



Validation of EarthCARE ATLID aerosol products using EARLINET measurements: preliminary results

*Ping Wang, Diego Alves Gouveia, Dave Donovan, Gerd-Jan van Zadelhoff, Arnoud Apituley, Diko Hemminga, Jos de Kloe
KNMI, NL*

**2nd ESA-JAXA EarthCARE In-Orbit Validation
Workshop**

Data and collocation methods

Statistics of collocated data

Examples of collocated profiles: pot, waw, kuo, cbw sites

ATL vs EARLINET mean profiles for

backscatter , extinction, lidar ratio, depolarization ratio

Summaries

EBD: EBD high resolution, 1 km pixel size

EBD L : EBD low resolution, about 100 km.

AER: low resolution >100 km

Data and method



Products

ECA_EXAA -- EXAE

ATL_AER_2A

ATL_EBD_2A

Extinction coefficient

Backscatter coefficient

Lidar ratio

Depolarization ratio

EARLINET products at 355
nm from EVDC

<https://www.earlinet.org/>

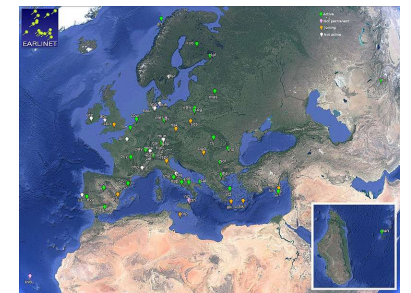
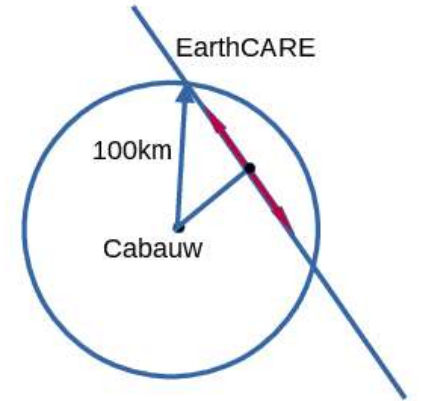
<https://evdc.esa.int/>

Collocation:

- 1) Distance < 100 km (radius and cord),
time difference < 1.5 hour.
- 2) ATL single measurement + 100 km
average
- 3) EARLINET 1 hour averaged data,
processed using SCC (standard)

Data quality control:

quality_status in AER, EBD = 0, 1
classification in AER >= 10, only aerosols
EARLINET, remove filled values and
unrealistic values (too large errors).



Statistic of collocated data



Statistics until 20250314

Version	Collocated data start	Collocated data end	Number of data	
EXAA	20240814	20241106	75	NRT
EXAB	20241115	20241122	7	NRT
EXAC	20240812	20250212	155	Reprocessed
EXAD	20250215	20250309	19	NRT
EXAE	20250311		1	NRT

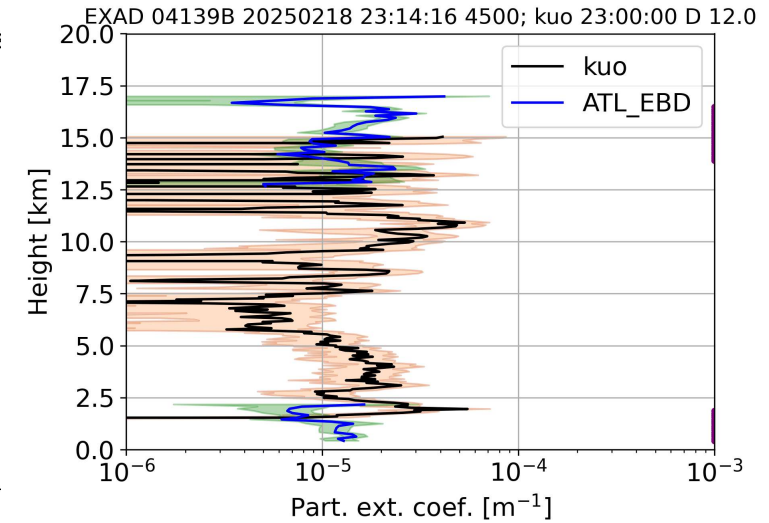
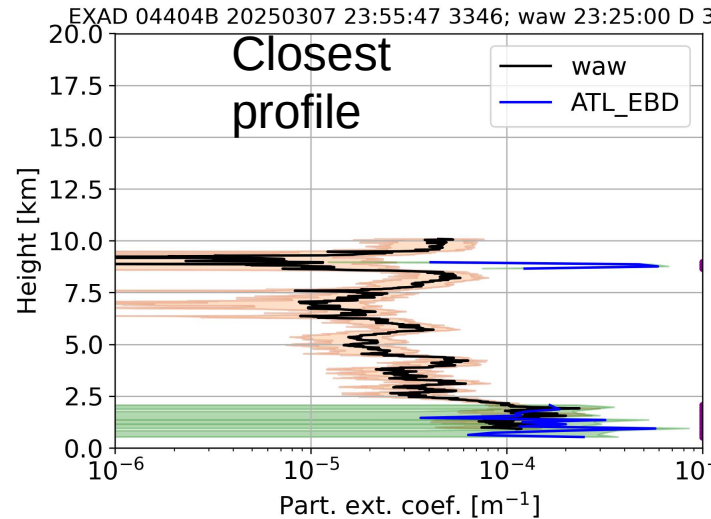
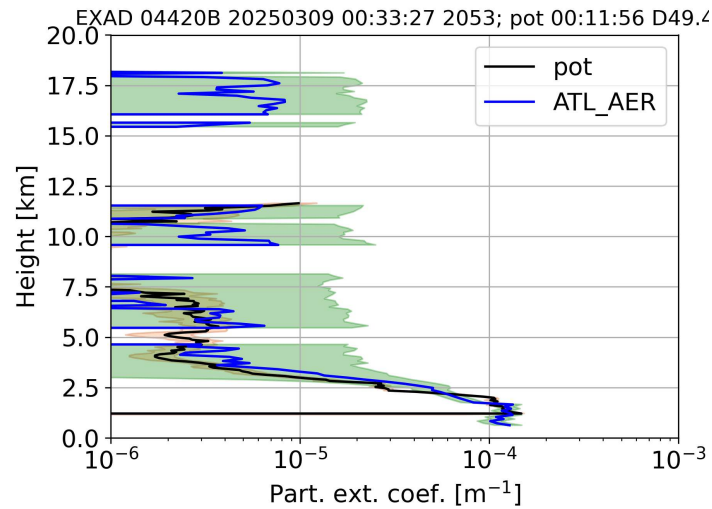
Top 5 sites in EXAC

Site code	waw	dus	pot	gra	cbw
Number of data	24	12	11	11	12
Site name	Warsaw, Poland	Dushanbe, Tajikistan	Potenza, Italy	Granada, Spain	Cabauw, Netherlands

Collocated cases pot, waw, kuo



EXAD



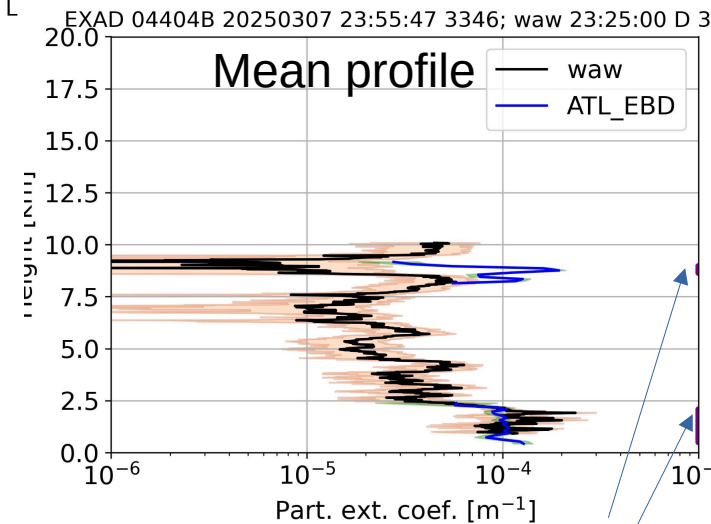
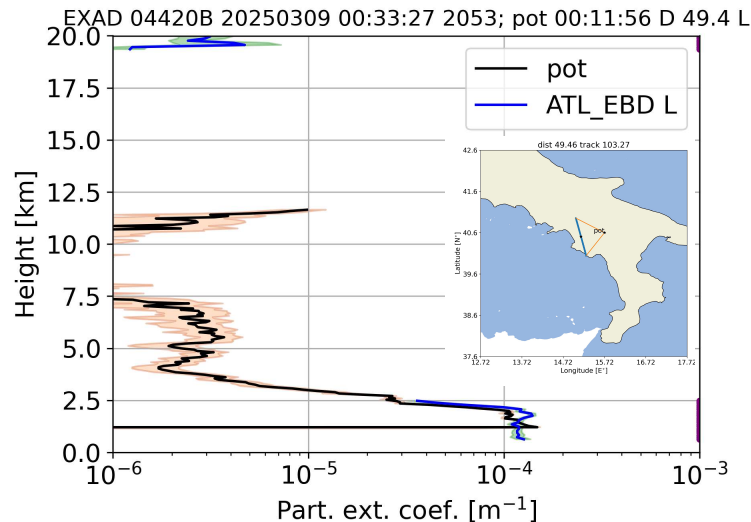
Averaging
EBD (HR)
improve the
agreement

Thin aerosol
layers

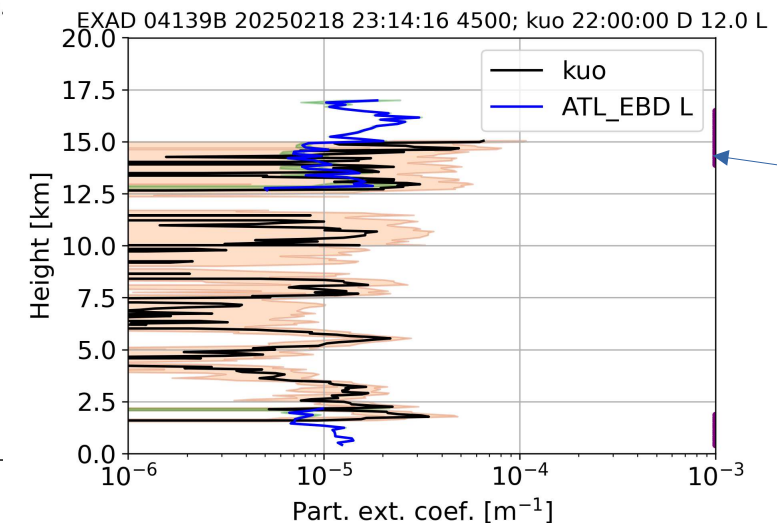
EBD and
EBD L
similar after
average

Strat.

Kuopio,
Finland



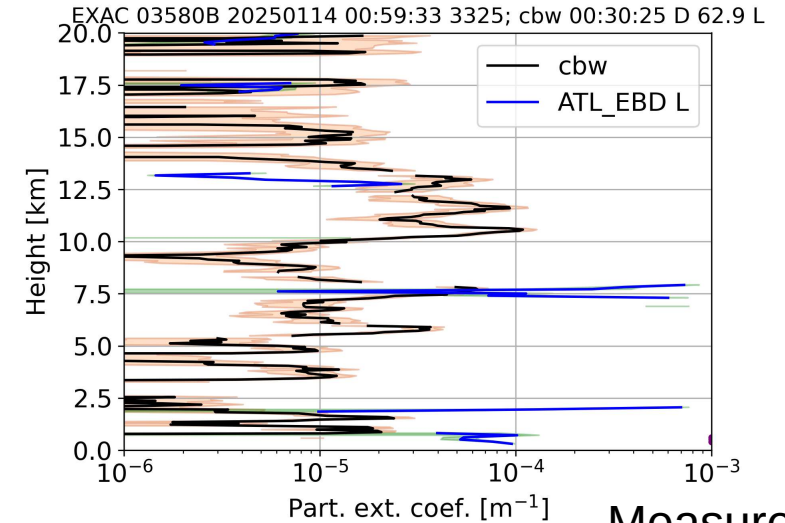
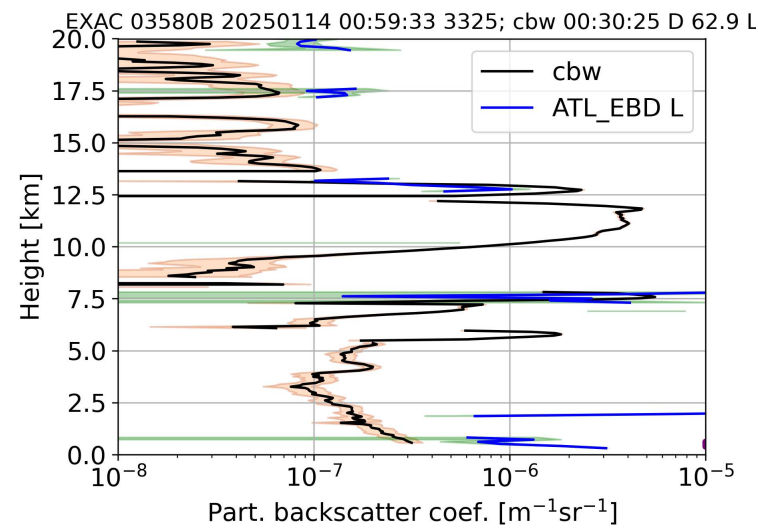
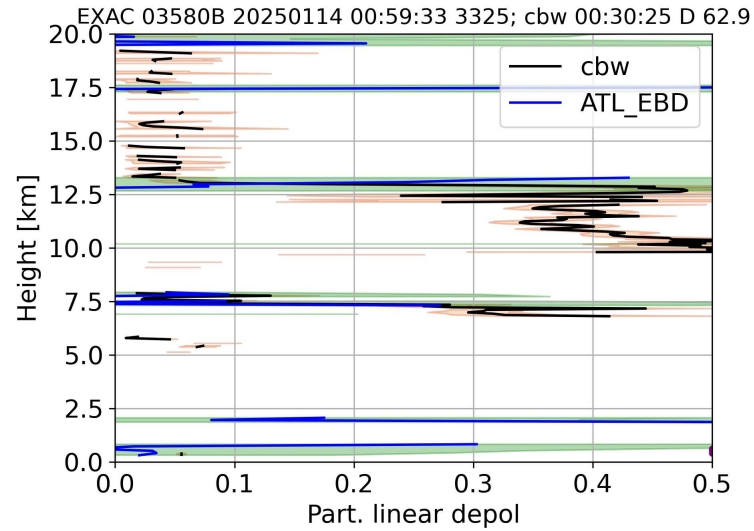
aerosols



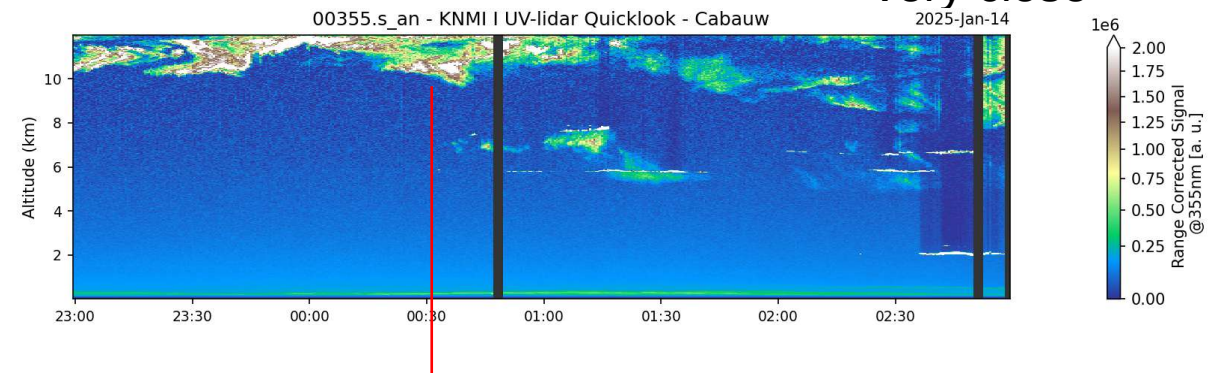
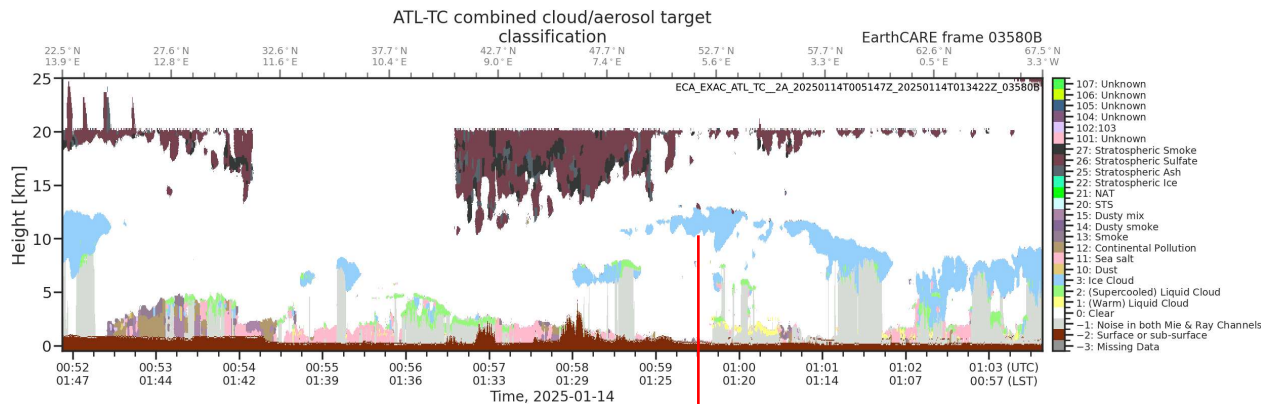
Collocated case Cabauw 20250114



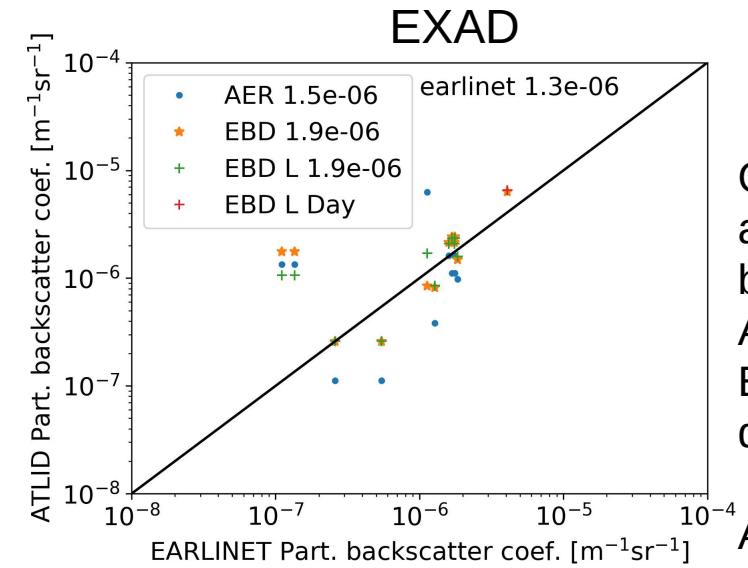
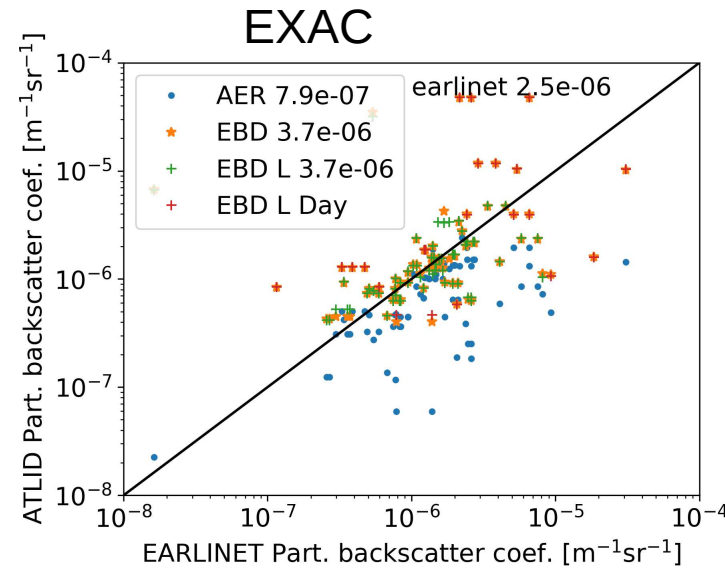
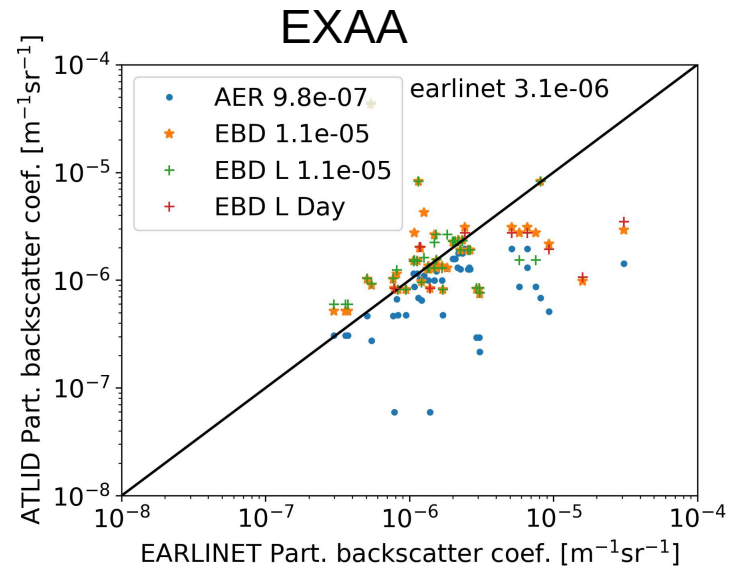
EXAC



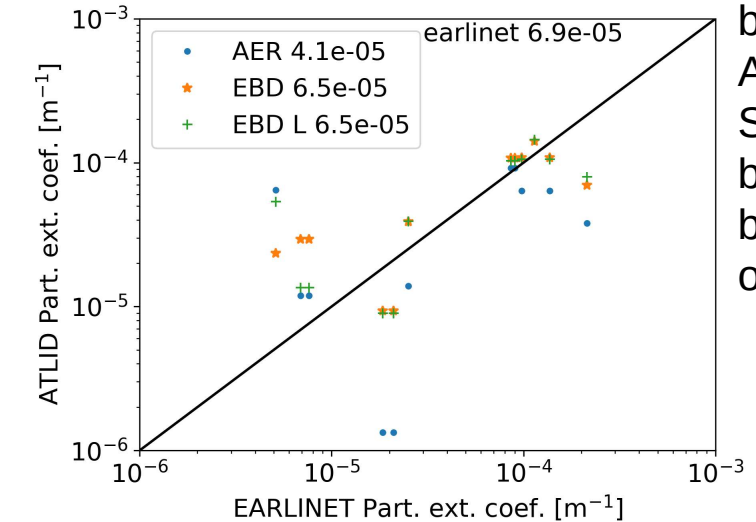
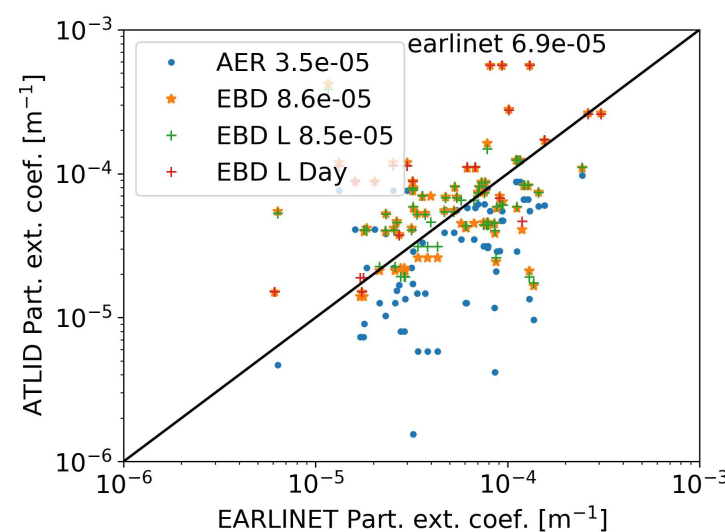
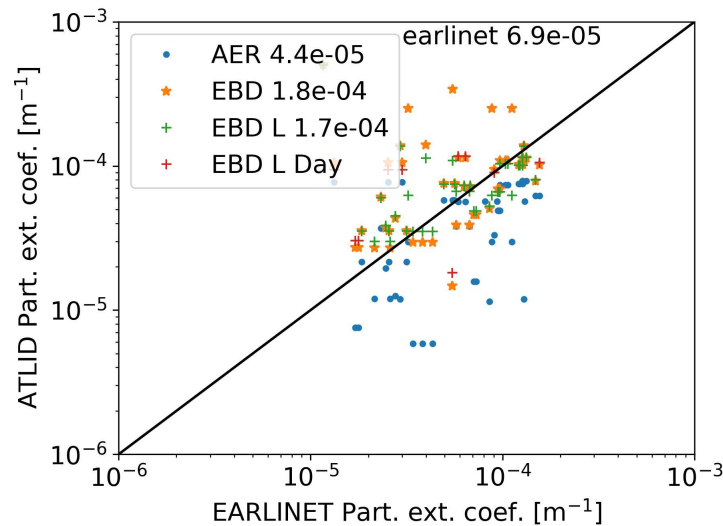
Measured cirrus clouds but not very close



Mean backscatter, extinction coefficients



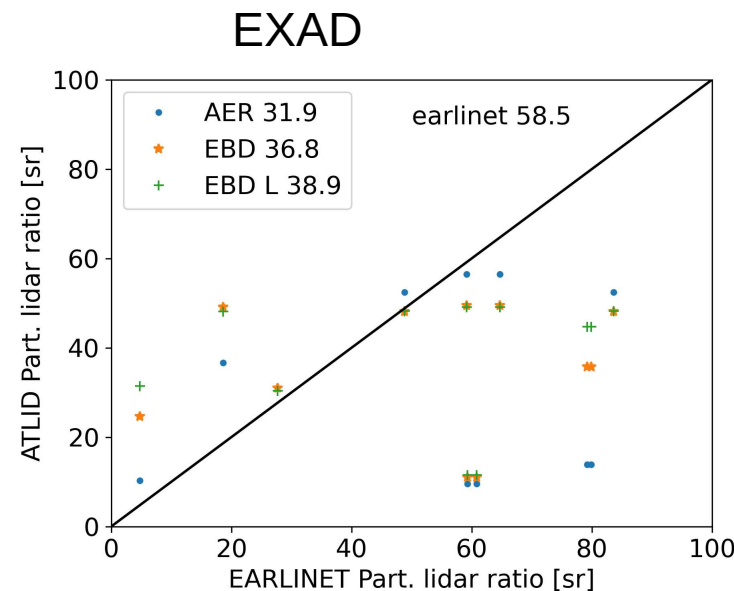
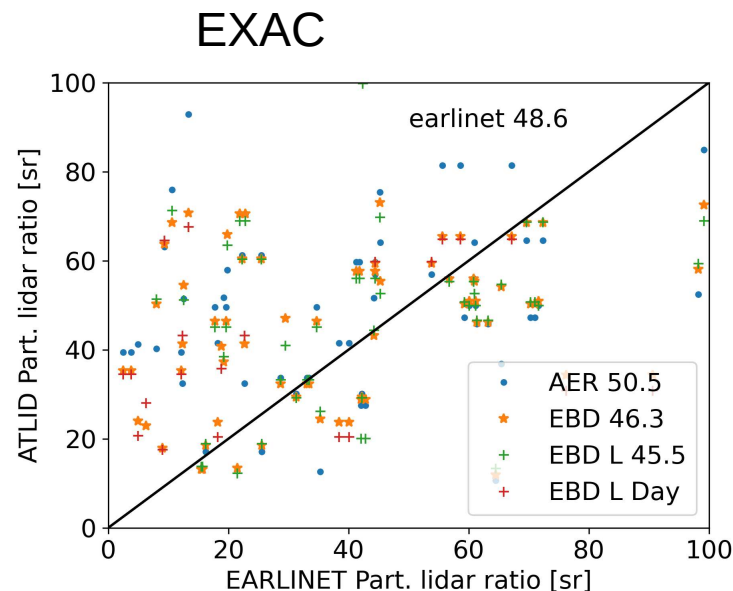
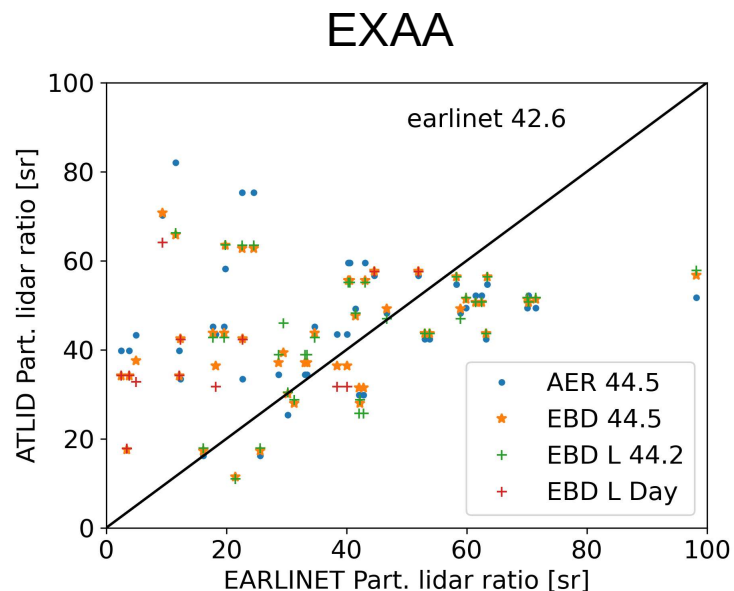
Good agreement between ATL and Earlinet data.



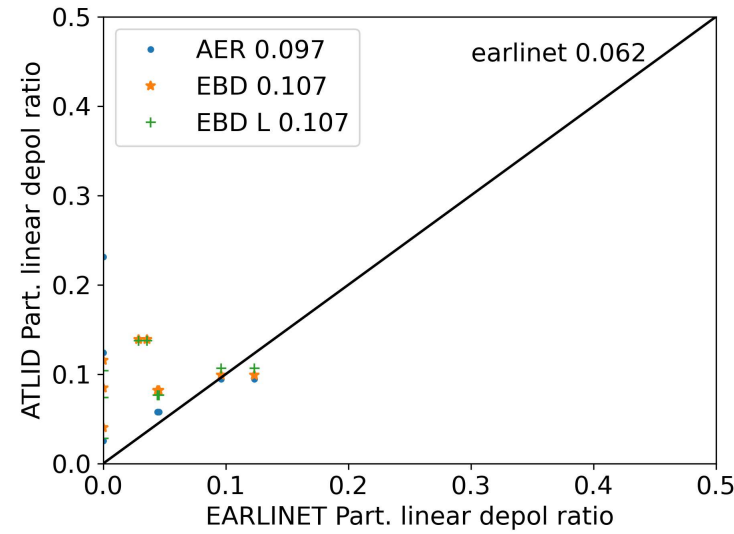
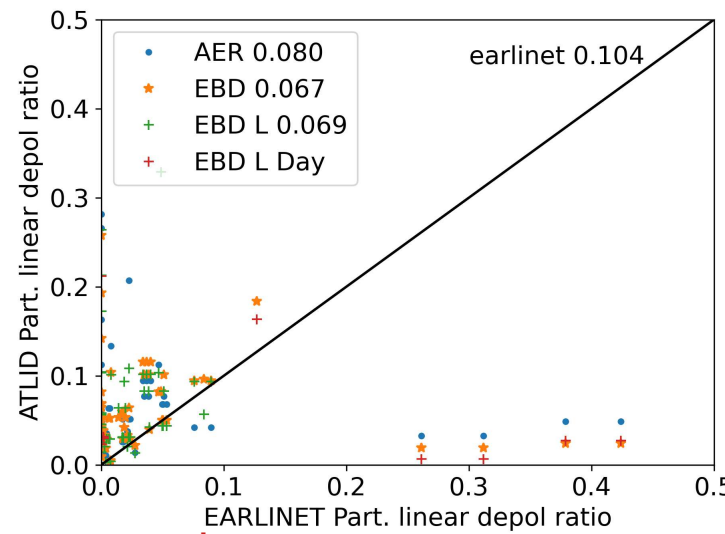
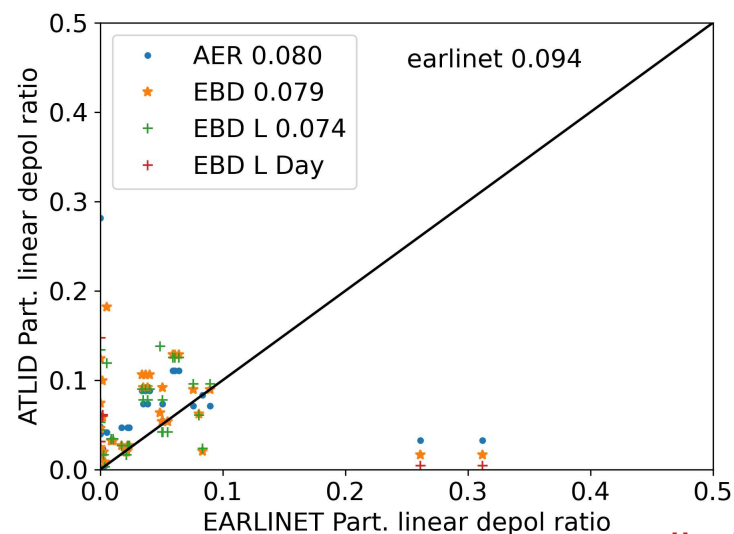
AER has a negative bias in AA, AC.
Seems no bias in AD but not lots of data.

Preliminary results

Mean lidar ratio, depolarization



Mean lidar ratios have good agreement between ATL and Earlinet



The depol values are mostly < 0.1.
The outliers are mainly daytime data

Preliminary results



Summaries



- We evaluate the ATLID AER, EBD products versions from EXAA to EXAE using EARLINET ECVT data. The comparisons of the collocated profiles are processed every day automatically.
- We showed the AER, EBD vs. EARLINET products for the versions AA, AC, AD.
- Generally the ATLID AER, EBD products are in good quality, especially the night time orbits and newer version.
- The AER product seems having a small negative bias in extinction and backscatter in version AA and AC.
- The comparisons can be improved by using more strict selection criteria, because some profiles have very low aerosol extinction coefficients and very thin aerosol layers.
- The selection of aerosols depends on the classification in the AER products.

We would like to thank the EVDC team, all EARLINET sites, all PollyNET sites for providing data in EVDC.

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