

# ***Interactive comment on “Coccolithophore fluxes in the open tropical North Atlantic: influence of the Amazon river and of Saharan dust deposition” by Catarina V. Guerreiro et al.***

## **Anonymous Referee #2**

Received and published: 17 July 2017

### General comments

The study by Guerreiro et al. report time-series coccolith fluxes to the deep ocean at two sediment trap sites in the tropical Atlantic and provide new insights in the environmental factors controlling their spatial and temporal variability. The authors demonstrate that the seasonality of the coccolith fluxes was strongly influenced by the location of the ITCZ and stability of the water column. They find similar seasonal flux pattern at both sites, but significantly higher coccolith fluxes at the western M4 site compared to the M2 site in the central Atlantic. Guerreiro et al. suggest that the higher fluxes at M4 compared to M2 are caused by the Saharan dust input and the eastward dispersion of

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the Amazon River plume, which retains nutrients within its less dense surface waters. The study also demonstrates striking differences in the coccolithophore community structure between the sites with higher abundance of opportunistic coccolithophore species at M4 site, which experiences sporadic nutrient inputs.

The sediment trap observations presented in the study are robust and supported well by the relevant remote sensing data providing meteorological, hydrographic and biogeochemical contexts. The statistical analysis and references to literature aiding the interpretation of the results and supporting the conclusions are also strong.

I recommend the publication of the article by Guerreiro et al. in Biogeosciences. Relatively minor issues however need to be addressed prior to publication of this article.

#### Specific comments

- The Abstract is at times too detailed (see comments for Page 1) with a couple of sentences being too long and thus hard to follow.
- The oceanographic and meteorological conditions at the trap location during October 2012–November 2013 are results but presented in the Methods section. I suggest moving lines 5–25 to the Results section.
- Table 1 is unnecessary as most of its content has been given in the main text. It can be moved to Supplementary material along with Table 2.
- Authors could provide more information on the splitting of the sediment trap samples (e.g. type of splitter, splitting error).
- The authors use  $1^{\circ} \times 1^{\circ}$  box over each trap location to retrieve satellite-based meteorological and oceanographic data to support coccolith fluxes at M4 and M2. The authors should elaborate on their choice: is it based on the consideration of the 'statistical funnel' or particle catchment area of a moored-sediment trap (see e.g. Baker et al. 1988, Siegel et al. 1997, Waniek et al. 2000)? For example, do the authors have complementary data on current speeds above the traps to derive back-trajectories of

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sinking particles? This would give some idea of the distance of particle origin in support of the chosen  $1^\circ \times 1^\circ$  area.

My other comments related (mostly of technical/language nature) are outlined below:

Page 1

Line 18: remove 'in successive 16-day intervals'

Line 19: correct to 'showed'.

Lines 24-25: provide coccolith fluxes as average  $\pm$  stdev.

Line 27-30: split into two sentences.

Line 26: correct to 'contributed to higher fluxes'.

Line 36: replace 'an open-ocean tropical setting' with 'the tropical open ocean'

Lines 35-38: split into two sentences.

Page 2

Line 13: replace 'from' to 'in'.

Line 14: remove 'next to'.

Lines 14-15: replace 'diazotrophic fixation . . . . by cyanobacteria' to simply 'N<sub>2</sub> fixation by marine diazotrophs'.

Line 18: replace 'despite low . . . . per unit area' to 'despite relatively low primary production rates'.

Line 27-29: this sentence needs rephrasing, and possibly split into two sentences.

Line 30-31: I do not see the reason for the contrast with opportunistic coccolithophores in this sentence. I suggest splitting the sentence into two for clarity.

Lines 37: 'whereas . . . coccolithophores studies using sediment traps' is confusing.

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Consider replacing to 'Although a significant amount of sediment trap data on coccolithophores fluxes exists for the open ocean. . . '.

Page 3

Lines 8: replace 'to 75 m depth' with 'in the top 75 m'.

Lines 9-15: please itemise the depth floral groups defined by Poulton et al. 2017, otherwise the sentence appears to long and hard to follow.

Line 15: More insight into what?

Page 4

Lines 1-3: this sentence needs rephrasing with respect to 'the world's largest river. . . for discharging large volumes'. I suggest 'the world's largest river with respect to fresh water discharge into the open ocean'.

Lines 22-24: This sentence does not read well. Please rephrase. I suggest 'Two sediment traps at sites M2 14° N, 37° W) and M4 (12° N, 49° W) collected sinking particles at 1200 m depth in synchronous intervals of 16 days from October 19, 2012 to November 7, 2013'.

Lines 24-26: this sentence is more suitable for the Supplementary Information.

Page 5

Lines 19-20: Does it mean that the larger the ratio the deeper nutricline is? Please, be a bit more specific in here.

Page 6

Please move Table 2 to Supplementary information

Lines 5-25: This is result, please move to the appropriate section.

Line 15: Do you need these many significant figures for the PAR values? Please be

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consistent with the number of significant digits when reporting values in the main text.

Page 7

Line 11: replace 'commonest' to the 'most abundant'

Line 14: replace 'factors' temporal variability...' to 'assess temporal variability of the factors'.

Lines 18-20: I suggest to use mean  $\pm$  stdev when reporting fluxes at the study sites. We can see the range from Figure 3 and Table 3.

Page 8

Figure 3 – dashed line for the Shannon-Weaver Diversity Index cannot be seen or appears as a solid line.

Line 14: remove 'fairly'.

Page 9

Line 4: this sentence is confusing, please rephrase. Figure 5 will benefit from segregating the coccolithophore taxa into LPZ and UPZ species (in the legend).

Lines 11 and 34: add subsection numbers for clarity.

Page 10

Line 3: replace 'further west' to M4.

Page 11

Table 3: identify LPZ and UPZ species; also, in table caption, consider replacing 'maximum' with 'range' as given in the table.

Page 13

Figure 8: be consistent how you report units in the legend. I suggest removing word

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'units' for precipitation rates. Also, in figure axes, consider using Latitude ( $^{\circ}$ N) and Longitude ( $^{\circ}$ W).

Line 5: replace 'drastically' to 'considerably' or 'significantly'.

Line 18: replace 'by contrast' to 'in contrast'.

Page 15

Line 14: elaborate on the meaning of Factor 1 – what variables does it represent?

Line 17-19: this sentence does not read well, please consider rephrasing.

Page 18

Line 8: remove 'quite'.

Line 34: correct 'Falkowsky' to 'Falkowski'.

Line 41: replace '...seem to fit quite nicely' with 'this fits well'.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-216>, 2017.

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