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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Black carbon emissions from Russian diesel sources: case study of Murmansk" *by* M. Evans et al.

Anonymous Referee #1

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This manuscript estimated the emission of black carbon (BC) from diesel sources in Murmansk, Russia. The inventory included diesel sources of on-road vehicles, off-road transport, fishing and diesel generators. The work is important to fill the gap in understanding one of the local source regions of BC in the Arctic. However, I don't recommend the publication of the manuscript in its current version due to the lack of important details, mostly regarding the methodology and the justification of the data. Please see the specific comments listed below.

Major comments:

Some detailed information is missing in the methodology part and emission estimation, which hinders the understanding of the whole manuscript. Such kind of information will

be needed to put either in the main text or as supplemental materials. Examples:

- (1) For data such as emission factors and BC/PM ratios for different sources, the use of the data needs to be clearly justified. The source of the data also needs to be specified; some references were missing in the manuscript.
- (2) First paragraph in Section 2, I would suggest the authors use equations to explain how the emissions were calculated for each source with fuel consumption, activity and emission factor.
- (3) Second paragraph in Section 2, the statements are vague. The authors need to clearly explain what the "Russian methodologies" are. What are the "other methodologies" used? Do "methodologies" mean "emission factors" or others?
- (4) Second paragraph in Section 3, how was the "consolidated estimate" was performed as the data are different for summary data, detailed data and estimated consumption? What is the difference (exact numbers) among the three datasets?
- (5) Third paragraph in Section 4.1, the paragraph is not well organized and difficult to follow. The authors really need to provide more details about NIIAT method and COPERT either in the main text or as supplemental materials (some of them are in Section 4.2 now). Full names of NIIAT and COPERT and the brief introduction need to be provided when they first appear. Moreover, the four methods in Table 3 need a clearer explanation.

Section 8, Uncertainty analysis, needs be expanded with more information about uncertainty calculation (equations), values of uncertainty (at least added in Table 5). Can the authors separate the uncertainties for activity and emission factors and create another table to show the values?

Section 9, I think this section needs either to be deleted or to be expanded to show the details on how the emissions are estimated for different sources for whole Russia, including activities and emission factors. I would rather suggest the authors to use the space for more discussions to interpret the emission data estimated with their method, possibly more graphs in addition to Table 5. How would the results be compared with BC emission in other parts of the world? Would it be possible for the authors to shown how the estimated emission can be applied in models to further understand its contribution to the Arctic BC concentration and BC climate impact?

The conclusion needs to be rewritten to reflect the ultimate message from this manuscript as well.

Minor comments:

(1) The manuscripts need to be proofread with professional English as there are some grammatical errors. Some of the paragraphs are very difficult to understand at the first time of reading.

(2) Page 3259, Line 1, the sentence is verbose and needs to be rephrased. I think the authors only need to say that "BC is a major component of PM 2.5".

(3) Page 3259, Line 25, how much higher? What is "older estimates"?

(4) The authors should be consistent to use Euro 4, Euro 5 or Euro IV, Euro V.

(5) Page 3261, Line 16, "we used similar methods to estimate organic carbon (OC) emissions". I don't think this sentence is necessary because OC emission is not discussed in the manuscript.

(6) Page 3268, Line 20, what is the "EPA speciation ratio"?

(7) Table S1, what does "adjusted data" mean?

(8) References missing (examples)

a. Page 3258, line 24

b. Page 3266, Line 24

c. Page 3267, Line 10 – 12

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 3257, 2015.