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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A modelling system for the exhaust emissions of marine traffic and its application in the Baltic Sea area" *by* J.-P. Jalkanen et al.

Anonymous Referee #1

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General comments:

This paper addresses a highly relevant topic, and clearly illustrates the applicability of AIS data in a novel model that is valuable in assessing shipping emissions. The attempt to model the effect of waves is interesting and relevant, although it does not seem to improve the results in the current model. The research provided a good introduction and rationale for the research. The language used is fluent and all figures are well presented.

However, the model description lacks a clear mathematical formulation, hindering replication of results. Referring to Figure 1 is not sufficiently precise. Equations for the es-

timation of emissions and fuel consumption should be provided, linking the described factors (engine power, emission factors, wave penalty etc) to the emissions.

Also, the general structure of the paper can be improved. In particular, the model description and the input data are not clearly separated. Prior to publication, it is suggested that the paper is reworked to more clearly separate between model description, input data, results, discussion and conclusions.

However, I urge the author(s) to consider the above suggestions and following comments, and recommend the Editor accept with revisions.

Specific comments:

15341, 20-21: What is the source for the vessel number - AIS?

15341, 25: It is commonly recognized that the most significant shortcoming in the existing methods are related to ship operational profiles; engine load/ship speed, days at sea etc. This should be mentioned.

15342, 21: Is this generally true, or limited to European or Baltic studies?

15343, 23: A brief overview of the structure of the paper should be provided, "In section 2. . . , In section 3. . . . Etc".

15343, - : Section 2 should more stringently describe the model developed. Emission factors and other input data should be described in the preceding sections. Mathematical formulations are needed.

15343, 27: A description of the "the internal ship database" as well as Lloyds is needed. In particular, the difference between the two and how much more information is gathered in the internal database, and for how many ships. Some information is scattered throughout the paper, but this should be collected and presented in a more structured manner.

15344, 2: What information is available in the AIS data for determining ship type?

15345, - : Section number heading is wrong?

15345, 17: Why is a “safety margin” used? The motivation should be explained. Does this margin conflict with the explicit modeling of wave resistance?

15345, 25: What is the relation between Pmax, P, installed power, and fuel consumption? Mathematical formulations are needed.

15345, 26: How, is k determined in this model?

15346, 17: If the database contains data on AUX engine size for 85% of the vessels, why then are the fixed values described above used? The results indicate that the AUX fuel consumption is consistently overestimated.

15347, - : The effect of waves should be mathematically linked to the fuel consumption. How does eq. 4 and 6a/b relate to the emissions? This is unclear.

15351, 14: Reference to Figure 2 is missing.

15352, 1: There is no “section 2.2.1”.

15352, 10: Statement about the effect of waves is not evident in the presented results.

15352, 17: “The effect of waves..” should read “The estimated effect of waves. . . ”

15352, 18: “The increase of..” should read “The estimated increase of. . . ”

15352, 21: While the inclusion of the wave-parameter is highly interesting, the model results seem to suggest that the current implementation do not improve the model results (rather to the contrary). This should be discussed more thoroughly, and suggestions for improvement should be made.

15354, 1: Can the large differences between ships built after 2000 after 1990 be explained solely be the NOx curve? A relevant point in this discussion is the number of hours spent in the Baltic for the different ships. The connection (or lack of connection) between number of ships and number of ship-hours for the different segments should

be discussed.

15354, 10-20: Again, the relevance of ship-hours vs ships should be discussed. Also, this information is highly relevant in the evaluation of emission reducing measures and legislation. This could be discussed.

15354, 25: How does the distribution in figure 10 compare to the flag distribution for the world fleet?

15356, 20-23: This should be included in the introduction.

Technical corrections:

Several references to IMO, 1973 and IMO, 1974 are made. This should be corrected to IMO 2002 and 2008 in the reference list.

15343, 9: End of sencence, a full stop “.” is missing after “. . . ships”.

15343, 9: Full stop “.” is missing after “. . . 2005)”.

15348, 1: Full stop “.” missing after “. . . (dimensionless)”.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 15339, 2009.