

***Interactive comment on “Downward fluxes of elemental carbon, metals and polycyclic aromatic hydrocarbons in settling particles from the deep Ionian Sea (NESTOR site), Eastern Mediterranean” by C. Theodosi et al.***

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General comments: The manuscript deals with the variability of export flux at a Eastern Mediterranean site, using sediment trap deployments at different depths. The data set seems quite significant and valuable, and it is certainly a steady basis to address such a study. In addition, the manuscript is written in a pleasant straightforward form. My main concern is that the conclusions of this work are not clear. A key question, I think, is to understand what are the parameters that control the temporal variability of export fluxes. The data set used here presumably permits to provide responses, but I have

C8365

not found clear conclusions (or, at least, suggestions). What is the role of atmospheric deposition of mineral matter ? Does it cause export, or does it only ballast mass fluxes ? This is very important to better understand the dynamics of mass fluxes. The wide range of parameters measured in the work of Theodosi et al. is very interesting, and should be used to compare the temporal variability of the respective emissions sources of trace metals and of organics with that of the export flux, in order to understand the causal relationships: What parameter(s) drive(s) the export ? External inputs of mineral matter or internal processes such as vertical mixing and/or biological productivity ? I am convinced that, once the authors have focused their efforts on such a conclusive way, using all the potential of their data set, the manuscript will be of great significance.

Specific comments: - Introduction: ‘The present study (...) and examines the role of seasonal changes in the biochemical composition of settling particles (Stavrakakis et al., 2012) as a driving force for their export to the deep Ionian Sea basins.’ The meaning of this sentence is not clear. Does it suggest that mineral matter (or any other type of matter) is likely to determine export fluxes ? (the term ‘driving force’ suggests that the occurrence of the export is caused by mineral matter). If any, this is very different of the ballasting effect, which only implies that the presence of mineral matter speeds up the sinking of matter. And marine fluxes are therefore expected to follow the same the seasonal patterns of atmospheric deposition, or, at least, it is expected that significant atmospheric events determine export fluxes, hence a coupling between the seasonal pattern of significant atmospheric events and that of export fluxes. Was it observed actually ? This point remains unclear in the further discussion. - Section 3.1.1: ‘Since EC is not participating in the food chain’, I am not sure this is definitely stated. See e.g. Potter (1908), Cattaneo et al. (2010) or Weinbauer et al. (2012). Please check it. - Section 3.1.2, last paragraph: ‘Crustal matter flux was determined using Fe or Al as tracers of crustal elements, assuming a relative ratio of 4.5 % and 7.1 % for each sample, respectively (Guieu et. al., 2002; Wedepohl, 1995).’ The use of these percentages is an obsolete method, I think: the content of Al, Fe, etc. in reference soils or rocks may vary quite significantly, and crustal matter is not made only of Fe and Al.

C8366

In addition, I do not clearly see why the authors do that. If they intend to demonstrate that mineral matter is sometimes the most important constituent of the sinking material, it might be easier to compare the sum of Al, Fe, and mineral Si (at least) fluxes, and the total mass flux. It would be approximative, but less than the method used here. Then, the authors write 'The average crustal content of the sediment trap material in the study area, using Fe as reference, ranged from 45% to 54% indicating that crustal material is the most important constituent of sinking material, as demonstrated also by Stavrakakis et al. (2012).' I am not convinced by this demonstration. Indeed, some sediment trap samples exhibit high mineral content : this is expected at certain periods, such as the convective period (in areas of dense water formation), when the mineral matter accumulated above the thermocline is rapidly transferred to depths with minimal concentrations of biogenic matter, or when a significant Saharan dust event occurs and is packaged with biogenic material, at any time of the year. And so what ? Once again (see my general comments), the authors should be more conclusive about that.

Technical corrections: - Introduction, page 19167, lines 10-13 : The sentence makes no sense. - The mineralisation protocol may not be adapted to refractory metals. Can the author provide results of CRM mineralisation and analysis ? - The reference Buat-Ménard 1989 is not correct in the reference list. - The reference Heimbürger et al. (Biogeosciences Discussion, 2010) should not be cited (never published in BG).

Cited references Cattaneo, R., Rouvière, C., Rassoulzadegan, F. & Weinbauer, M.G. (2010) Association of marine viral and bacterial communities with reference black carbon particles under experimental conditions: an analysis with scanning electron, epifluorescence and confocal laser scanning microscopy. *FEMS Microbiol. Ecol.* 1-15, doi:10.1111/j.1574-6941.2010.00953.x Weinbauer, M.G., Cattaneo, R., Malits, A., Motegi, C., Gasol, J.M., Herndl, G.J., Mari, X., Migon, C. & Rassoulzadegan, F. Black Carbon and Microorganisms in Aquatic Systems. In: *Black Carbon: Sources, Regulation and Environmental Impact*, J.A. Daniels (ed.), Nova Science Publishers, New York (USA), Vol. 25, pp. 1-37. Potter, M. C. (1908). "Bacteria as agents in the oxidation of

C8367

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C8368