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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Airborne and ground-based measurements of the trace gases and particles emitted by prescribed fires in the United States" *by* I. R. Burling et al.

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This is an excellent paper. It reports and analyses a comprehensive set of field emission data from prescribed fires in South US temperate regions. It is extensive and novel. Even the often unreported chaparral fires are included here. I specially want to commend the clear distinction between flaming and smouldering combustion, and the use of ECM as a proxy to fire dynamics. This is an elegant and complete approach to the problem. The text is well written and makes for a good read. The experiments were carefully designed and conducted, and methods are well explained. Key assumptions are justified. The conclusions are supported by the results. I recommend publication

after the following two points are addressed:

* Error bars in the field are larger The paper is experimental, but does not report any experimental error or measurement uncertainty. This needs to be corrected with inclusion at least of some error estimations in the following two aspects: - Data quality is not uniform over the different field experiments. For example, "only a limited number of samples of low concentration could be obtained" or "limited us to acquiring four low concentration smoke samples early in the fire"; these ought to be reflected with larger error bars or uncertainties for the burns where data quality is lower (and the opposite for better quality sets). - Asses the error committed when "We assumed a carbon mass fraction (Fc) of 50% for the fuels". Is the error from this assumption 5% or 30%?

The larger errors/uncertainties in the measurements is one of the most important disadvantages of field work because conditions are more difficult to control. Laboratory work can be designed to severely reduced these. This disadvantage is not mentioned in the discussion of pro/cons in field vs laboratory experiments and ought to be included.

* Smouldering fires vs RSC The results contain data from a fire in the coastal lowlands of North Carolina. Some ecosystems in NC and around contain highly organic soils (e.g., peat). Organic soils can burn (Fransend et al.) and when ignited, they smoulder and are difficult to extinguished (Rein et al 2009). (eg, 2008 Evans Fire in NC; recent 2011 smouldering fire in SC, etc). These are often the longest burning fires, resulting in biomass emissions per unit area dozens to hundreds of times larger than for flaming fire.

However, the paper only addresses smouldering as the residual burning phenomena taking place after flaming (called RSC). This is correct for their particular prescribe burns which did not ignite the soil. But for the sake of completeness the paper needs to mention this other much larger smouldering source of emissions and say it is not addressed here. Otherwise, it could lead to confusion.

- Frandsen, W.H., Canadian Journal of Forest Research 27 (1997) 1471–1477. - Rein,

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G., et al., Proceedings of the Combustion Institute 32 (2009) 2489–2496

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Interactive Comment