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Interactive comment on "Measurements of Black Carbon Specific Absorption in the Mexico City Metropolitan Area during the MCMA 2003 Field Campaign" *by* J. C. Barnard et al.

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1)The title of this manuscript should be changed to "Derivations of Black Carbon Specific Absorptions etc.". The specific absorptions are not being measured, as advertised in the title.

2)The authors have not made adequate use or comparisons with previously published, refereed articles, in quality journals, that discuss various measurements that have been made in Mexico City and that are directly related to the different parameters that the current article is attempting to derive (examples are given below).

3)The Aethalometer does not measure BC but uses a specific absorption of 19 m2g-1 to convert the attenuation value to a BC. How do the authors reconcile their value from that of the aethalometer? Given that other papers have conclusively shown that the specific absorption can vary by an order of magnitude, how reasonable is the BC derived from the aethalometer? Why is this not factored into a thorough uncertainty analysis? The “calibration coefficient” to which the authors refer is nothing but the specific absorption and it isn’t just the loading that is causing the difference but the freshness of the BC, the source and the mixing. All of these can alter the value.

3) Baumgardner et al., 2002, derived the specific absorption at 550 nm directly from BC measurements and found it to be 7+/- 0.5 m2g-1. It is odd that the authors lament the lack of direct measurements of BC yet fail to acknowledge or compare with those studies that have measured BC directly to derive specific absorption. In addition, Baumgardner et al. 2002 also give the authors of the present manuscript a unique method to derive BC from CO measurements and hence an alternative approach to calculate their specific absorptions. The relevant reference is:

Baumgardner, D., G. Raga, O. Peralta, I. Rosas, T. Castro, T. Kuhlbusch, A. John, A. Petzold, 2002: Diagnosing Black Carbon Trends in Large Urban Areas Using Carbon Monoxide Measurements, J. Geophys. Res., 10.1029/2001JD000626.

4) Aerosols are not well mixed as has clearly been shown by aircraft measurements (Nickerson et al. 1992). Why weren’t the lidar profiles used to look at the structure?

Nickerson, E., Sosa, G., Hochstein, H., McCaslin, P., Luke,W., Schanot, A., 1992. Project Aguila: in situ measurements of Mexico City air pollution by research aircraft. Atmospheric Environment 26B, 445-451.

5) There are very few observations that support the statement that pollution is transported out of the basin every day and the argument that they have to be leaving or there would be signs of mixing is simplistic, given the highly complex flow within the city. The only observational evidence thus far is that provided by Gaffney et al. 1999.

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The reference:

J. S. Gaffney, N. A. Marley, M. M. Cunningham and P. V. Doskey, 1999: Measurements of peroxyacyl nitrates (PANS) in Mexico City: implications for megacity air quality impacts on regional scales Ţ Atmospheric Environment, Volume 33, Issue 30, December 1999, Pages 5003-5012

6) The single scattering albedo reported in Table 2 is significantly higher than what can be derived from the scattering and absorption coefficients reported by Baumgardner et al., 2000. Single scattering albedos can be derived that range from 0.7 to 0.85, but as shown in that paper, relative humidity plays a huge role, something not mentioned by the authors in the present paper. Should the authors care to reference that paper:

Baumgardner, D., G.B. Raga, G. Kok, J. Ogren, I. Rosas, A. Baez and T. Novakov, 2000: On the Evolution of Aerosol Properties at a Mountain Site Above Mexico City. J. Geophys. Res. 105, 22243-22253.

7) The index of refraction, attributed to ammonium sulfate, that the authors derive from the remote sensing measurementsis, is inconsistent with Salcido et al. Part II, also part of the special issue, that shows that organic + BC is $>$ 60% of the aerosol and sulfate is $<$ 20%.

8) The possible choices in density and refractive index of BC is quite large and depending upon what they choose, in addition to the uncertainties in the BC derived from the aethalometer, the authors can easily derive specific absorption values that will match any number of values that have been reported by others.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 4083, 2005.