

Review of “A low-maintenance optoacoustic sensor for black carbon monitoring” by Haedrich et al.

Reviewer 2 - General comments:

In my opinion, the amount of contents and new achievements presented in this manuscript are both not rich enough to be published as an independent research paper. These results could be included in supplemental information or methodology section of one of other papers focused on applications (i.e., real-world observation) using this instrument.

*Thank you for the constructive comments and suggestions*

*In this research paper we are addressing the issue of particle deposition for black carbon sensors as it requires frequent human interference for filter-based sensors to replace filters or cleaning procedures for other instrument types. Specifically, the sensor presented operates filter-less and frequent cleaning is avoided.*

- 1. We present a sensor solution incorporating protective flows of clean air preventing particle diffusion out of the sample flow and thus unwanted particle deposition. This is a hardware solution to reduce maintenance requirements not demonstrated by any other sensor so far.*
- 2. We demonstrate the improved performance of the sensor.*
- 3. We demonstrate stability of the IDSS for high BC mass exposures.*
- 4. We estimate a cleaning cycle of 1.5 years for ship-board implementation. Filter exchanges or cleaning procedures of instruments currently available on the market require more frequent intervention.*
- 5. The sensor has been demonstrated before in two other papers in terms of sensitivity and performance on-board a ship. To test for long-term performance, i.e. the real 1.5 years integration much longer time spans are required and will be pursued in the future. However, we strongly believe it is important to already demonstrate the resilience against contamination of the sensor now with this paper, highlighting the need for low-maintenance sensors.*

Specific comments:

*The following changes have been implemented into the manuscript as requested by the reviewer:*

Page7 Line 174:

Define the acronyms ARD and MARD.

Page 7 Equations (1) and (2):

Physical quantities (i.e., concentration, time) should be written in italic style, while the other quantities or descriptors (i.e., BC, hours) should be written in regular style.

Page 7 section 2.6:

This very short section should be merged with one of the other sections.

Figures 3 and 4:

Resolution of these figures is too low for publication. Please follow the guidelines for Figure preparation.