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Atmospheric Chemistry and Physics Discussions

Interactive comment on "New emission factors for Australian vegetation fires measured using open-path Fourier transform infrared spectroscopy – Part 2: Australian tropical savanna fires" *by* T. E. L. Smith et al.

Anonymous Referee #1

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This paper presents a series of emission factors (EF) and emission ratios (ER) for tropical savanna fires based on measurements collected over 21 fires in northern Australia with an open-path Fourier Transform Infrared spectroscopic system. The Authors analyze these emission ratios and factors taking into account vegetation type, stages of the dry season and modified combustion efficiency, and compare their estimates with previous studies.

Savanna fires account for an important fraction of total global biomass burning

and these fire emissions are not yet well constrained. The Authors present an interesting EF and ER dataset over tropical savanna in Australia; the modeling community will benefit from these emission factor estimates. The manuscript is well written and organized. In my opinion, the paper presents results that would be of interest to the readers of ACP and I consider this article adequate for publication. Below, I have added some comments and notes that will help improve the manuscript; I hope the Authors consider them during the revision process.

Specific comments

- Introduction. I suggest adding a note in the introduction (e.g. at the end of Page 6316 Line 16) to explain that the paper is part 2 of a companion paper (Paton-Walsh et al., 2014), and briefly comment what part 1 and part 2 cover.
- Page 6316 Line 24. mercury-cadmium-telluride (MCT) detector
- Page 6320 Lines 5-9. It is not clear to me how different are the retrieval parameters from part 1 and part 2 of the work. Please clarify.
- Page 6322 Line 2. Figure 4d is mentioned before Figures 4a-c. The Authors should rearrange Figure 4 to cite the images sequentially.
- Page 6323 Line 11. "Figure 4c", same comment as above.
- Page 6324 Line 22. It is not clear what "this moves slowly" refers to. Please clarify.
- Page 6325 Lines 25-26. Why did Paton-Walsh et al (2014) (part 1 of the paper) find C_2H_4 better correlated to CO_2, whereas this paper finds C_2H_4 better correlated to CO? My understanding is that both papers use the same (or very similar) dataset. . ..
- Page 6328 Line 2. Missing parenthesis? (based on MCE<90

- Page 6328 Line 14. Drivers of variations in emission ratios *and* emission factors
- Page 6333 Line 14. I think it is Paton-Walsh et al (201*4*)
- Summary and Conclusions. I feel this section is mostly a summary of their work and lacks some conclusions...

Figures and Tables

- Table 2. Table refers to *Y * compounds, whereas the text refers to *X * compounds. Please be consistent. What are the units of the emission ratios, ppm/ppm? Also, the caption of the table is long. The table would be much clearer is some of the text is moved to footnotes below the table.
- Table 3. Table refers to *Y * compounds, whereas the text refers to *X * compounds. Please be consistent. What are the units of the emission ratios, ppm/ppm?
- Table 5. The caption of the table is very long. I think the table would be much clearer if most of the text is moved to a few footnotes.
- Figures 4a-b are not used in the text. The Authors should remove them or at least cite them in the text, for example with Figure 3 (page 6321 line 14)
- Figure 7. “Only the first 60 s following ignition are dominated by smoke from purely flaming combustion, with increasing contribution from the smouldering-phase combustion zone towards the end of this time series (as reflected by the decreasing MCE throughout).” This information is already in the text. I would omit it here.
- Figure 9. “Notice the higher correlation (R2) between each of the trace gases and carbon monoxide, than between each of the trace gases and carbon dioxide (Fig. 8).”. This is already explained in the text. I would omit it here.

- Figures 11a, 12 and 13. I think the MCE observations should be presented consistently. Figure 11a presents MCE ranging from 80% to 100%, whereas it ranges from 78% to 100% in Figure 12 and from 84% to 98% in Figure 13.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 6311, 2014.