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Interactive comment on "Carbon export and transfer to depth across the Southern Ocean Great Calcite Belt" *by* S. Z. Rosengard et al.

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Response 2

We thank referee #2 for thorough comments and clear suggestions for improvement. Here we discuss information from several new supplemental figures that synthesize ecosystem composition data with our particulate bulk concentration measurements at corresponding stations in the Great Calcite Belt cruises. We refer to the changes made in the manuscript using the original page/line numbers in the downloadable pdf-file on the interactive discussion webpage. To see the actual changes in main text and supplement, please refer to what we have appended to our response to referee #1.

We found that in responding to referee #1's first comment, we were able to address

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referee #2's main suggestions for improvement. Referee #2 wrote:

"I only have one minor comment related to the impact of the plankton community composition of POC export and remineralization. The authors present a large and well synthesize dataset of particle export but this paper is very 'particle centric'. Indeed, I would have liked to see external data to confort their conclusions on the impact of the plankton community composition on POC export that is only based on BSi and PIC fluxes in this study. Is there any external data available (HPLC pigments, phytoplankton compositions from slides/cytometry, remonte sensing estimations of phytoplankton composition such as PHYSAT and others ...)?"

We agree that more information on the phytoplankton community at all stations across GB1 and GB2 would strengthen our hypotheses connecting ecosystem composition to POC transfer, which are currently based on >51 μm BSi and PIC concentrations. To address this, we compared our [BSi] and [PIC] measurements to coccolithophore and diatom cell counts measured by co-author Barney Balch at corresponding stations and have added 3 supplementary figures (Figs. S2, S3, S4). The comparisons show that total coccolithophores and diatoms in the euphotic zone are significantly and positively correlated with >51 μm [PIC] and [BSi] at zPAR, respectively ($p<0.05$). This supports our use of biomineral concentrations to infer phytoplankton community structure across the Great Calcite Belt. The caveats of this comparison and methodology involved in the phytoplankton cell counts are discussed in the supplement. We now refer to these supplementary figures in the main text, Section 4.7 (pages 2867, 2868), where we discuss ecosystem composition in terms of >51 μm [BSi] and [PIC] measurements, and in the Fig. 10 caption. Notably, Fig. S4 demonstrates that several stations which we have interpreted to be "diatom-dominated" because >51 μm [PIC]:[BSi]<1 (e.g., page 2868, lines 9-11) exhibit more coccolithophore than diatom cell counts in the euphotic zone. Even though this may be due to the different size fractions that are being compared, this observation has persuaded us to reword our descriptions of stations as "dominated" by coccolithophores (if [PIC]:[BSi]>1) or diatoms (if [PIC]:[BSi]<1) in

BGD
12, C2353–C2355, 2015

Section 4.7. Instead, we describe such stations as either exhibiting higher “relative abundances” of coccolithophores (if [PIC]:[BSi]>1) or diatoms (if [PIC]:[BSi]<1) in the euphotic zone.

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