

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2021-376

Anonymous Referee #2

Referee comment on "Effects of vertical ship exhaust plume distributions on urban pollutant concentration – a sensitivity study with MITRAS v2.0 and EPISODE-CityChem v1.4" by Ronny Badeke et al., Geosci. Model Dev. Discuss.,
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The paper is a prosecution of a previous work (Badeke et al. 2021) aimed to investigate the vertical distribution of ship emissions. In this paper the authors study the influence of the vertical distribution of emissions on the ground-level pollutant concentrations at a few kilometres distance from the mooring point. The topic is of interest for an accurate assessment of the impact of ship emissions at berth in port cities. The paper deals with the development of an atmospheric dispersion model chain, for this reason it fits with the arguments treated in GMD journal.

I suggest the publication of the paper after the authors will reply to the following comments.

Methodology 116-120. The authors would better explain which obstacles have considered using MITRASv2.0. I guess they considered only the shape of the ship. What happens if ships with different shape are considered? Could the eventual presence of buildings near to the dock influence the presented results?

Line 145 "No chemical reactions occur in the simulations." This assumption can be considered valid also in case of very low wind speed?

Line 185 "No clear correlation was found for μ against the atmospheric stability, but a negative dependency has been found for stability against σ ". The absence of correlation of μ against the atmospheric stability is a logical consequence of the range of vertical height considered. If it contains all the plume also in case of high convective conditions then the result is logical. If the authors agree with this interpretation they could include it in the text. Otherwise give their interpretation.

Line 195 "Especially in cases of strong winds and stable atmospheric conditions, the simple Gaussian distribution delivers good results." But cases of strong winds are of less interest for the impact on air quality. This reduces significantly the value of the simple Gaussian distribution. It would be evidenced.

Line 315. It is not clear how initial vertical concentration profiles were converted into vertical emission profiles in EPISODE-CityChem. Could the author explain this point?

It would be useful to introduce the definition of upper plume boundary height.

I did not find in the paper the exact definition of initial concentration profiles. It is necessary to introduce this definition at the first time the authors discuss about "initial concentration profile"

The profile for the single cell emission model is reported in the caption of Fig. 7 but is not present in the diagram.

A final observation. The authors evaluated, among others, the impact of surface roughness on pollutant ground-level concentration. Since the interest is focused on the local scale (few kilometres from the source) do they consider important or necessary a precise description of the buildings and the streets instead of the use of a simple parameter like the surface roughness?