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Interactive comment on “Recommendations for the interpretation of “black carbon” measurements” by A. Petzold et al.

A. Petzold et al.

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Received and published: 30 June 2013

Dear Grisa,

Thank you very much for your comments and suggestions to our manuscript. You have raised several important points to which we will respond point by point:

1. We gratefully acknowledge your summary of the very first appearances of the term black carbon and related measurement methods which all date back to the first Conference on Carbonaceous Particles in the Atmosphere held in Berkeley, California in 1978. We included your suggestion in the section on historical definitions and start the section with a paragraph dedicated to this conference and the first papers on black carbon.

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2. You correctly mention that the term “equivalent BC” for BC mass concentrations derived from a measured quantity which is not mass, is not limited to data from optical absorption measurements but is true for all BC measurements, and that using the term “equivalent” might be confusing by itself. Instead you propose the terms “mass equivalent BC” and “mass equivalent refractive BC”. Here we do not agree because whereas light absorption is a quantity not linked to particle mass or volume, refractory BC is at least associated with the particle volume able to emit laser-induced incandescence radiation. Hence, we decided to keep the recommended terminology “equivalent BC” for data from light absorption measurement and “refractory BC” for data from laser-induced incandescence methods.

3. You suggested that we might change the empirical definition of BC, determined by the optical methods and use the absorption Angstrom exponent as the quantitative criterion; and define "blackness" as the aerosol property identical to an absorption Angstrom exponent of unity. This would avoid the limitations of current terminology. Here, we disagree because a "black" object is defined as completely light-absorbing with reflectivity of zero, an absorptivity of unity and an emissivity of unity. Defining BC as a material characterized by an absorption Angstrom exponent of 1.0 would limit BC to graphite-like particles with diameters in the Rayleigh limit for small particles compared to the used wavelength, i.e., this definition would introduce particle size as another defining property. On the other hand, BC, e.g. from pyrolysis processes, would be excluded by this definition.

Best regards

Andreas

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9485, 2013.

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