

Title: Effects of ultraviolet radiation on photosynthetic performance and N₂ fixation in *Trichodesmium erythraeum* IMS 101
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General Comments

The manuscript “Effects of ultraviolet radiation on photosynthetic performance and N₂ fixation in *Trichodesmium erythraeum* IMS 101” describes very interesting work on the effects of UV radiation on bloom-formation cyanobacteria that contributes to the input of N₂ into oligotrophic sea waters (specially tropical and subtropical regions). The results on CO₂ and N₂ fixation decrease in cells exposed to UVR shows the importance of this study in a context of climate change as a larger proportion of the studied negative effects would increase under enhanced UVR doses. This increment would be due to different factors, i.e., a more frequent stratification of the surface layer and a thermocline shallowing, both as a consequence of water temperature increase, and the higher UVR incidence on Earth surface because the ozone hole. Moreover, the study is well done and presented and only some changes in the manuscript need to be done. Therefore, publication of these data in Biogeosciences is fully justified. However, the addition of some important and clarifying paragraphs in some sections (mentioned below) is needed. 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).

Specific 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)*

Material and Methods

1.-Line 87: I would replace “Estrategy Work” by “Experimental Design”, and start explaining the experiments regarding the study’s objective. For example, *“The experiments to evaluate.....were carried on..... 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 assessed the exponential growth phase, it is necessary to define it.

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.

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.

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

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....."

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 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"

Discussion

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

2.- Lines 348, 431: The genus *Anabaena* for planktic morphotypes was replaced by *Dolichospermum* since 2009 (see *Wacklin et al., 2009*)

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.

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

Technical corrections

1.- Lines 255, 293, 303, 304: Be consistent in the used nomenclature, PAR treatment is already defined as P, and UVR treatment as PAB, so use the same terminology for all the cases

2.- Lines 266, 271, 287, etc: As was mentioned above: ultraviolet radiation is abbreviated as UVR, use always the same

3.- Line 277: As was mentioned above: high light acclimated cells: HL; low light acclimated cells: LL

4.- Line 413: Change to *Trichodesmium* instead of *Trichodemium*

5.- Line 472: Remove radiation, PAR already includes this term