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Atmospheric Chemistry and Physics Discussions

Interactive comment on "In-situ measurements of trace gases, PM, and aerosol optical properties during the 2017 NW US wildfire smoke event" *by* Vanessa Selimovic et al.

Anonymous Referee #1

Received and published: 20 December 2018

GENERAL COMMENTS

This study reports emission ratios and optical properties observed in smoke from wildland fires of various ages. The study measured ~500 hours of smoke impacts, making it very thorough in terms of sampling different ages, a variety of origins, and presumably a diversity of fire behavior. The study methods were appropriate, the presentation and discussion is thorough, yet concise. The authors have been careful to properly qualify their conclusions and have clearly pointed out limitations of the data. The discussion and conclusions are supported by the data presented. I found only one general issue that must be addressed. The comparison with prescribed fires somewhat overstates

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Discussion paper

the prescribed fire versus wildfire PM differences. The authors have compared their measurements versus all aircraft measured prescribed fire measurements in May et al. (2014), which were mostly SE coastal plain understory burns or California chaparral. Only two of the May et al. (2014) aircraft prescribed fires, the Shaver fire and Turtle fire in Montane forest seem to be similar ecosystems / fuel types to the source fires that impacted Missoula during their study. From a smoke/air quality impact perspective, the wildfire vs. prescribed fire tradeoff issue is largely a matter of forest fires in the western US. The duration, fuel loading, and total emissions involved with western forest fires significantly exceeds that of chaparral and sagebrush systems (see e.g. French et al., 2011 San Diego County fires). Therefore, in the context of a wildfire vs. prescribed smoke/air quality comparison the authors should compare their wildfire results with the Shaver fire and Turtle fire from May et al. (2014), for which the forest PM1/CO = 0.011+/- 0.01, about 40% higher than the 0.08 value presented in Table 5 and used the discussion. Likewise the Shaver / Turtle fire BC/PM1 is 0.006, much closer to that observed in the current study and similar to Liu et al. (2017).

French, N. H. F., et al. (2011), Model comparisons for estimating carbon emissions from North American wildland fire, J. Geophys. Res., 116, G00K05, doi:10.1029/2010JG001469.

SPECIFIC COMMENTS

1. P4, Ln 27-37: Was calibration conducted using the same flow set-up as ambient data, i.e. through scrubber and diffusion drier? Any estimate of particle loss based on other studies?

2. P6, L4-21: Please state the criteria used to define smoke impacted periods of sampling?

3. P6, L4-21: Was a diurnal variation observed in CH4 for background conditions (e.g. due to constant source + varying mixed layer depth)?

4. P7, L33-38 & Table 2: The authors should include CH4/CO ratios form Urbanski (2013) as the wildfires reported on in that study are most similar to the MT/ID/BC fires that impacted Missoula.

5. P7, L 37: “Our higher study average ER of CH4 is indicative of smoldering, or specifically glowing combustion (Yokelson et al., 1997).” This statement implies CH4/CO for glowing combustion is different from smoldering pyrolysis, which is at odds with ground-based field study of Reisen et al. (2018). Please comment on this apparent discrepancy. (Reisen, F., Meyer, C. P., Weston, C. J., & Volkova, L. (2018). JGR - Atmospheres, 123, 8301–8314. https://doi.org/10.1029/2018JD028488)

6. P9, L1: Reference needed.

7. P9, L14-15: Should note that Hobbs et al. (1996) were mostly prescribed fires of logging slash.

8. How robust is BC = f(MCE) from Selimovic ?

9. Fig 5. Adding date labels to a few ticks on the x-axis would be helpful.\

10. P9, L16-23: Does “annual” refer to 2011 or average over some period of time?

11. Section 3.5. Please note the value of PM2.5/CO over these periods

12. P13, L29-30: This should be restated, prescribed fires do not allow control over dispersion conditions, but allow one to ignite fires when dispersion conditions are favorable and/or manipulate ignition in a manner that enhances dispersion, e.g. mass ignition that puts smoke above mixed layer.

TECHNICAL

Mixing of units notation, superscripts and “/”, e.g. L minˆ-1 and L/min, throughout paper

P4, L36: missing “nm” after 401

P5, L13: “BrC” should not be subscript

P10, L35: missing “nm” after 401

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