the exponential growth phase, it is necessary to define it.

Responses: We added texts to explain it in new line 154-155: “In order to evaluate

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adaptation responses of *Trichodesmium* to natural solar irradiance, all parameters were obtained after one week acclimation outdoor.”

3.-Line 167: The measurement of effective quantum photochemical yield is not justified. It would be clarifying to include a paragraph explaining what this proxy indicates.

Responses: we added texts to explain F_v'/F_m' in line 173-175: “Effective photochemical quantum yield (F_v'/F_m') is generally considered to be light quantum using efficiency. We use this parameter to indicate Photosystem II activity.”

4.-Line 199: Because the procedure for absorption spectra measurement is explained before for *Trichodesmium*, it's not necessary to repeat the same for the other species.

Responses: we added text “as the same method in *Trichodesmium*” in line 208 to illustrate the same measurement as *Trichodesmium*. But in the *Trichodesmium* part I emphasize the Chlorophyll-specific absorption cross-sections (a^*) measurements not the Chl *a* measurement.

5.-Line 239: Acclimatization conditions of cultures instead of culture conditions is better understood

Responses: revised in new line 247.

Comments:Results 1.-Line 286: Because UVACs values before the 10 hours exposure are not shown, it is not clear if the change is referred to time or to differences among PAB, PA and P. In this latter case, it would be better if you explained the idea in the following way: “did not present differences between radiation treatments after exposure: : : : : :”

Response: We added texts : “. . .not present differences between radiation treatments after exposure to UV for 10 hrs.” in line 295.

2.- Line 312: The paragraph is not clear and/or wrong because you talk about long-term UV-A exposure, and the long term treatments were only PAB and P, there was not

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PA. I would replace this paragraph with “inhibition induced by UV-A at short exposures in PAB and P acclimated cells. was..... and higher than inhibition induced by UV-B”

Responses: we revised the text to “However, inhibition induced by UV-A at short exposures was about 58% in both P and PAB treatments and significantly higher than inhibition induced by UV-B radiation (Fig. 6B, $p < 0.01$).” in line 321-325.

Comments: Discussion 1.- It would be necessary to give a better closure to the discussion adding future research (see General Comments)

Responses: we emphasize the future research in the last paragraph: “...future research that would be necessary to confirm and/or deepen the consequences of UV effects in carbon and nitrogen cycle in the ocean.” 2.- Lines 348, 431: The genus *Anabaena* for planktic morphotypes was replaced by *Dolichospermum* since 2009 (see Wacklin et al., 2009) We added the new name in brackets in line 359 3.-Line 412: I would replace “adaptation” with “acclimatization capacity depending on intensity and spectral quality of radiation”. The latter is based on the difference between adaptation and acclimatization terms.

Responses: replaced

4.-Line 429: See Fiorda et al., 2011. It would be very valuable adding their results in the discussion about the change of morphology due to UVR exposure

Responses: We added texts to show their discussion: “... because UVR may affect calcium signaling then the expression of the key genes responsible for cell differentiation”

Technical corrections

Responses: All revised.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2017-106/bg-2017-106-AC2->

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supplement.pdf

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