

## ***Interactive comment on “Arctic shipping emissions inventories and future scenarios” by J. J. Corbett et al.***

**Anonymous Referee #1**

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Referee Comment "Arctic Shipping Emissions Inventories and Future Scenarios" (ACP, Corbett et al., acp-2010-236)

General comments:

The paper calculates present-day and future Arctic ship emission inventories for greenhouse gases, black carbon and other pollutants on a high-resolution grid of 5 km x 5 km for in-Arctic shipping and potential diversion traffic due to receding sea ice and determines the corresponding climate forcing. In general, the paper represents a substantial contribution to the scientific progress especially due to the high resolution of the inventory and the focus on black carbon. The overall scientific quality is good and further related work is considered. Concerning the presentation quality, the overall structure would be clearer if some descriptions of performed working steps are moved from the

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Results and Discussion sections to the Methods section. Figures, tables and language are clear and concise.

Specific comments:

1.) p.10275, l.14: I do not exactly understand how the shipping routes are determined. The routes follow longitude and latitude coordinates of each ship movement if available. How are the routes determined if these are not available?

2.) p.10275, l.15: The authors use ship activity data provided by Arctic nations and used in the AMSA analysis. How is the Arctic region for emission inventories of in-Arctic ship activity determined in this study? Do the authors analyse the ship movements of all Arctic nations or only those movements starting and/ or ending north of the polar circle. Furthermore, what geographical area is the basis for the calculation of emission totals in Table 5?

3.) p.10276, l.5: Activity-based emissions from fishing vessels are calculated differently than those from transport vessels and not provided geospatially. Can the authors mention some suggestions how emissions from fishing vessels can be distributed geospatially if calculated by number of days at sea and no geographical route information is available? Do they have geographical route information for fishing vessels at all?

4.) p.10278, l.8-12: The comparison of the resulting in-Arctic ship emission inventory to other studies should be moved from the Methods to the Results or Discussion part.

5.) p.10278, l.20: Which prior study gives the global inventory coverage of Arctic regions in Fig. 1a?

6.) p.10281, l.24: Does Table 7 show the percentage of ship activity (movements) by vessel type like the figure caption says or the percentage of emissions by vessel type like the text says?

7.) p.10282, l.7-18: The detailed description of both future scenarios should be moved to the chapter 2.6 "In-arctic future year scenarios".

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8.) p.10282, l.20, - p.10283, l.22: The part on the method of developing emission inventories of diversion traffic should be moved from the Results section to the Methods section to make a clear distinction between methods and results.

9.) p.10283, l.11-22: I find it really difficult to follow the authors' explanations how they found the percent diversion values for 2020, 2030 and 2050. Perhaps this description could be more clarified. What is the uncertainty of this approach? How did they develop the estimations in Table 12 which determine the dependence of the location of future Arctic shipping routes on the state of receding sea ice (depending on seasons and time in future)?

10.) p.10286, l.2, - p.10287, l.5: Parts of the climate forcing section in the Discussion chapter should be moved to the Methods and Results chapters in order to clarify the overall structure.

Technical corrections:

1.) p.10275, l.15: The word "nations" appears twice.

2.) p.10278, l.1: I think there is a typo concerning the indices. It should be average engine load factor for vessel  $j$  on route  $k$  in order to be consistent with the indices of other input variables.

3.) p.10279, l.3: Following the text flow the sequence of tables is incorrect. Table 5 (p.10279, l.3) is mentioned before Table 4 which is named Table 5 by mistake (l.18). Furthermore Table 6 in p.10281, l.6 should be Table 5.

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Interactive comment on Atmos. Chem. Phys. Discuss., 10, 10271, 2010.