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Comment by Meinrat Andreae on Peiro et al. (acp-2022-120)

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Community comment on "Optimizing 4 years of CO₂ biospheric fluxes from OCO-2 and in situ data in TM5: fire emissions from GFED and inferred from MOPITT CO data" by H el ene Peiro et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-120-CC1>, 2022

I have some concern regarding the emission factors used in section 2.3.1b, page 12f. The authors base their values for the emission factors of CO and CO₂ on GFED4.1s, which in turn are based on a blend of Andreae and Merlet (2001) and Akagi et al. (2011). Newer estimates for these emission factors are available in Andreae (2019). These newer estimates, which are based on a much more comprehensive data base than the previous estimates, differ from the ones used here by as much as 30% in some cases. I wonder how much difference it would make if the updated emission factors would be used in the authors' calculations.

One should also keep in mind, that in particular the EF for CO₂ and consequently the emission ratio CO/CO₂ are quite difficult to determine accurately in the field for a number of reasons. These include the difficulty of distinguishing the often relatively small fire inputs of CO₂ from large biospheric variability, the issue of variable background concentrations, and the problem of accounting for residual smoldering emissions that do not get lofted into the smoke plumes (Guyon et al., 2005; Burling et al., 2011; Yokelson et al., 2013). This introduces systematic errors in the EF(CO₂) values that may well exceed 10%. While this problem obviously cannot be mitigated here, it should be at least pointed out to the reader as a significant source of uncertainty and possibly explored by a sensitivity study.

Two minor issues:

In the caption of Table 2, van der Werf et al. (2017) should be cited explicitly (if the authors prefer to keep these emission factors).

I don't understand what is meant by the sentence: "Finally, the emission ratio for each vegetation type was divided to the posterior CO fire partitioned as used in Christian et al. (2003) and Basu et al. (2014)." (line 307f).

Akagi, S. K., Yokelson, R. J., Wiedinmyer, C., Alvarado, M. J., Reid, J. S., Karl, T., Crouse, J. D., and Wennberg, P. O., Emission factors for open and domestic biomass burning for use in atmospheric models: Atmos. Chem. Phys., 11, 4039-4072, doi:10.5194/acpd-10-27523-2010, 2011.

Andreae, M. O., and Merlet, P., Emission of trace gases and aerosols from biomass burning: *Global Biogeochemical Cycles*, 15, 955-966, 2001.

Andreae, M. O., Emission of trace gases and aerosols from biomass burning – an updated assessment: *Atmos. Chem. Phys.*, 19, 8523-8546, doi:10.5194/acp-19-8523-2019, 2019.

Burling, I. R., Yokelson, R. J., Akagi, S. K., Urbanski, S. P., Wold, C. E., Griffith, D. W. T., Johnson, T. J., Reardon, J., and Weise, D. R., Airborne and ground-based measurements of the trace gases and particles emitted by prescribed fires in the United States: *Atmos. Chem. Phys.*, 11, 12,197–12,216, doi:10.5194/acp-11-12197-2011, 2011.

Guyon, P., Frank, G. P., Welling, M., Chand, D., Artaxo, P., Rizzo, L., Nishioka, G., Kolle, O., Fritsch, H., Silva Dias, M. A. F., Gatti, L. V., Cordova, A. M., and Andreae, M. O., Airborne measurements of trace gases and aerosol particle emissions from biomass burning in Amazonia: *Atmos. Chem. Phys.*, 5, 2989–3002, 2005.

Yokelson, R. J., Andreae, M. O., and Akagi, S. K., 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, 2155-2158, doi:10.5194/amt-6-2155-2013, 2013.