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Interactive comment on “A case study into the measurement of ship emissions from plume intercepts of the NOAA Ship *Miller Freeman*” by C. D. Cappa et al.

Anonymous Referee #1

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GENERAL REMARKS

The manuscript reports results from a recent study on emission factors of gaseous and particulate constituents for a ship engine at cruise. The presented work is so far the only plume-intercept study that involves a single ship and covers various cruising speeds. Reported emission factors cover sulphur-containing compounds, organic matter, black carbon, CN, CCN and total particulate matter, and are reported for 5 different cruising speeds. Observed data are discussed in detail in relation to data reported in literature.

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The study was carefully designed and conducted and presents a state-of-the-art approach of this topic. It is of high scientific significance and makes an essential contribution to the important research field of the climate impact of global shipping. The presentation of the methodology, applied measurement techniques and obtained results is excellent. An in-depth discussion of found deviations from data reported in the scientific literature is provided, particularly for the ratio of particulate organic matter vs. elemental carbon which is given a separate section.

The paper is recommended for publication in ACP after few technical corrections have been considered.

TECHNICAL CORRECTIONS

Page 24639, line 20: It is recommended to report the rated power of the engine in a SI unit instead of khp.

Page 24653, line 11 ff: The recent study by Righi et al. (2011) on the climate effects of low-sulphur fuels in global shipping should be included in the discussion.

Page 24654, line 15: Please introduce F_{econ}

References:

Buffaloe et al.: Please update of possible

Petzold et al., 2013: Please cite ACP paper (Petzold et al., 2013)

Ryerson et al.: Please update is possible

Page 24667, Table 1: Please explain $Wt. Ave$ (most likely weighted average)

Page 24672, Fig. 5: Please refer to eBC instead of BC where appropriate; this would then be consistent with the remaining paper.

REFERENCES

Petzold, A., Ogren, J. A., Fiebig, M., Laj, P., Li, S.-M., Baltensperger, U., Holzer-Popp, C9236

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T., Kinne, S., Pappalardo, G., Sugimoto, N., Wehrli, C., Wiedensohler, A., and Zhang, X.-Y.: Recommendations for reporting “black carbon” measurements, *Atmos. Chem. Phys.*, 13, 8365–8379, 2013.

Righi, M., Klinger, C., Eyring, V., Hendricks, J., Lauer, A., and Petzold, A.: Climate Impact of Biofuels in Shipping: Global Model Studies of the Aerosol Indirect Effect, 45, 3519–3525, doi: 10.1021/es1036157, 2011.

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