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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The aerosol radiative effects of uncontrolled combustion of domestic waste" *by* John K. Kodros et al.

Anonymous Referee #2

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This paper presents an assessment of the direct and indirect radiative forcing due to aerosol particles that are emitted by the uncontrolled combustion of domestic waste. The emission inventory of waste-combustion emissions has large uncertainties. The authors address this issue by performing a suite of sensitivity simulations that vary the size parameter or the emission strength of the waste-combustion emissions, as well as the assumptions needed for calculating aerosol optical properties. The paper is interesting since this emission source is not generally included in global emission inventories but (as the authors show) contributes to the absorbing aerosol burden in certain regions of the globe. This study is one of the first that attempts to quantify the climate impact of this aerosol type and the topic fits well into the scope of this journal. I consider the paper worthy of publication in ACP after the following comments are addressed.

General comment on results: As the authors point out, many assumptions about the domestic waste emissions have large uncertainties. Since this is one of the first studies that investigates climate impacts of waste-combustion emissions, it would be useful to formulate explicitly in the conclusions, which aspects of the emission information would be most useful to improve in future work.

General comment on presentation: Some phrases are rather colloquial, and I suggest going through the paper and rephrase them. Examples are:

- p. 3, line 16: look at -> quantify.

- P. 5, line 1: making the GMD smaller -> decrease the value for the GMD

- P. 5, line 19: 6 -> six (write out numbers smaller than ten)

- P. 9, line 3: smaller number emitted particles -> smaller number flux of emitted particles

- The phrase "particle number" is often used when it should be "particle number concentration".

- P. 9, line 8: making our assumed size distribution smaller -> decrease the value for the GMD of the assumed size distribution.

p. 2, line 7: "... how the particles are mixed together": do you mean mixed together within the population or mixed together within one particle?

p.2, second paragraph: Scattering and absorption in general also depends strongly on the morphology of the particles. Assuming different variants of spherical particles may not reflect reality very well.

p. 2, line 25: define kappa.

p. 3-4: What about sea salt and dust emissions?

p. 3-4: Does the chemistry model include ammonium nitrate? If not, can you say

something how this might impact the conclusions? p. 5: Direct radiative effect calculation: are the six different optical assumptions applied to all BC containing particles, regardless of their source (i.e. not only to the waste combustion particles)?

p. 9, line 29/30: the minus sign was separated from the number due to a line break. Make sure that this doesn't happen.

p. 8, line 18: typo: dominant

Figure 2: To draw the conclusion that the BASE run and the WASTE_OFF run are different, you need to show the differences in slope and r2 are statistically significant. If it turns out that they are indeed different, please comment if the effect size is meaningful (i.e. of practical importance).

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