

Review of “Source contribution to ozone pollution during June 2021 in Arizona: Insights from WRF-Chem tagged O<sub>3</sub> and CO”

By Guo et al

This paper presents a study on the source attribution of surface and tropospheric O<sub>3</sub> and CO in Arizona during one month (June 2021) when fire emissions impacted the area. The authors use WRF-Chem tagged simulations as well as WRF-Chem sensitivity simulations (with and without fire) to determine the budget of O<sub>3</sub> for the region, including the fire contribution. They also investigate the meteorological, diurnal, and chemical conditions that influence O<sub>3</sub> production for two case studies in detail. While the study covers only a small spatial and temporal region/period, this kind of detailed case study is very interesting as there remains a high level of uncertainty and variability in O<sub>3</sub> production during fire events.

The authors have revised the manuscript based on the first round of reviews, and the concerns raised in the reviews have nearly all been addressed. I have only one major concern remaining, related to the authors’ interpretation of the tagged Mexico anthropogenic contribution when discussing Figure 9.

In Figure 9, I’ve assumed that the date tick marks correspond with 00:01 local time, thus, when the authors discuss June 15 and 17 in the text, they are referring to the particular area after (to the right) of the 0615 and 0617 ticks.

As such, it appears incorrect to say that on June 15th the Mexican Anthro contribution (red) exceeded the Arizona Anthro contribution (green), since this is only true in the first half (midnight to ~8am) of June 15<sup>th</sup>. The big peak when the exceedance (>70 ppb) occurred, has a large red area, indicating that the local anthropogenic contribution from Arizona is greater than that of Mexico, for a significant time period over this day, particularly during the exceedance time.

While the authors have revised the text in this discussion based on the first review, the new text is quite contradictory, e.g;

“exceedances of the NAAQS 70 ppb O<sub>3</sub> standard in Yuma are **often significantly influenced by emissions from Mexico**” yet “**these contributions are modest in absolute terms**”.

And:

“While **not dominant** overall...” yet “these transboundary emissions **play a substantial role in elevating** O<sub>3</sub> above background levels and contribute to exceedances”

...It’s as though by including the Mexican (green) portion at the top of the other contributions in the time series (Figure 9), they have perceived that the Mexican contribution caused the exceedances in Arizona. Whereas, if the Arizona (red) portion were placed at the top, one would perceive that *that* contribution caused the exceedance.

Therefore, I highly recommend that the text discussing Figure 9 be changed further to something like this before publishing:

“Figure 9 shows that O<sub>3</sub> levels in Yuma are largely dominated by the background level, primarily from long-range transport and natural sources. The exceedances of the NAAQS 70 ppb O<sub>3</sub> standard in Yuma were significantly influenced by a peak in this background contribution on June 15 and 17<sup>th</sup> when the background made up X% and Y%, respectively of the total daytime O<sub>3</sub>. On June 15 and 17<sup>th</sup>, the anthropogenic contributions from Arizona were W% and Z%, respectively, and the anthropogenic contributions from Mexico were U% and V% respectively.” (filling in the percents from your tagged simulation data)

This new suggested text would rephrase the discussion of these results in a quantitative way and remove any perception bias from the interpretation of Fig 9. The authors can also add a brief sentence related to the fact that these are modelled results, and the modelled peaks on June 15<sup>th</sup> and 17<sup>th</sup> are +/-X% different from the measurement peaks.

I also have one minor comment:

Figures 11(c and d) and 13 (c and d): When showing differences (“Diff”), please change to a divergent colour scale (e.g. blue to red with white at zero) instead rainbow, which makes it difficult to understand the results.