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Discussions

Interactive comment on "On the barium-oxygen consumption relationship in the Mediterranean Sea: implications for mesopelagic marine snow remineralisation" *by* Stéphanie H. M. Jacquet et al.

Anonymous Referee #1

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Jacquet et al. present new data of Baxs concentrations, O2 consumption rates from direct measurements and prokaryotic heterotrophic productions (PHP) from the ANTARES station in the Mediterranean Sea. The aim of this research is to investigate the connections between these three parameters (Baxs concentrations, O2 consumption rates and PHP) in order to validate the Baxs-O2 consumption transfer function first proposed by Dehairs et al. (1997) in the Southern Ocean. The authors found higher Baxs concentration associated to deeper PHP and to greater O2 consumption rate. Finally, they found a relatively good agreement between O2 consumption rates estimated by the Baxs transfer function from the Southern Ocean (Dehairs et al., 1997) and by direct measurements, confirming the use of this transfer function in the

Mediterranean Sea. Previous studies used Baxs as a tracer of O2 consumption and thus as a tracer of POC remineralisation, but they either assumed the universality of the Southern Ocean transfer function (e.g. Cardinal et al., 2005) or proposed new transfer function without direct O2 consumption measurements (e.g. Lemaitre et al., 2018). It is therefore of interest to investigate the conformity of this transfer function by directly measuring O2 consumption rates and PHP. For that reason, the findings of this study are highly valuable for the community. However, the authors report data from only one station (only one data added in both the PHP/Baxs and JO2-Baxs/JO2-opt correlations) which is weak to support their conclusions. Statistical analyses (p-values, errors on the slopes, etc) are needed. Also, a direct comparison of the Baxs/JO2-opt correlation from this study (where the authors show 4 data points; Fig. 3a) with the one proposed by Dehairs et al. (1997) in the Southern Ocean would be very useful and more convincing, to me. Many details are also missing in the methods to really understand how Baxs concentrations, O2 consumption rates and PHP were measured. Moreover, I would appreciate if there was a discussion about the variations found between ANTARES, PAP and DYFAMED stations, about the differences observed between the Southern Ocean and Mediterranean Sea correlations (Baxs background for example) and about the implications of this study in the water column C budget of the Mediterranean Sea. Finally, all the data (Baxs concentrations, O2 consumption rates and PHP) should be presented in a Table. Please, see all my comments in the attached file. Overall, the manuscript is well written and will be a good fit for publication in Biogeosciences, but considering the lack of details and comparisons, considering the relatively large error bar associated to the JO2-opt, and considering that this study adds only one data point to the JO2 correlation, I would suggest the authors to soften their conclusion on the 'universal validity' of the Dehairs's transfer function.

Please also note the supplement to this comment:
https://bg.copernicus.org/preprints/bg-2020-241/bg-2020-241-RC1-supplement.pdf