

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.

Anonymous Referee #2

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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

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(suggested below) have been made.

Specific comments The introductive 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. 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). 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). The part about the comparison between gross and net production could be also merged with the Discussion. The part 3.5 is a bit difficult to follow. 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. 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. 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.

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Technical comments In general, the language needs to be polished.

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