Dear Mr Hoppema!

We would like to thank both reviewers for their work as well as the editorial office. We have improved our manuscript in accordance with both comments. Corrections of English are marked in text in the track-changes file. We also have changed one of the grants, that supported this paper.

Nick I. McCave comments

14-21:

(1) In the introduction the authors mention the seminal work of Biscaye and Eittreim (1977) who ascribed thick bottom nepheloid layers (BNLs) to upward mixing of SPM, but they should also mention the lateral transfer arguments of Armi (1978) and McCave (1983), the ‘separated mixed layer’ model.

(2) We added both references

(3) The works of Armi (1978) and McCave (1983) pointed out the lateral advection of SPM, which occurs due to detaching of bottom mixed layer from the slope and leads to thickening and layering of BNLs.

52-56:

(1) With so few regional measurements of particle volume by Coulter counter one might ask whether the data presented here are ‘correct’, i.e. whether contamination has been avoided…

(2) After applying the apparent densities of suspended particles from the (McCave, 1983), we obtained the estimated weight SPM concentrations at the Ioffe-2000 transect. The according changes were put at the beginning of the Results Chapter.

(3) The work of McCave (1983) contains both the partly comparable dataset of SPM volume concentrations with a slightly wider size range (1.26—32 μm), and the apparent particle densities, that lies between 1.65 and 2.23 mg mm-3. Applying these apparent densities to our volume SPM concentrations, we got the implied weight concentrations about 0.016 to 0.35 mg L-1 (up to 0.8 mg L-1 in exceptional circumstances), which agrees with Brewer et al (1976) and Gardner et al. (2018).

174-184:

(1) The authors point to an influence of Amazon River sediments being more important than concentrations at the African end of the transect. Nevertheless, there is a marked high at the African end centred on about 800 m that the authors do not discuss and one wonders whether both might be due to internal wave activity on the upper slope.

(2) We added the lacking discussion

(3) The Ioffe-2000 transect did not reach the SPM-rich shelf waters, yet the coastal SPM source has caused a local SPM maximum at the margins of the transect at a depth of 300–900 m (up to 0.18 ppm in the west and up to 0.09 ppm in the east). It was the Amazon River that caused the

more pronounced rise in SPM concentration at the western edge of transect. It is well known that the surface SPM transport from the Amazon River to the open ocean turns to the northeast alongside the coast (Gibbs, 1974). The eastern edge of the Ioffe-2000 transect is located above the gentle slope between 200 m and 2000 m named Guinea Marginal Plateau (Egloff, 1972), adjacent to the high productive Guinea shelf (Vladimirov et al., 1990; Burlakova et al., 1997). Strong currents (Mittelstaedt, 1991; Stramma et al., 2005, 2008) and implied internal wave activity, based on significant density gradients on the shelf (0–200 m) (Sarafanov et al., 2007), may provide a framework for the SPM lateral transport from the shelf along the gentle Plateau slope.

225 et seq:

(1) The authors describe the high mid water concentrations extending down to the bottom over the Sierra Leone rise to the occurrence of aggregates ballasted with Aeolian dust. The concentration zone occurs 1000 km from the coast which is well beyond the zone of coastal upwelling-driven high productivity but does fall in the region of Sahara and Sahelian dust. The authors observe that this column of high concentration occurs under the Guinea dome, a permanent thermal upwelling dome with a cyclonic associated circulation. Other examples of high concentration columns are shown by Biscaye and Eitttreim over Bermuda rise and in the Argentine basin. It seems more likely that the authors observations are related to this circulation feature.

(2) According to Sarafanov et al. (2007), the Guinea Dome cyclonic circulation within the Ioffe-2000 transect was only noticeable within the upper 300 m of the water column, so we believe that it was incomparable with the DWBC that caused the high SPM concentrations shown by Biscaye and Eittreim over Bermuda rise and in the Argentine Basin. Naturally, the circulation in the area of our observations matters, yet we suppose that the entire system of currents, including the Guinea Dome, North Equatorial Current/Countercurrent/Undercurrent and the Canary Current plays a role mostly in the SPM transport from the highly productive area of the Northwest African coast and the region of Sahara and Sahelian dust.

(3) -

286-291:

(1) The intermediate nepheloid layer (INL) downstream of the ‘dam’is similar to the INL demonstrated by Tucholke and Eittreim (1974) deep western boundary current flows over the Puerto Rico Trench.

(2) We did put the additional reference in our paper.

(3) One of the most notable similar nephelometric features was described for the Puerto Rico Trench near the Navidad sill (Tucholke and Eittreim, 1974).

301-306:

(1) Lavelle (2012) has shown the effect of midocean ridges on accelerating currents along their flanks, currents which are likely to then lead to resuspension and generation of nepheloid layers.

(2) We added Lavelle (2012) in our paper.

(3) High levels of the SPM concentration were also noted above the MAR. There is the northward recirculation of rich in the SPM NADW (Sarafanov et al., 2007), which was noted both sides of the MAR at 36–40° W and 29–32° W. Another type of currents in the area is tidal currents Morozov (2018). According to Lavelle (2012), both these currents may be accelerated along the flanks of the ridge and represent a significant stirring mechanism for abyssal flow and cause the SPM concentration rise. Moreover, the axial region of the MAR including the rift zone experiences high seismicity and bears a large number of earthquake epicenters as well as the sulfide mineralization zones of various origins and bedrock zones showing strong hydrothermal imprints (Mazarovich and Sokolov, 2002); in particular in the Sierra Leone fracture zone, i.e. immediately below the Ioffe-2000 transect (see Fig. 1). Both high seismicity and strong hydrothermal activity may also be able to cause increased SPM concentrations in the bottom layer.

310-346:

(1) It would be helpful to have a figure in which some of the size distributions were illustrated - cumulative number plots for example.

(2) We thought that the most typical volume-size SPM distributions will be sufficient, but we will add the cumulative number figure as well.

(3) Additional Figure 7.

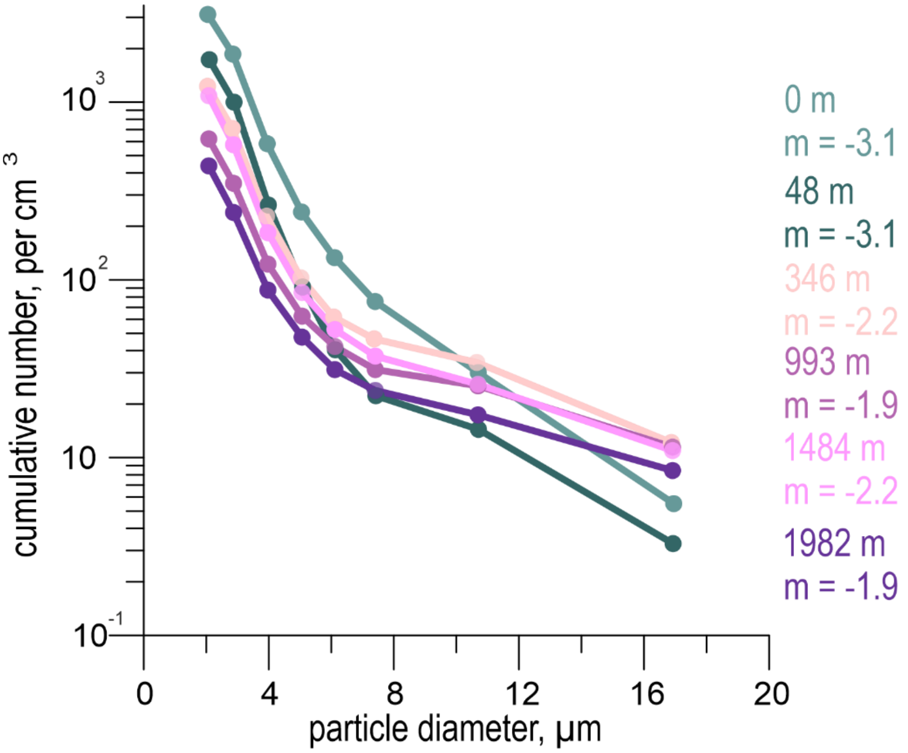

Figure 7. Cumulative particle number distribution for AI-868 station showing both “old” suspension in the upper ocean with the slope of the distributions close to –3 and “fresh” in the water column with steep slopes about –2. Station AI-868 is a part of the SPM-rich “vertical anomaly”. X-axis is particle diameter, Y-axis is cumulative particle number in log10 scale.

330-333:

(1) It is not clear how a large Brunt-Vaisala frequency in itself would lead to smoothing of a particle size distribution, but perhaps the authors wish to imply that there might be breaking internal wave-driven turbulence associated with frequency maxima that would promote aggregation.

(2) We paraphrased the paragraph in order to remove uncertainties.

(3) Increased shear in pycnoclines and internal wave-driven turbulence would promote aggregation and lead to a further smoothing of the size distribution (equivalent to a cumulative particle number distribution with a slope of -3) of SPM (McCave, 1984).

Additional references

Burlakova, Z. P., Eremeeva, L. V., & Morozova, A. L. (1997). Suspended matter in the estuaries of the Guinean shelf. physical Oceanography, 8(4), 269-283.

Stramma, L., Brandt, P., Schafstall, J., Schott, F., Fischer, J., & Körtzinger, A. (2008). Oxygen minimum zone in the North Atlantic south and east of the Cape Verde Islands. Journal of Geophysical Research: Oceans, 113(C4).

Vladimirov, V. L., Bezborodov, A. A., Martynov, O. V., Ovsyanyi, E. I., & Diallo, B. (1990). Relation between the depth of visibility of a white disk and the concentration of suspended matter in shelf waters off the Republic of Guinea. Soviet journal of physical oceanography, 1(6), 469-474.

Second referee comment

Fig. 2:

(1) A) It would be useful to add the approximate depth to the 1/2/3 notations, i.e. (numbers are just for illustration – please use the real ones): 1-surface currents (0-100m), 2-subsurface currents (100-300m), 3-deep surface currents (300-500m) A) and B): looks like isobaths are not at every 500m as stated in the caption. I see 1000, 2000, 3000, 4000, 4500, 5000. Please correct either capture or plots.

(2) We have changed both the caption of Figure 2 and Figure 2A itself.

(3)

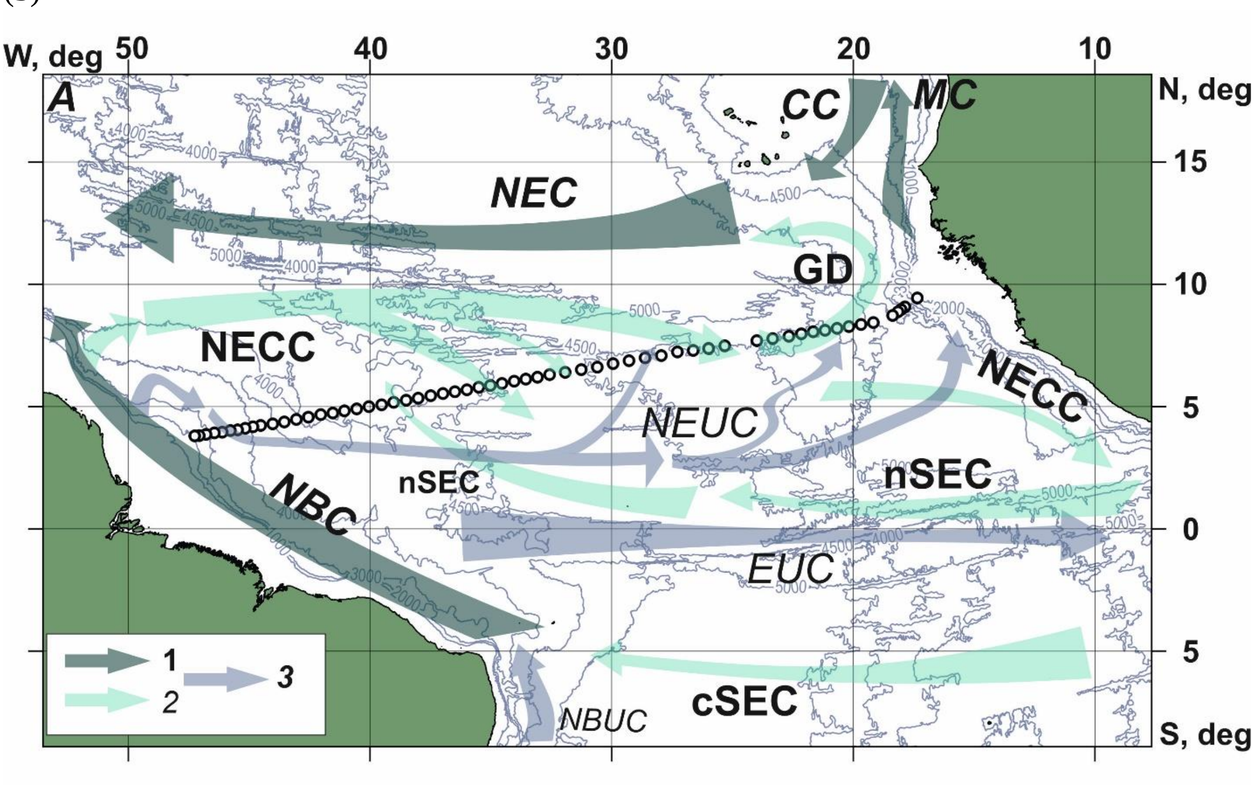

Figure 2. Generalized circulation schematics within the study area: surface and subsurface layers (A) and intermediate, deep, and bottom layers (B), where 1 — surface currents (from 0 up to 100 m), 2 — subsurface currents (from 100 up to 500 m), 3 — joint surface and subsurface currents (from 0 up to 500 m), 4 — the Deep Western Boundary Current (DWBC) cores, 5 — schematic DWBC recirculation, 6— AABW. The references and current abbreviations are explained in the text. White circles — Ioffe-2000 transect stations.

Lines 95-100:

(1) The sentence “The main existence conditions for GD existence is a cyclonic circulation composed of the eastward NECC and NEUC along with the westward NEC (Stramma and Schott, 1999).” could use some editing to eliminate a repetition of word “existence”.

(2) Corrected

(3) The main existence conditions for GD are a cyclonic circulation composed of the eastward NECC and NEUC along with the westward NEC (Stramma and Schott, 1999).

Fig. 3:

(1) Search radii? Show the mixed layer depth?

(2) We are afraid that showing the thin (100 m and less according to Sarafanov et al. (2007) upper mixed layer will not be illustrative, taking into account the fact that the overall depth in Figure 3 is 5000 m. Some information regarding gridding was added to the Figure 3 caption.

(3) The interpolation was done in the Ocean Data View software (Schlitzer, 2018) and the DIVA gridding (Barth et al., 2010) with 25 permille X-scale length and 65 permille Y-scale length.

Additional references

Barth, A., Alvera-Azcárate, A., Troupin, C., Ouberdous, M., & Beckers, J. M. (2010). A web interface for griding arbitrarily distributed in situ data based on Data-Interpolating Variational Analysis (DIVA). *Advances in Geosciences*, *28*, 29-37.

Lines 179-180

(1) Use station # for better location reference?

(2) We have corrected the paper.

(3) The SMP concentrations within the NBC are relatively low (stations AI-910–AI-912).

Line 197:

(1) “So the local SPM maximum in the GD area within the Ioffe-2000 transect correlate with this data” - show the correlation.

(2) The mathematical term “correlation” was a wrong choice for this sentence because there was no mathematical comparison.

(3) The local SPM maximum below the GD area within the Ioffe-2000 transect agrees with this data.

22.08.2021 Ekaterina Bubnova