Biogeosciences

Discussions

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Interactive comment on "Carbon Flux Explorer Optical Assessment of C, N and P Fluxes" *by* Hannah L. Bourne et al.

Anonymous Referee #1

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Comments on Bourne et al. paper

This paper conducts quantitative discussion on the relation between beam attenuation and settling particulate organic carbon / nitrogen / phosphate using Carbon Flux Explorer with time-series particle collector (CFE-Cals). In order to study the biological pump for quantifying CO_2 transport to the ocean interior, sediment trap experiment has been conducted all over the world ocean. However, moored or surface-tethered or even neutrally buoyant sediment trap has some specific disadvantages such as trapping efficiency and swimmer effect. In addition, it is hard to say that these "cost-performance" is high (need manpower and "ship time"). Nowadays, application of optical sensors such as transmissometer and backscatter meter to the study of marine particulate materials has been becoming more popular. However, although several scientists including one

of co-authors (Prof. Jim Bishop) have been making big efforts to calibrate optical data to actual POC and PIC flux, quantitative conversion of optical data to actual POC data is still on argument because optical observation spatiotemporally synchronized with particle observation has been difficult. Owing to development of CFE-Cals, this study has overcome this problem successfully, succeeding to Estapa et al. (2017). Thus, this paper is valuable for publication. However, I have some question and requests. Especially, discussion on comparison of previous reports is insufficient (explanation of previous papers is ambiguous). I would like to ask authors to make medium revisions as follows.

(Major points) (1) I cannot follow how authors drew Fig.6, especially regression line for previous papers. Please explain how to estimate respective POC: VAF relations of Estapa et al (2017) and Alldredge (1998) (there is no direct description about this relation in the original paper unlike Bishop et al. 2016 (1.0/2.8)) in section 3.4 Comparison to previous studies (or in supplement). (2) According to Figure A4 (Photograph of the surface-tethered BUOY-OSR) in Bishop et al. (2016), it seems that CFE-Cals was installed on the BUOY-OSR. I wonder if this data is not available. Although Bishop et al (2016) concluded that data obtained by BUOY-OSR is underestimated or sampling efficiency is low, if there is data, comparison of optical data and collected settling particle can be possible, POC/ATN relation can be proposed, and comparison of this data and present data can be possible. (3) The configuration figure of CFE-Cals like Figure A1 of Bishop et al (2016) is great helpful for readers to understand CFE-Cals. I strongly recommend authors to add configuration figure of CFE-Cals to this paper. (4) When large amount of settling particle or gigantic settling particle cover over window, settling particle which settle down on covered window cannot be counted and amount of particles or PC must be underestimated with ATN. What do authors think about this?

(Minor points) Page 1 Line 12 (P1L12) Why did not authors measure Ca with ICP-MS? Because Bishop (co-author) reported that "we have no data on the conversion of PIC(POL) to PIC(flux)" in his previous paper (Bishop et al. 2016).

P5L14 Please explain why Fluorinet (3M) was selected as initial liquid.

P5L16 Please explain how to rotate the sample selector rotator (is there motor and gear?)?

P9L20 Insert "(2008)" after "Lamborg et al."

P10L30 Description "(data for regression in Table S1)" should be placed between "this study" and "vs".

P14L18 (reference) C.H.Lamborg => Lamborg, C. H.

Table 1 (1)What does asterisk (*) of some filters mean? Please explain.

(2)I think information of "tilt" is important. How about touching upon information of "tilt" when sampling briefly in table caption or in appropriate place in the text?

Fig. 6 (1) Please explain difference between left figure and right figures. (2) Please explain "Estapa 2017" blue data and "Estapa 150 m " light blue data (150, 300, 500m data set and 150 m data, respectively?) (3) Blue color and light blue color are used not only for different regression lines (forced through zero intercept and allowing for an intercept), but also for different data set (150 m data only and all 150, 300, 500 m data?). This is confusable. Please change color set.

Table S2 (1) No description about Table S2 (2) More detail explanation about respective column in caption

References There are many mistakes and different description (e.g. Deep. Res. => Deep Sea Res, K.O Buesseler <=> Buesseler, K.O.). Please check format.

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