

Interactive comment on “CALIPSO climatological products: evaluation and suggestions from EARLINET” by N. Papagiannopoulos et al.

Anonymous Referee #1

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The paper “CALIPSO climatological products: evaluation and suggestions from EARLINET” by Papagiannopoulos et al. presents CALIPSO Level 3 product validation study based on multi-wavelength Raman lidar system on the frame of The European Aerosol Research Lidar Network (EARLINET). EARLINET is one of the most sophisticated, consistent and organized lidar network and play an important role in the CALIPSO validation as shown in several studies published in the recent years. As mentioned in the manuscript, just few studies have been conducted in order to investigate the performance of CALIPSO Level 3 products, showing the importance of this network. This study clearly address relevant questions about the CALIPSO retrieval and presents an interesting methodology for long-term measurements to validate CALIPSO Level 3 data. However, some suggestions and corrections should be taken into consideration

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before the manuscript is published.

General comments:

EARLINET has currently 27 active stations and the contributing stations have been performing correlative measurements with CALIPSO satellite, would be interesting taking into account data from other stations beside the five one used. It would increase the number of comparable data, reducing the uncertainties from spatial and temporal differences. One important conclusion for the differences observed on CALIPSO and ground-based retrievals is the difference in sampling volumes and the spatial variability of the aerosol fields, which is expected when validating satellite data. However, the investigation of the influences of air masses trajectories between ground-based lidar stations and CALIPSO overpasses region should be considered in order to reduce or at least justify these differences.

General questions and comments for consideration:

Subsection 2.3.1 – page 31205: It is described the comparison methodology between CALIPSO CL3 products and EARLINET retrievals. Please, could the authors explain in more details how the CL3* products were produced?

Page 31206, line 9: Can you consider two measurements representative of a month? For cases with only two lidar measurements, how many CALIPSO measurements were used to produce CL3* products?

Page 31206, line 28: Is the term approximate particle depolarization ratio or volume depolarization ratio?

Page 31211, line 1: What would be the causes for the discrepancies between extinction and backscatter profiles in the lowermost part of the profile between CALIPSO and Granada station (figures 3b and 4b)?

figure 5b-page 31239: In the lidar ratio profile for Granada station is presented the lidar ratio signal starting at 2 km approximately. How is the procedure to classify or identify

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the aerosol subtype in the region between 1 - 2 km presented in figure 7a, since the lidar ratio signal is missing in this region?

Page 31212, line 13: "The CALIPSO typing, shown in Fig. 8b, for the height interval 1–2km identifies Smoke and Polluted Continental equally". If the CALIPSO algorithm uses the layer altitude to classify the aerosol between Smoke or Polluted continental, I'm wondering, why there are aerosol layers between 1 - 2 km classified as smoke over Leipzig station?

Page 31213, line 10: "In the region of 3 - 4 km there is good agreement between the two platforms with mean lidar ratio values of $S_{aer} = 44 \pm 4 \text{ sr}$ for Naples station and $S_{aer} = 44 \pm 2 \text{ sr}$ for CALIPSO". However, in figure 5d is missing the lidar ratio profile between 3 - 4 km for Naples station. Would be this agreement of $S_{aer} = 44 \text{ sr}$ in the region of 2 - 3 km? Why is the profile missing between 3 - 4 km? How can this missing lidar ratio information can compromise the confidence of the EARLINET aerosol typing between 3 - 4 km presented in figure 9a?

Page 31214, line 9: "The lower level disparity typically is weakened during summer months, and it is intensified in winter, yet the sample size is too small to quantify the periodicity of this discrepancy". Despite the difficult to obtain a large quantity of coincident data between CALIPSO and ground-based lidars, would be interesting to mention what is the period/season of the year the most of data were obtained and what kind of discrepancies or influences can produced in this validation study.

Page 31215, line 6: Why the relative differences of the extinction and backscatter comparison presented in figure 11 are so large for elevated altitudes? How the mean relative differences were calculated, $\frac{\beta_{EARLINET} - \beta_{CALIOP}}{\beta_{EARLINET}}$?

Page 31216, line23: Would be interesting to present values of marine lidar ratio retrieved by the EARLINET stations for cases of mixture, in order to check the disagreements between the lidar ratio values assigned by CALIPSO. It can helps to improve the CALIPSO algorithm for polluted dust aerosol subtype, for instance.

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