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Comment on acp-2022-211

Anonymous Referee #1

Referee comment on "Tropical peat fire emissions: 2019 field measurements in Sumatra and Borneo and synthesis with previous studies" by Robert J. Yokelson et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-211-RC1, 2022

This manuscript reports new emission factors for CO2, CO, CH4, and wide range of organic gases for burning peat. The emission measurements were obtained during 2019 field measurements in Indonesia. The authors combine these recent measurements with previous field measurements and laboratory studies to provide a comprehensive emission factor database for burning Indonesian peat, an important source of regional air pollution. The study provides significant updates to emission factors for CO2, CO, and CH4 and these should have an important impact on peat fire emissions inventories. The methods employed are sound, the paper is well written, and the presentation is clean and concise. The discussion provides valuable guidance for applying the papers emissions factors for peat fire emission inventory development. I have only a handful of comments for the authors to address.

Specific Comments

R1. Discussion

In the discussion the authors fail to include the Indonesian peat fire EFs reported by Wooster et al. (2018). This study reports in-situ measurements of fresh emissions from pure sub-surface peat fires (as in the current study) and surface fuels + peat fires from fires Central Kalimantan, Indonesia during October 2015 (described as the 'peak' of peat fires). The authors should include Wooster et al. EFs for CO2, CO, CH4, and PM2.5 for pure peat fires. The Wooster et al. EFs for fires involving peat + surface fuels would also be very useful for informing the discussion of applying EFs for bottom-up estimations of emissions from peat fires in SE Asia. While Wooster et al. uses optical methods to report EFPM2.5, they are based on calibration versus gravimetric PM2.5 using simultaneously collected filter samples from the field. Interestingly, their EFPM2.5 is roughly the same as that reported in current study. Also, since they did not measure NMOGs, their EF will be inflated somewhat. Nonetheless, these previous results should be included in the

discussion with appropriate qualifications.

R2. Application of EFs for estimating emissions from SE Asia peat fires

The emissions literature indicates the carbon content of Indonesian peat varies by 30% (44% – 61%, Iinuma et al. 2007, Wooster et al. 2018). This variability is similar to the uncertainties in EF for CO2, CO, CH4, and PM2.5 and may be worth mentioning for those seeking to apply emissions factors.

The discussion of large-scale emissions estimates for peat burning in SE Asia and the impact of updated EF that is presented in Wooster et al. could inform the discussion in 3.4 Context and guidance for using peat fire emission factors, at a minimum it should be mentioned.

R3. L10-12 P11: "Compared to other biomass fuels, the dominance of acetic acid and the ranking of ethane above ethene stand out for peat fires where the latter observation is consistent with relatively high alkane emissions in general from semi-fossilized biomass."

Please provide citation or explanation.

R4. Can the author offer any comments on the large difference in EFacetamide for FIREX (0.3 g/kg) and FLAME-IV (4.2 g/kg)?

R5. Technical – Typo? Table1: a couple entries with n=2 bur R2!= 1

References

Iinuma, Y. et al. (2007) Source characterization of biomass burning particles: The combustion of selected European conifers, African hardwood, savanna grass, and German and Indonesian peat, J. Geophys. Res.-Atmos., 112, D08209, https://doi.org/10.129/2006JD007120

Wooster et al. (2018) New tropical peatland gas and particulate emissions factors indicate 2015 Indonesian fires released far more particulate matter (but less methane) than current inventories imply, Remote Sensing,10, 1–31, https://doi.org/10.3390/rs10040495, 2018.