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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Air quality monitoring in communities of the Canadian Arctic during the high shipping season with a focus on local and marine pollution" *by* A. A. Aliabadi et al.

**Anonymous Referee #2**

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The manuscript of Aliabadi, Staebler and Sharma "Air quality monitoring in communities of the Canadian Arctic during the high shipping season with a focus on local and marine pollution" touches the timely discussion of ship emissions in the northern latitudes. The paper describes the measurement methodology and source apportionment of air quality observations with the help of modeling tools. I find the topic very interesting and the manuscript well structured. However, the authors have chosen to neglect some relevant data sources, like AIS data, which seems strange, especially since the authors cooperate with maritime authorities who can provide this data.

List of detailed comments: 1. Chapter 2.1. Here it is stated that the authors are using



data from Canadian Coast Guard, which includes Lloyds registration numbers. However, in the Conclusions and future work section (page 29578, lines 25-27) it is stated that no data for ship engines were available. It is not stated whether data for individual vessels for example from IHS Fairplay were used or not. It should be noted that the classification societies' websites (DNV GL Exchange, Americal Bureau of Shipping, Korean Register, Russian ship register, Class Nippon Kaiji Kyokai, Bureau Veritas) offer this data for free for individual vessels (searchable by IMO number). This makes the statement "engine data was not available" a bit flimsy and the authors should explain why they have not used this approach.

2. Section 2.1: It seems that Automatic Identification System data was not used for this work. Why not? At least it should be mentioned that AIS data could be used for this purpose. It seems that not all ship activity data sources were included and the authors should explain why they have not done so.

3. Section 2.5: To my knowledge, tire and brake wear do not contribute to SOx pollution. Usual markers for tire and brake wear are Fe, Cu, Sb and Ba whereas resuspended mineral dust (sand) consists of Ca, Si, Fe and Al components. Table 2 seems to list tire & brake wear as sources for SOx, which is odd.

4. Section 2.6, AQHI use: Equation (1) does not seem to describe polyaromatic hydrocarbons. Are these included in health effect evaluation? Also, in Stieb et al (2008), AQHI goes to zero whereas here the authors say that the minimum is one. Why?

5. Section 3.1: Here a references to Figs 8 and 9 are made, but Figs 8-9 are introduced later, in Section 3.2.2. Could the authors check the consecutive numbering of figures.

6. Section 3.4.1: Authors state that sometimes the local pollution events are superimposed with the ship plumes. Looking at Figs 7 and 12a and 12c, this seems to occur 2/3 times in Cape Dorset. In Fig 12a, the wind blows from west, which is marked as "Town" and "Waste burn" sectors in Fig 7. How can the ship plume be identified in these cases, if the wind blows away from the measurement site? Fig 12b seems to be

consistent with the wind direction, though.

7. Section 3.4.3, lines 575-578. Authors state that "shipping degrades the air quality, in a statistically significant way, with current traffic levels". However, it should also be mentioned how the findings relate to WHO limits for PM, NOx and SOx.

8. Section 3.4.4: Authors state that DMS contributes to sulphate/PM measurements, but do not mention sea salt in this regard. According to O'Dowd et al (Atm. Env., 31, 1997, 73-80) this would seem relevant in the size range reported by the authors. Was sea salt contribution considered in the analysis?

9. Section 3.4.5, lines 665-671. In Resolute, BC measurements were made. Is it possible that the vessel plumes are produced from burning distillate fuels instead of HFO? This could explain why BC emissions are lower than found in the existing literature. Did the Resolute measurement setup include measurements for Ni or V, which are usually considered as markers of HFO burning?

10. Figure 7. I would recommend arranging the labels in such a way that they do not overlap with each other.

11. Figure 10. Is there a contribution from residential heating (small scale wood combustion) in PM results? There seems to be a slight upward trend in PM concentrations towards to the end of the study period. Levoglucosan can be used to trace this contribution. Would it be possible to identify the relevance of small scale wood combustion from the PM results?

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 29547, 2014.