

Interactive comment on “Technical Note: Sampling and processing of mesocosm sediment trap material for quantitative biogeochemical analysis” by T. Boxhammer et al.

Anonymous Referee #1

Received and published: 5 January 2016

The manuscript from Boxhammer and colleagues is a technical note submitted in the frame of the Special Issue: Effects of rising CO₂ on a Baltic Sea plankton community: ecological and biogeochemical impacts. Although I believe such protocol oriented papers are highly informative and therefore would ultimately recommend this manuscript for publication, I believe it is rather incomplete and would request a proper evaluation and discussion of the well-known problem of “swimmers”. The authors very quickly mention that: “Subsamples of sediment trap material for measurements such as zooplankton contribution (Niehoff et al., 2013)” were taken, and that “Total volume of all subsamples should be kept small (ideally below 5%) in order to limit the subsampling bias on the remaining sample”.

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In my opinion, a proper evaluation of the potential bias in keeping zooplankton in the sediment trap samples must be presented. Questions to answer and/or discuss: what is the proportion of swimmers in samples collected since 2010? According to Niehoff et al. (2013), most organisms collected in Svalbard sediment traps were alive (referred to as swimmers in opposition to sinkers). How efficient and precise is this protocol to evaluate zooplankton contribution based on subsamples of at most 5% of the sampling volume, especially considering the occasional “patchy” distribution of particles mentioned by the authors? The authors further mention removing “Mesozooplankton actively swimming in the liquid phase, mostly copepods, . . . together with the supernatant from the settled material” If “some” swimmers are indeed manually removed, how do you precisely evaluate swimmers contribution for subsequent biogeochemical analyses? Are there some alternatives, for instance, solutions to “repel” swimmers from sediment traps or to avoid sampling for them?

Sampling of the mesocosms: Although I do really see the advantage of a surface sampling (avoiding frequent diving in cold areas), I wonder whether the system, used for several years, has been occasionally blocked (a 1 cm inner diameter hose seems small to me) or prone to malfunctions. Are you 100% sure of the efficiency of this sampling procedure (i.e. that all sinking material is collected)? A very informative evaluation would be to show average deviations in terms of collected mass between replicated mesocosms (control mesocosms for instance) during the various experiments.

Separation of particles from bulk seawater: This is a very informative section based on a proper evaluation of the efficiency of each technique. Since it leads to one of the main conclusions of this manuscript, it should be clearly highlighted in the abstract that does not provide any recommendations so far. I think that Figure 5 is not very informative and not easy to read as presented. What the reader wants to know and easily verify is: how many times did you observe an “unnatural” undersaturation in treated samples? A simple xy plot, Omega_{ar} before vs. after chemical treatment should be sufficient. Furthermore, did you check whether these pH decreases leading

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to stronger undersaturations resulted in significant carbonate dissolution during the flocculation process (how long did it last? maybe I missed it)?

Efficiency of grinding process: Table 2. Please provide results for N measurements as well, and if available for ^{13}C and ^{15}N . Showing CV% for C that represents 20-25% of the organic matter is ok. Providing similar estimates for N that is potentially 10-20 times lower in mass would be even better! Figure 6 should be moved to the supplementary material. Several cryogenic grinding systems are commercially available, providing (according to the technical specs) a powder of ~ 5 microns. One could ask what is the originality of your system. Is there a step forward compared to these commercial units (e.g. Cryomill from Retsch or others) that I do not see?

Interactive comment on Biogeosciences Discuss., 12, 18693, 2015.