Comments on: Scattering and absorption properties of near-surface aerosol over Gangetic-Himalayan region: the role of boundary layer dynamics and long-range transport

"On the other hand"

This phrase is over used and usually is out of context or doesn't add to the sentence content. I suggest deleting all uses of this phrase as it detracts from the paper.

Page 4

The filter was changed whenever the amount of transmitting light achieved is ~70% of the initial intensity

The filter was changed whenever the site technician was allowed into the trailer and not when the filter transmission dropped to 0.7. The text should read "Absorption data with filter transmissions below 0.7 were rejected in this study."

Following the methodology from several previous works (Bond et al., 1999; Ogren, 2010; Virkkula et al., 2011), the raw PSAP data were processed to estimate the σ_{ap} by incorporating the sample area, flow rate and spot size calibrations. Other biases are due to the scattering and multi-sample …

The correction of Ogren is an additional correction that is applied to the Bond et al. correction. The Virkkula correction is different than that of Bond et al. The data downloaded from the ARM archive uses the Bond and Ogren corrections and not the Virkkula correction.

The angular non-idealities (i.e. truncation error) and non-Lambertian light source were corrected following the methodology described by Anderson and Ogren (1998) and details given in Dumka and Kaskaoutis (2014 and references therein). These corrections are needed to subtract the light scattering by air molecules, the instrument walls and the detector background noise.

The wording in the above paragraph is awkward. The truncation correction correction is unrelated to the subtraction of background scattering from the walls and filtered air. I suggest removing the sentence "These corrections are needed to subtract the light …"

Page 6

It should be noted that the properties of $D_{1\mu m}$ particles are also included in the $D_{10\mu m}$, but with much lesser contribution

All the examined variables present a slight decreasing trend with wavelength, but the largest differences are seen as a function of the particle size, since $D_{10\mu m}$ particles exhibit higher scattering, backscattering and absorption as well. On the other hand, the range of all variables is larger for $D_{10\mu m}$ particles since their size distribution is much more expanded, suggesting larger variability in source regions, mixing processes and optical properties. Although such a behavior is expected for the scattering and backscattering processes via the Mie theory (the larger particles are more efficient scatters especially at longer wavelengths), the higher absorption by the larger particles is an important finding of the GVAX campaign.

The above sentences should be removed from the discussion. These are obvious and don't need to be stated. Unless there is an instrument error it isn't possible for the subum scattering and absorption values to be greater than those of the sub 10 um aerosol.

Page 7

It should be noted that the difference in absorption coefficient between $D_{10\mu m}$ and $D_{1\mu m}$ was found to be larger for higher aerosol loading. On the other hand, the scattering is much larger (~ 40%) for the $D_{10\mu m}$, especially at longer wavelengths, while the σ_{bsp} exhibits rather neutral wavelength dependence.

Refer here to the Rap and Rsp values. Scattering and absorption values will always be higher for sub 10um than subum aerosol.

Lower values of σ_{sp} (97±9 Mm^{-1}) and higher of σ_{bsp} (14 ± 1 Mm^{-1}) at 550 nm compared to Nainital were found in Anantapur, south India during January – December (Gopal et al., 2014), suggesting dominance of different aerosol types.

This sentence is awkward. Refer instead to the backscatter fraction at both sites to compare aerosol types rather than scattering and backscattering values as these only depend on the aerosol loading and not the aerosol type.

Page 8

The SAE follows an anti-correlation with the coarse-to-fine mode ratio exhibiting much higher values for sub-micron aerosols, especially at shorter wavelengths (Andreae et al., 2002).

This is obvious and doesn't need stating.

The spectral $D_{1\mu m}/D_{10\mu m}$ SAE ratio is nearly constant to 1.68 suggesting that $D_{10\mu m}$ particles possess higher scattering at longer wavelengths leading to a more neutral spectrum (Manoharan et al., 2014).

This is obvious and doesn't need stating. 10um aerosol will always have higher scattering at longer wavelengths than 1um aerosol and hence a lower SAE.

Thus, despite the fact that $D_{1\mu m}$ and $D_{10\mu m}$ particles exhibit similar annual pattern for scattering and absorption (Dumka and Kaskaoutis 2014), the values and the wavelength dependence may be quite different, indicating that the particle size plays a prominent role in altering the aerosol optical properties and wavelength dependence.

Can you restate this sentence, as it doesn't make much sense? It would be better to compare the seasonal variations in Rap and Rsp.

Page 10

The larger SAE that was found in monsoon (Fig. 3) indicates particles of smaller size, which are associated with more isentropic scattering and smaller b values. During post-monsoon and winter, the b increases (except a small decrease in November) reaching its highest value in March suggesting more irregular type of scattering and favoring of backscatter, which is characteristic of the dust particles (Liu et al., 2008). The b is larger at longer wavelengths, especially for the $D_{1\mu m}$ particles, since the backscatter wavelength dependence is lower than that of total scattering (Fig. 2) and, therefore, the backscatter-to-total scattering ratio (b) is more enhanced at longer wavelengths. Slight higher b values are found for the sub-micron particles over Nainital at 0.45 and 0.55 μm, which become significantly higher at 0.7 μm compared to those of $D_{10\mu m}$ (Fig. 5).

Smaller particles have both higher SAE and higher backscattering fractions. Isotropic scattering is indicative of smaller particles. Forward scattering and smaller backscattering fractions sre indicative of larger particles. It would be good to plot Mie calculations of SAE and bsf as a function of particle size to understand how these two variables coincide and when they don't coincide. Lack of a covariance usually indicates a bimodal distribution.

Both fractions are below 1, especially for the scattering as was seen in Fig. 2, suggesting that the particles larger than 1 μm contribute more to scattering and absorption.

There is a fundamental misunderstanding of the measurements that is repeated through the paper. The submicron scattering and absorption values will always be less than 1.0. Sub 10um indicates all particles less than 10um. It contains both the coarse and accumulation mode aerosol, not just the coarse mode. Hence the sub10um scattering and absorption values will always be greater than of equal to the subum values.

The sub-micron absorption fraction is higher than that of scattering suggesting that the SSA would be higher for $D_{1\mu m}$, as justified (SSA for $D_{1\mu m}$ = 0.93, SSA for $D_{10\mu m}$ = 0.91) in a previous study

Higher absorption in the subum mode implies a lower SSA, not higher.

Page 16

For a certain absorption value, the scattering of $D_{10\mu m}$ particles was larger than that of $D_{1\mu m}$ for σ_{sp} values above 200 Mm^{-1} indicating that for clean atmospheres the discrimination of the optical properties between super-micron and sub-micron aerosols is really difficult.

Again there is a misunderstanding of the aerosol size modes. Best to compare Rap and Rsp as a function of loading.

Figure 2 can be removed and the information placed in a table.