Cuesta-Mosquera *et al*.: Intercomparison and characterization of 23 Aethalometers under laboratory and ambient air conditions: Procedures and unit-to-unit variabilities.
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REVIEW

The AE33 is used at a large number of measurement sites and applications all over the world. Therefore it is very important that its performance and unit-to-unit variability is tested and presented to the whole community using it. In this paper very many AE33 units were compared which gives credibility to the results. The instruments were compared using both generated soot and nigrosin particles and ambient aerosols. The effects of different maintenance procedures were also analyzed. All of this is important. The experiments were conducted carefully and the paper is well written, I didn't find any obvious errors, I can recommend its publication in AMT. I only have two very minor modification suggestions:

1) L206AMCA? What does this stand for? Why 21.1°C? The most commonly used standard temperatures are 0°C and 25°C.

2) L377-378 " *... From the mathematical definition (Eq. (3) and Eq. (4)) the k values are inversely proportional to eBC, ...*" First, this claim is not intuitively clear from Eqs. (3) and (4). I wish you derived the relationship, for instance this way:

$$b_{abs} = \frac{s(\Delta ATN/100)}{F_1(1-\zeta)C(1-kATN)\Delta t} = \frac{1}{1-kATN}\frac{(\Delta ATN/100)}{F_1(1-\zeta)C\Delta t}$$

Here the last term is the non-compensated absorption coefficient $b_{abs,nc} = \frac{s(\Delta ATN/100)}{F_1(1-\zeta)C\Delta t}$

Then the compensation parameter can be calculated as as function of absorption coefficient

$$\Rightarrow b_{abs} = \frac{1}{1-kATN} b_{abs,nc} \Leftrightarrow 1-kATN = \frac{b_{abs,nc}}{b_{abs}} \Leftrightarrow kATN = 1-\frac{b_{abs,nc}}{b_{abs}}$$

$$k = \frac{1}{ATN}\left(1-\frac{b_{abs,nc}}{b_{abs}}\right) = \frac{1}{ATN}\left(\frac{b_{abs}-b_{abs,nc}}{b_{abs}}\right)$$

and when the relationship $eBC = b_{abs}/\sigma_{air}$ is used for both b_{abs} and $b_{abs,nc}$:

$\Rightarrow k = \frac{1}{ATN}\left(\frac{eBC - eBC_{nc}}{eBC}\right)$, where eBC_{nc} is the non-compensated eBC concentration.

Or if you don't want to write all the steps you could at least write the last equation to support your claim. It shows that for a given ATN, if $eBC > eBC_{nc}$ then k > 0 and k is inversely proportional to eBC. There is no doubt that for the generated BC and nigrosin particles this is the case. However, it should not be written as if this were true for all aerosols. In the ambient aerosol the compensation parameter can also be close to zero or even negative, possibly depending on the coating of particles, as has been noted by (Virkkula et al., 2015; Drinovec et al., 2017; Greilinger et al., 2019).

Virkkula et al.: On the interpretation of the loading correction of the aethalometer, AMT, 8, 4415–4427, 2015

Drinovec et al.: The filter-loading effect by ambient aerosols in filter absorption photometers depends on the coating of the sampled particles, AMT, 10, 1043–1059, 2017.

Greilinger et al.: Evaluation of measurements of light transmission for the determination of black carbon on filters from different station types, Atmos. Environ., 198, 1-11, 2019.