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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Extension of an assessment model of ship traffic exhaust emissions for particulate matter and carbon monoxide" *by* J.-P. Jalkanen et al.

Anonymous Referee #2

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This paper presents STEAM2, a bottom-up model for calculating ship emissions. A unique feature of this model is that it uses actual ship velocity and position data from the "Automatic Identification System", a tool for the short-range identification and tracking of ships. STEAM2 extends a prior model version that could only calculate the emissions of NOx, SO2 and SO2. The updated model includes additionally the treatment of particulate matter and CO and has also a refined treatment of the resistance calculation and load balancing.

General comments:

There is no question that constructing better emission models is an important task

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as uncertainties in the quantification of emissions in general and ship emissions in particular are a major problem for regional and global model simulations. The paper under review represents an important step in this direction by using a more "process-oriented" approach. However, the problem that I see is that its main contribution (i.e. the presentation of the model) is not adequate. I agree with Referee 1 that in some instances too many details are given; but on the other hand important information is missing that would be necessary to make this work reproducible for other scientists, and I will give specific examples below. For this paper to be considered for publication, these problems need to be addressed.

Specific comments:

1. The introduction would benefit from some streamlining. In particular the paragraph on page 22134, l. 3-22, contains too much detail. While it is important to (concisely) describe in the introduction what the advances of STEAM2 are over STEAM, many details of this paragraph should be moved to the model description. This paragraph might also be combined with the paragraph starting on p. 22131, l. 26, where STEAM is described. The sentences at the end of the introduction (p. 22124, l. 28-p. 22125, l. 2) are also redundant, given the list of objectives above.

2. Model description: As mentioned in the "General comments" above, this needs to be reworked, so that it is clear how to get to the output quantities (emissions) from the input quantities in Figure 1. Specific comments are:

a. P. 22135, l. 24: What is the temporal and spatial resolution that is typically achieved?

b. It is not clear where equation (1) enters.

c. Is equation (2) always needed or only to infer the propeller rpm?

d. How is the power eventually calculated?

e. Equation (4): I assume that this should be "+" instead of "=".

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f. Equation (5): I assume that this should be "=" instead of "-"?

g. Equation (6c): Is the variable "load" the same as "EL" in equations (4) and (5)?

h. How is EL eventually calculated?

i. Equation (9): What is delta_t?

3. Example application in section 3.4: It would make the paper stronger if the claim on page 22150, l. 11-15, could be quantified. How different is the STEAM2 emission inventory really from other currently available inventories? Are there conditions (e.g. seasons) when these differences are particularly large/small?

4. Are there any other areas except for the Baltic Sea where AIS data is available at all?

5. Figure 4: This figure would look clearer if it was not in 3D. I.e. use fuel sulphur content and engine load as axis and PM emission factor as contours.

6. Figure 11: If this is the original size of the figures, the labels on the color bar are not legible.

7. Typo: p. 22136, l. 1: should read "model".

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22129, 2011.

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