The review comments on the manuscript entitled "Diatoms as paleoproductivity proxy in the NW Iberian coastal upwelling system (NE Atlantic)" by Zúñiga D, Santos C, Froján M, Salgueiro E, Rufino MM, De la Granda F, Figueiras FG, Castro CG, Abrantes F for possible publication in Biogeosciences.

Major comment

The objectives of this paper is "How diatoms species determine primary production signal?" (quotation from Abstract), "to evaluate the use of marine diatoms as a paleoproductivity proxy for NW Iberian coastal upwelling system" (from Introduction). I understood the importance of resting spores and *Paralia sulcata* in diatom flora from sediment trap and sediment samples for paleoceanographic studies around the study area. It is meaningful to try to find the relationship among living diatom flora (biocoenosis), sinking flora obtained by sediment trap, and fossil assemblage in sediment (thanatocoenosis). The research results on diatom assemblage shows strong influence of lateral material advection and taphonomic bias due to seasonal downwelling event. As far as I saw the figures in this manuscript, it looks like that there is interannual variation in downwelling period length and intensity of rive discharge which probably reflects climate condition. The deciphering relationship between these events and diatom remains in sediment is another topic for further application of diatom fossils as a paleoenvironmental proxy. On the conclusion as the answer to objectives of this paper, it is a little bit uncertain for me to understand which of valve contents (valve number/dry g sediment) or % in total diatom valves is better to estimate paleo primary production signal. I feel that there are several points to be considered and/or corrected before the publication. My specific and editorial comments are as follows. Because I'm not a native English speaker, I did not care for the English style in this manuscript. I hope some of these comments are helpful to revise this manuscript.

Specific and editorial comments

2. Regional setting

p. 3, l. 11 "important source of terrestrial sediments to the inner shelf"

> In addition to lithogenic material advection by river discharge, are there any significant influences of river discharge to nutrients for primary production and abundance of particulate organic matters in study area?

3.2. Water Column

p. 4, l. 9 "For diatoms counting … collected as 5m water depth"

> Why water samples for diatom analysis were taken from 5 m depth? I'm not sure the water samples from 5m depth can be treated as a representative of diatom biocoenosis in water column. For example, would authors show vertical distribution of chlorophyll-a concentration during the monthly ship-board observation?

p. 4, l.12 “microorganisms were counted and identified”

If resuspended dead specimens are included in the assemblage data from water samples for assemblage comparison with sediment trap and sediment samples, please mention it.

3.3. Sediment trap samples

p. 4, l.16 “from March 2009 to June 2012”

As far as I see Figure 5, it looks like there were no deployment periods. If there is a blank of sampling period, please mention it in text or figure captions.

p. 4, l.16 “The trap was deployed at 35 m”

I hope that the subsurface chlorophyll maximum was locating shallower than 35m throughout the sediment trap deployment period.

p. 4, l.19 “Only in exceptional cases… mooring tilts between 15-20°.”

When this event was observed?

p. 4, l. 32-p. 5, l.3 “Diatom flux was calculated as …where the flux F is expressed as number of valves m^{-2} d^{-1}, …”

How did authors count resting spores in sediment trap samples? The unit of resting spore flux in Fig. 7e is “number of spores m^{-2} d^{-1}”. In the result section (p.6, l. 27), Table 3, and Fig. 5e, total diatom flux including resting spores is expressed as “# m^{-2} d^{-1}” which is different from the diatom flux unit explained here. The resting spore of *Chaetoceros* species listed in this study and *Leptocylindrus danicus* is composed of two valves. If total diatom flux including resting spore is expressed as the sum of vegetative cell “valve numbers” and “spore numbers” (not spore valve numbers), I think that the contribution of resting spore to total diatom flux will be underestimated and relative abundance of vegetative cells will be overestimated. If this is just a problem in expressive style in this manuscript, please revise the unit of spore abundance to avoid confusion. If resting spore contribution to total diatoms flux was actually underestimated in the dataset, re-analysis of CCA, replotting figures, data correction in tables 2 and 3 will be required.

p. 5, l.9 “a percentage higher than 2% of total abundance were considered for further analysis.”

Which species were applied to diatom analysis? please note it in appendix A table for encountered diatom taxa (for example, using bold font of “X”).

p. 5, l.11 “42°10’N N,”

Correct the duplication of “N”

p. 5, l.19 “main groups of diatoms (freshwater diatoms, benthic diatoms, …)”

Is the category of benthic diatoms containing freshwater benthic and terrestrial species? If possible, would authors show which species are categorized into which group in Appendix A table, please?

4.1. Environmental conditions

p. 6, l.9-11 “Hydrographically, in a first phase … Later on, we differentiate the mixing period…”

Would authors show the first phase and later mixing period in the result figures?

p. 6, l. 14 “(~14 cel mL-1)”

cells?

p. 6, l. 14 “Small centric cells”

What is the definition of small cell size? The aim of this paper is to evaluate the marine diatom availability as a paleoproductivity while there is no discussion on the relationship between diatom abundance in cell volume (or carbon content) of each species and chlorophyll concentration (or primary production) throughout the manuscript. I see the high numerical dominance of *Chaetoceros* and *Leptocylindrus* in cell number in this study, and I agree their significant contribution among diatom species to primary production. However, some documentation on diatom contribution to primary production may be required in view point of cell volume or particulate carbon content for each species in studied samples. Because BioSi may not be primal component in siniking particles (Fig. 5b) and no information on other component in sinking particles, readers will not be sure that diatom is the most important contributor to primary production in the study area.

p. 7, l. 10 “Diatom abundance in GeoB 11002-1 … higher than in the offshore GeoB 11003-2”

What is main reason on the difference of diatom valve contents in surface sediment at two sites? On the cell contents and relative abundance of proxy species in sediment samples, which is better to use for paleoproduction proxy?

p. 7, l. 11 “# valves gr^{-1}”

The unit should be revised as # valves g^{-1} based on International System of Units.

5. Discussion

p. 8, l. 9-10 “diatom contribution … achieved maximum percentage”

maximum percentage to what? To total biogenic opal flux or particulate organic carbon?

Comment: In general, coastal sediment sample except for varve sediment will be treated as an accumulation of settling particles for several-decadal years. In the case of studied sediments, diatom assemblage should mainly reflect the downwelling season because much of settling diatoms were supplied in downwelling season rather than upwelling season.

5.1. Sediment trap diatom assemblage as a tracer of allocthonous sources in sinking material

Comment: Are there any relationships between lithogenic particle fluxes and occurrence patterns of

freshwater and benthic diatom taxa if they are treated as a kind of proxies for sediment resuspension and lateral material advection? Can authors mention on time-series fluctuation of lithogenic particle flux in this paper?

5.2. Seasonal succession of diatom species during upwelling seasons: the imprint over the fossil diatom assemblage

Comment: As the answer to the objectives of this paper, it is a little bit uncertain for me which of valve contents and % of resting spores is better to use for the paleo productivity proxy? More additional and detail explanation may be required as my impression.

References

The style should be corrected to the format of Biogeosciences.

Table 1. "Main relationships"

How did authors define the main relationships? What is representing the data value in bold with darker gray background?

Table 2. "Pearson correlations"

It is unclear whether this Pearson correlation coefficient was calculated on diatom valve flux or relative abundance of each taxon in total diatom flux.

"Main relationships"

How did authors define the main relationships? $p<0.05$?

Table 3.

What is the difference of 0 and blank in diatom flux data?

Fig. 4(a)

There is small arrow symbol located near the maximum flux of Small centric species. What does this arrow mean?

Fig. 4(e, f)

Are these plots including the data on resting spore of *Leptocylindrus* and *Chaetoceros*?

Fig. 5

The downwelling period in 2010-2011 is differ from Fig. 2. Please check and fix it.

Fig. 5(c)

The flux unit is a little bit uncertain. For example, "individuals m^{-2} d^{-1}" may be better (in this case, diatom flux must be treated as cell number rather than valve number).

Fig. 6

The downwelling period in 2010-2011 is differ from Fig. 2. Please check and fix it.

Fig. 6(a) "Benthic"

Is this mean that benthic form of both marine-brackish water and freshwater species are included in this data set?

Fig. 7(a, b, e)

On the flux spike over the upper limit of vertical axis, I cannot find which species made the high flux.