

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2021-47

Anonymous Referee #1

Referee comment on "Development of a moving point source model for shipping emission dispersion modeling in EPISODE–CityChem v1.3" by Kang Pan et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-47-RC1>, 2021

General comment

The paper present a new modelling approach to take into account movements of ships in simulation of transport and dispersal of atmospheric pollutants. Some specific cases have been simulated and compared to other modelling approaches such as fixed emission points and line source models. The paper is interesting, suitable for the Journal and could be of interest also for future studies. However, there are several aspects that could be made more clear and also an over-interpretation of results because I believe that it is not very clear that this new modelling approach is performing effectively better compared to other approaches at least when several ships are considered (see my specific comments). In conclusion, I believe that the paper should have a careful revision before publication.

Specific comments

One aspect that raised my curiosity is why SO₂ has not been considered in this work. Shipping-related SO₂ is quite important and the most recent international policy from IMO enforce the sue of low-sulphur content fuel that will have a strong impact on the emission of SO₂ (in addition to particulate matter). In addition, it is mentioned that simulations

were performed also for PM2.5 but I only see NO2 in the results.

In several parts of the paper there is a confusion between "emissions" and concentrations". In line 154, 162, 202-205 I believe that authors are mentioning actually concentrations rather than emissions.

Lines 171-175. These limitations are effectively necessary? What are the reasons behind these choices?

The simulations cover a very limited period (only a few hours). Will the results of the comparison among the different models similar if larger time span are used for simulations? Often daily or seasonal averages are used to investigate the impacts of specific sources to air quality. I ask this because, it seems that when a large number of ships are included, the differences of moving ship model and line emission model become negligible.

What are the emission conditions such as vertical exit velocity, height of emissions, buoyancy and so on? Are the same conditions used for each ship or a difference has been done according to the typology of ship (for example cargo, cruise, ferry and so on). Could author comment if the uncertainty arising from the assumption made on emissions is smaller or comparable with the differences observed among the different models?

Figure 7. It is actually difficult to compare results because the colour scale is very different. It should have been better to have all figures with the same colour scale. The same for Figs. 13, 14, 15

Figures 16 and 17 are based on only a few points so that the correct line joining the points is a straight line rather than a "non-estimated" curve.

Lines 349-360. The better performance of MPS is not really visible. Results of MPS and line source in Figure 17 are essentially the same with negligible differences especially if compared to the uncertainty rising from assumption on emissions. Therefore this part of the discussion should be revised.

The same thing for the conclusions (line 370-373), it is possible that, for very short calculation periods and with a very limited number of ships, MPS could furnish more realistic results. However, this aspect is not really demonstrated by comparison with measurements. Regarding the conclusions (lines 383-387) of "real-world" simulation, I believe that it is not true that MPS furnish better results than line source model. The differences found among the two approach are negligible. This should be clearly stated in the conclusion of the paper.