

Re: Chemically Speciated Air Pollutant Emissions from Open Burning of Household Solid Waste from South Africa
Wang et.al.

This paper addresses a major research gap in air quality research in Africa. Use of emission factors derived from Emissions from North America for air quality modeling in Africa has been a serious handicap. The paper provides a very important and critical information for the region and can encourage similar work in other African Countries.

Main concerns that need to be addressed

1. “Open burning has low burning efficiency” needs to be backed by measurements of Modified Combustion Efficiency (MCE) to determine burning conditions.
2. Line 30 Important recent relevant studies are missing and my need to be included (more are added below related to calculation of emission factors and Africa relevant work

Gordon et.al “The Effects of Trash, Residential Biofuel, and Open Biomass Burning Emissions on Local and Transported PM_{2.5} and Its Attributed Mortality in Africa”
<https://doi.org/10.1029/2022GH000673>

Pokhrel et al. Determination of Emission Factors of Pollutants From Biomass Burning of African Fuels in Laboratory Measurements <https://doi.org/10.1029/2021JD034731>

Hodshire et. al. “Aging Effects on Biomass Burning Aerosol Mass and Composition: A Critical Review of Field and Laboratory Studies” <https://doi.org/10.1021/acs.est.9b02588>

3. Line 83: How valid is using food discards from Nevada to be used to represent food discards in Africa. The food discards in Africa are probable fresh from the farm or bakery unlike the processed food with preservative chemicals in the US. How would the preservatives contaminate the samples?
4. Line 97: More details on the burning condition is needed. If a tube furnace is used at 450 it often corresponds to smoldering combustion based on the MCE. Pokhrel et al has shown MCE dependence of emission factors.
5. Some details need to be provided on how trash burning experiments are done. The trash in trash dumps in Africa are a mixture of food discards, plastics, paper products and vegetation. How is this exactly done? Furthermore, there is evidence of fuel type dependent emission factors for biomass fuel are reported. When the authors indicate vegetation, it is quite broad, and the type of vegetation needs to be described. The results from the combined waste do not quite match with the results of individual types of trash. If the combination of fuels or trash contains everything, then all the EF’s pollutants should show in proportional amounts. How do the authors explain this?
6. The major concern is a missing information on how Emission factors are calculated for each species. Table 1 is an important table, and I am sure all the authors these results are compared to have provided the methods and assumptions used in calculating emission factors. Examples are Pokhrel et al,

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, *Journal of Geophysical Research-Atmospheres*, 104(D23), 30109-30125, doi:10.1029/1999jd900817.

Andreae, M. O., and P. Merlet (2001), Emission of trace gases and aerosols from biomass burning, *Global Biogeochemical Cycles*, 15(4), 955-966, doi:10.1029/2000gb001382.

Selimovic, V., Yokelson, R. J., Warneke, C., Roberts, J. M., de Gouw, J., Reardon, J., & Griffith, D. W. T. (2018). Aerosol optical properties and trace gas emissions by PAX and OP-FTIR for laboratory-simulated western US wildfires during FIREX. *Atmospheric Chemistry and Physics*, 18(4), 2929–2948. <https://doi.org/10.5194/acp-18-2929-2018>

Weyant, C. L.; Chen, P.; Vaidya, A.; Li, C.; Zhang, Q.; Thompson, R.; Ellis, J.; Chen, Y.; Kang, S.; Shrestha, G. R.; et al. Emission measurements from traditional biomass cookstoves in south Asia and Tibet. *Environ. Sci. Technol.*, 2019, 53 (6), 3306-3314. DOI: 10.1021/acs.est.8b05199.

Stockwell, C. E., Jayarathne, T., Cochrane, M. A., Ryan, K. C., Putra, E. I., Saharjo, B. H., et al. (2016). Field measurements of trace gases and aerosols emitted by peat fires in Central Kalimantan, Indonesia, during the 2015 El Niño. *Atmospheric Chemistry and Physics*, 16(18), 11711–11732. <https://doi.org/10.5194/acp-16-11711-2016>

Vakkari, V.; Beukes, J. P.; Dal Maso, M.; Aurela, M.; Josipovic, M.; van Zyl, P. G. Major secondary aerosol formation in southern African open biomass burning plumes. *Nat. Geosci.*, 2018, 11 (8), 580-583. DOI: 10.1038/s41561-018-0170-0.

Minor comments:

Line 10. Is household trash burning a large source of pollutant worldwide or Global South.

Developing countries in current literature is now referred to as Global South

Line 12: what does activity data mean?

Line 13: Scarcer? Is it grammatically, correct?

Line 21: Plastic bottles, plastic bags, rubber and .. (remove “and between plastic bottles and bags)

Line 30: Global south instead of developing countries

Line 35-36: Instead of communities with low socioeconomic status better use Low-income communities

Line 42” emission factor and activity data? What is activity data?

Line 58: ...highlighted a large variation instead of the

Line 60: Detailed PM chemical composition data are.. (data is missing)

Line 65: PM light scattering, and absorption properties depend on its chemical composition and associate hygroscopicity and optical properties. change to “PM optical properties depend on chemical composition and hygroscopicity” absorption and scattering are the optical properties

Line 77: Ef’s for acidic... remove including elements

Line 244: Higher combustion temperature doesn’t indicate burning condition. Need MCE

Line 385: dearth of measurements “of is missing”