Anonymous Referee #2 (new comments)

I still don't believe that this is the backscatter coefficient β (in m-1 sr-1). The integration time is much too short for such a retrieval. The ceilometers output is at most the attenuated backscatter! This is also the quantity that is described in the reference you give: Muenckel at al. (2007):'After solving for all the instrument specific factors, constants and squared distance, the attenuated backscatter coefficient can be retrieved. This quantity is the product of the volume backscatter coefficient β at range x and the square of the transmittance of the atmosphere between the lidar and the scattering volume τ 2.'

We thank the reviewer for this comment. It is actually true that the ceilometer's algorithm solves for attenuated backscatter coefficient, although in the User's Manual, it is not so clear. However, according to Muenckel et al (2007), the optical power received by a ceilometer from distance x is:

$$P(x,\lambda) = \frac{c}{2x^2} \underbrace{P_0 A \eta O(x) \Delta t}_{\text{instrument specific}} \times \underbrace{\beta(x,\lambda)\tau^2(x,\lambda)}_{\text{attenuated backscatter}}$$

In this equation, $\beta(x, \lambda)$ is the backscatter coefficient, $\tau(x, \lambda)$ is the transmittance of the atmosphere between the lidar and the scattering volume, λ is the wavelength of the emitted laser pulse, and x is the distance between lidar and scattering volume. After solving for all the instrument specific factors, constants and squared distance, the attenuated backscatter coefficient can be retrieved. This quantity is the product of the volume backscatter coefficient β at range x and the square of the transmittance of the atmosphere between the lidar and the scattering volume τ^2.

In the new revised version of our manuscript, the ceilometer's attenuated backscatter coefficients are now compared with the lidar-derived attenuated backscatter coefficients. The attenuated backscatter profiles from lidar are calculated by multiplying the Klett backscatter retrievals with the square of the transmittance for each altitude. The extinction term for the estimation of the transmittance is calculated by multiplying the backscatter coefficient with the height independent lidar ration (also assumed for the Klett backscatter calculation, which in our case equals 30sr).

We have to mention here, that due to the low AOD values (0.03<AOD<0.07) for the cases presented (except the one at 01 June 2009, where the AOD was 0.18 due to the Saharan dust event) in our paper (the AODs were also validated by coincident AERONET measurements), the transmittance term is close to 1 and thus, the differences between the aerosol backscatter (old version) and the attenuated backscatter (new version) calculations is not significant. The transmittance term becomes more significant for the Saharan dust case, however, for the full overlap heights examined here (greater than ~500m), the transmittance is again close to 1 (0.96).

In any case, the attenuated backscatter coefficients have to be compared between the ceilometer and the lidars and, now, this is done in the new version of our manuscript, following reviewer’s suggestion.