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Interactive comment on “Factors controlling the temporal variability of mass and trace metal downward flux at 1000 m depth at the DYFAMED site (Northwestern Mediterranean Sea)” by L.-E. Heimbürger et al.

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Understanding oceanic trace element cycling is a major objective of the GEOTRACES project. The manuscript by Heimbürger et al. contributes to this project in that it presents trace element fluxes obtained from the times series station DYFAMED. This station is unique in that it is strongly influenced by atmospheric dust deposition. The manuscript presents trace element fluxes from a sediment trap at 1000 m water depth which is characterized by parallel trace element and mass fluxes. Based on these parallel flux patterns the authors argue that the flux of trace elements (TM) is not

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determined by the atmospheric deposition of TM but by the mass flux which in-turn is controlled by bioproductivity and deep water mass convection. I have difficulties to see the innovation of this manuscript; this is to say I do not see any new findings/interpretations which go beyond the conclusions of previously published papers. In addition the manuscript lacks a convincing discussion of the TM data:

My major concerns are: 1. In a recent publication by TERNON et al. (The impact of Saharan dust on the particulate export in the water column of the North Western Mediterranean Sea, *Biogeosciences* 7, 809-826, 2010) the atmospheric dust deposition is compared to the particle flux determined at DYFAMED. Heimbürger et al. use the same sediment trap data set; however, they do not cite the TERNON paper. This is not understandable (and not acceptable; note that both first authors have the same affiliation) because the TERNON paper discusses in detail the effects of the atmospheric dust deposition on the seasonality of particle flux at DYFAMED. A clear presentation of the result of this paper and a convincing discussion of new ideas and/or interpretation which go beyond those presented in TERNON et al. is needed before the manuscript can be considered for publication. 2. There is a lack of discussion of TM data. What are the sources (terrestrial, anthropogenic) of the individual trace elements? Does the trace element composition of sediment trap material change over time? How do the data from Heimbürger et al. compare to the TM data from DYFAMED 200m trap previously published by MIGNON et al. 2002? Again, a clear presentation of previous results and interpretations is missing. 3. A main conclusion of the manuscript is "... TM downward transfer is controlled by the seasonal variability of mass flux and not by the variability of atmospheric fluxes..."(page 2558, lines 8-10). This statement may be misleading as the question which may come up is: What kind of mechanism other than the mass flux could transport the trace elements from the surface ocean to a sediment trap? What (I assume) the authors want to show is that the atmospheric deposition is not necessarily generating a particle mass flux in the water column. In order to discuss the link between TM flux determined in the sediment traps and the atmospheric deposition, the atmospheric origin of TM determined in the sediment traps has to be

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clearly shown. This is missing in the manuscript although the data would be available (<http://www.obs-vlfr.fr/~heimbuerger/>). 4. The close correlation between the trace element fluxes and the mass flux is the main argument of the authors that the flux of trace elements is determined by the organic carbon flux and not by their seasonally variable atmospheric deposition. Correlation matrixes calculated from the composition of sediment trap material are based on a closed data set, i.e. the data have not been obtained independently. In closed data sets spurious relationships can occur and therefore the resulting correlations are not meaningful. 5. The authors exclude TM data in 2005 (February to June) and 2006 from the discussion due to high currents. It would be interesting to see how the TM composition changes during such events (see also Ternon et al, 2010).

In summary I think the manuscript needs a complete re-writing before it can be considered for publication.

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