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Biogeosciences Discussions

Interactive comment on "Contrasting distribution of aggregates >100 μm in the upper kilometre of the South-Eastern Pacific" *by* L. Guidi et al.

Anonymous Referee #2

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The authors present a new set of data across several differing regions from the equatorial Pacific to the Chile margin. From what I have seen of their methods presented here and in other papers, the quality of data are excellent and bring new insight into the dynamics of particles in the ocean. Lots of data exist on the distribution of small particles, but this team of scientists is making an important contribution in measuring the distribution of large aggregates and interpreting their distribution.

I suggest that the title of the paper include fluxes: **Contrasting distribution of aggregates >100 μm and fluxes in the upper kilometre of the South-Eastern Pacific**

I'm not sure that the word "Contrasting" is needed at the beginning of the title.

It is great that they were able to deploy sediment traps as they worked in different

regions. While another paper is referenced that describes how those traps were used, it would be helpful to briefly describe what kind of traps were used, how long they were deployed, and how they were protected from surface motion so the reader can evaluate their validity. Figure 6 compares the trap flux with the calculated aggregate flux, and since it is a log-log plot there is a lot of scatter, but the $>$ 2 order-of-magnitude range of fluxes shows a very convincing correlation.

Throughout the document the term “superficial” needs to be replaced with a better term. Clearly the intent is to refer to the “surface layer” of the ocean, or the aggregates in the “surface layer.” Whether the term “surface layer” is accurate depends on what the authors mean. Are they referring to the “surface mixed layer”? -the “euphotic zone”? – down to the pycnocline? It may be that none of these terms apply to the zone they are referring to at all stations. Somehow they have to define the “surface zone” they are referring to and use it appropriately throughout the text and figures. Perhaps “surface zone” would be sufficiently descriptive without being tied to other features of light, mixing or density.

In the equations explained in Methods (page 876-877), it is important to be more explicit as to how you deal with the equations of Alldredge and Gotschalk. It reads like you use the Alldredge and Gotshalk equation directly for calculating aggregate fluxes, whereas I understand that it is the minimization procedure that really gives you the parameters of A and b that are used.

In a number of places (see specific notes below), the authors suggest that remineralization is the reason for the decrease in aggregates. While I agree that this is the most likely cause, they need to add that aggregates could also be broken up to particles/aggregates smaller than the 100μm cutoff of the UVP.

With some further explanation of techniques and procedures, this will be an important contribution contribution to the literature of particle dynamics.

Specific comments:

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I have provided an electronic copy of the paper with many small changes in tracking mode. Below are some comments with a little more detail.

872-5 The decrease with depth in aggregate abundance is attributed to remineralizaton processes. Undoubtedly this occurs, but since the UVP data are limited to particles $>$ 100 μm in diameter, there is also the possibility that disaggregation of large aggregates into aggregates or particles $<$100 μm can account for some of the decrease.

872-26 Many oceanographers refer to the particulate matter in the ocean as SPM - suspended particulate matter. I have done so my self in the past. As we seek greater understanding not only of particle distribution in the ocean, but the processes which cause their distribution, we must reexamine our terminology. "Suspended" implies some force that keeps the particles from settling. In rivers there is sufficient turbulence to keep particles suspended, and this is where the term was coined - to differentiate between suspended and bed load rolling along the bottom. Particles in the upper mixed layer of the ocean may be "suspended" by circulation within the mixed layer, but once they get below the mixed layer, they are no longer suspended by any outside force. There may be some organic particles – from microns in size to diffuse aggregates - which are not settling because their bulk density equals the density of surrounding water. The lack of settling results from buoyancy, not a suspending force. In oceanography I think it is important to refine our terminology so that we don't inadvertently convey incorrect notions. I'm sure that the authors of this paper, who are experts on the subject of marine particles and dynamics, are fully aware of this dichotomy, but we have all stayed in the rut of referring to "suspended" particles. We never talk about SPOC – suspended POC, and I suggest we likewise talk about particulate matter (PM) not SPM.

873-4 There needs to be some discussion or comment on density and how you deal with that in your assumptions and measurements.

878-22 You need to provide a brief explanation of what type of traps were used and how long they were deployed.

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880-23 to 881-11 This paragraph is a repeat of material in Methods (down to 881-4) and Methods and Results (881-5 to 11). It should be deleted from the Discussion, but make sure all of it is in the Methods or Results.

883-10 I can understand the possibility of aggregation or advection causing the increase in flux with depth, but how are you suggesting that anoxic conditions would cause this increase? I don't disagree that it could occur, I just think you need to briefly mention why. Morrison et al. (1999) show a particle increase at the depth of the oxygen minimum. The oxygen minimum zone in the Arabian Sea during 1995. Deep Sea Res. II 46: 1903-1931. They note that particle maxima have been observed in low oxygen zones in the Arabian Sea previously by Naqvi et al. (1993), and off the coast of Peru by Pak et al. (1980). Naqvi et al. (1993) demonstrated that the particle maxima in the Arabian Sea are tightly coupled with the secondary nitrite maximum and denitrifying conditions, and not solely low-oxygen concentrations. This is a region of denitrification, and the presence and activities of bacteria may cause the increase in particles.

885-21 Disaggregation of particles by feeding or swimming was shown nicely in experiments by Alldredge and students/colleagues. I don't have the reference at hand, but I'm sure you can find it easily and add it to the references on line 24.

Figs 2, 4, 5, and 8 – Add the station labels that are on Fig. 1 to these figures so the reader can more easily identify the features you refer to in the text.

Interactive comment on Biogeosciences Discuss., 5, 871, 2008.