

# ***Interactive comment on “Zooplankton faecal pellet transfer through the meso- and bathypelagic layers in the Southern Ocean in spring” by Anna Belcher et al.***

## **Anonymous Referee #2**

Received and published: 6 February 2017

General comments The manuscript by Belcher et al. compares estimates of copepod faecal pellet production in the epipelagic with those of faecal pellet abundances in the meso- and bathypelagic derived from Marine Snow Catcher (MSC) and sediment traps. The study was conducted in the Scotia Sea, Southern Ocean. Based on faecal pellet morphology and abundance, the main conclusion of this study is that small faecal pellets are in high abundance in the epipelagic but do not contribute much to export fluxes. Instead, repackaging of faecal pellets and de novo production take place in the meso- and bathypelagic. The manuscript is well written. The findings are in accordance with expectations derived from earlier studies on faecal pellet export in the ocean.

Specific comments I suggest that the authors provide more information on their meth-

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ods and measurements to allow for better evaluation of the data. I also suggest a more critical discussion on the comparability of data on faecal pellet fluxes derived from net tows, MSC and sediment traps. 1) Lines 89 and 90; here, an estimate for a mean current velocity at the study site of  $<10 \text{ m s}^{-1}$  is given and Whitehouse et al. (2012) are cited to suggest that lateral advection can be neglected. It is not clear where the current velocity was measured and for what processes it can be neglected. I assume that a current meter was used in the cited study to estimate the trapping efficiency of the sediment traps, but this information should be given. Is the current velocity in the epi- and mesopelagic in the Scotia Sea in the same range? Does one have to consider lateral advection of faecal pellets in the water column? This is important to estimate how well samples from a MSC and deep traps can be compared. 2) 140ff.; please indicate how many splits were analyzed. Were the splits analyzed separately so that a sampling error can be given? How many pellets per split, or in total, were counted? So far only relative abundances are given in the manuscript and supplemental information. The authors may consider providing a table with absolute counts in the supplemental information. Please give this information also for faecal pellets determined in the MSC samples. 3) 159 ff.: The quality of the faecal pellet sinking velocity measurement and therewith of the faecal pellet fluxes cannot be evaluated. The authors state that they used two different approaches to determine faecal pellet sinking velocity and that there were no significant differences between the methods. But how reliable are the obtained sinking velocities? The range of sinking velocities given in line 246 is rather large (24-950 m d<sup>-1</sup>). The ranges given in lines 248-249 are much smaller. How do these numbers compare? What was the variability of sinking velocity within each approach? What was the variability within each size class? Since these data are used to calculate the faecal pellet flux (FPF), the original data should be given in the manuscript and their accuracy assessed critically. Please add more information. 4) The authors conclude that small FP that sink more slowly are not transferred efficiently to depth as they are subject to remineralization and coprophagy for a much longer period of time than fast sinking large particles. This is very well comprehensible. However, I would like

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to see a more critical discussion of the comparability of data from net tows, MSC and sediment traps, which takes into account the spatio-temporal variability in that region, the three-dimensional flow field and the current velocities. In addition to biogenic loss process, slowly sinking fecal pellets found in the MSC of stations P 2 and P3 may not be represented well in the sediment traps at 1500 and 2000m depth, because the traps collect particles from a much wider area (e.g. Waniek et al. 2000) and integrate over a longer, and different, time period.

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Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-520, 2016.

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