

Interactive comment on “Experimental calibration assessment of a MPLNET/Micro-Pulse Lidar system in comparison with EARLINET lidar measurements for aerosol optical properties retrieval” by Carmen Córdoba-Jabonero et al.

Anonymous Referee #2

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The manuscript fits within the journal scope, as it describes the results from an inter-comparison campaign in order to evaluate the Micro Pulse lidar overlap function taking EARLINET Martha and Polly systems as reference.

The manuscript is interesting, nevertheless some major changes are needed before publication.

1) I understand that it is not very practical to find an horizontal line of sight free from obstacles with an homogenous atmosphere, but I think that this setup is way easier

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than organizing a measurement campaign on purpose. Moreover, shooting the lidar horizontally is more accurate than the proposed method.

2) The manuscript needs a deep English editing, because some parts are not clear at all. I was editing some parts, but it is not a reviewer role.

3) Some sections in the manuscript seem to be out of context. As stated in the title and mostly in the abstract, the main objective is to calibrate the MPL instruments with respect to the reference EARLINET lidars. The part where POLIPHON algorithm is applied is not adding value to the paper with respect to its main goal. I suggest to the authors to better contextualize it (maybe editing English will make it clearer) or delete it. Moreover, I think that the retrieval doesn't make so much sense. First, Leipzig is not the best spot to detect dust outbreaks, because the aerosol layer traveled so much before reaching the observation site. Then dividing the backscattering coefficient into those 3 categories is rather audacious and potentially wrong. There is not any information regarding the aerosol size distribution. Then D_c and D_f how are assessed? Just using the Particle Depol Ratio and the LR? In this case, no information is available on how the dust particles aged, i.e. if dust mixes up with urban or continental aerosol. Also, the used values are probably found for some specific measurement campaigns and cannot be assumed valid in general. For this reason, those values will show a very high variability making the error on retrieval huge. What if, during the advection, the dust particles mix with other aerosol particles? The LR changes, the depolarization changes...

4) Being the P-MPL a product commercially available, it is not possible to establish with precision which technology is used to detect the depolarized laser light, because, as stated on MPLNET website, there exist at least two different P-MPL models that depend on fabrication year. For the P-MPL models produced before 2013, the use of nematic liquid crystal polarizer introduces a delay in data rates. A new P-MPL model was developed around 2013 following Flynn et al 2007, but using a ferroelectric liquid crystal (FLC) for faster data rates and a slightly modified measurement strategy to

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accommodate the difference in polarizer properties. For this reason, as long as a proper instrument characterization and stability study of the polarized design and its calibration procedures will be not available, equation 4 and section 3.2 are based on speculations.

Specific comments are found in the attached files.

Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2020-427/amt-2020-427-RC2-supplement.pdf>

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-427, 2020.