Comments by Owen R. Cooper (TOAR Scientific Coordinator of the Community Special Issue) on:

Feasibility of robust estimates of ozone production rates using satellite observations

Amir H. Souri, Gonzalo González Abad, Glenn M. Wolfe, Tijl Verhoelst, Corinne Vigouroux, Gaia Pinardi, Steven Compernolle, Bavo Langerock, Bryan N. Duncan, and Matthew S. Johnson

EGUsphere [preprint], https://doi.org/10.5194/egusphere-2024-1947

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This review is by Owen Cooper, TOAR Scientific Coordinator of the TOAR-II Community Special Issue. I, or a member of the TOAR-II Steering Committee, will post comments on all papers submitted to the TOAR-II Community Special Issue, which is an inter-journal special issue accommodating submissions to six Copernicus journals: ACP (lead journal), AMT, GMD, ESSD, ASCMO and BG. The primary purpose of these reviews is to identify any discrepancies across the TOAR-II submissions, and to allow the author teams time to address the discrepancies. Additional comments may be included with the reviews. While O. Cooper and members of the TOAR-II Steering Committee may post open comments on papers submitted to the TOAR-II Community Special Issue, they are not involved with the decision to accept or reject a paper for publication, which is entirely handled by the journal's editorial team.

General Comments:

TOAR-II has produced two guidance documents to help authors develop their manuscripts so that results can be consistently compared across the wide range of studies that will be written for the TOAR-II Community Special Issue. Both guidance documents can be found on the TOAR-II webpage: https://igacproject.org/activities/TOAR/TOAR-II

The TOAR-II Community Special Issue Guidelines: In the spirit of collaboration and to allow TOAR-II findings to be directly comparable across publications, the TOAR-II Steering Committee has issued this set of guidelines regarding style, units, plotting scales, regional and tropospheric column comparisons, tropopause definitions and best statistical practices.

Guidance note on best statistical practices for TOAR analyses: The aim of this guidance note is to provide recommendations on best statistical practices and to ensure consistent communication of statistical analysis and associated uncertainty across TOAR publications. The scope includes approaches for reporting trends, a discussion of strengths and weaknesses of commonly used techniques, and calibrated language for the communication of uncertainty. Table 3 of the TOAR-II statistical guidelines provides calibrated language for describing trends and uncertainty, similar to the approach of IPCC, which allows trends to be discussed without having to use the problematic expression, "statistically significant".

Specific Comments:

The goal of this analysis is to develop globally consistent maps of ozone production (these maps do not depict ozone loss, or net ozone production). The authors suggest on line 595 that the ozone production maps can be used to identify regions with high levels of ozone pollution, which seems perfectly reasonable. For example, they show that the regions of New York City, Los Angeles, San Francisco Bay area, and Lake Michigan have high levels of ozone production, and these same regions are well-known for persistent ozone pollution in the summer months. However, there are many other regions across the

USA and Canada that have high ozone pollution levels, which don't seem to stand out on the map for July 2019. Perhaps this is due to just one month being shown, and perhaps other regions would stand out during other months, but without any evaluation, we don't know if this is the case. I think there is a good opportunity here to apply the ozone observations in the TOAR database to these ozone production maps to see if they do indeed capture the urban areas with the highest ozone pollution. For example, Figure S1b in the supplement to Fleming et al. (2018) (pasted below) shows the number of days per year that maximum daily 8-hour average ozone (MDA8) exceeds 70 ppb, across North America, Europe and East Asia, based on observed ozone from 2010 to 2014 (these data are from the TOAR database). A similar map could be made for July 2019 (or other months) to see if the observed ozone pollution hotspots coincide with the ozone production hot spots. The American Lung Association publishes an annual report (State of the Air) listing the urban areas in the USA with the highest ozone pollution. The most recent analysis, based on EPA ozone data for 2020-2022, lists the following urban areas with the highest ozone pollution (number of days per year when MDA8 ozone exceeds 70 ppb) (https://www.lung.org/research/sota/city-rankings/most-polluted-cities):

1. Los Angeles
2. Visalia (Central Valley)
3. Bakersfield (Central Valley)
4. Fresno (Central Valley)
5. Phoenix, AZ
6. Denver, CO
7. Sacramento (Central Valley)
8. San Diego
9. Salt Lake City, UT
10. Houston
11. Las Vegas
12. San Jose-San Francisco-Oakland
13. Dallas
14. NYC
15. El Paso, TX
16. Fort Collins, CO
17. Chicago
18. El Centro, CA
19. Reno, NV
20. Colorado Springs, CO

The 4 high ozone production regions in the USA identified by the authors are in this list of the top 20 polluted cities, but why don't the other 16 cities stand out on the ozone production map? Similarly, the Po Valley of northern Italy is the ozone hot spot for Europe, but the ozone production map gives the impression that Benelux would have higher ozone pollution levels.

Minor Comments:

In the first paragraph the authors make some general statements about the importance of ozone for health, vegetation and climate, but provide no references. This would be a good opportunity to cite the findings from the first phase of TOAR in three key publications, TOAR-Health (Fleming et al., 2018), TOAR-Vegetation (Mills et al., 2018) and TOAR-Climate (Gaudel et al., 2018).

Line 199
SZA is first mentioned here, but it needs to be defined

Line 679
“This data has” should be “These data have”

References:

Fleming, Z. L., R. M. Doherty, et al. (2018), Tropospheric Ozone Assessment Report: Present-day ozone distribution and trends relevant to human health, *Elem Sci Anth*, *6(1):12,* DOI: https://doi.org/10.1525/elementa.273

Gaudel, A., et al. (2018), Tropospheric Ozone Assessment Report: Present-day distribution and trends of tropospheric ozone relevant to climate and global atmospheric chemistry model evaluation, *Elem. Sci. Anth., 6(1):39*, DOI: https://doi.org/10.1525/elementa.291

Mills, G., et al. (2018), Tropospheric Ozone Assessment Report: Present-day tropospheric ozone distribution and trends relevant to vegetation, *Elem. Sci. Anth*., *6(1):47*, DOI: https://doi.org/10.1525/elementa.302

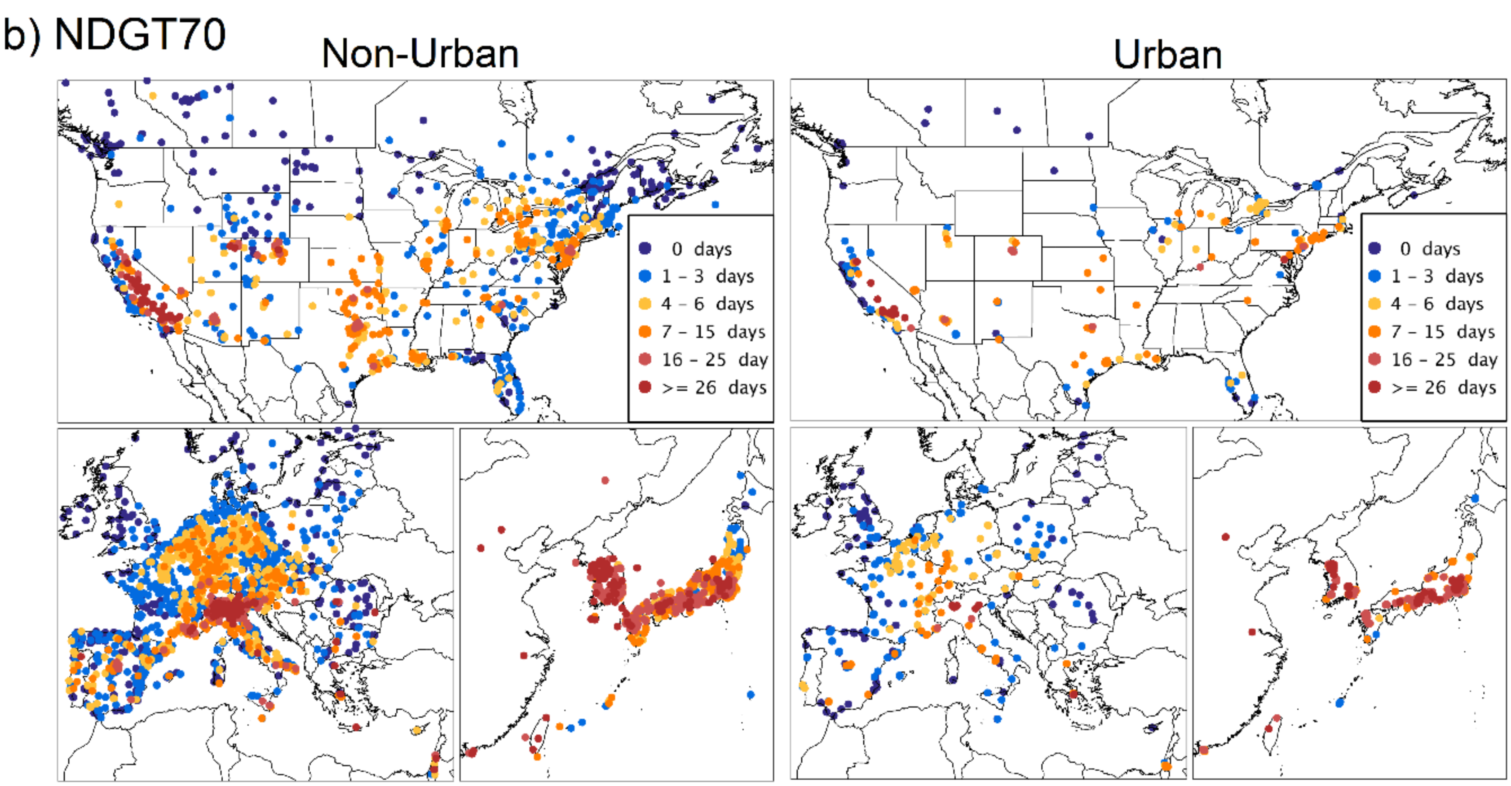

Figure S1b from Fleming et al., 2018