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Interactive comment on "Coccolithophore biodiversity controls carbonate export in the Southern Ocean" *by* Andrés S. Rigual Hernández et al.

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This paper is a very useful and original contribution to our understanding of how coccolithophore diversity shapes carbonate export in the Southern Ocean based on time series of sediment trap data. The paper is a pleasure to read: very well written, well structured, comprehensive, clear, and concise, with high-quality figures, and in-depth discussion. I highly recommend publication of this work in Biogeosciences. Congratulations to the authors for this very nice piece of work. I only have a few very minor comments that may improve the paper.

P3L87-89: replace "satellite reflectance observations" with "ocean color satellite re-

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flectance observations" to precise that it is the fraction of incoming VISIBLE and NEAR-INFRARED solar radiation that is reflected from the ocean surface. Add reference (Balch et al., 2005) (Gordon et al., 2001) at the end of the sentence. These are the NASA standard algorithms for PIC retrieval.

P4L111: reference for representativeness is missing

P5L132: remove "that".

P6 Figure 1: STZ not included in legend.

P8L234: Can you briefly explain the method to calculate daily fluxes?

P9L253-255. I strongly appreciate the authors obtained two independent estimates of coccolith fluxes based on the birefringence and morphometric methods, each with their own advantages and disadvantages.

P10L294: Can you briefly explain why you think that the finding of <5% error on DSL estimates from polarization would apply to other species than the one tested?

Materials and Methods section: I think you should add a section on the ocean colour satellite data treatment. Which data did you use? Figure 2 suggests you used weekly data for PIC but monthly for Chla? Why not the same temporal resolution? Did you use multisensor merged products (such as GlobColour?)? Did you do any spatial averaging and how did you compute the weekly averages?

P12 Figure legend: specify "ocean color satellite-derived". Panel b, please add Chla data for October/November to see the potential rise in Austral spring. Can you present PIC and Chla data at the same temporal resolution? That would make sense.

P12 Figure 2: panel c at 61S is missing.

P16L429: the secondary maximum of satellite PIC might be an artefact of satellite data treatment, but it's hard to say, since that critical information is missing from the manuscript Materials and Methods. . .

P14L377: Not clear what you mean with total CaCO3 export in Fig. 5. Is this the combined export of coccos and forams? If yes, how did you quantify foram export? I suggest you also explain total CaCO3 in the Figure legend.

P17L436: it may also be a foraminiferan signal, see for example (Rembauville et al., 2016).

P18L497 etc.: The satellite PIC algorithm has indeed been calibrated in Northern hemisphere waters, where E. huxleyi greatly outnumbered other coccolithophore species, which is also the case in your study areas. In fact, the satellite signal (which is proportional to the particulate backscattering coefficient) is more sensitive to the concentration of E. huxelyi-sized particles, compared to larger, less abundant cocco species. Indeed, if larger, much heavier species are more prevalent in the Northern hemisphere waters, where the conversion factor for backscatter to PIC is calibrated, then this would lead to an overestimation of PIC in any waters where larger species are less prevalent. Put in other words, the conversion factor of backscatter to PIC is dependant on the size of the calcite particles. An alternative explanation for the overestimation of PIC is Southern Ocean waters is the contribution of bubbles to the backscattering coefficient.

P23L654: poleward expansion of E. huxleyi to the Arctic has also been demonstrated by (Neukermans et al., 2018)

P24L664 etc.: see also recent review in (Krumhardt et al., 2017)

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