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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Air Quality Impact of the Northern California Camp Fire of November 2018" *by* Brigitte Rooney et al.

Anonymous Referee #1

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This paper presents the results of a systematic aerosol dispersion and air quality modeling exercise based on the 2018 Camp Fire in northern California. A careful analysis is given, using a combination of satellite and surface measurements over the duration of the fire. There is a great need to analyze and improve such models, to provide reliable air quality forecasting. This work is worthy of publication in ACP in my opinion. I hope the notes below offer some avenues for minor improvements.

1. Lines 110 to 116. I'm not clear what values were selected for some of the parameters in Equation 1, and the degree to which uncertainty in these parameters affects the final model results. This is only partly addressed in Section 4.2; presenting what was learned about emissions process modeling in more detail might be helpful.

2. Lines 122-123. Wildfires tend to have a very distinct diurnal cycle. Especially

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given the extensive modeling effort performed here, using a 13:30 local time sample as diurnally representative might not be the best assumption. There also might be MODIS FRP data at 10:30 am as well as nighttime sampling for this fire.

3. Lines 144-146. The Camp Fire reportedly also burned the town of Paradise, California between 8 and 10 November 2018. Does urban structure represent a land cover type that should be included in the simulation, as it can produce very different emissions from grassland or forest?

4. Lines 274-278. Given the assumptions required to perform the TROPOMI ALH retrieval, it might be worth comparing the results with any height retrievals from MODIS/MAIAC (Lyapustin et al. 2019, doi:10.1109/LGRS.2019.2936332) or MISR or CALIPSO. The comparison might help quantify measurement uncertainty. Line 285. Is the TROPOMI ALH actually accurate to 100 m?

5. Line 282. Figure 9 is first referenced after Figures 10, 11, and 12. Probably warrants re-numbering.

6. Lines 337-339. There are notable uncertainties in the satellite estimates of smoke emissions. For example, the satellite results are not species-specific, relatively coarse pixel resolution contributes, etc. The factor of 5 adjustment from Archer-Nicholls et al. is not unusual, and is an indication of the underlying limitations.

7. Given the complexity of the problem, I understand why you perturb individual factors in this study. As you have built an advanced modeling capability to assess smoke dispersion for air quality applications, I'm wondering whether testing at least a few combinations of the main factors might yield some additional insights. There are likely some non-linear interactions among mechanisms, and if the goal is to improve air quality prediction, this might be important.

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