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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Biomass burning emissions disturbances on the isoprene oxidation in a tropical forest" *by* Fernando C. Santos et al.

Anonymous Referee #2

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Santos et al. present an informative study of how biomass burning emissions during SAMBBA field campaign changed the oxidative capacity of Amazon rainforest. Fresh plumes especially seem to favor isoprene oxidation compared to aged plumes, which is an important result. But the approach and methods need to be further strengthened. I recommend the following for additional analyses: 1. Section 2.2: Classification method of flight tracks: Since the study focuses on aircraft measurements, it is very important to understand local background is different from regional background. Although CO background for a large region could be around 150 ppb as suggested by the authors, the local background could be changing much more dynamically, since it is influenced by plume. One approach might have been to classify flight tracks over a given region based on O3 or NO thresholds and determine local background CO for these tracks.

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Discussion paper

Some discussions of local background variations and justification of a constant CO background is needed

2. Table 2: Values of ER (delta ozone/delta CO) vary significantly in different regions. While a threshold of <0.1 as an upper limit may be reasonable for fresh biomass smoke (based on Table 2), using this same threshold as a lower limit for aged smoke is not very convincing. At the minimum, some sensitivity tests are needed where the threshold for aged smoke is increased to say 0.5. How will this change in threshold affect results presented in this study? Also, ozone formation and photochemistry can be slowed down in thick smoke plumes or under cloudy conditions. Is this considered in the ER comparisons?

3. Figure 9: There are large differences between Karl et al. 2007 and the results presented in this study for vertical profiles of OH. Can additional supporting evidence from measurements be provided to show which approach is better? One approach might be to look at trends with altitude.

For example, as altitude increases from 0 to 2000 m, Karl et al. 2007 report OH increases by a factor of 2 (2.5 e7 to 5 e7). But the authors report a much larger increase (close to zero at 500 m to 1e6 at 2000 m). Did the authors observe large increases in ozone and NO with altitude similar to OH increase? In other words, even if quantitative OH measurements may not be available, some analysis about predicted OH trends with altitude and whether these can be justified based on other measurements like ozone and NO could be provided.

Line 355: 360: Fresh biomass plumes could be expected to be low NOx since VOC/NOx ratio may be very high in these plumes, even though fires also emit NOx. Could the authors comment on how the ratio of isoprene oxidation products to isoprene would vary depending on whether NOx regimes are low or high in plumes, and also how these NOx regimes would differ in the local background?

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