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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new method for estimating aerosol mass flux in the urban surface layer by LAS" *by* R. M. Yuan et al.

Anonymous Referee #2

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The manuscript is innovative to define the Atmospheric Effective Refractive Index (AERI) and the Atmospheric Effective Refractive Index Structure Parameter (AERISP), then, use the imaginary part of AERI to derive aerosol mass concentration and, particularly, its vertical flux. This is very important for numerical simulation of air quality and for the regional climate models. The results are generally acceptable.

Revision suggestions:

1. It may not be proper to differentiate the common used LAS and the USTC one by 'gLAS' and 'sLAS'. The so-called sLAS, except a slightly shorter IR wavelength, others (especially hardware) are basically similar. The authors stressed the bandwidth of the amplifier and a higher sampling rate, however, the effects particularly in the low frequency region, which may be important for the detection of the imaginary part

of AERI, are not clear. By the way, from the theory of LAS, the effective eddies are with the size about LAS aperture (here $\sim$0.18 m, which is also in the inertial part of turbulence spectra). The contributions from high frequency smaller eddies and low frequency larger eddies are actually minor. This can be easily checked by the refractive index power spectra.

2. As mentioned in later parts, the observation was conducted in late December. Do you think the using of 'free convection' approximation (Eqs. (3), (4), etc.) is proper? As we know, using 'free convection' in the LAS calculation of sensible heat flux may induce an underestimation of 20-30%. How much the error would be induced in the estimation of aerosol concentration and flux in this method? It would be not so difficult to use directly the general similarity formulas.

3. It would be better to have some method used in Hefei to validate the results obtained with this new method.

4. 'Abstract' line 5-6, '...a new method for measuring atmospheric aerosol vertical transport flux is developed based on the similarity theory of surface layer'. This is incomplete. Actually, this work was also based on, especially, the observations & studies of the effective refractive index (and the theory of light propagation in turbulent atmosphere).

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