

Interactive comment on “Absorption and scattering properties of organic carbon vs. sulfate dominant aerosols at Gosan climate observatory in Northeast Asia” by S. Lim et al.

Anonymous Referee #2

Received and published: 14 February 2014

This study is meaningful in that it tried to analyze the optical and chemical properties of carbonaceous particles whose measurements are hard to obtain. The analysis is expected to enlighten various properties of aged aerosol. When additional explanations and clarifications are complemented as in the following comments, the scientific claims made in this study are expected to be more clearly supported.

Page 7: Aerosol optical properties related to meteorological variables need to be addressed. As shown in Table 1, RH at the 880 nm group is relatively high (58~79 %). In the humid condition, hygroscopic growth of water-soluble ions such as sulfate is concerned because the optical properties of inorganic aerosols could be changed.

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Page 9: I wonder if the inorganic ions of 370 nm group are derived solely from salts deposited in dry lakes in northeastern China. If any measurement data from a local source like Jeju island are used, they need to be specified in the study.

Page 12: The SMPS results in Figure 4 seem to be somewhat weak to claim that BC was internally mixed with sulfate. Can the authors distinguish the difference between externally mixed vs. internally mixed BC from the SMPS results? How?

Page 14: It seems the AAE estimate of the 880 group (~1.0) is too low. Such low AAE needs to be explained further.

Page 16: More discussion is needed with regard to the claim that the sulfate coating on BC particles contributed to the absorption of the longer visible light. In Figure 5(b), compared to the 370 nm group, MAC of the 880 nm group under sulfate dominant conditions is large as the wavelength is increased, contributing to the absorption of the longer visible light. However, it seems not reasonable that the 880 nm group SSA that was in the decreasing trend slightly increased at the end. For the 370 nm group, the SSA was the minimum when MAC was maximized at the UV region.

Page 15: The climate effects of aerosol and/or radiative forcing are not fully addressed in Section 3.3. There is some related discussion in Section 3.3.2 but it is not enough.

Page 28: I wonder if the authors can distinguish between external vs. internal mixture BCs from the Figures 3(a) and (b). More detailed description on the figures would be helpful, for example, distinction of fresh/aged particles by size, shape, or color. Also, elaborate further why Figures 4(c) and (d) are necessarily analyzed as internal mixture of BC, not external mixture of BC.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 33207, 2013.

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