Interactive comment on "Global database of oceanic particulate organic carbon to ^{234}Th ratios: Improving estimates of the biological carbon pump" *by* Viena Puigcorbé et al.

Anonymous Referee #2

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Global database of oceanic particulate organic carbon to 234Th ratios: Improving estimates of the biological carbon pump by Viena Puigcorbé, Pere Masqué, Frédéric A. C. Le Moigne

General comments

Overall, this data description paper is straightforward and generally well-written. The data compilation has the potential to further the reuse of the extensive dataset and be useful for future interpretations and models. However, as it should contain all data available, it would be necessary and reasonable to extend the dataset to 2018 (at least). In addition, some sections are redundant and the conclusion section is too

similar to the abstract.

Specific comments

Lines 29-32: However, quantifying the magnitude of the biological carbon pump at both the regional and global scales is challenging and current assessments vary widely, with estimates ranging from 5 to 20 GtC y-1 being exported below the euphotic zone or the mixed layer depth (Guidi et al., 2015; Henson et al., 2011; Laws et al., 2011).

Are the wide ranges of estimates due to the challenges of quantifying the magnitude of the biological carbon pump, or do they simply accurately reflect the actual spatial and temporal variations? Please clarify the statement.

Lines 85-87: The sinking particles from which the ratio is measured should, ideally, be collected at the depth where the export has been estimated and represent the pool of particles that is driving the export of organic carbon.

It would be informative to highlight these 'ideal' datasets in the table; future users may want to focus on these data only. It would also be interesting to verify if the same trends reported here would be observed when using these data only.

Lines 149-150: The database consists of 9110 measurements of POC/Th ratios in the ocean. Particles were collected using in situ pumps (ISP), water collection bottles (CB) and sediment traps (ST).

Could you provide the amount of measurements for each method in the text?

Other points to discuss:

1- POC flux composition

Lines 201-206: High POC/Th ratios are usually associated to the presence of large phytoplankton groups, such as diatoms, which are dominant in high latitude areas with no nutrient limitations, or where zooplankton populations are large and there is a significant input of fecal pellets, which should have also high POC/Th ratios. Low ratios, on

the other hand, are commonly observed in warm oligotrophic areas where productivity is limited and the main phytoplanktonic groups are picoplankton (see Buesseler et al., 2006 and references therein).

While the influence of the composition of the POC flux is mentioned, it is possible that this is the main factor influencing POC/Th ratios. Seasonal, regional and depth variations may actually simply reflect variations in the composition of the fluxes. Could the authors further discuss this important aspect? Determining the composition of the POC flux is critical to better understand variations in POC/Th ratios and in the magnitude of the POC flux and this should be emphasized.

2-Timescale

What about the difficulty of comparing POC/Th ratios (timescale of weeks) to global patterns of surface productivity, phytoplankton composition, zooplankton abundance, mixed layer depth, dust inputs to the surface ocean, and ice cover; all measurements with shorter timescales? Please address this issue.

3-Lateral advection

Could the export of small particles reflect lateral advection instead of downward export?

Technical corrections

-The first sentences of the introduction are the exact same sentences than the abstract - Please modify.

-While Lepore and Moran (2007) is listed in Pangaea, it is not listed in the reference list and in the table. Was it included in the analysis? - Please revise the reference list.

-Some sentences are much too long - Please revise throughout the text.

-Please do not use language such as: . . .is presented in Figure 4; Figure 3 shows. . . ; . . .are shown in Figure 4. Simply refer to the figure at the end of the sentence.

-Figure 2: Could you adjust the color scales (log?) so that it is possible to see a gradient? It appears all or nothing as it is.

-Figure 4 would benefit from larger fonts.