



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-486-RC2>, 2022  
© Author(s) 2022. This work is distributed under  
the Creative Commons Attribution 4.0 License.

## **Comment on egusphere-2022-486**

Anonymous Referee #2

---

Referee comment on "Impacts of urbanization on air quality and the related health risks in a city with complex terrain" by Chenchao Zhan et al., EGU Sphere,  
<https://doi.org/10.5194/egusphere-2022-486-RC2>, 2022

---

### General comments:

Accelerated urbanization across the globe has resulted in considerable changes in land surface parameters and subsequently affect meteorological conditions and air pollutant levels. In this study, Zhan et al. reveal the changes in criteria air pollutants between 2015 and 2021 and probe the environmental consequence of rapid urbanization over a typical megacity situated in southwestern China, Chengdu. They also quantify the premature mortalities attributed to exposure to ozone and PM<sub>2.5</sub>. This paper is well-written and presents results that would be interesting to the air quality modeling community from a practical perspective. I have several concerns that the authors should consider when revising the manuscript, as listed below. I recommend publication after the following comments are adequately addressed.

### Specific comments:

1) The literature review could be better. The authors only provide an example of urbanization impacts focused on the YRD by Liao et al. (2015), while extensive studies have been focusing on identifying the effects of urbanization on the regional meteorological phenomena and air quality (including the Beijing-Tianjin-Hebei area and the Pearl River Delta). Furthermore, recent studies have widely acknowledged the critical role of urbanization in altering air quality in Chengdu [Wang et al., 2021, 2022a]. Thus, these studies should be discussed and properly cited.

2) Line 34-36: This sentence is a bit vague and I genuinely don't understand this sentence - please rephrase.

3) Figure 1: It seems that the shapefile used by the authors (NCL default shapefile) is wrong. Please check. Also, please clarify the source of SO<sub>2</sub> emission for subplot (b). Moreover, it would be valuable to provide the boundary of Chengdu city in Figure 1 for making it clear.

4) Line 190: The criterion for PM<sub>2.5</sub> and MDA8 ozone is a bit vague. I believe that it is annual PM<sub>2.5</sub> concentrations less than 75µg/m<sup>3</sup> and MDA8 ozone less than 160µg/m<sup>3</sup>. Please clarify the time period for these metrics.

5) Line 193-196: The authors apply the annual mean MDA8 ozone concentrations for illustrating the variations of ozone across Chengdu over time. However, annual mean MDA8 ozone is not a meaningful metric as wintertime low MDA8 ozone would pull low ozone levels. In general, it is recommended for using the warm season (April-September) MDA8 ozone average (see Wang et al., (2022b)) or the 90th percentile of MDA8 ozone (which is based on Chinese NAAQS GB3095-2012).

6) It would be better to use "heat maps of (a) daily average PM<sub>2.5</sub> and (b) MDA8 O<sub>3</sub> concentrations" rather than "distribution" for the caption of Figure 2.

7) Line 219-220: "the premature mortalities due to O<sub>3</sub> fluctuate." This is an incomplete sentence. Please check.

8) Line 221: "annual average" might be "7-year average". Please check.

9) Line 275-278: Is the WRF-Chem model performance comparable with prior studies over Chengdu (or Sichuan Basin)? It would be valuable to briefly compare the model performance with previous studies (Yang et al., 2021; Wu et al., 2022) for demonstrating the robustness of model results.

10) Line 369-370: This sentence is a bit vague and I genuinely don't understand this sentence - please rephrase.

11) Line 385-395: The authors attribute the ozone changes in Chengdu to the Ozone-NO<sub>x</sub>-VOCs regime but do not provide any details about the formation regime. A comprehensive discussion on the underlying mechanism of the VOCs-limited ozone regime in urban Chengdu is needed (Wang et al., 2022a).

## References

- [1] Wang, H., et al. (2021). Impact of different urban canopy models on air quality simulation in Chengdu, southwestern China. *Atmospheric Environment*, 267, 118775. <https://doi.org/10.1016/j.atmosenv.2021.118775>
- [2] Wang, H., et al. (2022a). Impact of Urbanization on Meteorology and Air Quality in Chengdu, a Basin City of Southwestern China. *Frontiers in Ecology and Evolution*, 10, 845801. <https://doi.org/10.3389/fevo.2022.845801>
- [3] Wang, Y., et al. (2022b). Long-term trends of ozone and precursors from 2013 to

2020 in a megacity (Chengdu), China: Evidence of changing emissions and chemistry. *Atmospheric Research*, 106309. <https://doi.org/10.1016/j.atmosres.2022.106309>

[4] Wu, K., et al. (2022). Drivers of 2013–2020 ozone trends in the Sichuan Basin, China: Impacts of meteorology and precursor emission changes. *Environmental Pollution*, 300, 118914. <https://doi.org/10.1016/j.envpol.2022.118914>