

Interactive comment on “Assessing the role of dust deposition on phytoplankton ecophysiology and succession in a low-nutrient low-chlorophyll ecosystem: a mesocosm experiment in the Mediterranean Sea” by V. Giovagnetti et al.

V. Giovagnetti et al.

christophe.brunet@szn.it

Received and published: 18 March 2013

We would like to thank the second referee for her/his comments, touching aspects either related to plankton (heterotrophic and autotrophic) succession/competition dynamics, or phytoplankton physiological changes, after atmospheric pulses of new micro- and macronutrients. We agree with all the critics and suggestions made by the second referee, and please find below our responses. Please take notice that line numbers refer to the revised version of the manuscript. We changed the manuscript accordingly and we will submit it in agreement with Biogeosciences journal timing.

C9078

Best regards,

Vasco Giovagnetti and Christophe Brunet, on behalf of all the co-authors.

General comments

The present manuscript deals with the effect of Saharan dust addition on the phytoplankton community of a Mediterranean low-nutrient low-chlorophyll system. The approach is innovative (in situ mesocosms) and the set of data produced on phytoplankton impressive. Indeed both the switch of the different phytoplankton class sizes/groups (assessed by a combination of flow cytometry and HPLC) and their physiology (pigments and photosynthetic activity) were assessed before and after dust deposition in an elegant and convincing way. The conclusions raised by this study are of importance and certainly merit publication in Biogeosciences after some corrections (suggested below) have been made.

We would like to thank the referee for the positive critical evaluation of our study, as well as for the critics and suggestions made, which have been thoroughly considered while correcting the manuscript. Changes and additions in the text are in blue colour (see below).

Specific comments

The introductory part is very complete and instructive on the different aspects the study deals with; few lines on the regulation of the photosynthetic activity in phytoplankton by dust deposition would be welcome.

We would like to thank the referee for this suggestion. Few sentences have been added in the manuscript introduction, in order to cover such aspects (Line 75).

The Materials and Methods are well described although some information, supposed to be accessible in ‘in preparation’ manuscripts, lacks; it would be useful to show a summary of this information in the present study (same remarks for some parts of the Results section where these papers are cited).

C9079

We agree with the referee, and we are sorry for the confusing citations along the text and related lack of information. A table has been added, also accordingly to one of the comment of the other referee, showing the initial environmental conditions, as well as the evolution of the main environmental properties of the studied area during the course of the experiment (Table 1), in order to provide few essential information.

The Results section is rather long and it feels like some parts could be moved to the M&M section (page 19211 and 19214) and some to the Discussion section (top of page 19215).

We would like to thank the referee for this suggestion. Few parts of the Results section have been modified or cut (and merged to the Discussion section), to shorten the manuscript and gain in clearness (Lines 411, 425, and 584).

The part about the comparison between gross and net production could be also merged with the Discussion.

We would like to thank the referee for this suggestion, and we agree with her/him. The comparison between gross and net primary production has been shifted and merged in the Discussion section (Lines 406 and 615).

The part 3.5 is a bit difficult to follow.

We agree with the referee, and we would like to thank her/him for this suggestion. Subsection 3.5 has been modified to gain in clearness (Line 423).

Part 4.1: it would be good to discuss the potential impact of dust deposition of the bacteria/archaea community and how its activity could influence the bioavailability of the fresh nutrient input.

We agree with the referee's comment, and the response to dust additions of the bacteria/archaea community of the studied system was discussed (Line 492). The protocol by which evapocondensed dust was prepared prevented any biotic (bacteria/archaea) input with the dust addition (Guieu et al., 2010b).

C9080

Part 4.2: I do not agree that 'fast regulative (NPQ) responses require energetic nutrient costs' (page 19223, line 20-25). It is the opposite to long-term acclimative strategies: NPQ 'only' needs physical changes in the light-harvesting antenna including the built-up of a transthylakoidal delta-pH and, depending on the group of phytoplankton, xanthophyll conversion (for instance Cyanophyceae do not need such conversion). The xanthophyll conversion requires already existing pigments and co-factors for the involved enzymes (like ascorbate, O₂ and NADPH) which are usually abundant in the cells. I agree that the synthesis of new pigments (both chlorophylls and xanthophylls) needs energy and is probably rather costly on a nutrient basis.

We agree with the referee's comment, and instead of correcting this sentence, we decided to delete it, because it was not giving further insights to the argument (Line 604).

Throughout the Discussion section: the authors might want to use the numerous studies performed in controlled conditions on representatives of the different phytoplankton groups; to give precise examples would help supporting the results of this study which were obtained on a complex system; that would further support their hypotheses on the effect of nutrients (and the coupling between nutrients and light) on the growth and physiology of the different groups of phytoplankton.

We would like to thank the referee for this suggestion. We agree with her/him, and therefore added few sentences and citations to support and strengthen our in field results (Lines 507 and 578).

Technical comments

In general, the language needs to be polished.

We agree with the referee. We are sorry for the language faults/problems within the manuscript. In the revised version of the manuscript, language has been polished, with changes in blue colour.

C9081

We would like to acknowledge the referee for all the valuable suggestions/comments, which have been thoroughly considered during manuscript correction.

Interactive comment on Biogeosciences Discuss., 9, 19199, 2012.

C9082