

## ***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.***

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Review of: Absorption and scattering properties of organic carbon vs. sulfate dominant aerosols at Gosan climate observatory in Northeast Asia. Authors: S. Lim et al.

The authors report the scattering and absorption optical properties of the ambient aerosol at the Gosan Observatory in 2008. Based on absorption Angstrom exponents as well as chemical analysis they separate the aerosol into classes based on the aerosol OC and BC composition with those aerosol absorbing at short wavelengths being dominated by OC and those aerosol absorbing at longer wavelengths being dom-

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inated by BC.

I recommend the paper for publication provided the authors respond to the comments below and make the appropriate changes to the paper.

Introduction: Page 33209 Line 5: remove the word “and” and make 2 sentences. “..directly and indirectly. The relative..” Line 13: remove the comma after the word “that” Line 27: replace word “particles” with “species” or “compounds”.

Page 33210 Line 1: remove “even though they theoretically should be the same”. Absorption measurements measure absorption and not BC. There never has been a theoretical basis for aerosol absorption being only attributed to BC. This has only been done for simplicity.

Page 33211 Line 16: Reword this sentence. I think you mean to say “ In the He/O $\hat{A}$ ñ2 mode. . .”

Section 3.2.1 Part of your analysis of an enhanced absorption at the shorter wavelengths implies that you are using the correct mass absorption coefficient (MAC) for BC at these wavelengths. How accurate is the MAC that Magee Scientific uses to calculate EBC for EC at wavelengths other than 880? Bond et al. (2013) uses a value of 7.5 m<sup>2</sup>g<sup>-1</sup> at 550 nm for freshly emitted BC. What value does Magee use at this wavelength? Since you have both the BC mass and the absorption coefficient it would be better to calculate the MAC from this study and compare it to MAC values from this region (ACE-Asia) or other regions. An MAC value at each wavelength is much more informative than the EBC from the aethelometer.

Page 33216, line 12: There are several species that have similar or even much higher scattering efficiencies than (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>. Ammonium nitrate and oxidized organics have a similar scattering efficiency as ammonium sulfate. The MSE of organics is often higher than that of sulfate (Sciare et al., ACP, 2005). The Tang study is very limited.

Section 3.2.2 Only a fraction of the scattering can be attributed to sulfate. OC and

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other ions may contribute as much if not more to the aerosol scattering than sulfate. Even though the relative scattering per sulfate mass was lower in the 880 group than in the 370 group, there could be other non-sulfate, highly scattering species in the 880 group that contribute to the scattering. Also note that the samples taken for the 370 group were early in the year when the ambient RH was low. The samples in the 880 group were taken in the spring when ambient dew point was quite high (see [www.wunderground.com](http://www.wunderground.com) for daily meteorological values from Cheju in 2008). What this means is that the aerosol in the 880 group may have taken up a significant fraction of water inside the instrument, which enhanced the scattering significantly compared to the 370 group. You need to check the differences in the internal nephelometer RH for these two sample times. It's best to either remove the discussion on BC enhanced absorption or explain the possibility of water uptake by the aerosol. Enhanced BC absorption with coatings may not be apparent in filter measurements of the aerosol may spread upon impaction on the filter.

Section 3.3.1 Page 33220 An AAE of 1.0 is consistent with absorption of BC or soot. I don't see any correlation of AAE to an influence of sulfate on absorption as BC without sulfate has a similar AAE. You need to remove this sentence in lines 21-22.

Page 33221 This paragraph is very confusing as you contradict yourself quite a bit. You simply need to state that UV absorption was enhanced for 370 group and the 880 group had enhanced absorption in the IR. You mix up the terms former and latter, which is confusing. Try to state this in as few words as possible to make it clear.

Throughout the paper you need to better define "enhanced absorption". Enhanced relative to what, BC? A better term would be to use brown carbon absorption rather than enhanced absorption.

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