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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Near-field emission profiling of Rainforest and Cerrado fires in Brazil during SAMBBA 2012" *by* Amy K. Hodgson et al.

C. Paton-Walsh (Referee)

clarem@uow.edu.au

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This is an excellent paper presenting some very valuable measurements of emissions from fires in Brazil, a poorly sampled region of the globe. The paper is definitely suitable for publication in ACP, and has been expertly reviewed already by Bob Yokelson and Gavin McMeeking. I have a few minor additional comments below:

1. It has become traditional (following Yokelson et al.,[1999]), when calculating emission ratios via the best straight-line fit to a plot of one species against the reference species, to first subtract the background amounts and then force the regression to go through zero. However, subtracting background amounts is not required, because this has no mathematical impact on the gradient of the best line fit. Forcing the line through zero may change the gradient, but it puts unnecessary weight to the background con-

centrations measured/assumed. If these are very close to the real (and unchanging) background amounts, then the change to the gradient that occurs when you force the line through zero will be small. If the background assumed is incorrect, or is changing, the effect can be quite significant, as pointed out in a later paper by Yokelson et al., [2013]. A generalised least squares regression (that takes into consideration the uncertainties in both x and y) is a mathematically simpler and more accurate way to determine the emission ratio. I recommend this way to calculate emission ratios. It will not avoid all of the issues pointed out in Yokelson et al., [2013] if the background amounts are hugely variable, but it will minimise them compared to the calculation the authors have used in this study. Having said that, the high r-squared values lend confidence to the results in this study. If the authors are confident that they haven't biased their results significantly and do not wish to go back and recalculate the emission ratios, then I recommend that a sentence is added on this matter. The sentence should point out that forcing the regression through zero can bias the emission ratio if the background amounts assumed are wrong or change, but in this case they are confident they are not subject to the pitfalls described in Yokelson et al., [2013].

2. The use of the 1 sigma uncertainty of the best line fit as the total uncertainty in the emission ratio is not valid when the uncertainties in the individual points are correlated with one another (which they are in this case). Ideally you should undertake a proper uncertainty analysis of your measurements. As a minimum you should acknowledge that the uncertainties in each point are correlated and so your value of the uncertainties will be an underestimate (since it will include the random errors only).

3. Finally, I assume that the correction to the AMS data that was required as a result of the partial blockage of the inlet would have added to the measurement uncertainties? Again, if it is not feasible to undertake a proper uncertainty analysis, you should at least acknowledge this has not been done and mention the additional uncertainty in the text.

References Yokelson, R. J., M. O. Andreae, and S. K. Akagi (2013), Pitfalls with the use of enhancement ratios or normalized excess mixing ratios measured in plumes to characterize pollution sources and aging, Atmos. Meas. Tech., 6(8), 2155-2158, doi:10.5194/amt-6-2155-2013.

Yokelson, R. J., J. G. Goode, D. E. Ward, R. A. Susott, R. E. Babbitt, D. D. Wade, I. Bertschi, D. W. T. Griffith, and W. M. Hao (1999), Emissions of formaldehyde, acetic acid, methanol, and other trace gases from biomass fires in North Carolina measured by airborne Fourier transform infrared spectroscopy, J. Geophys. Res.-Atmos., 104(D23), 30109-30125, doi:10.1029/1999jd900817.

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