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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemical apportionment of southern African aerosol mass and optical depth" *by* B. I. Magi

Anonymous Referee #1

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Review of acp-2009-345

Specific comments:

P13440, L15 Is the estimate that 26-27% of the aerosol absorption is due to OC really that precise?

P13441, L2 Perhaps being overly picky, but the word "we" is used, which implies a group decision even though this is a single author paper. It may be worth stating somewhere if Kirchstetter and Gao are in agreement with the correction that was derived.

P13441, L9-10 The statement that an analysis of regional haze was precluded until now may need some qualifying. There was a "distributions" paper and a GEOS-

CHEM-measurement comparison paper that dealt with the regional haze by Sinha et al. Schmid et al discussed the regional haze as did Magi to some extent. So it may help to make this sentence a little more specific. Then at some point it may be worth noting if the conclusions of the Sinha et al papers and the original Gao et al paper are affected by the correction.

P13441 The aircraft sampled lots of fresh plumes, but those samples are evidently not included in this analysis. That should probably be clarified somewhere near the beginning. Also, the author largely ignores any SOA that may occur.

P13441 It may be worth putting in the introduction that the tropical portion of the region studied is impacted mostly by biomass burning and the extratropical part has relatively more industry and desert-dust sources.

P13443, L25-26 Its not immediately clear how an increase in particle number would increase the SSA. Further Table 6 lists just one value for MSC and MAC for BC and OC and the tropical aerosol has a higher OC/BC ratio (implication of Fig 2) so that seems to suggest a higher SSA for tropics. It doesn't seem consistent.

L13443, L28 Can "shape of the size distribution" be defined in a more precise fashion?

P13444, L17 I think that normally a flow meter reading should not depend on whether other flow meters are in use and perhaps that is why the word "defective" is used on line 28. Can the author give a simple reason why this problem could occur (e.g. broken meter, incorrect wiring?).

Section 2.3 General The correction is based on a limited amount of data, but the results of the correction seem logical at a first reading. I was on the same aircraft and saw higher CO and other pollutants expected to correlate with aerosol in the tropics. However, it might be worth clarifying (if possible) what evidence supports the conclusions of the paper in addition to the corrected data. In other words there is probably plenty of evidence that the conclusions of the paper are sound even without using the

“corrected” Gao data. And is there any impact on Sinha et al distrubutions paper and the GEOS-CHEM modeling?

P13448, L19 Here and through out is assumed that NH4+ is the +1 counter ion. In fact couldn’t K+ be the counterion as well? It doesn’t matter for mass calculations since NH4 and K are within one mass unit of each other. Is it also immaterial for the optical properties though? Or can K+ be ruled out even though it is often used as an indicator of biomass burning (BB) and can be some 4% of fresh BB aerosol.

P13448, L24-25 Not critical but Aiken et al also have a paper supporting the higher OM/OC ratios for BB aerosol.

P13449, L11-13 The data presented seem to indicate an important role for SVOC, but that is not clarified or developed.

P13449, L20 Standard temperature should be specified (273 or 298?).

P13450 Somewhere in this section the author may want to specify if there is an assumption of an internally or externally mixed aerosol and if it makes any difference. Also, I can only find optical properties listed for nitrate and sulfate so the properties are evidently independent of the counterion. If that is the case it may be worth stating somewhere at this point in the text.

P13452, L 3 and 12 and P13453, L6 The word “concentrated” or something like it is more appropriate than the word “intense” which could be interpreted as a description of fire behavior.

General comment on this section: The southern Africa gyre and the “river of smoke” are responsible for at least some mixing between the tropical and extratropical regions investigated here. This would cause a little blurring of the distinction between the regions.

P13455, L1 Was the value of MAC(BC) 7.5 +-1.2 m2/g from Bond et al restricted to a fuel type or region? I ask because a detailed study by Martins et al of smoke in the

Amazon suggested a value of 12+-4 m2/g.

P13456, L1-2 Not a critical comment, but this could be more precise, since “OC” is not an actual molecule that absorbs light, but a measure of the mass of C found in organic molecules. The chromophores that absorb light are quite often functional groups that contain O, H, or N.

P13456, L15-17 You could leave out “the plume” since smoke can likely age even after it is no longer in a coherent plume. This is sort of why chosing a smoke age appropriate for models is tough. What age and how reproducible are the aging effects no-one knows.

Table 1: I expected N2/N1 to crudely correlate with C/F, but it doesn’t. Not sure if that matters or not.

Table 2 header should perhaps signal that these values are "uncorrected" or “pre-corrected”

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 13439, 2009.