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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.***

**Anonymous Referee #2**

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This is an important contribution that takes a species-based approach to the attribution of carbon flux and potential CO<sub>2</sub> draw down. Sediment traps that tap export from the surface layer in key locations in the Pacific sector of the Southern Ocean offer an important insight into the operation of the biological carbon pump. The paper is, on the whole, well written, with just a few lapses in phrasing (see detailed comments below). While the role of key species and species groups is generally well considered, there are some potentially miss-leading and contradictory over-generalisations regarding some taxa, notably *Thalassiothrix* – see detailed comments below. Specific comments: Last

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sentence of abstract is muddled – needs rephrased to e.g. “*F. kerguelensis* plays a major role in the decoupling. . .”. P 8619 – line 7 replace “to determine” with “the determination of”. P 8621 – line 12 “biological distributions” - meaning uncertain – do you mean “biological characteristics”? P. 8622 lines 23-27. It is not clear how a subsurface chlorophyll maximum (SCM) can be formed as a response to iron and silicate colimitation. Surely the SCM is formed either by settling of cells to depth or by growth at depth – this needs clarification. P. 8626 line 19 – replace “at” with “to”. P. 8633 – line 17 – insert “the” before “relative”. P. 8633 – line 25 replace “distributions” with “characteristics”. Discussion: p. 8636 – line 5; the authors state that *Chaetoceros* resting spores are indicators of coastal environments. – Yes – but not exclusively – see for example the recent account of massive flux of *Chaetoceros* resting spores in the oceanic North Atlantic (Rynearson, T.A. 2013 “Major contribution of diatom resting spores to vertical flux in the sub-polar North Atlantic” *Deep-Sea Research I*, 82, 60-71). This study should be referred to here, and the possibility of oceanic resting spore formation acknowledged. P. 8641 – line 11: replace “any” with “one”. P. 8646 - lines 13-17 – here the authors lump a number of species together including *Thalassiothrix antarctica* with *Fragilariopsis kerguelensis* – following the quoted Assmy et al (2013) study. But, in fact, both the present discussion paper and the Assmy study are selective here. Both studies make the ecological association of *T. antarctica* with other subsurface chlorophyll maximum taxa such as the relatively more lightly silicified *Proboscia* – then both papers place *T. antarctica* together with *F. kerguelensis*. The main difference here is that *T. antarctica* with its fall dump sedimentation (along with *Proboscia*) is probably much more critical as a carbon sinker than *F. kerguelensis*. The manuscript would benefit from a fuller discussion of these issues.

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