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The influence of zooplankton and oxygen on the particulate organic carbon flux in the Benguela Upwelling System

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Reviews and Comments

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We are once again very thankful to the editor and to the reviewers for their valuable comments and suggestions for the improvement of our study. We have followed up all comments in detail and have revised the manuscript according to the suggestions and comments. All changes are marked in blue in the current version to make it easier to follow the differences to the original. We have addressed the individual comments of the reviewer as described below.

Abstract:

Specify what you mean by ‘ambivalent’ nature of the OMZ

We have rewritten the last sentence of the abstract to make the statement clearer (lines 32-34)

Introduction:

Line 171: here depths are trap depths, not water depths.
(changed; line 171).

Line 123: ‘..in the shadow of oceanic fronts ..’ can you specify?
(specified in lines 121-122)

Methods section:

Take Table 3 closer to line 176.

Table 3 moved as close as possible in this early stage of the manuscript. Positioning might change during editorial handling of the journal).

The transfer of dried material from polycarbonate filters to agate mortar, may not be 100% efficient for the small particles fraction. Have you an estimate of this transfer efficiency? Explain how the filtered material is recovered from the polycarbonate filters after drying.

We have now explicitly stated how the filters were treated. All filters were thoroughly visually inspected to ensure that no sample material larger than 0.45 μm (mesh size of the polycarbonate filter) remained on the filter surface. This ensures that virtually blank filters were left behind and no particles on the filters remained untreated. (see lines 225-227)

Results section:

Reposition the Figure 4 showing with POC fluxes. Now it appears in a section where PP data are shown. Move the figure closer to line 281? Specify in legend of Fig. 4 that data shown are for moored traps.

We have swapped the figure numbering for Figures 4, 5 and 6 so that they match the text passages better. Former Figure 4 (now Figure 6) has been moved close to line 281. The figure caption of Figure 6 explicitly states now that data are derived from mooring deployments.

Discussion section:

Line 281: ‘However, our time series **in the sBUS** is still too short ...’ (*changed; line 282*)

Line 325: [...] we have selected the commonly used equation (Eq. 1, Martin et al. 1987) for describing the POC flux... (*changed; lines 326-327*)

Line 329: The choice of taking 10m as the MLD seems somehow arbitrary considering that Temp profiles indicate MLD’s between 30 and 14m. For instance using an MLD of 14m instead of 10m will increase Fz values by some 30%. Can you convince the reader of you choosing a 10m MLD? FMLD values should be shown without decimals (Lines 331, 344), considering the variabilities involved.

We have now explained why we decided on an MLD of 10 m and that this value matches the observations during the different seasons. ‘The selected MLD as well as the determined FMLD and ‘b’ values were then used to calculate the POC fluxes using the Martin curve and the water depth. The calculated and measured POC fluxes correlated with each other ($r = 0.925$, $n = 31$) and showed the best agreement at an assumed MLD of approximately 10 m. The values for FMLD and ‘b’ obtained from the curve fitting were $1117 \text{ mg C m}^{-2} \text{ day}^{-1}$ and -0.74 (Fig. 8). Temperature profiles obtained during our expeditions at our long-term sediment trap sites showed that MLDs in the nBUS and sBUS varied between approximately 30 m and 15 m during the austral spring (Fig. 9a). In late summer, the mean depth varied between about 1 m and 14 m (Fig. 9b), showing that an MLD of 10 m, as assumed for the curve fitting, is within the range observed during our expeditions.’ (lines 329-336)

Line 349: ‘.. despite the enormous deviation..’ replace by ‘despite the large variations’ (*changed; line 334*)

Figure 9 legend: mention M153 is during summer; 4th line: .. that the MLD at St7 showed .. (*changed; lines 358 and 361*)

Figure 10 legend: 2nd line: ‘.. which is identical’ replace by ‘which is similar’ (idem for Line 381) – (*changed; line 374*)

Lines 381 – 383: sentence is unclear. Reformulate please.

We have reworded this passage. ‘As mentioned above, the attenuation coefficient ‘b’ is an expression of the strength of remineralisation. According to our results, ‘b’ is similar in both subsystems, which leads to the assumption that the effect of a lower oxygen concentration on ‘b’ in the nBUS is comparable to the effect of zooplankton on ‘b’ in the sBUS.’ (lines 386-388)

Summary:

Line 406-407: ‘..and a much higher zooplankton abundance in the sBUS implies that ..
(*changed; line 411*)