

Interactive comment on “Wildfire influences on the variability and trend of summer surface ozone in the mountainous western United States” by Xiao Lu et al.

Anonymous Referee #1

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Overview: The paper presents a new approach to examining the influence of wildfire smoke on ozone mixing ratios at remote/rural monitoring sites in the U.S. intermountain west. Overall the paper is well written and suitable for publication in ACP. I recommend that the authors consider the following ideas in revising the manuscript.

- 1) Line 285: The sentence starting with “These underestimates” requires substantially more justification/analysis/references.
- 2) Line 315: There are many reasons that a model like GEOS-Chem will not adequately represent the role of fires. The standard versions of GEOS-Chem do not emit short lived VOCs, and the emission factors for NO_x emissions from fires are quite variable in reality. The model also adds all the emissions within the boundary layer. The authors

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clearly recognize this because they use a 5km cut off for the FLEXPART analysis, and are certainly aware of recent work by Val Martin et al. (e.g. 2010) with respect to plume heights over North America. This should be discussed in depth or omitted. A reference to Zhang et al., (2014) is inadequate.

3) Why does this paper narrowly focus on the intermountain west? This region has many wildfires, but the smoke travels and the impact on ozone may be larger downwind (see Brey and Fischer, 2016). S. Brey and E.V. Fischer (2016), Smoke in the City: How often and where does smoke impact summertime ozone in the United States, Environ. Sci. Tech., DOI:10.1021/acs.est.5b05218.

4) I have two questions with respect to Figure 7 (and the associated discussion). First, is it appropriate to use the entire range of 1989-2010 to look at the number of exceedance days. There have been trends in ozone during this time. Second, and more importantly, would it be more appropriate to view the exceedance days as a percentage of the total, rather than as a count. Yes, there will be more exceedance days as we lower (tighten) the ozone standard, all things held the same. However, do we have a way to determine if the relative importance of fires will increase?

5) Finally, I think all the SI materials should be moved into the main paper. There are very important figures in the SI materials, and I had to refer to them to follow the paper. Without them in the main manuscript, it would be easy to overlook the fact that the MLR really does not do a good job reproducing the highest ozone days. This is an important point in considering the value of this analysis.

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