

## ***Interactive comment on “Effects of ultraviolet radiation on photosynthetic performance and N<sub>2</sub> fixation in *Trichodesmium erythraeum* IMS 101” by Xiaoni Cai et al.***

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1.Comments: I would move or remove the first paragraph about ozone depletion as it does not flow onto the rest of the introduction. The importance of CB is enough to justify the study.

Response: We have removed ozone depletion part.

2.Comments: Line 160-163: This movement of P, PA or PAB to “another treatment” – but which? You do not specify and this is very confusing. Then in Figure 2 on Carbon and N<sub>2</sub> fixation you also have UVA, UVB and UVR and I have no idea what

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they represent in terms of your treatments. Lines 307 to 324 that detail the results using P', PA', PAB', P, PA, PAB and UVA, UVB and UVR are all confusing.

Response: We have added description in Line 159-161: (namely P grown cells divided into P<sup>+</sup>, PA<sup>+</sup>, PAB<sup>+</sup> treatments; PAB grown cells divided into P<sup>+</sup>, PA<sup>+</sup>, PAB<sup>+</sup> treatments)

3.Comments: Figure 1: why are there no damage and repair rates for P treatment? Values for all three treatments are given in the text (lines 259 to 262) but not in Figure 1C.

Response: We added damage and repair rates of P treatment in Fig 1C and D.

4.Comments: Figure 2: For both carbon fixation and N<sub>2</sub> fixation you calculated inhibition induced by UVA, UVB and UVR and termed this IP, IPA and IPAB. Why not use this terminology in the Figures 2B, 2D? – instead you use two different namings –UVA, UVB and UVR– this is confusing.

Response: We changed namings of UVA, UVB and UVR to IUVA, IUVB and IUVA+UVB in Fig 2 and Fig 6.

5.Comments: Line 274: In your UVB treatment, it includes UVA, right so the treatment is actually UVA+UVB?

Response: there actually three treatments in short-term exposure, one is PAR alone, one is PA (which is PAR+UVA), the other is PAB (which is PAR+UVA+UVB) treatment.

6.Comments: Line 282: “other phytoplankton” is referred to here and in Figure 3A. Given that you are comparing with other cultures, you need to specify in the methods how they were grown and give their full names as they are abbreviated in the Figure itself. Some readers may not be aware of these species.

Response: Yes, I have already given detail information about the full names of those species and growth conditions, which were written in Line 194-198 in M&M.

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7.Comments: Line 294: “addition of UVR significantly reduced the trichome length by 22% and 11%” How can one treatment (UVR) cause two different reductions (22 and 11%)?

Response: this experiment was conducted outdoor, light irradiance was different every day, so as the growth rate, the trichome length was measured on the day 11th and day 15th, on those two days, the trichome length of PAR+UVA+UVB treatment was reduced by 22% on day 11th and by 11% on the day 15th, compare to the PAR treatment. I have modified the sentence to make this statement more clearly in Line 294-295.

8.Comments: Lines 366-368: I think you should cite Neale et al 1998 J Phycol here. One aspect that should be discussed more is that fact that UV absorbing compounds (most likely MAAs) are expensive to make (see Litchman et al 2002) in terms of Nitrogen in particular so this is an interesting aspect that should be discussed given your results. At the end of the paragraph (lines 465-467) would be a good place.

Response: Thanks for your advice, I have cite this reference there. We added the citation in new Line 370-374: A red-tide dinoflagellate *Gymnodinium sanguineum* Hirasaka accumulates about 14-fold more MAAs in high (76 Wm<sup>-2</sup>) than in low (15 Wm<sup>-2</sup>) growth light and the high-light grown ones have lower sensitivity to UV radiation at wavelengths strongly absorbed by the MAAs (Neale et al., 1998). We also added new lines to discuss N limitation and UV sensitivity, in new Line 470-474: On the other hand, the UV absorbing compounds (most likely MAAs) are expensive to make in terms of nitrogen in particular (Singh et al., 2008). Decreased nitrogen supplied may increase sensitivity of phytoplankton assemblages to UV further (Litchman et al 2002), thus potentially creating a positive feedback between N-limitation and the UV sensitivity.

9.Comments: Technical corrections:

Response: All Revised

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Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2017-106/bg-2017-106-AC1-supplement.pdf>

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