Atmos. Chem. Phys. Discuss., 15, C12426–C12428, 2016
www.atmos-chem-phys-discuss.net/15/C12426/2016/

Atmospheric Chemistry and Physics Discussions

ACPD

15, C12426–C12428, 2016

Interactive Comment

Interactive comment on "The real part of the refractive indices and effective densities for chemically segregated ambient aerosols in Guangzhou by a single particle aerosol mass spectrometer" *by* G. Zhang et al.

G. Zhang et al.

bixh@gig.ac.cn

Received and published: 15 February 2016

This paper describes measurements of the real part of the refractive index and density of aerosol particles having different chemical compositions using simultaneous scattering measurements with time of flight aerosol mass spectrometer measurements. Though the basic concept of the method is not new, the authors developed a measurement instrument and applied to the observation in Guangzhou, China. They compared their results with previously reported measurements and discussed characteristics of aerosols in the observed region. The paper is well written, and the content is suitable for publication in ACP. One general comment, which may be beyond the scope of this paper, is that the method is not sensitive to the imaginary part of refractive index as described in the paper. However, the imaginary part of refractive index or the single scattering albedo of aerosol particles is an essential parameter determining radiative characteristics. Are there any possible extensions of the single particle aerosol mass spectrometer techniques for detecting some signals related to absorption, for example, by detecting infrared radiation at the ionization with the pulsed laser?

We would like to thank the reviewer for his/her useful comments and recommendations to improve the manuscript. We agree with the comment that the method is not sensitive to the imaginary part of refractive index although it is an essential parameter determining radiative characteristics. The absorption properties of particles are typically obtained through the measurements of the attenuation of light that the particles pass through (e.g., Arnott et al., 2005; Petzold and Schonlinner, 2004). This procedure requires some amount of particles collected in at least a few minutes to accurately obtain the attenuation of light. The single particle and highly time-resolved measurement limits the ability of SPAMS to collect strong enough signal on the attenuation of light. However, it is noted that this limitation only poses effects on absorptive particles, i.e., soot-containing particles.

Regardless of this limitation, Moffet and Prather (2009) have developed a method to investigate the absorptive properties of soot-containing particles. They applied Mie core-shell model, assuming soot as cores with a constant refractive index (1.8 + 0.71i) and non-absorbing components as shells. This coated spheres model adjusts the core diameter to obtain best fit between the measurements with theoretical results. In this way, the scattering and absorbing of soot-containing particles could be retrieved. It is necessary to note that since the refractive index for soot varies, and thus uncertainty would not be avoided in the model.

Arnott W.P., Hamasha K., Moosmuller H., Sheridan P.J., Ogren J.A., 2005. Towards aerosol light-absorption measurements with a 7-wavelength Aethalometer: Evaluation

ACPD

15, C12426–C12428, 2016

Interactive Comment

Full Screen / Esc

Printer-friendly Version

Interactive Discussion

Discussion Paper

with a photoacoustic instrument and 3-wavelength nephelometer. Aerosol Science and Technology 39, 17-29.

Moffet R.C., Prather K.A., 2009. In-situ measurements of the mixing state and optical properties of soot with implications for radiative forcing estimates. Proceedings of the National Academy of Sciences of the United States of America 106, 11872-11877.

Petzold A., Schonlinner M., 2004. Multi-angle absorption photometry - a new method for the measurement of aerosol light absorption and atmospheric black carbon. Journal of Aerosol Science 35, 421-441.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34647, 2015.