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Comment

Interactive comment on “Direct estimates of emissions from the megacity of Lagos” by J. R. Hopkins et al.

J. R. Hopkins et al.

mat@env.leeds.ac.uk

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We thank the reviewers for their comments which have helped us to create a better paper. Here we reply to their detail comments and show how we have addressed them in a revised manuscript.

Reviewer 1

Concentration and mixing ratio: These two quantities are both referred to simply as “concentration” in the manuscript. Please use the correct term in the correct place. For example, the last paragraph of Section 2 incorrectly uses the term “concentration” three times (it should be mixing ratio). ** We have changed the use of concentration to mixing ratio where appropriate.

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p 8668, l 6: Please mention the uncertainties for these emissions estimates in the abstract. Elsewhere in the paper these uncertainties are quoted as -66% – +100%. ** Uncertainties are now included in the abstract together with a more detailed description of the error analysis.

Section 2, final paragraph: Please mention the date of the flight. ** The date of the flight is given in Section 1. We do not feel that giving this again would add to the paper.

p 8674, l 1: The units for the NO_x emissions are given here are Tg(NO₂)yr⁻¹, although they are quoted as Tg(N)yr⁻¹ in the caption to Table 1. Which are the correct units? ** The table has been made consistent with the text.

p 8674, l 4: Please elaborate on why the study of Oketola et al. (2007) is inconsistent with your understanding of urban NO_x sources. ** We have included the following text into the paper.

The NO_x emissions (0.03 Tg yr⁻¹) derived are more than an order of magnitude smaller than those quoted by Oketola et al. [2007] (0.97 Tg yr⁻¹). Oketola et al. [2007] suggest a per capita NO_x emission an order of magnitude higher than highly developed cities such as London and Tokyo. Large NO_x emissions occur in high temperature combustion processes typical of heavily trafficked developed economies, thus the high value of Oketola et al., [2007] appears inconsistent with previous analyses of the sources of urban NO_x. Our emissions are consistent with other studies, especially when considered per capita.

p 8674, l 21: Gas-fired power plants can be important point sources of NO_x, and plumes from such power plants can remain intact some distance downwind of the emission location. Can you comment on how well you think your sampling methodology is capturing NO_x emissions from this power station? ** We have added the following to our paper 'The vertical mixing within the boundary layer is not instantaneous, leading to the mixing ratio at 350m not being wholly indicative of the concentrations throughout the boundary layer. Plumes from large point sources such as power-plants etc may be

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missed if they pass under or over the aircraft, and if plumes are intercepted they will bias the dataset.' We have also included a discussion of this uncertainty in the text.

Table 1 (a): The presence of the second column of numbers in this table is confusing. It is not explained well in the table caption, but it seems to me that the first column is the mass of chemical compound in each class, and the second column is the mass of carbon or nitrogen in that class of compounds. If this is indeed the case, then it seems to me that the claim made in the caption (NO_x species reported in Tg(N)_{yr}) is in fact false, because it is obviously reported in two different units in the first two columns. In which units are the subsequent literature-based columns reported? As far as I can tell, there is no need for the results of this study to be reported in both mass of compound and mass of element. I suggest that the results of this study be reported in a single column in whichever units are most appropriate for comparison with the numbers from the literature. At the very least, the table caption should be edited to clarify explicitly which units apply to which numbers. ** We have removed one of the columns as suggested by the reviewer.

Table 1 (b): There are numbers missing from the final column of this table. Why is this so? I find it odd that the population of London is not reported, but the per capita emissions of CO are reported. How is it possible to report both the total and per capita emissions without knowing the population? And if the population of London, along with the total emissions of NO_x and VOC are known, why are the per capita emissions of these other classes not reported? ** As the author's point out there is no good reason not to report the population of London. This was a typo and we have corrected the table for this.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 8667, 2009.

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