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# ***Interactive comment on “Latitudinal and temporal distributions of diatom populations in the pelagic waters of the Subantarctic and Polar Frontal Zones of the Southern Ocean and their role in the biological pump” by A. S. Rigual-Hernández et al.***

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## General comments

Rigual-Hernandez and co-workers studied the seasonal and interannual variability of particle and diatoms fluxes trapped at two locations in front areas between Tasmania and Antarctica. Station 47°S was deployed in the central SAZ (two-year record), while Station 54°S (six-year record) was located in the PFZ. They compare and discuss their data with results previously gained at both stations and at 51°S and 61°S. Fluxes are

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highly seasonal, with two maxima registered during the austral summer and minima during winter. Biogenic silica (opal) is the dominant component at 54°S, less important at 47°S. The strong correlation between opal and organic carbon suggests that a significant fraction of the organic matter exported to the deep sea is delivered by diatom productivity events. Seasonal diatom fluxes appear driven principally by changes in the flux of *Fragilariaopsis kerguelensis*, the main contributor to the diatom/opal flux during the bloom season. In addition, a diverse diatom assemblage delivers information on species dynamics, which can be useful for understanding the signal preserved in late Quaternary sediments from the Southern Ocean.

The manuscript is well written and well organized and can be published in Biogeosciences after some revision. The Introduction and the Discussion would greatly benefit from some shortening. Below I list a few remarks and make some comments, which I hope the authors find helpful.

#### Specific comments

The Introduction addresses several subjects. Although these subjects are discussed afterward, I suggest some shortening and/or a re-arrangements of issues addressed. The first paragraphs mainly deals with the significance of the Southern Ocean in the marine realm. Part of the issues addressed here are also mentioned in “2. Oceanographic and biological setting”. Paragraphs 3 (Diatoms in water and sediments) and 4 (Temporal variability of diatom productivity) can be shortened and combine into one paragraph. The research using sediment traps has been running for some decades in the meanwhile. I don't think it is necessary to extend much on this issue in the Intro. Issues related with diatoms and/or biological pump can be combined into Paragraphs 2 and 3-4. Objectives 1. and 2. are very similar. Rephrase (or combine?). p. 8621, l. 17-18: provide a recent reference for SST. Rintoul and Trull, 2001, hardly cover the studied period presented in the manuscript. p. 8621, l. 22-24: sort of similar to what is said above in l. 16-18. Revise. p. 8622, l. 6: which zones? Clarify. p. 8622, l. 8: chemical elements sometimes fully written, sometimes abbreviated. Please revise and

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unify. P. 8623, l. 14: it is not quite right to state that results are presented for a six-year record between 1997 and 2007. Please detail which years have been sampled. The info about the trapping intervals should be in the Abstract and in the Intro as well. P. 8624, l. 12: any suggestion of the “degree of undertrapping” being seasonally dependent? Or remained the same all-year round? P. 8628, l. 17-19: start describing new results, move this sentence to the end of the first Results paragraph. P. 8629, l. 17-19: plot the temporal pattern of BSi:PIC mole. P. 8631, l. 16-17: are these diversity index values annual averages? Or averages for the entire trap experiments? Same question for the statement in l. 19: 43% for *F kerguelensis* refers to which interval? The same for the listed spp. in the following lines. P. 8632: “4.3. Principal component analysis” OF WHAT? In general, the description of the PCA is wordy and tedious to read. Rephrase and shorten! P. 8632, l. 6-7: the use of only two axes for site 47°S explain less than 40% of the variance. Whether this information is ecologically significant is a quite different issue. P. 8636, “5.2. Latitudinal diatom species distribution” and “5.3. Seasonal variability of diatom assemblages”: these two Discussion sections can be shortened and combined. The seasonal variability in the composition of the diatom community follows the same pattern of discussion: first the community at 47°S, then at 54°S, then the comparison with previous near-by studies. I suggest also constraining the discussion to the ecologically most significant species (based on PCA?). Section 5.3. is extremely detailed and wordy. For the audience less familiar with diatoms, it is difficult to follow and try to pick up the main message/s. Some space can be saved by abbreviating the genera name (no need to fully write them once they have been mentioned). P. 8637, l. 17: abundance of *F kerguelensis*: relative or absolute? P. 8638, l. 7-17: this has been already discussed above. P. 8643: as long as the authors do not provide own observations on the occurrence of aggregates in their trap samples, this part of the Discussion remains speculative. In l. 10-27 factors affecting/defining the formation of aggregates is discussed: is this necessary? In P. 8644, l. 8-14, the possible effect of aggregate formation is again raised. The “aggregate” issue appears also in “6. Conclusions” (P. 8647, 14-16). P. 8644, l. 2.5: this is somehow confusing. Please revise. Figures: Fig

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2: what do the authors mean with “Others”? Lithogenics? (see also Fig 3) References:  
I leave this up to the Editor: for a research article, the Reference list is quite long.

BGD

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Technical corrections

P. 8639, l. 23: delete the dot before Kopczynska. P. 8644, l. 2: delete w after to.

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