Anonymous Referee 1

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General comments: This manuscript was a real pleasure to read both with respect to science presented and the way the manuscript is written and structured. I recommend the publication of this manuscript as it is with optional minor corrections.

We would like to thank the referee for these very positive comments. All suggestions have been taken into account and are detailed below.

- *Lines 87-92: This sentence is too long and therefore confusing. I suggest splitting it into two shorter sentences.*

We agree and this has been changed in the revised manuscript.

Lines 99-104: Finally, as described elsewhere (Daniault et al., 2016; García-Ibáñez et al., 2015; Kieke and Yashayaev, 2015; Zunino et al., 2017; this issue), these provinces also differ in terms of their hydrographic features. The NADR province is crossed by the sub-arctic front (SAF), which was located near Station 26 during GEOVIDE (Fig. 2). Strong currents were observed near the Greenland margin (probably influencing Stations 51 and 64), and an intense 1500 m-deep convection happened during the winter preceding GEOVIDE in the central Labrador Sea (Station 69) due to the formation of the Labrador Sea Water (LSW) in winter (Fig. 2).

- *Line 93 and 95: Please state the depth of the upper ocean POC export flux*

OK.

Lines 105-108: The highest POC export fluxes from the upper-ocean (calculated at the depth "z" ranging from 30 to 110 m at Station 44 and 32, respectively) were observed in the NADR province and in the Labrador Sea and reached up to 10 mmol C m^{-2} d^{-1} at Station 69 (Lemaitre et al., 2018; this issue).

- *Line 96: For the transfer efficiency, I suggest to replace 'e.g.' with 'here defined as'; again, please state the depth of upper ocean POC export flux.*

OK.

Lines 109-111: The transfer efficiency (defined as the ratio of the POC export at z+100 m over the POC export at z) was more variable, ranging from 30% at Station 69 to 85% at Station 26 (Lemaitre et al., 2018; this issue).

- *Lines 228-232: The comparison of the Baex inventory at stations 44 and 51 to the GEOSECS Baex concentration data would benefit from adding the latter to the respective individual profiles in Figure 5.*

We agree and Figure 5 has been changed:

Figure 5:

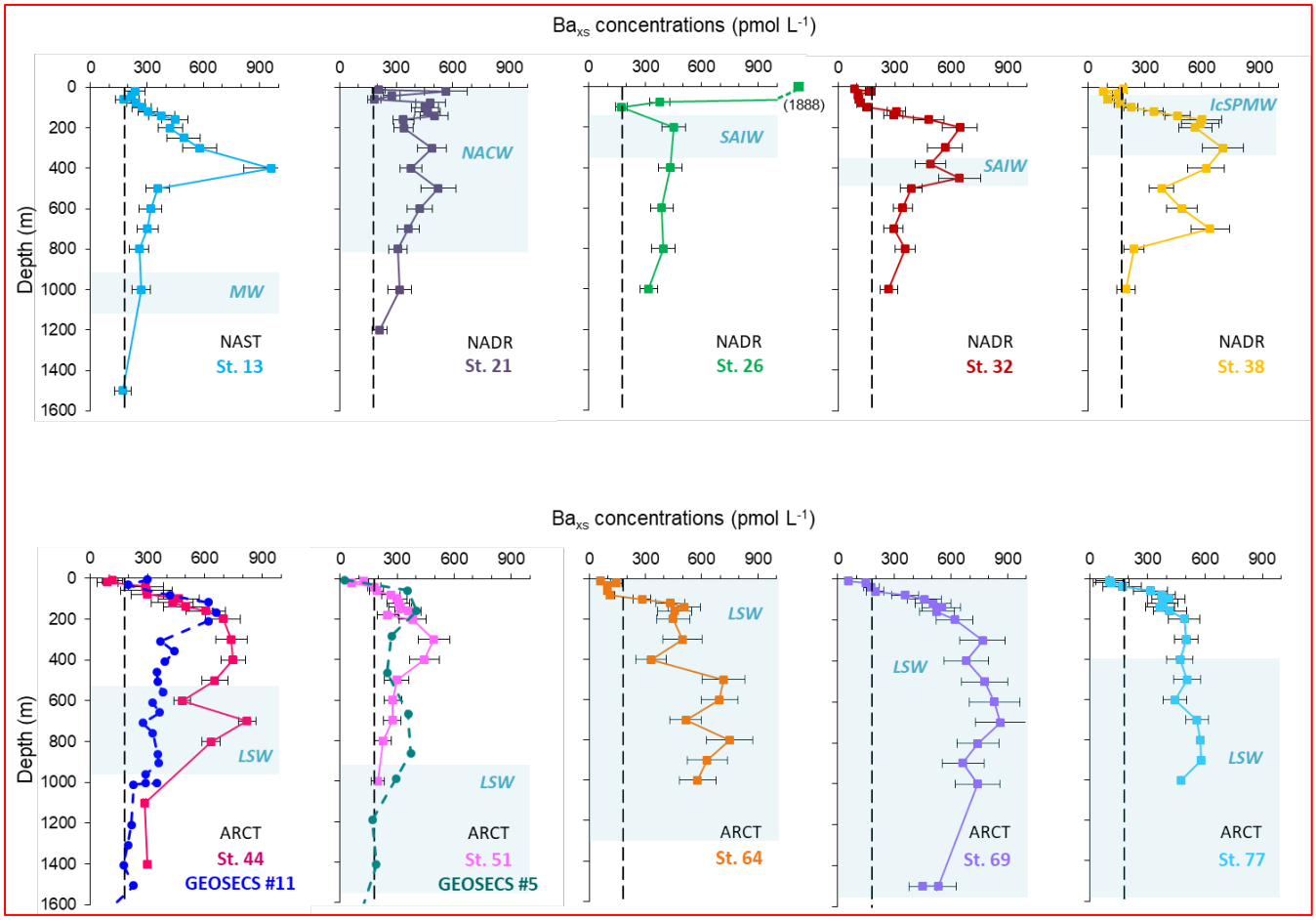

Figure 1: Vertical profiles of Ba_{xs} concentrations (in pmol L^{-1}) determined from Niskin casts during GEOVIDE (squares) and GEOSECS (circles) cruises. The vertical black dashed line (at 180 pmol L^{-1}) represents the deep-ocean Ba_{xs} value (or Ba_{xs} background signal; Dehairs et al., 1997). The approximate depth range of the major water masses is also indicated in blue shading.

- *Lines 334-336: What are the R^2 and p values for the new relationship between Ba and oxygen consumption with and without station 44? Both R^2 and p values should feature the regression in Figure 8.*

With Station 44: R^2 = 0.33 and p-value = 0.07
Without Station 44: R^2 = 0.63 and p-value = 0.006
The values, R^2 and p-value, without considering Station 44 have been added to Figure 8, and the values including Station 44 have been added to the figure caption.

Figure 8:

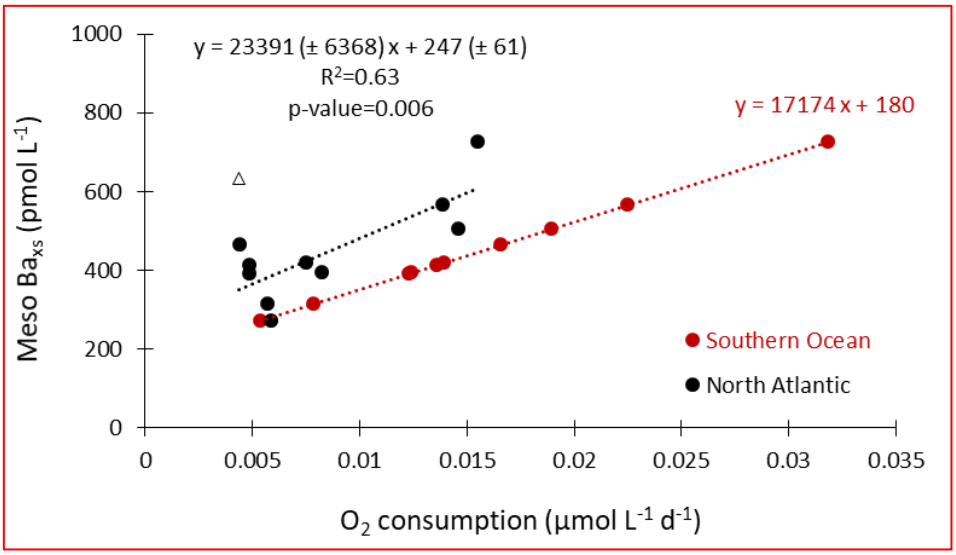

Figure 2: Regression of DWA mesopelagic Ba_{xs} (pmol L^{-1}) versus O_2 consumption rate (µmol L^{-1} d^{-1}) using the Southern Ocean transfer function from Dehairs et al. (1997; red circles) and the transfer function obtained here for the North Atlantic (black circles). Station 44 (triangle) was excluded from the regression. If station 44 is included, R^2=0.33 and p-value= 0.07.

- *Lines 649: Table 3 shows a comparison of Baex inventory and related POC remineralisation fluxes in the global ocean. The manuscript will benefit from having MR fluxes plotted on a global map.*

OK. We generated a new figure, Figure 9:

Figure 9:

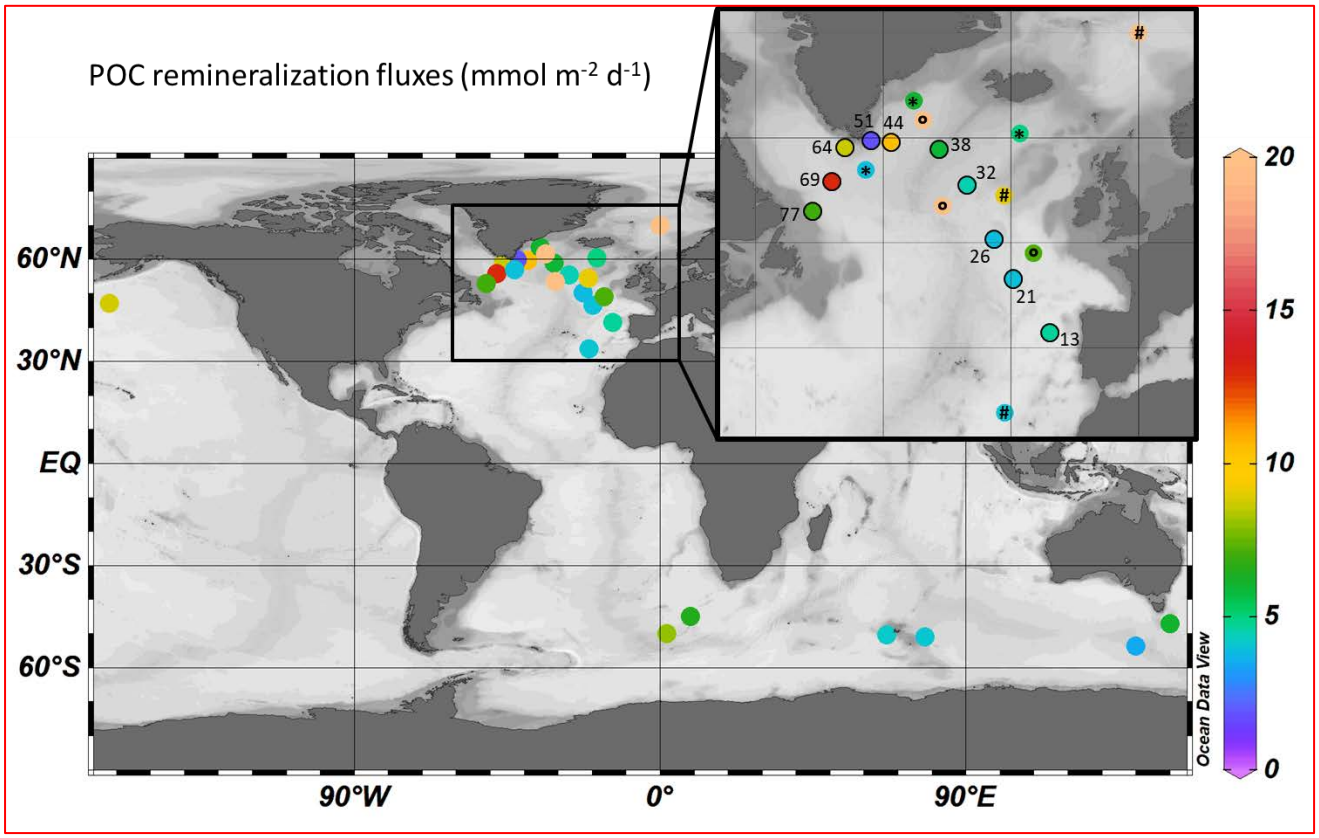

Figure 3: Summary of published POC remineralisation fluxes (in mmol C m^{-2} d^{-1}) in the World's Ocean. The remineralisation fluxes for the Pacific Ocean (Dehairs et al., 2008) and the Southern Ocean (Cardinal et al., 2005; Jacquet et al., 2008a, 2008b, 2011b, 2015; Planchon et al., 2013) were calculated based on the Ba_{xs} inventories. Insert shows data for the North Atlantic: sites indicated by circles lined in black are from the present study; at sites labelled with # symbols remineralisation was deduced from POC fluxes recorded by moored sediment traps (Honjo et al., 2008); at sites labelled by ° remineralisation was obtained from on-board incubations (Collins et al., 2015; Giering et al., 2014); sites labelled with * are GEOSECS sites for which we calculated remineralisation from existing Ba_{xs} profiles (Brewer et al., unpublished results). Data were plotted using the ODV software (Schlitzer, 2017).

- *Line 705: The legend of Figure 5 should include the reference to the dashed line.*

OK. The legend was modified as follows:

Figure 4: Vertical profiles of Ba_{xs} concentrations (in pmol L^{-1}) determined from Niskin casts during GEOVIDE (squares) and GEOSECS (circles) cruises. The vertical black dashed line (at 180 pmol L^{-1}) represents the deep-ocean Ba_{xs} value (or Ba_{xs} background signal; Dehairs et al., 1997). The approximate depth range of the major water masses is also indicated in blue shading.

- *Lines 735-738: The legend of Figure 9 should acknowledge the use of Ocean Data View (Schlitzer et al. 2004).*

Right, thank you for notifying this. Please, see above the new legend.