

Interactive comment on “Deep ocean mass fluxes in the coastal upwelling off Mauritania from 1988 to 2012: variability on seasonal to decadal timescales” by G. Fischer et al.

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Received and published: 4 April 2016

We thank the anonymous reviewer #1 for the constructive comments and for the time spent to review the manuscript.

RC Fischer et al. present 25 years of sediment trap fluxes collected off Cape Blanc in the area of permanent upwelling. This is a very impressive data set and it is quite obvious that it is dominated by interannual variations and not by a clear seasonality. It is therefore consistent to investigate the relationship between fluxes and indices of climate oscillations of multiannual or decadal scale (AMO, NAO, ENSO). The authors manage to present this complex matter in a comprehensive and concise way. The

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paper is well written and well organized and the evaluation of the results is critical and refrains from over-interpretation. Tables and Figures are of good quality and present the results appropriately.

I have some questions regarding the data used in the paper which need to be clarified. The authors state that fluxes in the upper and lower traps are very similar and therefore use the upper fluxes to fill in gaps in the lower record. The paper cited to show this (Fischer et al., 2009b) presents only one record of upper and lower traps. The authors should show that this can be done for the whole data set despite the vertical distance of about 2000m between the upper and lower traps.

AC The reviewer is right in mentioning this problem and stating that the paper by Fischer et al. (2009b) presented only one annual time series (deployment CB-13, 2002–2003, see also Table 1 of the submitted ms). Fischer et al. (2009b) showed a good match between upper and lower trap fluxes regarding absolute values and timing of peaks, but also an increase in flux with depth during winter-spring due to an additional lateral source, which is located closer to coastal upwelling east of the CB trap location. Due to this process, the lower CB traps are better suited to record any long-term changes in coastal upwelling intensity.

We admit, however, that we cannot be sure that the upper traps mimic the temporal and absolute flux pattern of the lower traps in all seasons in each year in all details. For our study, the winter fluxes may be critical due to their potential relationship to the winter NAO (Figs. 6, 7, 9a). When plotting all available lower and upper trap total mass fluxes for winter, a close correspondence is observed ($R^2=0.84$ for $N=10$), with slightly higher fluxes in the deeper trap due to lateral particle advection processes (described in detail by Fischer et al., 2009b, and modelled by Karakas et al., 2006, 2009). However, considering the entire record presented here, it seems that the upper trap fluxes of the winter seasons 1998 and 2004 may be critical due to a smaller filament area (Fig. 7b). The area with elevated chlorophyll and high particle concentrations may not have reached the upper offshore trap. Because of lateral advection from the

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east and the larger catchment area of the deeper traps (Siegel and Deuser, 1997), particle fluxes might have been higher in the deeper water column in winter 1998 and 2004. A possible alternative is eliminating the two data points (winter 1998 and 2004) in Figure 7. This slightly improves the correlation between winter fluxes and the NAO, without significantly influencing our findings and conclusions. However, we suggest to keep the two data points in Figure 7 also in the revised version, mentioning in the caption and in the corresponding text passages that the upper trap data from winter 1998 and 2004 might have been different from the deeper traps. Additionally, we added the argumentation presented here to chapter 3.2 (mass fluxes) in the revised manuscript.

RC Moreover, the authors integrate their data for spring, summer, fall and winter and thus lose some of the original high resolution sampling. The authors should explain their reasons.

AC The reason for this is that the focus of our MS is the longer-term variability on timescales of seasons and beyond (as stated by reviewer #1, page C7709, second sentence). Due to logistical reasons, we have very different time resolutions in our trap samplings (from a few days to several weeks), which may sometimes limit comparisons between specific intervals. Furthermore, represented data points from intervals with a high sampling resolution (e.g. a few days) can hardly be seen in the figures. By doing so, this would partly lead to overloaded figures and may be confusing for the reader. This is now explained in the revised version of chapter 3.2. (mass fluxes).

RC Page 17653, line 14: incomplete sentence

AC Sentence will be deleted

RC Page 17657, lines 17-20: This part on the time delay is too short and difficult to understand. The motivation/results should be explained in more detail.

AC This section/sentence indeed needs more explanation. We will rephrase this accordingly and explain our arguments on/ideas concerning a possible time delay be-

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tween NAO forcing in winter (DJFM) and flux response in the deep ocean in spring in the revised version of the discussion section 5.2 in more detail.

Interactive comment on Biogeosciences Discuss., 12, 17643, 2015.

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