Atmospheric
Measurement
Techniques
Discussions

Interactive comment on "Remote sensing of PM$_{2.5}$ during cloudy and nighttime periods using ceilometer backscatter" *by* Siwei Li et al.

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This paper describes a method to extract information on PM2.5 from lidar ceilometer observations. This may improve knowledge of PM2.5 concentrations at sites where no other PM2.5 measurement equipment is available. The advantage of using lidar data is that it can be used to determine PM2.5 also during cloudy or nighttime conditions, in which case methods based on satellite measurements of AOD cannot be used. The paper is interesting as it shows the dependence of the relation between PM2.5 and lidar backscatter on meteorolocical variables.

In general the paper is well written and well structured.

Page 1, line 18-19. I have some doubts about the validity of the conclusion reached in the Abstract, line 18-19. The numbers given there seem to be flawed because

these correlations pertain to the so-called 'best fit' rather than averaging over the 100 fits that were performed. I would like to replace these correlations by the average correlations of the 100 fits instead of using the results for the best fit. The point is that if one wants to apply the method for a site with no PM2.5 measurement instrument and only a ceilometer, one does not know what fit-parameters would give the best fit, and these parameters will certainly depend on site and meteorological conditions and aerosol characteristics. Hence, showing best-fit results gives a too optimistic view on the accuracy of ceilometers to estimate PM2.5 concentrations at sites where no other instruments are available.

Page 5, line 16. Please explain what is meant by "overfitting". Also introduce "best fitting", as results are given in the paper both for the average correlations of the 100 filts as well as for the fit that gives the best fit.

Page 9, line 1. Correlation coëfficiënt, is R or R_square meant here?

Page 9, figure 4. Is R or R_square equal to 0.40, 0.46 and 0.29, respectively? On the x-axis, also give the unit of "surface backscatter". Is this the same as the backscattering coëfficiënt as defined in equation 6? If so, please use the same name for the same quantity.

Page 12, figure 9/Page 13, figure 10. Is R or R_square presented, and why is the relation shown using the best fit only? To me this gives a flawed impression to the reader, see comment on the Abstract of this paper.

Page 13, line 13. "ARM SGP site were" –> "ARM SGP site was"

Page 13, line 19. I think it is better to remove this sentence. I do not know by what criterion one can arrive at the conclusion that the regression model works well. The correlations presented in line 17 are based on the best fit, and to my opinion give flawed results (see comment on the Abstract)

Page 14, line 11. "laser power are" –> "laser power is"

Page 15, line 24. Also here the best fit results are presented, which I find problematic.

C3