

Interactive comment on «First validation of GOME-2/MetOp Absorbing Aerosol Height using EARLINET lidar observations» by Konstantinos Michailidis et al.

RC2: 'ACP-2020-98', Anonymous Referee #1

Received and published: 16 July 2020

We would like to thank Reviewer #1 for his/her comments. In the revised version the reviewer's comments have been extensively taken into account, by improving the discussion of many sections and by improving the figures that lacked of an accurate description. Below we report the changes included in the revised manuscript as a response to the comments of the reviewer. We addressed each comment below and highlighted our answers in red, the referee's comments are black.

Remark: The figure numbers and the page numbers in the referee comments and in our replies correspond to the original manuscript.

P1/L22: difference → difference,

REPLY: Changed as requested.

P1/32: please updated cited literature with very recent publications

REPLY: Changed as requested. The text has been modified accordingly and the full reference has added to new manuscript.

References:

IPCC: Climate Change 2014, Synthesis Report, Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, edited by: The Core Writing Team, Pachauri, R. K., and Meyer, L. A., IPCC, Geneva, Switzerland, available at: <http://www.ipcc.ch/report/ar5/syr/> (last access: 5 October 2020), 2014.

P2/L4: add "Pappalardo et al., 2010; Pappalardo et al., 2013

REPLY: Changed as requested. The text has been modified accordingly and the full reference has added to new manuscript.

Add to the text: "In the framework of aviation ... is essential (e.g., Balis et al., 2016; Pappalardo et al., 2010; Pappalardo et al., 2013)."

References:

Pappalardo, G., Mona, L., D'Amico, G., Wandinger, U., Adam, M., Amodeo, A., Ansmann, A., Apituley, A., Alados Arboledas, L., Balis, D., Boselli, A., Bravo-Aranda, J. A., Chaikovskiy, A., Comeron, A., Cuesta, J., De Tomasi, F., Freudenthaler, V., Gausa, M., Giannakaki, E., Giehl, H., Giunta, A., Grigorov, I., Groß, S., Haeffelin, M., Hiebsch, A., Iarlori, M., Lange, D., Linné, H., Madonna, F., Mattis, I., Mamouri, R.-E., McAuliffe, M. A. P., Mitev, V., Molero, F., Navas-Guzman, F., Nicolae, D., Papayannis, A., Perrone, M. R., Pietras, C., Pietruczuk, A., Pisani, G., Preißler, J., Pujadas, M., Rizi, V., Ruth, A. A., Schmidt, J., Schnell, F., Seifert, P., Serikov, I., Sicard, M., Simeonov, V., Spinelli, N., Stebel, K., Tesche, M., Trickl, T., Wang, X., Wagner, F., Wiegner, M., and Wilson, K. M.: Four-dimensional distribution of the 2010 Eyjafjallajökull volcanic cloud over Europe observed by EARLINET, *Atmos. Chem. Phys.*, 13, 4429–4450, <https://doi.org/10.5194/acp-13-4429-2013>, 2013.

Pappalardo, G., Wandinger, U., Mona, L., Hiebsch, A., Mattis, I., Amodeo, A., Ansmann, A., Seifert, P., Linne, H., Apituley, A., Alados Arboledas, L., Balis, D., Chaikovskiy, A., Comeron, A., D'Amico, G., Freudenthaler, V., Grigorov, I., Papayannis, A., Perrone, M. R., Pietruczuk, A., Pujadas, M., Rizi, V., Spinelli, N., Wang, X., Wiegner, M.: EARLINET correlative measurements for CALIPSO: first intercomparison results, *J. Geophys. Res.*, 115, D00H19, [doi:10.1029/2009JD012147](https://doi.org/10.1029/2009JD012147), 2010.

P2/L5: do not use the same word "sensing" in the same phrase

REPLY: Changed as requested.

P2/L6: of → of the

REPLY: Changed as requested.

P2/L8: add "Papayannis et al., 2008"

REPLY: Done. We add the reference, according to reviewer comment. The full reference has added to new manuscript.

Add to the text: "Lidar (Light detection and ranging ... of a few meters (Papayannis et al., 2008)."

Reference:

Papayannis, A., Amiridis, V., Mona, L., Tsaknakis, G., Balis, D., Bosenberg, J., Chaikovski, A., De Tomasi, F., Grigorov, I., Mat- tis, I., Mitev, V., Muller, D., Nickovic, S., Perez, C., Pietruczuk, A., Pisani, G., Ravetta, F., Rizi, V., Sicard, M., Trickl, T., Wiegner, M., Gerding, M., Mamouri, R. E., D'Amico, G., and Pappalardo, G.: Systematic lidar observations of Saharan dust over Europe in the frame of EARLINET (2000–2002), *J. Geophys. Res.*, 113, D10204, doi:10.1029/2007JD009028, 2008

P2/L10: one word "spaceborne"

REPLY: Changed as requested.

P2/L14: change ground based to "ground-based"

REPLY: Changed as requested.

P2/L17: Omit "the"

REPLY: Changed as requested. We remove the word "the" from the sentence.

P2/L22: "Sect" → "Sect."

REPLY: Changed as requested.

P2/L22: "Sect. 4" → "Section 4"

REPLY: Changed as requested.

P2/L24: "Sect." → "Section"

REPLY: Changed as requested.

P3/L10: Provide citations here!

REPLY: Done. Citations are provided and added to new manuscript.

Add to the text: "Within ACTRIS, many developments ... the lidar data (Matthias et al., 2004; Freudenthaler et al., 2009, 2016, 2018)"

References:

Matthias, V., Bösenberg, J., Freudenthaler, V., Amodeo, A., Balis, D., Chaikovsky, A., Chourdakis, G., Comeron, A., Delaval, A., de Tomasi, F., Eixmann, R., Hågård, A., Komguem, L., Kreipl, S., Matthey, R., Mattis, I., Rizi, V., Rodriguez, J. A., Simeonov, V., and Wang, X.: Aerosol lidar intercomparison in the framework of the EARLINET project. 1. *Instruments, Appl. Optics*, 43, 4, 961–976, 2004a

Freudenthaler, V., Esselborn, M., Wiegner, M., Heese, B., Tesche, M., Ansmann, A., Müller, D., Althausen, D., Wirth, M., Andreas, F. I. X., Ehret, G., Knippertz, P., Toledano, C., Gasteiger, J., Garhammer, M., and Seefeldner, M.: Depolarization ratio profiling at several wavelengths in pure saharan dust during SAMUM2006, *Tellus B*, 61, 165–179, 2009.

Freudenthaler, V.: About the effects of polarising optics on lidar signals and the 490 nm calibration, *Atmos. Meas. Tech.*, 9, 4181–4255, <https://doi.org/10.5194/amt-9-4181-2016>, 2016.

Freudenthaler, V., Linné, H., Chaikovski, A., Rabus, D., and Groß, S.: EARLINET lidar quality assurance tools, *Atmos. Meas. Tech. Discuss.*, <https://doi.org/10.5194/amt-2017-395>, in review, 2018.

P3/L12: provide citations here!

REPLY: Done. Citations are provided in the new manuscript. In addition, we also add the following sentence in the revised version which now reads:

“The SCC is a major component of the ACTRIS Aerosol Remote Sensing Node (ARES) responsible for the curation and the processing of the ACTRIS aerosol remote sensing data (D’Amico et al., 2015, 2016; Mattis et al., 2016)”

References:

D’Amico, G., Amodeo, A., Baars, H., Biniotoglou, I., Freudenthaler, V., Mattis, I., Wandinger, U., and Pappalardo, G.: EARLINET Single Calculus Chain – overview on methodology and strategy, *Atmos. Meas. Tech.*, 8, 4891–4916, [doi:10.5194/amt-8-4891-2015](https://doi.org/10.5194/amt-8-4891-2015), 2015

D’Amico, G., Amodeo, A., Mattis, I., Freudenthaler, V., and Pappalardo, G.: EARLINET Single Calculus Chain – technical – Part 1: Pre-processing of raw lidar data, *Atmos. Meas. Tech.*, 9, 491–507, [doi:10.5194/amt-9-491-2016](https://doi.org/10.5194/amt-9-491-2016), 2016

Mattis, I., D’Amico, G., Baars, H., Amodeo, A., Madonna, F., and Iarlori, M.: EARLINET Single Calculus Chain – technical – Part 2: Calculation of optical products, *Atmos. Meas. Tech.*, 9, 3009–3029, [doi:10.5194/amt-9-3009-2016](https://doi.org/10.5194/amt-9-3009-2016), 2016

P3/L13: "of" → "of the"

REPLY: Changed as requested.

P3/L13: "web site" → "website"

REPLY: Changed as requested.

P3/L16: Replace "h" by "UTC"

REPLY: Changed as requested.

P3/L19: Add hereafter: O. Soupiona, A. Papayannis, P. Kokkalis, M. Mylonaki, G. Tsaknakis, A. Argyrouli, and S. Vratolis, Long-term systematic profiling of dust aerosol optical properties using the EOLE NTUA lidar system over Athens, Greece (2000–2016), *Atmospheric Environment*, 183, 165–184, 2018;

REPLY: The text has been modified accordingly in the revised manuscript. The full reference has been added to the new manuscript.

Add to the text: “(e.g. Balis et al., 2003; Amiridis et al., 2009; Sicard et al., 2011; Pappalardo et al., 2013; Fernández et al., 2018; Soupiona et al., 2018)”

Reference: Soupiona, O., Papayannis, A., Kokkalis, P., Mylonaki, M., Tsaknakis, G., Argyrouli, A. and Vratolis, S.: Long-term systematic profiling of dust aerosol optical properties using the EOLE NTUA lidar system over Athens, Greece (2000–2016), *Atmos. Environ.*, 183 (April), 165–174, doi:10.1016/j.atmosenv.2018.04.011, 2018.

P3/L22: add ";L. Mona, D. Müller, A. Omar, A. Papayannis, G. Pappalardo, N. Sugimoto, M. Vaughan, Lidar measurements for desert dust characterization: A Review, *Advances in Meteorology* (Special Issue: Desert Dust Properties, Modelling, and Monitoring), 2012, ID356265, doi:10.1155/2012/356265, 2012."

REPLYThe full reference has added to new manuscript.

Add to the text: "EARLINET observations have already ... forecast modeling (Perez et al., 2006; Mona et al., 2014; Mona et al., 2012), among others."

References:

L. Mona, D. Müller, A. Omar, A. Papayannis, G. Pappalardo, N. Sugimoto, M. Vaughan, Lidar measurements for desert dust characterization: A Review, *Advances in Meteorology* (Special Issue: Desert Dust Properties, Modelling, and Monitoring), 2012, ID356265, doi:10.1155/2012/356265, 2012.

P5/L16: "(Fig.6)" → "(cf. Fig. 6)"

REPLY: Changed as requested.

P5/L29: Please add V; Freudenthaler recent paper on QA tests.

REPLY: The full reference has added to new manuscript.

Add to the text: "Additionally, some quality standards ... network products (Freudenthaler et al.,2018)"

References:

Freudenthaler, V., Linné, H., Chaikovski, A., Rabus, D., and Groß, S.: EARLINET lidar quality assurance tools, *Atmos. Meas. Tech. Discuss.*, <https://doi.org/10.5194/amt-2017-395>, in review, 2018.

P6/L10: "the" → "the aerosol"

REPLY: Changed as requested.

P7/L32: "of Fig.3" → "(cf. Fig. 3)"

REPLY: Changed as requested.

P8/L1: "of Fig.3" → "(cf. Fig. 3)"

REPLY: Changed as requested.

P8/L7: "Fig.5" → "Figure 5"

REPLY: Changed as requested.

P8/L17: "Fig.7" → "Figure 7"

REPLY: Changed as requested.

P9/L1: "February 21st and 23rd" → "21-23 February"

REPLY: Changed as requested.

P10/L19: "Figure" → "Fig."

REPLY: Changed as requested.

P11/L27: "February 21st to 23rd," → "21-23 February 2017"

REPLY: Changed as requested.

P12/L18: For instance the PIs of each EARLINET lidar station should be acknowledged for the provision of data.

REPLY: The text was changed according to the reviewer's suggestion.

The text was rephrased to: "The authors would like to thank the EARLINET PIs and their staff for establishing and maintaining the EARLINET sites and for the provision of ground-based data used in this paper."