

Interactive comment on “Methods for identifying aged ship plumes and estimating contribution to aerosol exposure downwind of shipping lanes” by Stina Ausmeel et al.

Anonymous Referee #2

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The paper provides a practical and simplistic approach to attribute particle emissions from ships, measured in the plume of the ships identified by AIS. The methodology is practical but there may be some uncertainties in the method. I provide my detailed comments below. I recommend a major revision.

You can refer to two more studies in the literature that specifically focused on ship plumes and characterization of emissions in northern latitudes. These are given below and may be added to the literature review section:

Aliabadi, A. A., Staebler, R. M. & Sharma, S. (2015), 'Air Quality Monitoring in Communities of the Canadian Arctic During the High Shipping Season with a Focus on

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Local and Marine Pollution', Atmospheric Chemistry and Physics, 15(5), 2651-2673, doi: 10.5194/acp-15-2651-2015.

Aliabadi, A. A., Thomas, J. L., Herber, A. B., Staebler, R. M., Leaitch, R. W., Schulz, H., Law, K. S., Marelle, L., Burkart, J., Willis, M. D., Bozem, H., Hoor, P. M., Kollner, F., Schneider, J., Levasseur, M., & Abbatt, J. P. D. (2016), 'Ship Emissions Measurement in the Arctic from Plume Intercepts of the Canadian Coast Guard Icebreaker Amundsen from the Polar 6 Aircraft Platform', Atmospheric Chemistry and Physics, 16(12), 7899-7916, doi: 10.5194/acp-16-7899-2016.

The most major concern is lack of accurate wind measurements. It is likely the air circulation patterns near coastal areas be very non-uniform horizontally. For instance wind speeds and directions can change significantly from the location of the ship to that of the weather station on land. I understand that the simplistic nature of the method justifies using a few weather stations, but the authors can investigate potential errors more. Below are some ideas.

Was there wind speed and direction measurement on board of some ships? In this way you can characterize some differences between wind conditions on the sea and on land. You can also perform some hypothetical plume dispersion simulations near the coastal waters of interest to see if wind conditions are generally horizontally homogeneous. You can use HYSPLIT web-based trajectory or dispersion modelling to investigate this quickly. For instance try some diurnal times and different seasons to investigate this. If you use trajectory modelling, you can investigate trajectories of air parcels arriving at the weather station of AQ trailer. Otherwise, if you use dispersion modelling, you can use point source and the ship stack to see where the plume goes. Having a few simple simulations included in the paper can add value on adequacy of the simplistic approach for meteorological model. (<https://www.ready.noaa.gov/HYSPLIT.php>)

The paper is already very short. So why not including all the supplemental figures, tables, text, and references in the main paper? This way the paper will be much easier

to read without having to refer to multiple documents.

The authors can compare their aerosol size distribution as a function of plume age to those reported by Aliabadi et al. 2015.

I hope these suggestions can improve the quality and demonstrate the suitability of the simplistic approach taken.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-445, 2019.

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