**Atmospheric
Chemistry
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Discussions**

Interactive comment on "The tropical forest and fire emissions experiment: laboratory fire measurements and synthesis of campaign data" *by* R. J. Yokelson et al.

Anonymous Referee #3

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Overview: This is a good paper and topic for ACP, and deals with a critical; namely comparison of lab with field measurements with the ultimate derivation of a "fire averaged" emission factor much higher than those derived from spot measurements. This is a difficult problem and the work does not end with this paper. Am worried about the extrapolations performed within, but discussion and debate needs to start somewhere. But it is a great study to add to the scientific knowledge base and as a whole is pretty executed. I have revealed myself to the lead author, and I agree with the previously posted reviewer in all aspects. To reduce repetition, I will go directly to two major comments.

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Most importantly, the authors fail to acknowledge in their paper that this is an issue that has been considered for over 15 years in various ways. While the issue has not before been tackled as directly or as well as this manuscript findings previous findings need to be considered. I say this not simply to increase the number of citations in the paper (including my own), but they bare real relevance to the issue at hand. To begin, the authors are encouraged to read the two review papers by Reid et al., [2005], in particular the sections on smoke evolution, mass growth and emission. In there the authors will find several key references. For example, Guild et al., (1998) showed that for pasture fires in Brazil (important topic for this paper being reviewed here), the authors found that a significant amount of smoke production is not from the grass, but from lingering fallen trees from the original clear cut. They clearly point out the nature of the problem discussed in the current manuscript. Comparing Guild with Yokelson, the issue of large woody fuel (much bigger than what was in the burn chamber), shows an even more compelling reason why fire averaged emission factors are so important.

Along a similar thread, the authors must be very mindful of the differences between a "fire lab" fire and a "real fire." As the authors are as I am sure so keenly aware, combustion is a true chemical reaction process with extraordinarily complex reaction sets. Real fires have different temperatures, ventilations and concentrations. Big fires make up the bulk of emissions (Kaufman et al., 1998), and the chemistry of such fires is different from small fires, as is fuel makeup and heterogeneity. Thus, while I truly believe that there is much to be learned from lab fires, simple comparison between lab and field data is not in the slightest way straightforward. In Section 2.1, the authors go to great lengths to impress upon the reader all of the advantages of a burn lab. How about equal coverage of all of the reasons why burn lab data is problematic?

Regarding references on particle condensation/secondary production, as I stated in my first review, the reference to the material in Reid et al., 1998 is incorrect should be 40% (pg 4242 l3). Particle mass growth is probably on the order of 15-40%. This is inline

with the papers discussed in Reid et al., 2005. On one occasion for a very intense fire during SCAR-C a data point said 80%, as described in Martins et al., 1996; Hobbs et al., 1996. Thus, while it is possible for it to happen, more likely values are probably half this.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4221, 2008.

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