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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.

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We would like to thank anonymous referee #2 for the positive comments and suggestions. Below we address the referee's specific comments:

Comment (1) Section 4.1: Is the regression used to calculate the emission ratios similar to reduced major axis (RMA) regression? Is this another term for the RMA approach?

Reply (1) To the best of my knowledge after reading more about the RMA approach, I can see no differences between this and the regression approach used for this paper and Part 1 (Paton-Walsh et al. 2014). The purpose of using generalised least squares regression is that this approach takes into account measurement errors for both axes variables as seems to be the case for RMA regression.

Comment (2) Figure 8: Please increase the font size throughout.

Reply (2) Figure 8 will be redrawn subject to advice from the typesetters of the revised manuscript.

Comment (3) Figure 11: Please increase the font size on your axes and axes labels.

Reply (3) Figure 11 will be redrawn subject to advice from the typesetters of the revised manuscript.

Comment (4) Figure 12: This is a nice Figure. Please discuss how other trace species behave w/r/t MCE - i.e. do they show a similar pattern as methane with approximately the same pattern of increasing emission ratio as MCE is reduced? I would actually recommend putting similar plots for the other species in the supplemental materials.

Reply (4) There is a large number of data in Figure 12 (thousands of individual measurements from all of the 21 fires). There is such a large number of data for CH4 because CH4 mole fractions are retrievable from FTIR spectra even at ambient concentrations. This wealth of data provides us with samples spanning the full range of modified combustion efficiencies (from 78% up to almost 100%). This is also the case for a number of other trace gases whose mole fractions in the smoke from these fires are well above the detectability limits of the spectroscopy (CO, NH3, CH3OH, CH3COOH, CH2O, C2H4). For these gases, which are produced predominantly during smouldering-phase combustion, we see the same relationship as is evident in Figure

12 for CH4. For gases that are close to the detectability threshold (HCN, HCOOH, C2H2, C2H6) of the instrumental setup, we do not see a wealth of data, indeed, some of these gases were only detected at a few of the 21 fires (see Table 4). As such the corresponding plots for these gases are data sparse and it is difficult to draw the same conclusions. These plots will be made available as supplemental materials.

References

Paton-Walsh, C., Smith, T. E. L., Young, E. L., Griffith, D. W. T., and Guérette, É.-A.: New emission factors for Australian vegetation fires measured using open-path Fourier transform infrared spectroscopy - Part 1: methods and Australian temperate forest fires, Atmos. Chem. Phys. Discuss., 14, 4327-4381, doi:10.5194/acpd-14-4327-2014, 2014.