Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-363-RC2, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-segregated characteristics of OC, EC and organic matters in PM emitted from different types of ships in China" *by* Fan Zhang et al.

Anonymous Referee #1

Received and published: 18 September 2019

General comments:

Results are interesting and new and the language is overall good.

I lack a discussion on the relevance of the study in a larger context. It should be elaborated upon from the viewpoint that the engines are relatively small, high speed marine engines, and only representative for smaller marine craft.

I find that very little attention is given to the engine and combustion characteristics. It is stated that "Overall, fuel type, fuel quality, engine type might have higher influence on particle mass distributions from ships than the operating mode", but it seems from Figure 1 that also operational mode is important for individual ships. Results on EC and

OC at different engine loads are not discussed. It is necessary that the authors also describe whether the presented results are average values from all samples from the tested engines. This would imply mixing of samples representative for different engine loads.

The abbreviations of ship types appear inconsistent and subjectively applied. Inconsistent in the sense that two types are named by installed power (high or low) and a third by fuel (HFO). Further, it is difficult to follow the specific ship name abbreviations. I suggest to use a different naming for ships that makes it easy to relate names to the relevant investigated category. An argumentation to support the cutoff in engine power between the chosen categories is necessary. It is not apparent to me why it should matter whether the engine is on a fishing vessel, a research vessel or an engineering vessel etc. Rather, categories should be based on whether it is a 4-stroke cycle or 2-stroke cycle and the engine speed. To use "diesel" as a term for distillate marine fuels can be confusing since diesel is mainly referred to when discussing engine types rather than fuels (also heavy fuel oil is used in marine diesel engines). "Marine distillate oil" could replace "diesel" to avoid the confusion on whether a fuel or engine type is discussed.

The work includes a lot of literature references and reasoning about the particle number size distributions, which could possibly be cut down to make the manuscript more concise. No own results of PN is presented.

Influence of measurement methods can be very important. I strongly recommend that the sampling system, the dilution ratios and the fuels used are described at least in the supplementary material. I have not had a chance to review this.

I find that in the results and discussion section it can be difficult to understand what is findings from this study, and what was previously known. E.g. page 16 lines 371-390 and page 21 line 501 to 505. I think this can be solved by changing the tense in the presentation.

Detailed: Abstract line 28 and 29 “basically presenting downward distribution trends with the increase of particle size” – difficult to understand, rewrite Abstract line 34 and 35. Conclusions on OC1, OC2 etc should be summarized in the abstract. The fractions of OC and EC need introduction given in the text but are not suitable for the abstract. Page 6 Line 140. Is 12 different vessels the same as 12 different engines? Clarify. Page 10 Line 238. As I read the referred to article the size distribution that results are compared with are from HFO combustion and not marine distillate oil “diesel”. Page 10 Line 249 (and reoccurring) It is stated the the HFO ship has low combustion efficiency and elsewhere that 2-stroke engines have lower combustion efficiency than 4-stroke. Is this referring to the particular engine studied? Please, specify combustion efficiencies of the engines if this should be part of the explanations of the results. This also relates to the reasoning on page 11 Line 289 and below discussing sir/fuel ratios which should not differ much between an engine burning HFO and marine distillate oil. Please check your reference again. Page 10, line 259 and below. I suggest leave out since it seems this refers to a calculation rather than measurement. If not, marine aux engines are often of comparable power to the main engines in this study. Page 18, line 443. Misspelled “existing” Page 18, Line 445 “high volatile organic matter” should be either “highly volatile organic matter” or “high volatile organic matter content” or similar.. Page 25, Line 563. The ratio of HMW/LMW PAHs is said to indicate that fine particles are more toxic than coarse. Should it not be HMW/particle mass unit? I do not follow the reasons given.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-363, 2019.