

Interactive comment on “Particle fluxes in the deep Eastern Mediterranean basins: the role of ocean vertical velocities” by L. Patara et al.

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General comments

The fluxes of particulate matter and, mainly, the fluxes of particulate organic carbon (POC) from the surface layer of the oceans to the deep waters is one of the main vectors of performance for the carbon cycle in the oceans, or the biological pump.

Fluxes of POC in the water column show a profile of power law decrease with regard to the gone out of the surface layer. This decrease of the POC is owed to processes as the dissolution, the disintegration and to the activity of the bacteria and zooplankton.

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From a general way the term "flux" is defined as a measure of the rate of transfer of material from one reservoir to another (Honjo, 1996), in our case, the mass of particles (M , mg) from the water column that is recovered in a trap of sediments of a surface determined ($L2$, m²) in a time headway precise (T , day). The flux of particles and particulate organic carbon in the water column is very sensitive to, among others, two parameters: the concentration of particles and the sinking speeds of them. Any small variation of one of these parameters can affect the profile of fluxes in an important way.

Patara et al. report on the relationship between particle fluxes in the deep Eastern Mediterranean Sea and ocean current vertical velocities (CVV). Thinking logically, downward CVV must increase the particle flux and the upward CVV must decrease the flux of sinking particles? But, as this work shows, the magnitudes of CVV are relatively small (two orders of magnitude lower) to see direct influences to the speed of sinking particles. The authors propose an indirect process to explain the positive correlation between upward CVV and particle fluxes: the fertilisation of the euphotic layer by the upwelling waters and the enhanced primary production that stimulates the grazing activity of the zooplankton and the subsequent faecal pellet production.

The data set provided is interesting and the paper is well written, and we consider that the paper merits publication in Biogeosciences after the following comments have been taken into account.

Note: we are quite surprised by the Data Revision published in late August 2008, changing statistical methods, figures, tables and the results and discussion sections itself. We have the impression that authors submitted the paper without carefully checking basic issues like the sampling periods of the sediment traps. They must revise deeply manuscripts in future submissions. Overall, this has made complex the process of revision.

Specific comments

All specific comments are related to the new version of the manuscript submitted in

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late August 2008.

-Page 6, paragraph 1. Give characteristics of the sediment trap (type, sampling area, collecting cups, etc.)

-Page 6, paragraph 2. As the paper by Malinverno et al. is still in preparation, please give some basic technical details of the sampling procedures. In addition, explain the units of coccoliths flux.

-Page 11, section 3.1. This section is part of the introduction to the study area any result is shown.

-Page 13, paragraph 1. Why 25 mg m⁻² d⁻¹?

-Page 13, paragraph 1. Why 5 x 10⁸ nC m⁻² d⁻¹?

-Page 14, paragraph 1. "good preservation of coccolithophore tests";. The dissolution of coccolithophore and coccoliths can be controlled by microscope.

-Page 14, paragraph 6. Without any additional information (i.e. organic matter, calcium carbonate or lithogenic concentrations) I do not see the common sinking mechanism between biogenic and lithogenic material. Explain better. Idem for page 19, paragraph 1. Do authors have checked relationship between the relative abundance of coccolith per sample (number/mg) and total mass flux? The positive correlation between fluxes does not give trivial information as usually any constituent of the flux match the pattern of total mass flux. In addition, I suggest to include SeaWiFS-derived chlorophyll-a concentration to support discussion related to enhanced primary production.

-Page 15, paragraph 2. Give details regarding the settling velocities calculations. I'm afraid authors have used the peak of May 2000, which is an overestimated value at both depths. Otherwise, I'm not able to find which TCF peak is recorded at the same time at both depths.

-Page 16, paragraph 1. Why this seasonal polarity of CVV?

BGD

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-Page 19, paragraph 3. Remove "most probably", it's sure that mass flux contain other constituents. I suggest to include percentages of organic matter, calcium carbonate etc. as found in the literature for the study area.

-Page 21, paragraph 1. See Zuñiga et al (2008) for a direct effect of Saharan dust on the particle fluxes measured with sediment traps in Western Mediterranean.

-Reference Volpe et al. (submitted) is missing.

References HONJO, S (1996): Fluxes of Particles to the Interior of the Open Oceans. In Particle Flux in the Ocean Edited by V. Ittekkot, P. Schäfer, S. Honjo and P. J. Depetris .SCOPE Published by John Wiley & Sons Ltd, pp 91-156.

Zuñiga et al. (2008): Compositional and temporal evolution of particle fluxes in the open Algero-Balearic basin (Western Mediterranean). Journal of Marine Systems, Volume 70, Issues 1-2, March 2008, Pages 196-214

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