

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-189

Anonymous Referee #1

Referee comment on "Attribution of surface ozone to NO_x and volatile organic compound sources during two different high ozone events" by Aurelia Lupaşcu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-189-RC1>, 2022

The manuscript presents the high O₃ episodes in two heatwaves in Germany, attributing the O₃ levels to NO_x and VOC sources within and outside Germany using the TOAST system in the WRF-Chem model. The manuscript is very well written, well-structured, and easy to navigate. The tables and figures are relevant and to the point, well-supporting the discussion of the results. There are few points that should be addressed before the manuscript can be published in ACP.

- The emissions are based on the TNO-MACC III for the year 2015. Are the emissions used for the 2018 simulation kept the same or somehow scaled? Information on 2018 anthropogenic emissions is lacking.
- There is no mention on the dust emissions or if dust is used at all in the simulations, ie from the boundaries. This might be important to consider since some periods are associated with southerlies with pressure systems starting from Africa. Dust can alter the radiation in the atmosphere, which can impact the chemical reactions such as O₃ formation. Using an online-coupled model has the advantage to account for these feedbacks and not using dust emissions or particles from boundaries can partly be a reason for biases in temperature and O₃ levels.
- It would be good to describe why the NO_x and VOC attribution simulations use different sets of source regions. Is it a simplification based on the complexity or computationally as VOCs included many lumped species?

- Temperature plot in Figure 1 does not show overestimations at nighttime as suggested in the manuscript (Line 216).

- Figures 5-8. Add that the dots represent the observed O₃ concentrations.

- In general, it would be beneficial if the contributions are not only given in absolute terms but also in relative terms (percentages) so the reader can see if the impact is large or small.