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Assesment of CALIPSO's level 3 climatological product

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Since December 2011 has been released the latest CALIPSO Level 3 (CL3) monthly product and is subject to calibration/validation studies. EARLINET as the unique European lidar network on a continental scale is the key candidate for these kind of studies. CALIPSO Level 3 data were compared against EARLINET monthly averages obtained by profiles during satellite overpasses. Data from stations of Potenza, Naples, Granada, Évora and Leipzig equipped with advanced multi-wavelength Raman lidars were used for this study. EARLINET monthly profiles yielded higher extinction values comparing to CALIPSO ones.
In order to mitigate uncertainties due to spatial and temporal differences, we reproduced the CL3 filtering rubric onto the CALIPSO Level 2 data. Only grid CALIPSO overflights during EARLINET correlative measurements were used. From these data, monthly averages on 2x5 grid are reconstructed. The CALIPSO monthly mean profiles following the new approach are called CALIPSOLevel 3*,CL3*. This offers the possibility to achieve direct comparable datasets, even if greatly reduces the number of satellite grid overflights. Moreover, the comparison of matched observations reduces uncertainties from spatial variability that affects the sampled volumes. The agreement typically improved, in particular above the areas directly affected by the anthropogenic activities within the planetary boundary layer. In contrast to CL3 product, CL3* data offers the possibility to assess also the CALIPSO performance in terms of the backscatter coefficient keeping the same quality assurance criteria applied to extinction coefficient. Lastly, the typing capabilities of CALIPSO were assessed outlining the importance of the correct aerosol type assessment to the CALIPSO aerosol properties retrieval.
This work is the first in-depth assessment to evaluate the aerosol optical properties reported in the CL 3 data product. The outcome will assist the establishment of independently derived uncertainty estimates that can be used to create more reliable model forecasts based on CALIPSO data. Moreover, the presented work can contribute to current and future studies that use space-based lidar data.

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