

Differential photosynthetic response of marine planktonic and benthic diatoms to ultraviolet radiation under various temperature regimes

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General comments

This paper presents results from laboratory experiments manipulating the UVR (two levels) and temperature to assess the sensitivity of two diatom species to both factors. The experiment was performed during 120 minutes a single time. The study deals with an interesting topic to phytoplankton ecologists, and tries to clarify a relevant question on the differential photosynthetic responses of the benthic and planktonic species in coastal areas against a scenario of global warming. However I find several problems in the manuscript:

The first impression after reading this manuscript is that it is rather long for the type of study done. The topic is interesting, but this is really a snapshot experiment on two hours on two diatoms species. The most suitable presentation of these results would be/could be as a Note and not as a full length paper. On the other hand, this very short-term experiment, with increments of 10 C in temperature, is very unrealistic. Furthermore, a conclusion like this; “the temperature-mediated UV sensitivities might also have implications for phytoplankton in the future warming oceans” seems to me too much speculative.

My main concern is related to the statistical analysis performed in this study which is not suitable to the experimental design performed and to test the working hypothesis. The authors manipulated two independent factors, so they should do a two-way ANOVA.

Also, when authors analysed the effect on variation in the time of the photosynthetic response to light and dim, they should use a RM-ANOVA. Only when they evaluated the temperature effect on the relative UVR inhibition (%), one-way ANOVA is the correct statistical procedure. Moreover, to test their hypothesis, the authors should evaluate the interactive effect UVR and temperature on the two species as well as to quantify the magnitude of these interactive effects. To my impression a wrong test was used. This fatal error determines that the results and discussion must be re-written.

The estimation of the growth rates is confusing. From the description done, it is not easy to understand how was calculated. If I have understood, it was calculated on fluorescence variation in a 1-hour interval of time, so unit cannot be day; Moreover, I think that the fluorescence is not a good proxy of biomass or abundance, therefore these values did not represent an accurate measurement of growth rates; caution should be taken to discuss this result with those from literature generally obtained from changes of biomass or abundance.

In the results section, there is a lack of precision in the description of the results, making them difficult to understand. The authors should consider remove some of the figures (e.g. Fig. 1 and Fig 2). I think that the figures should be regrouped in two panels, one per each specie, it could benefit the understanding of the Ms. You should present the results in a more synthetic way.

I would like to see the results of the statistical analysis in tables, with the df, F and p values. Likewise, the post hoc results should be presented as part of the figures (lowercase letters).

The authors should pay attention to repetition through the text of terms which was defined in M&M (for instance, photosystem II (PSII), damage rate (k) repair rate (r), Effective quantum yield (y) etc... Likewise, the authors should be consistent with the name of treatments (P-exposed not PAR-exposed; UVR vs PAB) through the text; and in figure legends the radiation treatments are written as P or P+UVR whereas in graphs are shown as P and PAB. Finally, the variables should be clearly defined, (e.g. Relative UV inhibition (%) in figures but in line 159 Relative inhibition (%) etc...).

Specific comments

Abstract

It is Ok

Introduction

Line 85-90. This paragraph might seem repetitive.

Method:

Using the Aquapen fluorometer the authors had to remove 4 ml for each measurement (I'm assume that the cuvette is 1 cm), there are 5 measurements in light, 5 in dim plus an initial sample, so in sum about 45ml are needed. How this work if the sample volume had only 35ml?. This needs to be clarified.

Line 104. *both species were inoculated into enriched seawater...* It would be necessary to give more details about the culture medium, please.

Line 110. *Determination of spectra*, What do you mean?

Line 114 . This sentence *The cut- off filters were scanned in the same wavelength range against air as a blank*. I think it is not the suitable place, because it makes the text confusing.

Line 141. A total of 12 tubes (2 species and 2 radiation treatments).....? The temperature treatments were not made simultaneously? Moreover, how were done the measured of acclimated vs. short-term samples? I can't understand how the experiment was performed. I hope to be wrong, but seems that the experiment was not a full factorial. In my opinion, the paper would benefit if an illustration of the experimental design would be included.

Line 169. This sentence "*where P_0 and P_t represent the initial effective quantum yield and yield at time zero and t (minutes), respectively*" is confusing, perhaps is better where P_0 and P_t represent the effective quantum yield at time zero and t (minutes), respectively.

The propagation errors should be applied to calculate the variance of the relative inhibition UVR (as percentage) as well as the variance in the quotient r:k

Results

Lines 181-186. This paragraph should be removed because the data are not very informative

.Line 222-225. I'm sorry, but I don't reach to see what brings to this study the treatments with antibiotic.

This section presents comparisons among different temperatures and radiation treatments which could not be evaluated by one-way ANOVA, and post hoc analysis, except to the relative inhibition UVR variable. See above

Discussion

Line 260-264. This paragraph is very general; I would like to read something about what is the main contribution of this study.

The discussion, probably will be modified after addressing the points and questions related with experimental set-up and statistical analysis.