

Interactive comment on “Large clean mesocosms and simulated dust deposition: a new methodology to investigate responses of marine oligotrophic ecosystems to atmospheric inputs” by C. Guieu et al.

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Firstly, the entire MS has been edited by an American colleague.

About the first remark of the reviewer: several manuscripts showing the actual data have been published or are in revision (listed below) and several are in prep (at list 2 of them will be submitted quite soon) and refer to the present manuscript concerning the methodological aspects: it was the decision of the DUNE group to proceed this way because the methodological aspects are important and need a complete descrip-

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tion both for the atmospheric and the marine part and they are a prerequisite to all the papers that can be written using the data acquired during the experiment. Shortly after the campaign, one report was published in the SOLAS bulletin (SOLAS News, issue 9, Spring 2009, p36-37. <http://www.solas-int.org/news/newsletter/files/issue9.pdf>) with highlights of the main results that are or will be published separately. Also, a recent update about the ‘DUNE science’ was published in the ‘SOLAS Endorsed Projects’ section of the SOLAS website [http://www.solas-int.org/science/researchendorsements/resendprojects/DUNE_Update_May2010.pdf].

List of the papers, reports and abstract where the data are presented:

1. Pulido-Villena E., Rerolle V., Guieu C., 2010, Transient fertilizing effect of dust in P deficient LNLC surface ocean, GEOPHYSICAL RESEARCH LETTERS, vol. 37, L01603, doi:10.1029/2009GL041415
2. Wagener, T., Guieu, C., and Leblond, N., 2010, Iron cycle in the surface Mediterranean Sea: Results from dust fertilization in large mesocosms (DUNE-1-P experiment), BIOGEOSCIENCES DISCUSSION, 7, 2799-2830. (available on website)
3. M. Laghdass, S. Blain, M. Besseling, P. Catala, C. Guieu, I. Obernosterer : Impact of Saharan dust deposition on the bacterial diversity and activity in the NW Mediterranean Sea. AQUATIC MICROBIAL ECOLOGY, 2010, in rev. (available on request)
4. Guieu C, 2009 DUNE- a DUsT experiment in a low Nutrient, low chlorophyll Ecosystem - Quantifying the role of atmospheric input on marine ecosystem using large ‘clean’ mesocosms, SOLAS News, Issue 9, Spring 2009, 36-37. (available on SOLAS website).
5. Desboeufs K., Guieu C. and Leblond N., "Chemical and mass budget in sediment traps after dust fertilisation in large mesocosm : Assessment of new dust tracer to estimate lithogenic fluxes", to be submitted to BG
6. Ridame, C., Ternon, E., Guieu, C. and S. L’Helguen: Impact of a Saharan dust

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input on primary production and N₂ fixation in Mediterranean Sea, International SOLAS Conference, Barcelona, 15-19 nov. 2009. (poster)

7. Ridame, C., Biegala, I., Dekaemacker, J., Bonnet, S., Guieu, C. and L'Helguen S. Impact of dust deposition on N₂ fixation and primary production in the surface Mediterranean Sea: results from a mesocosm seeding experiment. to be submitted to L&O.

8. Dulac, F., Desboeufs, K., Laurent, B., Bon Nguyen, E., Schmechtig, C., Bergametti, G., Losno, R., Marticorena, B., Guieu, C., and Loÿe-Pilot, M.D.: Aeolian dust deposition in the western Mediterranean and the project ChArMEx, In Proc. 39th CIESM Congress, Venezia, 10-14 May 2010, Rapp. Comm. Int. Mer Médit. Monaco, in press, 2010.

Third remark: the reviewer thinks that the MS is too long. Accordingly several unnecessary details have been removed throughout the text: this in total represented ~20 lines of text in the .doc document. The new version is about the same length as the previous version because of the requested additions by the reviewers.

“Unclear points”: about the PVC that was used for the covers. Here is the absorption spectrum (attached file). We really believe that the present sentence ‘Measurements of the absorption spectrum (J. Ras, personal communication, 2008) indicate that PVC absorbs in the UV domain but not in the visible domain’ is enough and do not need to be illustrated by the actual spectrum (shown below). Moreover this would contribute to increase the length of the paper.

Concerns about the scientific part of the introduction. Some of the people involved in the DUNE project have performed different types of dust and nutrient additions in microcosm and we have some papers related to those experiments (not all referenced in the text though). For ex., Pulido-Villena, Wagener and Guieu (GBC 2008) have shown that the heterotrophic bacteria was highly stimulated by both natural and artificial dust addition while the autotrophic response was not significant, suggesting a process similar to the ‘bypass’ stated in Thingstad et al. 2005. This is exactly the reason why in

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the DUNE project we attempt to explore the ‘responses’ within different compartments (bacteria, phytoplankton, zooplankton and recently in the DUNE2010 experiment, also viruses) and the interactions between the different trophic levels (by the way we had both a significant response in heterotrophic bacteria (abundance and respiration) and phytoplankton (biomass and production). We thus totally agree with the fact that there is no reason to anticipate an answer of the autotrophs community and certainly this part of the introduction was confusing: the small section mentioning the ocean color satellite data have been removed. This will have to be discussed in the companion papers. One of the papers of the Special Issue on CYCLOPS experiment (Herut et al., 2005) was already cited.

About the export of material and its collection in the small sediment traps at the base of the bags: indeed, this appears like a challenge to collect on the most appropriate way the exported material mainly because of the design of the trap itself. Underwater, the divers were very rapid in changing the bottles (it was mentioned ‘few minutes’ in the previous version but after talking again with the divers, it was actually done ‘in less than one minute’ (this was changed in the present version): to our opinion and experience, the changing of the bottle is not the reason of the discrepancy. At the end of section 5.3, the following changes have been made: “When replacing by the diver, the small opening at the base of the bag (diameter = 3.5 cm) was left open for less than one minute: as there is no pressure gradient between the inside and the outside of the bag this could have lead to an exchange of at most a volume of few hundreds of milliliters and the amount of material that could have been lost during the operation was negligible.” To answer the questions of the reviewer, the section p2706 lines 12-23 have been rewritten: “This discrepancy could have come first from the design of the trap itself, as the shape of the bottom allowed a small, flat rim close to the screw thread where some exported material did accumulate during the experiment and could not reach the trap. Further, although visual inspection of the inside of both the vertical walls and the cone of the mesocosms at the end of the experiment did not allow establishing a significant loss by particle retention,

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some particulate material could have stuck on the walls. An iron budget during the DUNE-1-P and DUNE-1-Q showed that only a maximum of 60% of the iron stock lost from the mesocosms after the fertilization (estimated after 48, 120 and 168 h) was recovered within the traps (Wagener et al., 2010.). This supports the idea that the trap design could have led to uncertainties in, and underestimates of, the amount of exported material. Nevertheless sediment traps data were very useful for quantifying the particulate transfer and for tracing the lithogenic flux, in particular because the dust introduced in the DUST-mesocosms was extremely well-characterized. The sediment traps dataset is fully discussed in (Desboeufs et al., in prep.)” As it is mentioned in the conclusion: “some improvements will have to be made regarding the device used to collect the exported material”: in our recent DUNE2 experiment, the design of the trap was indeed successfully revisited but we don't think that this is a significant information for the readers of this paper.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/7/C2042/2010/bgd-7-C2042-2010-supplement.pdf>

Interactive comment on Biogeosciences Discuss., 7, 2681, 2010.