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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical and geometrical aerosol particle properties over the United Arab Emirates" *by* Maria Filioglou et al.

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Thank you for the question. The overall relative errors in the retrieved Raman backscatter coefficients and linear depolarization ratios for the PollyXT lidar correspond to 5-10% and for the extinction coefficients the range is 10-20%. These uncertainties propagate to the retrieved Ångström exponents and LRs. A better description has been added due to the comment of one of the reviewers in which we have updated the text in the manuscript. In Sect 2.3 we have added: "For the mean optical properties, only regions where the extensive aerosol properties (backscatter and extinction coefficients) were nearly constant were considered. This means that within the defined layer, the variability of the optical properties should be less than the statistical uncertainty of the individual data points". Regarding the retrieval of the optical properties,

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we have used the validated, under the EARLINET network, algorithm which has been developed by TROPOS team in Leipzig, Germany. Systematic errors in the lidar arise from the non-linearity of a photodetectors, errors in the calibration of the optical data or due to imperfect optical components that are sensitive to polarized light. The first two are considered through subtraction of the background signal and the correction of the dead time. Furthermore, an adequate reference height and the operation of the photo-multipliers in the linear region reduces further the two corresponding errors (Baars et al., 2016; Engelmann et al., 2016). The third systematic error is corrected through the methodology proposed by Mattis et al., 2009. As mentioned, all these systematic errors are corrected thus their contribution to the reported uncertainty is assumed to be 0. Therefore, the uncertainty in the optical parameters is solely the result of the statistical errors. In general, we try to minimize (detect and correct) the systematic errors through the mandatory annual quality assurance routines developed within EARLINET (telecover test, Rayleigh fit, trigger delay, dark measurement test and depolarization calibration) (e.g., Freudenthaler, 2009; Pappalardo et al., 2014; Wandinger et al., 2016). For example, through the telecover test, we detect misalignments in the near range while the depolarization calibration is crucial for the correct calculation of the relative amplification factor between the cross and parallel polarized channels. Thus, Fig. 7 concerns the statistical errors and the standard errors from the multiple layer statistics in each height range.

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