

Interactive  
Comment

## ***Interactive comment on* “The influence of cruise ship emissions on air pollution in Svalbard – a harbinger of a more polluted Arctic?” by S. Eckhardt et al.**

**D. Lack (Referee)**

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My apologies for the delayed review of this article.

I will limit this to some broader comments as I believe the manuscript is well presented and the other reviewer has captured many of the minor details that require attention.

1) The International Maritime Organization is currently discussing the issue of the impact of shipping BC on the Arctic. The review of Lack and Corbett discusses some of this and I think it is worthy to note in the introduction and discussion that your work contributes a very unique data set to this discussion. It is important for policy makers to know what the contribution of shipping is to the Arctic area. For example, it is believed

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that about 2% of global BC is from shipping. In your study region you show that ships increase the summer BC burden by 11%. Although not directly comparable your data does provide room to discuss these issues without reaching beyond the scope of the work.

2) Introduction: Although the Arctic population is low, shipping emissions will also contribute to health concerns. Perhaps worth a mention (Corbett et al health study on ships) given that the Arctic Council has identified environmental and social effects of Arctic development as concerns.

3) P3073 L23: I would recommend removing the Granier reference and associated text, while adding in the quantitative details of ozone from Dalsoren. I believe it is apparent that the scenarios of Granier are high and including the extreme scenario is a little distracting.

4) General Comment: Biomass burning BC is a major source for the Arctic. Is it possible to estimate the contribution of biomass burning emissions to local BC during the period of this study? The timing of various sources is important, as you mention. It would be great to understand how much these sources contribute during Spring, summer, fall etc.

5) P3077 L3: You include 4 hours post-departure of the ship. Why not 4 hours prior?

6) Section 2.4: How are the scattering corrections of the PSAP done? This requires a measure of scattering.

7) Section 2.4: Can you justify a mass absorption efficiency of  $10 \text{ m}^2 \text{ g}^{-1}$  for fresh ship emissions?

8) How long does it take, for the enhancements observed due to ships, to return to a 'background'? Can you estimate this for the case study?

9) P3082 L10: What are the contributions and source regions to Arctic haze? I think this is worth mentioning, and also discussing that most current Arctic pollution requires

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long range transportation to get to the region.

10) P3083 L7: The comment on "entire year" refers to the yearly average of these pollutants correct? Be explicit here to be clear that the yearly average burden is currently low, however there are some days where the contribution from ships is significant.

11) It is always concerning to me when measurement uncertainties are not presented and the impact of those uncertainties on results discussed. Most of this work is comparative in nature so this concern is reduced somewhat, however i believe it is still worth discussion.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 3071, 2013.

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