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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Parameterizing the vertical downward dispersion of ship exhaust gas in the near-field" *by* Ronny Badeke et al.

Anonymous Referee #2

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This is an interesting paper on the vertical downward dispersion of a prototype ship exhaust gas in the near-field and its dependence upon several input parameters, using MITRAS model simulations. The topic is actual and important. The paper does not present substantial new concepts. However, the considerable number of combinations of input parameters makes the paper of great interest. The paper contains a significant number of assumptions, but this is impossible to avoid given the complexity of the case under consideration. The paper is well-structured, the results are discussed properly.

I have some comments which would improve the quality of the paper but are not essential for publication.

1) I would like to see a bit more about the plume rise calculation and the parameterization of entrainment coefficient in MITRAS. Please give one formula for better under-

standing the physical processes involved in plume rise. This may be helpful for those readers who are not familiar with it.

2) As you mentioned, several authors pointed out that Gaussian pollutant distribution might not be well suited in the near field. When the distribution is asymmetric, the perfect reflection from the surface may not be the best choice. Did the authors consider using a more sophisticated algorithm for reflection?

3)Two multiple regressions are performed (with and without ship). It would be interesting to vary the prototype shape and include it as independent variable (e.g., aspect ratio, length/width).

4) The emission is assumed to occur in grid cell (2m x 2m x 2m), but the real stack is usually round and have a smaller diameter. This is an intrinsic problem of Eulerian modelling. Did the authors consider comparing their results with other dispersion models (e.g., Lagrangian particles models)?

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-753, 2020.