

Dear Editor,

We thank the Reviewers for their time devoted to our manuscript "Variation of light absorption coefficients by fractions of various sizes of suspensions in the southern Baltic Sea" by Justyna Meler, Dagmara Litwicka and Monika Zabłocka. We are glad that we were able to satisfactorily respond to most of the comments of both Reviewers.

We followed the directions of Reviewer#1. We modified the abstract and made some changes to the Introduction and Conclusions to better emphasize the importance of our research.

Please find our detailed response for Review#1.

**Reviewer#1:**

Reviewer's comment:

I would like to thank the authors for their sincere efforts to address my concerns. However, I wonder if it can be any more generalized conclusions based on this study. I think that the readership of Biogeosciences would expect broader implications. As I mentioned in the previous review, the manuscript is descriptive, making it difficult to follow what are the new findings described in this study. Especially, the abstract is still descriptive and should be modified again. Furthermore, although I agree with the significance of the HELCOM monitoring program in the Baltic Sea, it seems to me that the pilot studies and/or an introduction to further research (which was mentioned in Author's response to my major comment No.2) are not satisfactory for the journal's criteria to merit publication in Biogeosciences.

Author's response:

We thank the Reviewer for constructive comments.

We modified abstract to better highlight the main findings of this work. Our research mainly concerned the variability of light absorption coefficients depending on the size fraction of particles suspended in seawater. However, we also showed the contributions of individual fractions to the total concentrations of SPM and Chla. Knowledge of particle sizes and their biogeochemical and optical properties in given size fractions is the basic knowledge that leads further to the carbon study in the Baltic Sea. The size of the particles determines the amount of organic matter that will be transported deep into the sediments. For example, pico and nanoplankton in clean ocean waters is the main carrier of POM deposited in the sea bottom. Therefore, particle size plays a very important role in the efficiency of a biological pump. This fact alone is an important justification for undertaking such research for the waters of the Baltic Sea, which is characterized by different biogeochemical and optical properties than ocean waters.

Presented and analyzed in this paper data base of individual particle size fractions in the total SPM, Chla and related absorption properties for the southern part of the Baltic Sea is relatively small as an effect of time consuming study methods. However, the conducted research is unique and significant in the study on carbon bulk in Baltic Sea. Particle size

determines the proportions of the organic carbon suspended in the water column and deposited to the sediments. The main source of POM in sea sediments are particles smaller than 20  $\mu\text{m}$  (Moynihan et al., 2016). Our research shows that in the surface layer, the POM/SPM ratio is the highest for particles < 5  $\mu\text{m}$  (for ultra particles about 72%, for pico particles about 63%). Nano particles transfer about 59% of POM in SPM, while micro particles transfer 53%. These studies show that the process of deposition of organic particles in Baltic Sea sediments should be ongoing in a similar way as in other coastal areas. Baltic Sea, however, is characterized by a permanent pycnocline (Kowalczyk et al., 2015; Sagan, 2008). Portion of the sinking organic particles never reaches the bottom sediments but is trapped by the halocline and mineralized there. Our research can be helpful with understanding of POM transfer to the sediments of Baltic Sea and calculating its pace and bulk.

Reviewer's comment:

In addition, I am a bit confused about the sentences explaining Phytoplankton Functional Types (PFTs). The manuscript focuses on the size components of absorption spectra of particles, NAP, and phytoplankton as well as both Chl a and SPM concentrations so that this study could contribute to the further understanding of Phytoplankton Size Classes (PSCs). In this sense, it is difficult to follow the logic in the Introduction and the last sentences in the Discussion section explaining PFTs. To better establish consistency, these sentences should be modified.

Author's response:

Indeed, the manuscript does not focus on PFT. Our research is general and shows the variation in light absorption coefficients for all particles, not just phytoplankton. Our goal was to show that part of our research can be used to determine the size structure of phytoplankton in the Baltic Sea.

In the Introduction we have added appropriate supplementary sentences in lines 35-45 and 120-123, and in the Conclusion in lines 670-690.