

## ***Interactive comment on “Model for leisure boat activities and emissions – implementation for the Baltic Sea” by Lasse Johansson et al.***

**Anonymous Referee #2**

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Dear Editor,

this MS presents a modelling simulation for leisure boat emissions in the Baltic Sea. Addressing leisure boats fills a much needed research gap, when compared to larger vessels. One innovative and very useful contribution, in my view, is the estimation of metal emissions (Cu and Zn) from anti-fouling paints. Proxies are used to validate the model (e.g., AIS-based fuel consumption), which supports the model's robustness. My main concern is whether Zn and Cu emissions from ships at port were included, which is unclear to me when reading the text. Otherwise, the manuscript may be accepted for publication after review.

Specific comments: - Please review the English, for small errors, e.g. \* line 32, "utilizes" should be "utilize" \* line 33, same for "combines" \* line 46, "fail" should be "fails" \* line

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64, "some studied" should be "some studies"

- line 91, how are the bins defined? Which boat characteristics define a bin? Please clarify

- lines 126-127, "Secondly, the emission factors for contaminants are affected by the geographical distribution of the marina (different paints and release rates are applied)." Please clarify, does this mean that, for example, boats located close to open sea have higher release rates due to more intense waves, than those located at more protected locations?

- line 127, "specifically on the amount of days spent at sea (ðíŞaðíŞă). ", this is not entirely correct, given that metals are released as long as the boat is in contact with water, i.e., also when the ship is at port. Have the authors considered the emissions while at port? This is especially relevant for water quality at the ports, given the lower dispersion of pollutants (and thus, higher concentration rates) than in open sea. Overall, not including release in the port waters will result in an underestimation by the model, which should be highlighted as a potential limitation.

- line 201, what are "otto engines"?

- line 204, "the emission factors for CO and NMHC for older Otto-engines are very high", minor clarification, do the authors mean that the EMEP/EEA emission factors for these engines are much higher than expected for the Swedish fleet?

- Table 3: antifouling paints are assumed to be used, do the authors have specific information on each boat? I assume that this level of detail was not possible, which is understandable. Please highlight this as a limitation, in addition to the possibility of traces of older paints (anti-fouling and others, and therefore different to the ones in Table 3) still remaining on the hull (although their impact would be minimal).

- Table 4, just to clarify, average values were used in regions where more than one type of paint was expected? For example, in Southern Sweden, the authors used the

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average of paints A, B and C?

- lines 341-349, this is a very smart approach, congratulations on having identified this potential source of model underestimation.

- Table 5, please clarify the meaning of the column "Fleet composition type (%)", adding a space after each comma (otherwise it looks like a single number and is quite confusing)

- line 442, "causes the main source of releases to be stationary boats at the marina locations", please clarify, are the AFP emissions from stationary boats also included? Please see my comment above, as the text in line 127 seemed to suggest the opposite.

- section 3.1 (comparison between leisure and commercial shipping): can the authors elaborate on the differences between Zn and Cu emissions, from both types of boats? Are the differences between commercial ships and leisure boats due the surface coated by he pains, or do commercial ships use different types of anti-fouling paints? Is the regulation different for both types of vessels?

- line 510, are these emissions for the year 2016? Or the average per year for the study period?

- line 514, "Also the impact on air quality", are any data available on the release of Cu and Zn to ambient air, during maintenance operation of vessels in the marinas?

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