

Atmos. Chem. Phys. Discuss., referee comment RC2
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Comment on acp-2022-178

Anonymous Referee #2

Referee comment on "Changing ozone sensitivity in the South Coast Air Basin during the COVID-19 period" by Jason R. Schroeder et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-178-RC2>, 2022

General Comments:

Overall this is an interesting, multi-faceted, and comprehensive paper that is well written and adds to the ever-expanding body of literature on the impacts of the COVID-19 pandemic and lockdown on ozone pollution, in this case for the SoCAB region. While I think it does provide some important results that would be suitable for publication in ACP, I have a number of general and specific comments related to methods, analysis, and discussion/conclusions that need to be considered below. My formal recommendation is to reconsider the paper after major revisions.

First, I have some issues with using a 10-year old version of WRF model, but this can be rectified by providing an associated meteorological evaluation to verify usage to drive the CMAQ model. Also, it wasn't entirely clear if 2020 meteorology was actually used in the WRF simulations used to drive CMAQ.

Second, I feel there is a lack of a necessary supporting document, which should contain a number of supporting analysis to the main results shown. For example, while there is discussion on the development of COVID-19 transportation-related activity data in the paper (Section 2), I feel these analyses should be shown graphically or in tabular form in a supporting information document. These activity changes are critical to development of COVID-19 related emissions and ozone precursor changes, and eventual ozone formation modeling results.

Third, there appears to be some conflicts with a recent paper on COVID-19 impacts on ozone sensitivity and concentration changes also in the SoCAB region (Parker et al., 2022), which need to be at least discussed and/or rectified as to the major differences. Particularly, two of Parker et al. conclusions are the following:

- "Although meteorology played the major role in the increases in ozone between 2019 and 2020, the reduction in NO_x emissions due to the response of the COVID pandemic also **caused ozone increases** in Los Angeles County and into western San Bernardino County, with more widespread ozone decreases further east."

- "Ozone formation in parts of the **SoCAB is still VOC-sensitive**, and the locations where NO_x reductions cause ozone increases occur in areas with some of the highest population density in the SoCAB".

Which conflict somewhat with the conclusions of this present paper, such as:

- "Model simulations performed with base-case and COVID-adjusted emissions capture

this change to a NO_x-limited environment and suggest that COVID-related emissions reductions were responsible for a **0-2 ppb decrease in O₃** over the study period."

- "Historical trend analysis from two indicators of O₃ sensitivity (the satellite HCHO/NO₂ ratio and the O₃ weekend/weekday ratio) revealed that Spring of 2020 was the first year on record to be **on average NO_x-limited**, while the "transitional" character of recent Summers became NO_x-limited due to COVID-related NO_x reductions in 2020."

While I tend to agree more with the present study findings because they explored the ozone formation/sensitivity using a combination of satellite data, surface monitors, and models, some discussion and comparison on the different conclusions reached in these two studies are necessary here, likely in the "Discussion" section. This also could be rectified by expanding the modeling analysis to show COVID19-Baseline results spatially across the SoCAB. There are also some similarities between studies, such as both finding that warmer than average temperatures in the SoCAB played a major role in ozone increases during the COVID-19 lockdown periods of spring/summer 2020. Please review carefully and provide additional analysis and discussion.

Parker, L.K.; Johnson, J.; Grant, J.; Vennam, P.; Parikh, R.; Chien, C.-J.; Morris, R. Ozone Trends and the Ability of Models to Reproduce the 2020 Ozone Concentrations in the South Coast Air Basin in Southern California under the COVID-19 Restrictions. *Atmosphere* 2022, 13, 528. <https://doi.org/10.3390/atmos13040528>.

Specific Comments: Please refer to the attached PDF supplement for specific comments.

Please also note the supplement to this comment:
<https://acp.copernicus.org/preprints/acp-2022-178/acp-2022-178-RC2-supplement.pdf>