

Atmos. Chem. Phys. Discuss., referee comment RC2
<https://doi.org/10.5194/acp-2022-144-RC2>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2022-144

Anonymous Referee #2

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. Faloona, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-144-RC2>, 2022

The paper presents a detailed analysis of surface measurements and radiosone observations on the impacts of wildfire smoke on surface ozone production and boundary layer dynamics. The authors demonstrate an overall difference between fire impacted and non-fire days with the former exhibiting enhanced surface ozone concentrations and reduced buoyancy fluxes and boundary layer height. This is a very well conducted analysis and the paper clearly and in detail discusses the approaches and results. I also want to comment positively on the comprehensive review of and reference to other studies that puts this study well into context of previous works.

I recommend publications but believe that the paper could be strengthened if the following points would be addressed:

- 1) I agree with the other reviewer that the uncertainties associated with the surface NO₂ measurements impact the calculations of ozone production. The authors do address this to some degree but wonder if an uncertainty analysis could be conducted assuming various degrees of corrections to the data
- 2) The authors combine measurements from different surface sites in their analysis, e.g. near-by meteorological data when colocated data are not available at chemistry measurement locations or the joint analysis of RASS and AmeriFlux measurements. Can the authors comment on the variability across the study region and what uncertainties these assumptions might introduce in their results?
- 3) The authors briefly mention that also climatological conditions might contribute to the differences seen between fire and no-fire days. While I understand that a full analysis of this such as an assessment of large scale weather patterns is beyond the scope, it would be good to elaborate on this point some more.

3) Section 2.2: Do I understand correctly that for background days only cloud-free days are considered whereas for fire impacted days both cloud-free and cloudy days are considered? On fire-impacted days one would also expect that the high aerosol loading leads to more cloud formation which, in addition to aerosol loadings, would impact dynamics.

As for the use of NAM: The study region has rather complex terrain and I wonder if the 12km resolution is sufficient to resolve the transport well enough. Have the authors considered using the higher resolution HRRR product?

4) Figure 3: it would be informative to also for this figure state the number of data points available for each bin.

5) Figure 4: Label fire/no-fire is missing

6) Line 354: Do you have a hypothesis why these two sites show negative increments?

7) Figures B1 and B2 appear to be of fairly low quality.