

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-144

Anonymous Referee #1

Referee comment on "The impacts of wildfires on ozone production and boundary layer dynamics in California's Central Valley" by Keming Pan and Ian C. Faloon, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-144-RC1>, 2022

This manuscript describes an ambitious effort to characterize the effects of wildfire smoke on photochemical ozone production and boundary layer dynamics in the Central Valley of California between 2016 and 2020. The authors use HYSPLIT and HMS mapping to identify periods influenced by wildfires, and measurements from two Ameriflux sites to evaluate the boundary layer impacts. The paper is well written and organized to integrate these two themes. The greatest weakness of the paper is with the ozone production estimates which rely heavily on NO₂ measurements based on the conversion to NO on a heated molybdenum surface, a technique fraught with problems that the authors recognize and discuss at length. As they note, it has long been known that heated molybdenum also converts other NO_y compounds (e.g., PAN and HNO₃) to NO, and they apply the correction developed by Steinbacher et al. (2007) from measurements at two sites in Switzerland to correct for this interference. This correction can be quite large outside of urban areas, however, and the study by Steinbacher et al. found that the apparent NO₂ measured using molybdenum converters was more than 2.5x the actual value on summer afternoons at a rural site. Newer studies (e.g., Xu et al., 2013) have reached similar conclusions, and the situation is made even worse in aged wildfire smoke where there is very little actual NO_x. Recent findings from WE-CAN (Peng et al., 2021) show that nearly all of the NO_x in wildfire plumes is converted to PAN or HNO₃ within a few hours which makes the inferred fire-related increases in NO_x and calculated ozone production efficiencies extremely uncertain to say the least. I'm not convinced that the CARB NO_x measurements can be corrected to the degree needed for this analysis and I recommend that these sections be removed from the manuscript. The remaining material is of sufficient interest to warrant publication.

Specific comments.

L16-18. Delete.

L115-120. Replace with "We also present the enhancement ratios (ERs) for O₃/T, PM_{2.5}/CO during the wildfire influenced periods in the CV."

L150-166. Delete.

L209-238. Section 2.3 should be deleted.

L233. Perhaps moot, but there is no Eq. R(6) in the text. Should this be "...Eq. R(3) and R(4)..."?

L275 and Figure 3. The NO_x panel can be deleted.

L285-286. Delete.

L348-387 and Figure 5. Delete.

L471-472. Delete.

L477-480. Delete.

Table C1. Delete.

