

Comparison of ATLID aerosol products produced by ESA and JAXA

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2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop

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- Both ESA and JAXA have their own Level 2 production chains.
- The products (variables) are often similar, but the algorithms usually differ in detail.
 - The EarthCARE Joint Mission Advisory Group has requested product comparisons to support users in the understanding and selection of data.

ATLID Aerosol Products

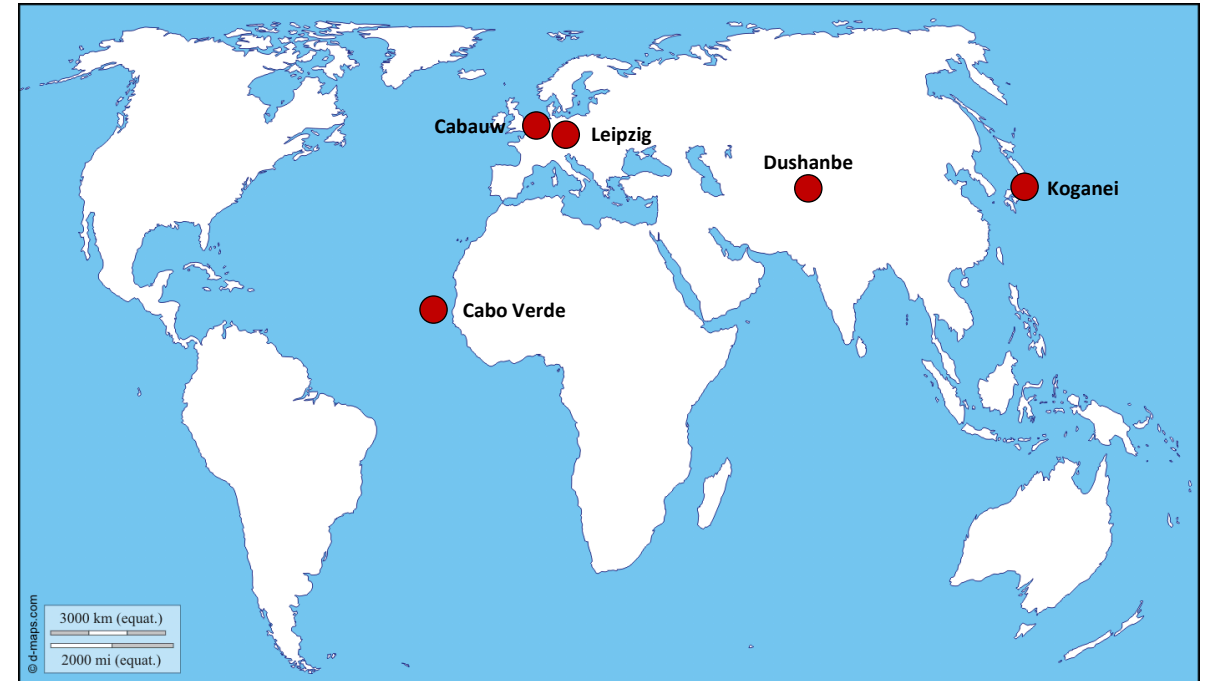
- JAXA aerosol information is contained in the ATLID Cloud and Aerosol Product
ATL_CLA
- ESA aerosol information can be found in different products
A-AER, A-EBD, A-TC, A-ALD + synergistic products

Here, we focus on the standard lidar profile data.

Selected Comparison Cases

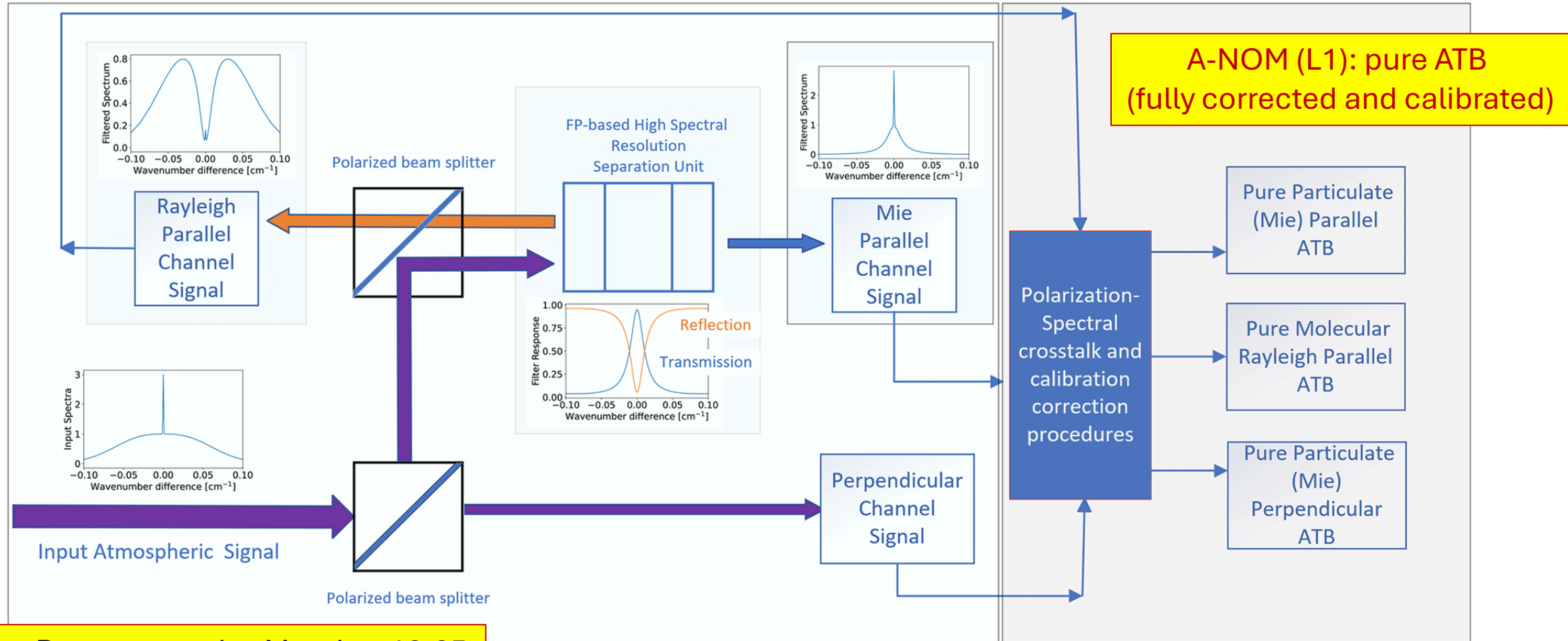


FRAME	DATE	SITE	DAY / NIGHT
1495B	02 Sep 2024	Cabauw	night
1508B	02 Sep 2024	Dushanbe	night
1752D	18 Sep 2024	Leipzig	day
2866A	29 Nov 2024	Cabo Verde	night
3201B	20 Dec 2024	Koganei	night



- ATLID L1 data reprocessed with prototype version 5 processor → baseline AE
- ATLID L2a data produced by ESA (A-PRO, prototype of baseline AE) and JAXA (standard ATL_CLA processor)
- Ground-based data provided by Cal/Val teams of KNMI, TROPOS, and NIES

ATLID Level 1 Signals (A-NOM)



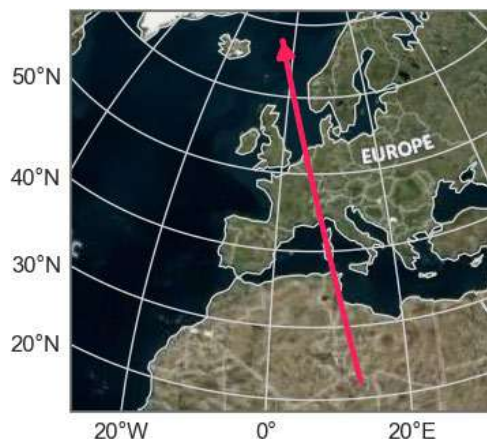
see Donovan et al. – Monday, 12:35

Donovan, D. P. et al.: The EarthCARE lidar cloud and aerosol profile processor (A-PRO): the A-AER, A-EBD, A-TC, and A-ICE products, Atmos. Meas. Tech., 17, 5301–5340, 2024.

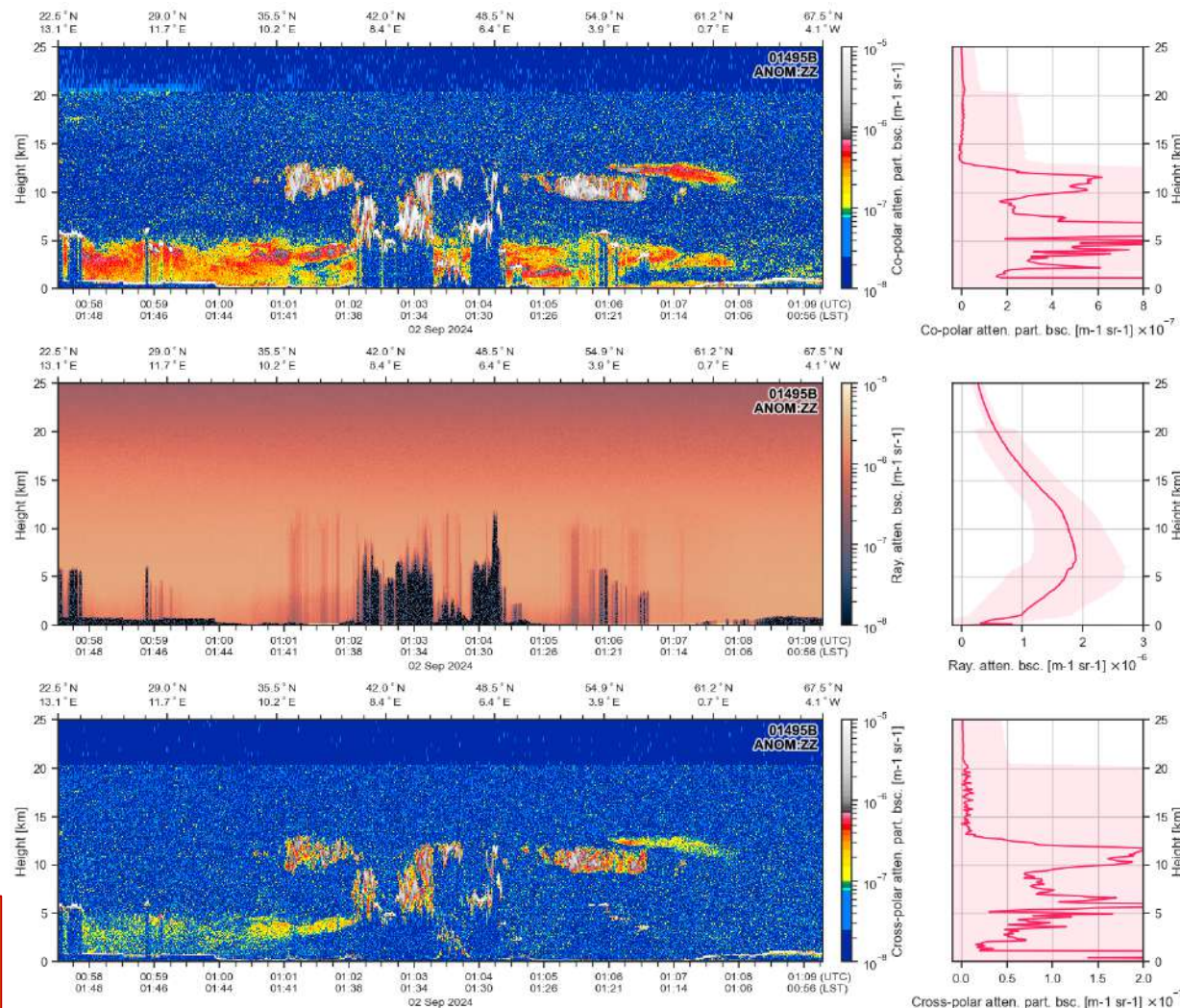
ATLID Level 1, Baseline AE, Frame 01495B

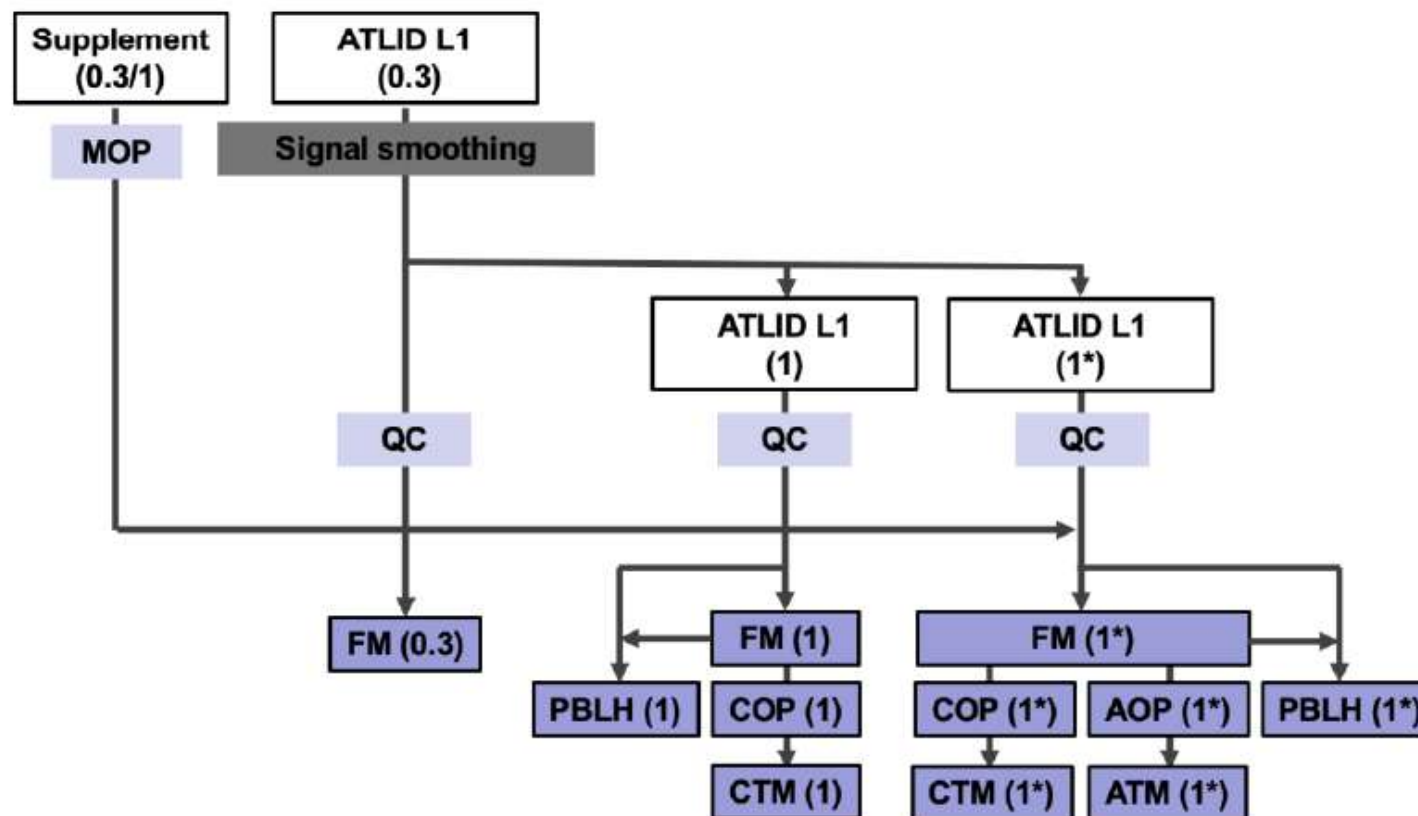


2 Sep 2024, 00:57-01:09 UTC 01495B



ATLID L1 products are of very good quality
see also Wirth et al. – Monday, 13:05





- ScienceData
 - Data
 - L2_quality_flag_10km
 - L2_quality_flag_1km
 - PBL_height_10km
 - additional information status
 - aerosol_backscatter_10km**
 - aerosol_depolarization_10km**
 - aerosol_extinction_10km**
 - aerosol_lidar_ratio_10km**
 - attenuated_backscatter_10km
 - attenuated_backscatter_1km
 - cloud_backscatter_10km
 - cloud_backscatter_1km
 - cloud_depolarization_10km
 - cloud_depolarization_1km
 - cloud_extinction_10km
 - cloud_extinction_1km
 - cloud_lidar_ratio_10km
 - cloud_lidar_ratio_1km
 - crosspolar_attenuated_backscatter_10km
 - crosspolar_attenuated_backscatter_1km
 - feature_mask_03km
 - feature_mask_10km
 - feature_mask_1km
 - quality_flag_03km
 - quality_flag_10km
 - quality_flag_1km
 - target_mask_10km
 - target_mask_1km
 - volume_depolarization_ratio_10km
 - volume_depolarization_ratio_1km

JAXA ATLID L2 products have a fixed resolution
see Nishizawa et al. – Wednesday, 9:15

1 km res.

10 km res.

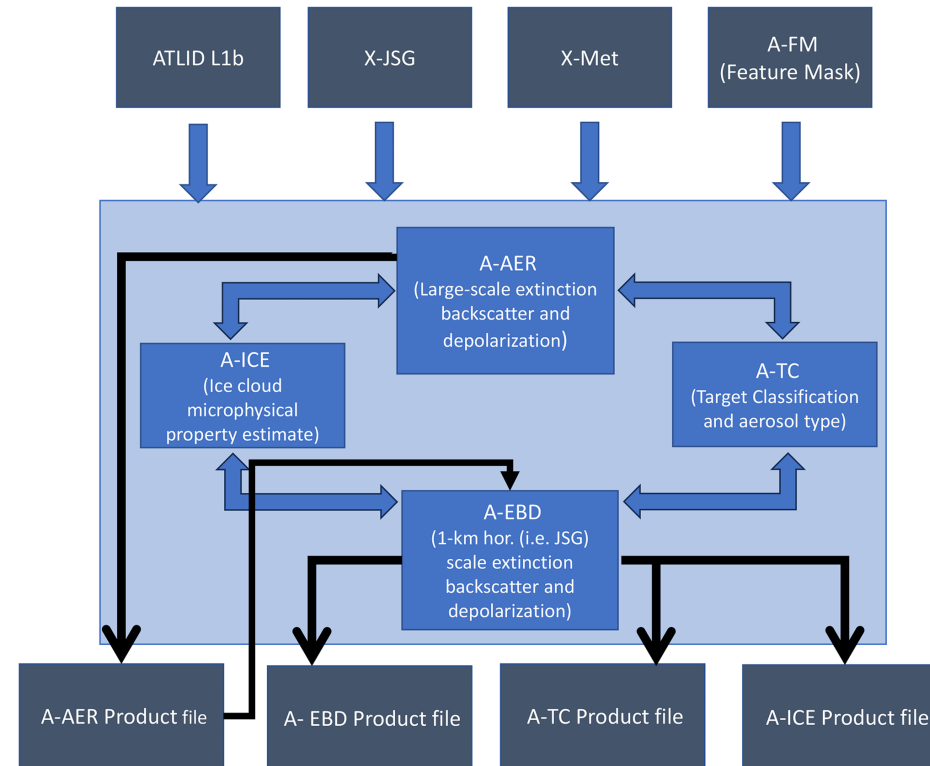
Nishizawa, T., et al.: Algorithm to retrieve aerosol optical properties using lidar measurements on board the EarthCARE satellite, Atmos. Meas. Tech. Discuss., in review, 2024.

ESA A-PRO Processor (A-AER, A-EBD, A-TC)



products provided on JSG
feature-dependent smoothing
variable resolution
adaptive and configurable

ESA ATLID L2 products have
variable resolution
see Donovan et al. – Tuesday, 16:05



horizontally (~ 100 km)
and vertically (~ 300 m)
smoothed
classic retrieval

high res. (~ 1 km)
medium res. (~ 50 km)
low res. (~ 100 km)
optimal estimation, layer-wise

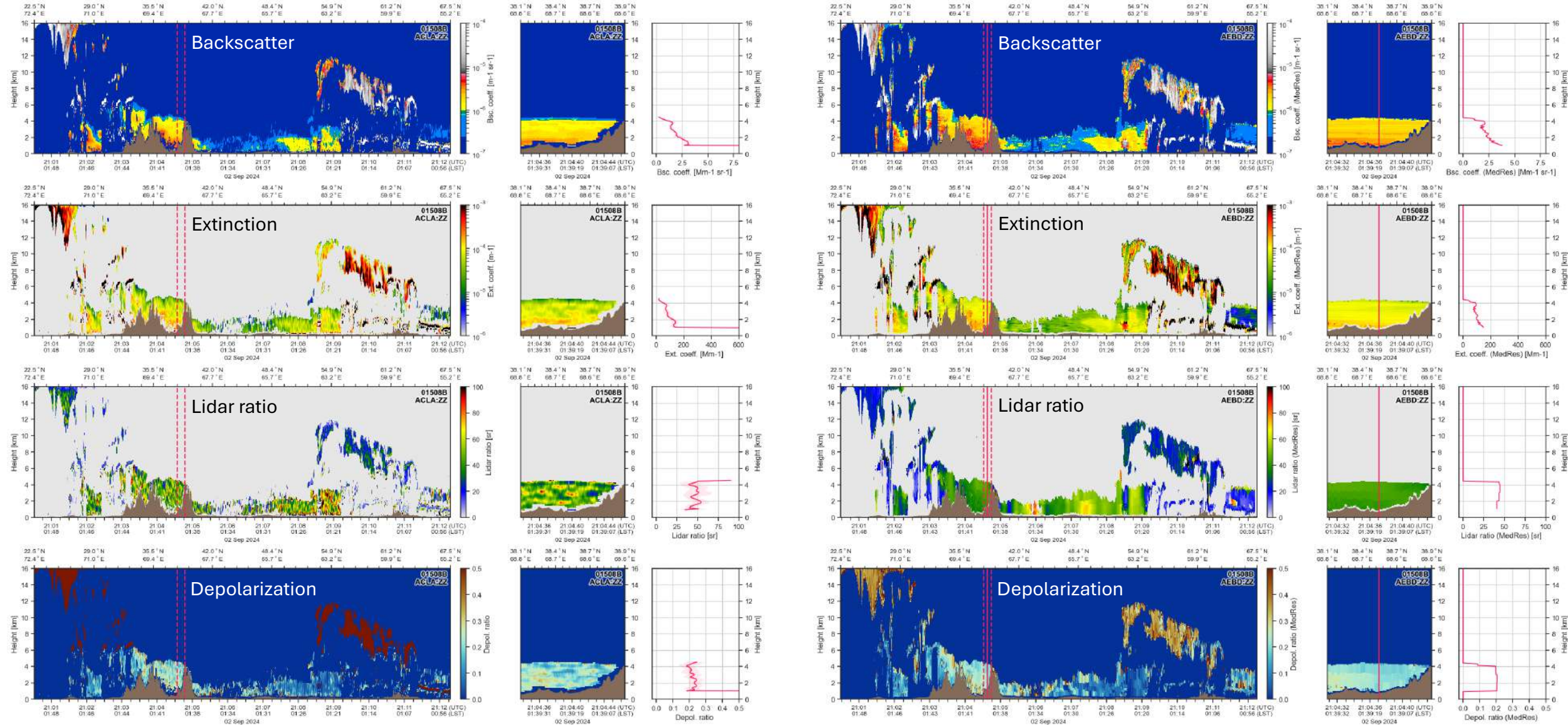
Donovan, D. P. et al.: The EarthCARE lidar cloud and aerosol profile processor (A-PRO): the A-AER, A-EBD, A-TC, and A-ICE products, Atmos. Meas. Tech., 17, 5301–5340, 2024.

Dushanbe, 2 September 2024, night, 50 km radius

01508B

JAXA ATL_CLA - AOP

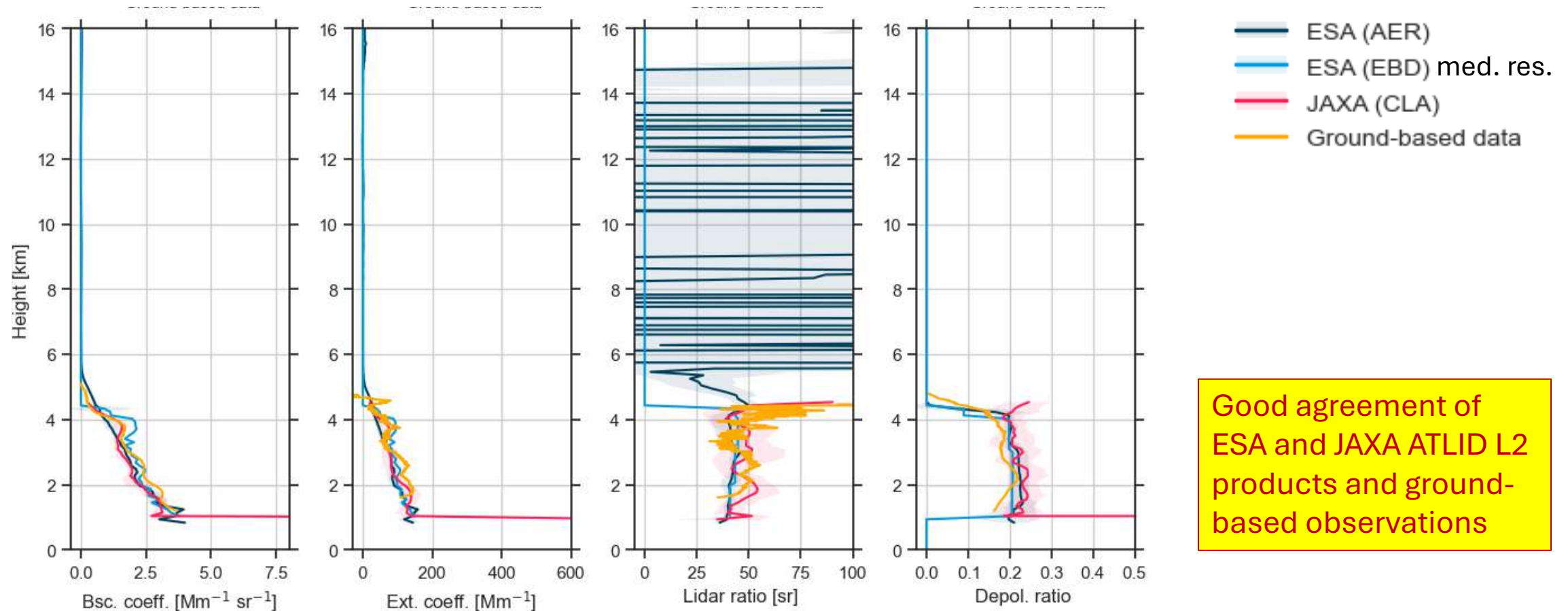
ESA A-EBD medium res.



ATLID Level 2 Comparison with L1 Baseline AE



Dushanbe, 2 September 2024, night, 50 km radius, 01508B

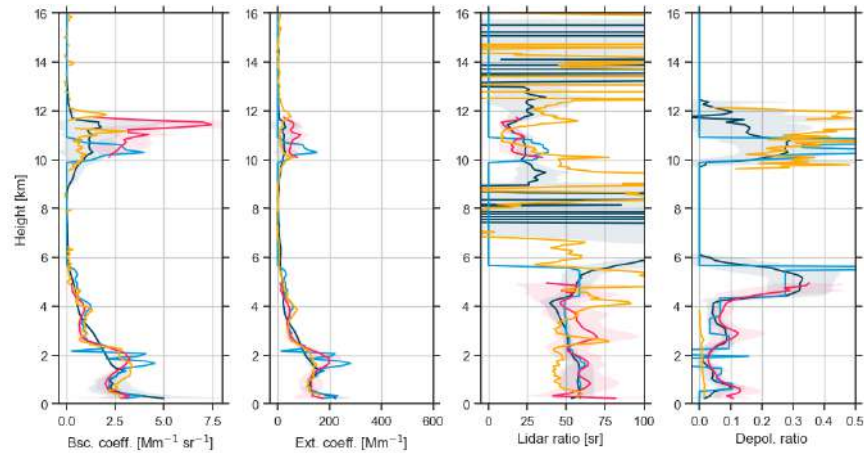


Good agreement of
ESA and JAXA ATLID L2
products and ground-
based observations

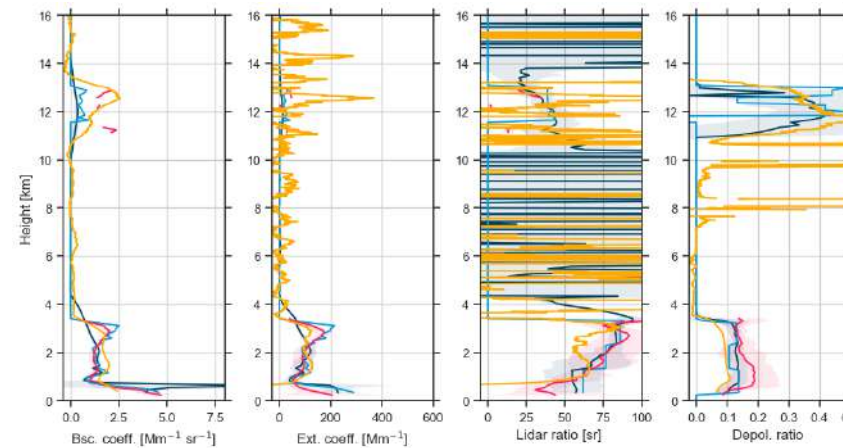
ATLID Level 2 Comparisons with L1 Baseline AE



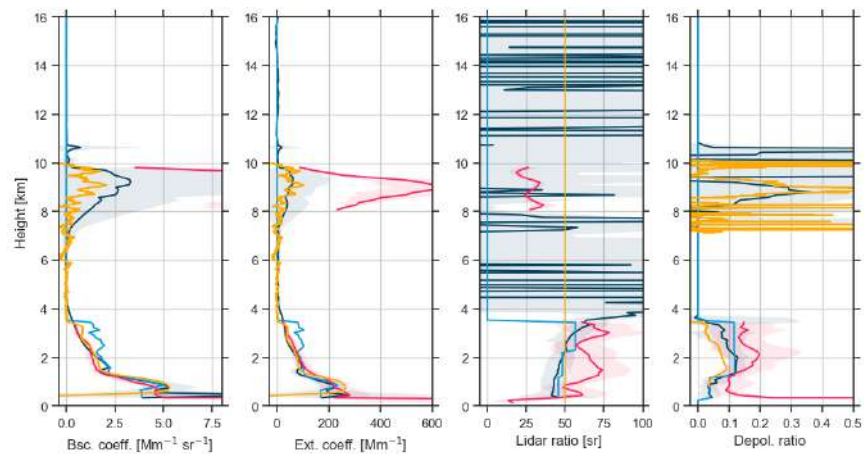
Cabauw, 2 September 2024, night, 50 km radius, med. res.01495B



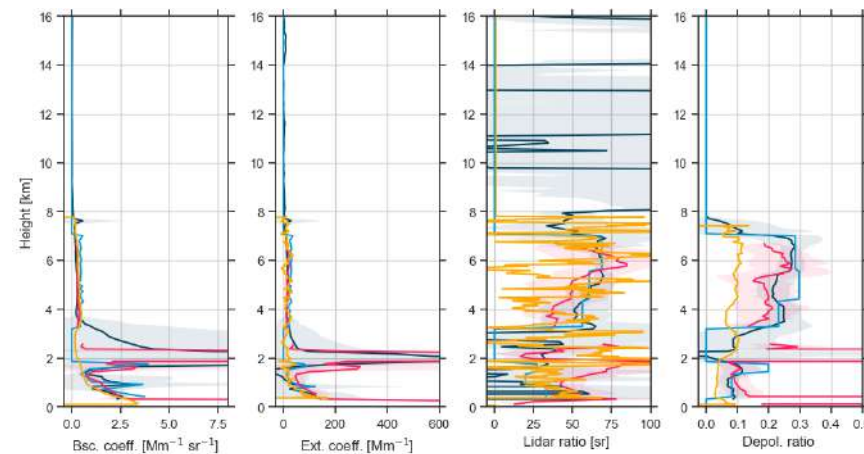
Mindelo, 29 November 2024, night, 100 km radius, med. res., 02866A



Leipzig, 18 September 2024, day, 50 km radius, med. res., 01752D



Koganei, 20 December 2024, night, 50 km radius, med. res., 03201B



- First comparisons show good agreement of ESA and JAXA ATLID aerosol products
- Products have different resolution according to the different averaging strategies
 - might be challenging for users
 - but can also be helpful for the different applications (fixed vs adapted resolution)
- Next steps:
 - more cases, statistical comparisons
 - comparison of layer products
 - comparison of aerosol classification / typing

We encourage the Cal/Val teams to work with the different ESA and JAXA products!

Special thanks to Manuel Ángel Ruiz Saldaña (GMV) for reprocessing the Level 1 and ESA Level 2 data!

Thank you!

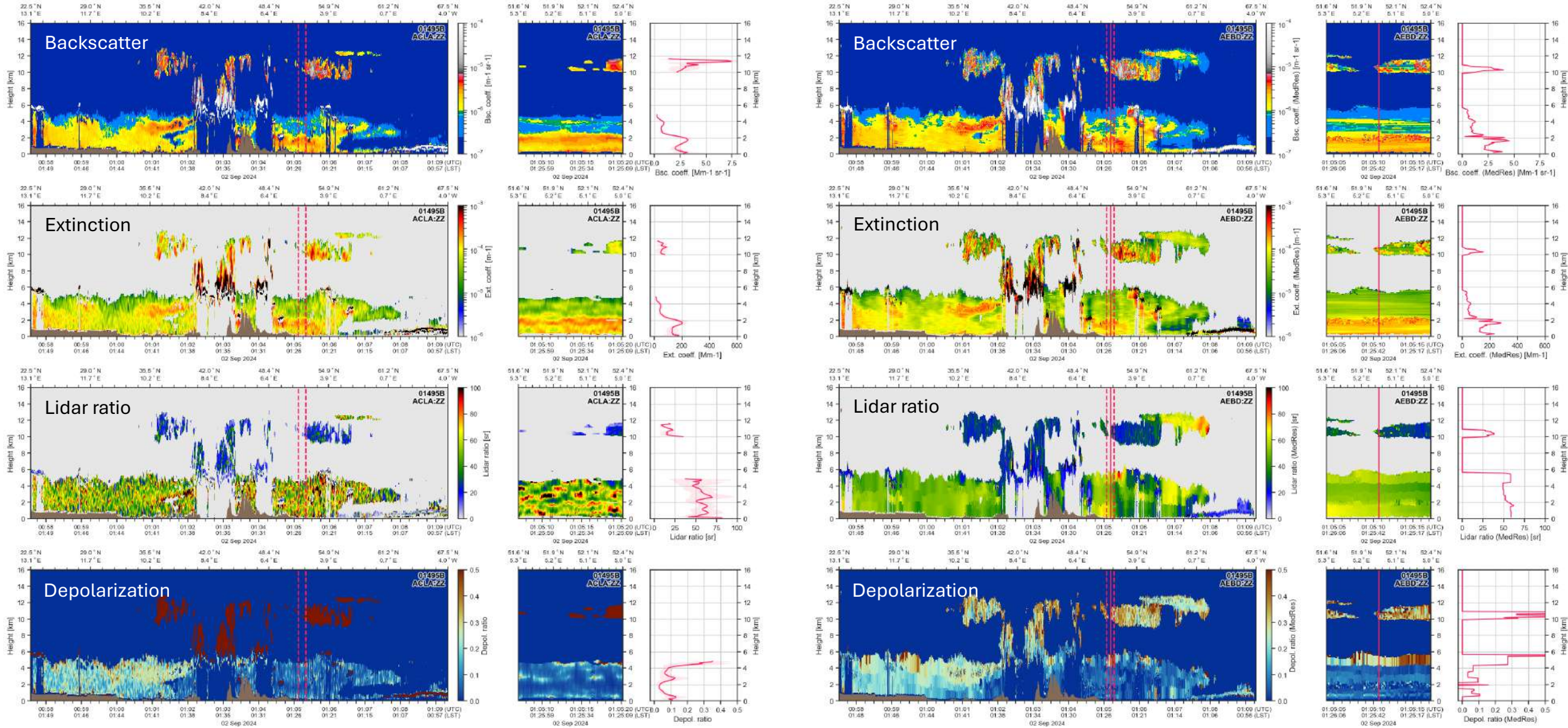
All cases

Cabauw, 2 September 2024, night, 50 km radius

01495B

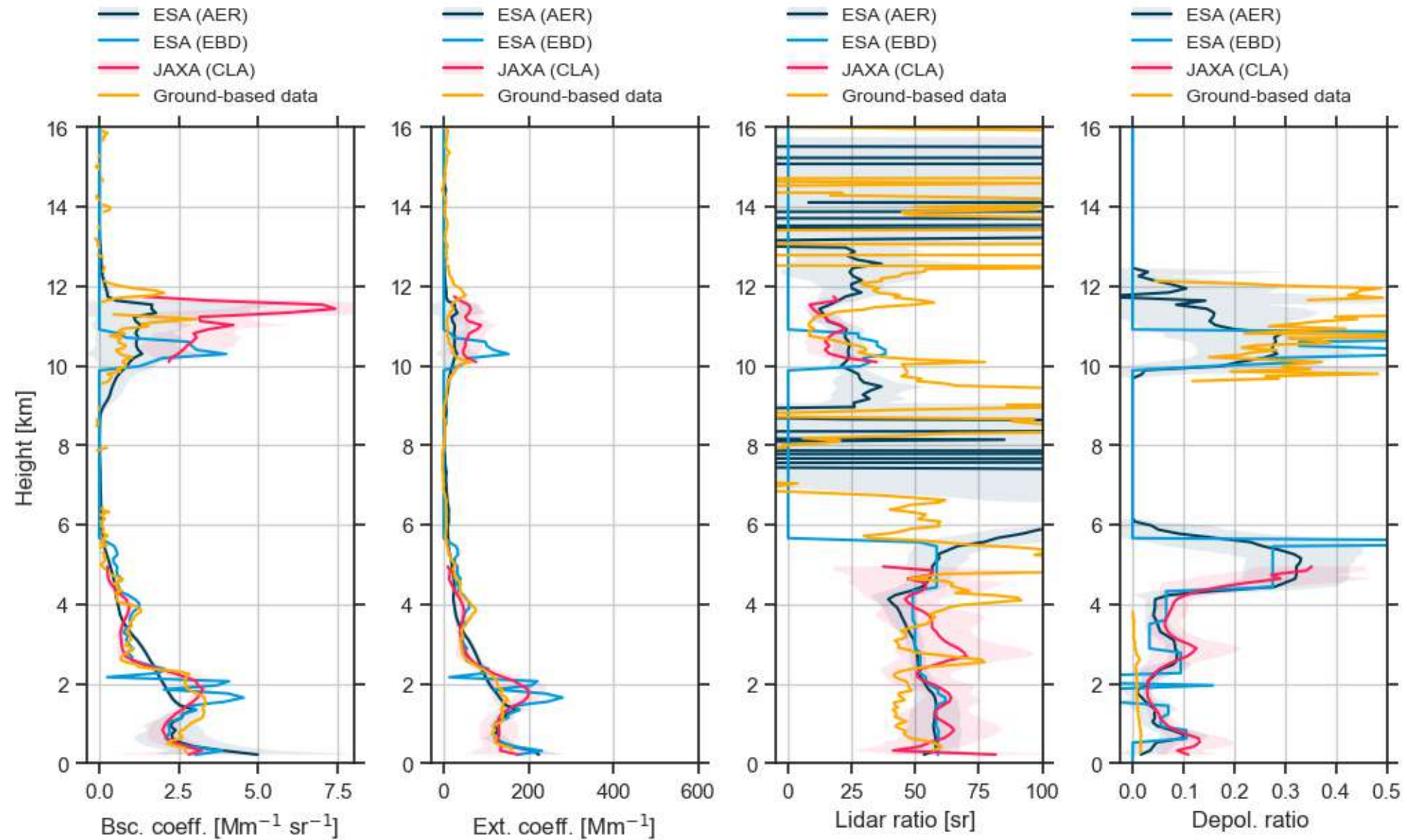
JAXA ATL_CLA - AOP

ESA A-EBD medium res.



Cabauw, 2 September 2024, night, 50 km radius, med. res.

01495B

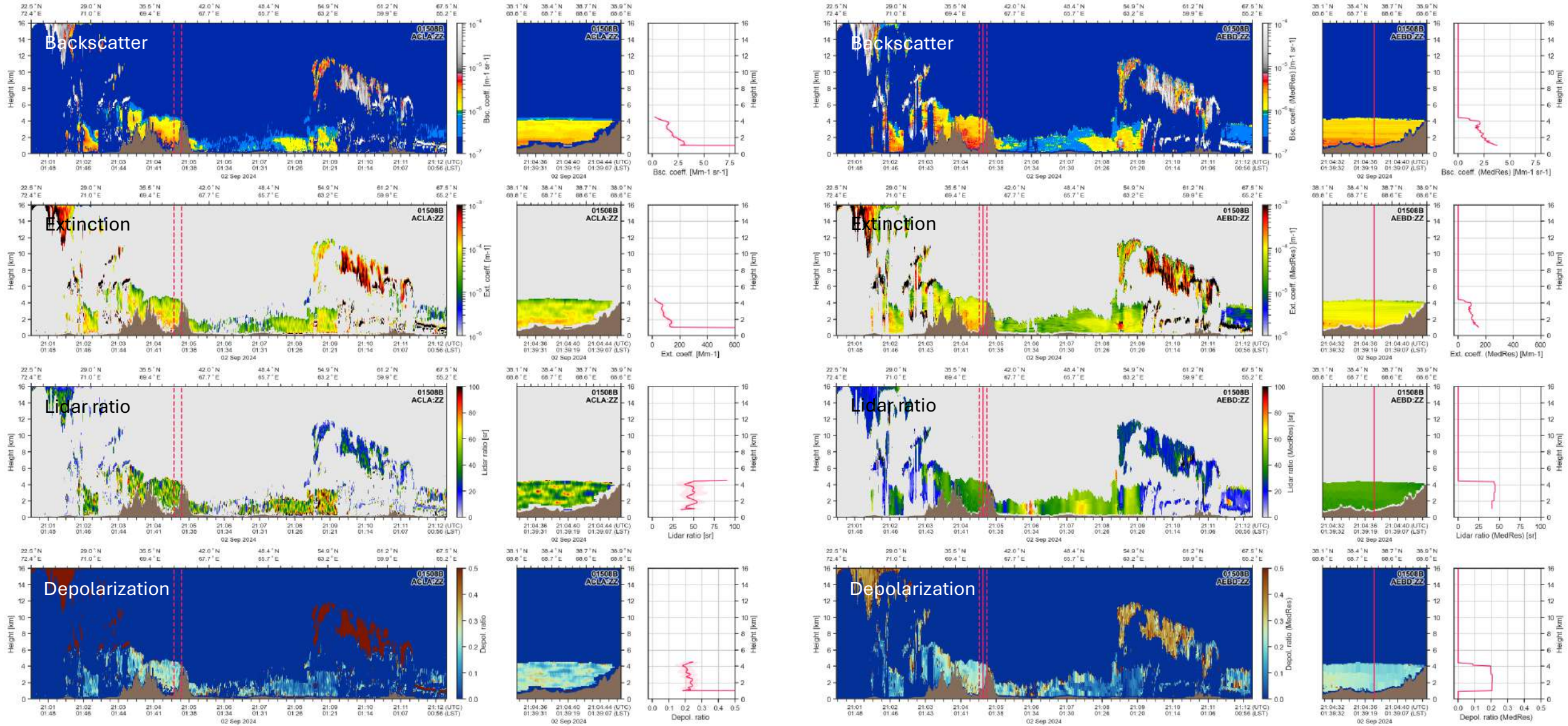


Dushanbe, 2 September 2024, night, 50 km radius

01508B

JAXA ATL_CLA - AOP

ESA A-EBD medium res.

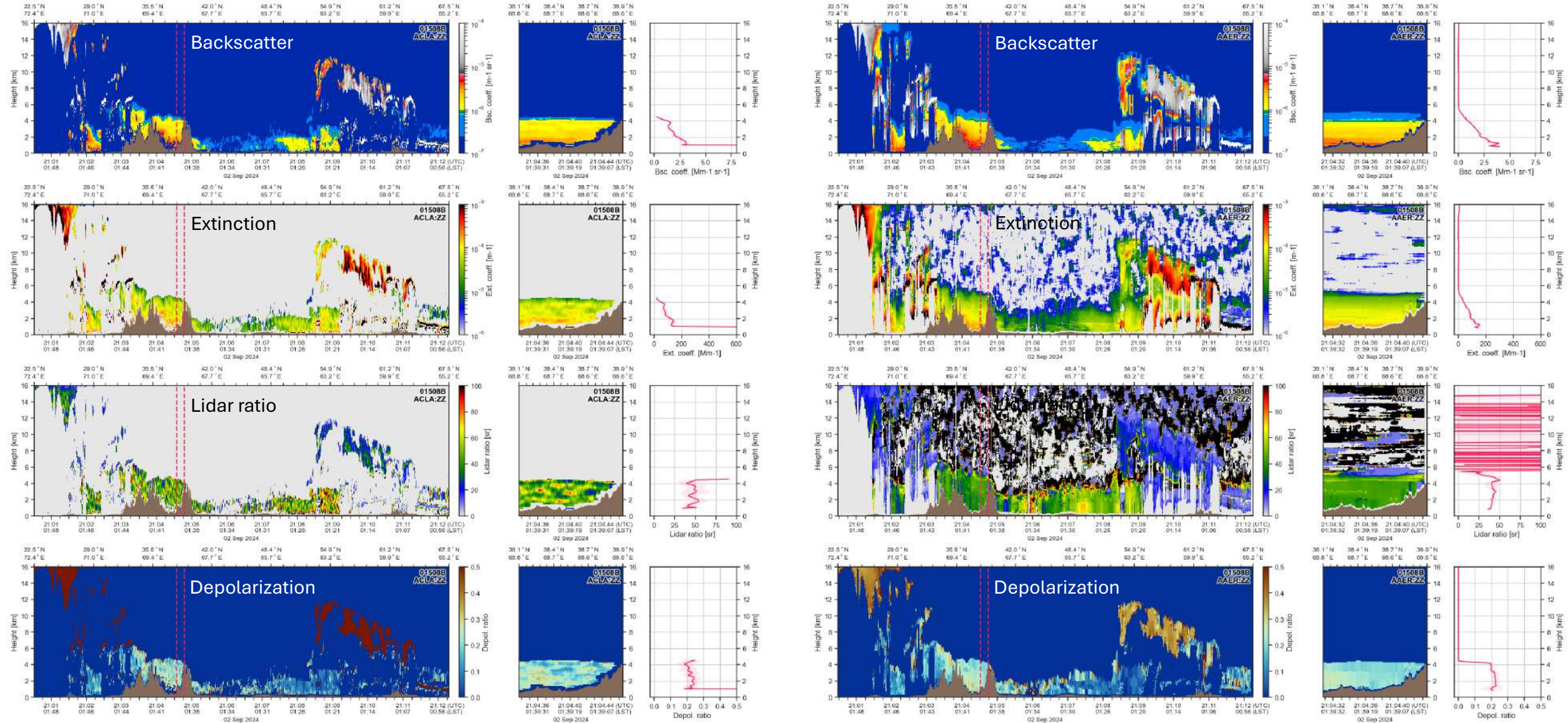


Dushanbe, 2 September 2024, night, 50 km radius

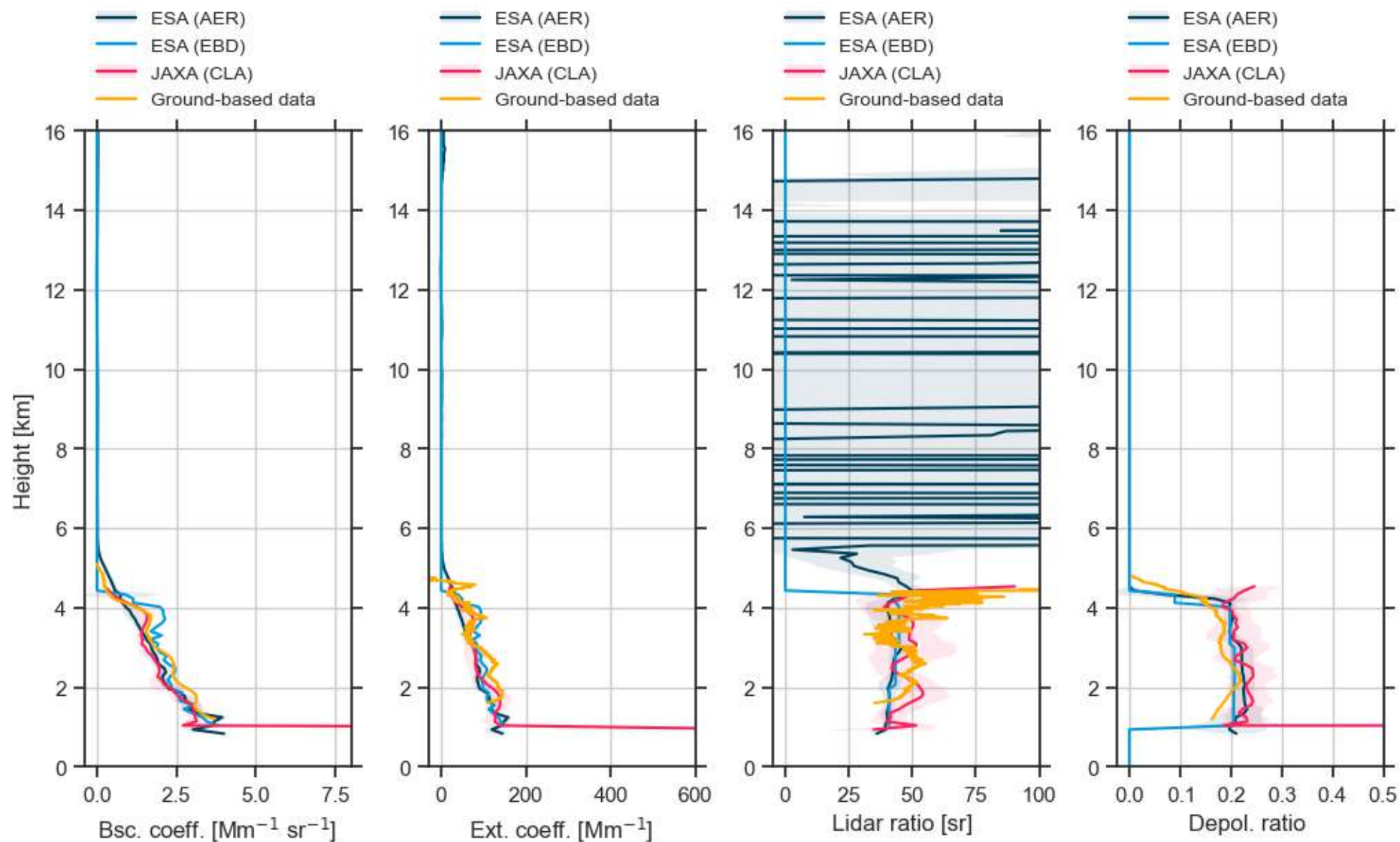
01508B

JAXA ATL_CLA - AOP

ESA A-AER



Dushanbe, 2 September 2024, night, 50 km radius, med. res.
01508B

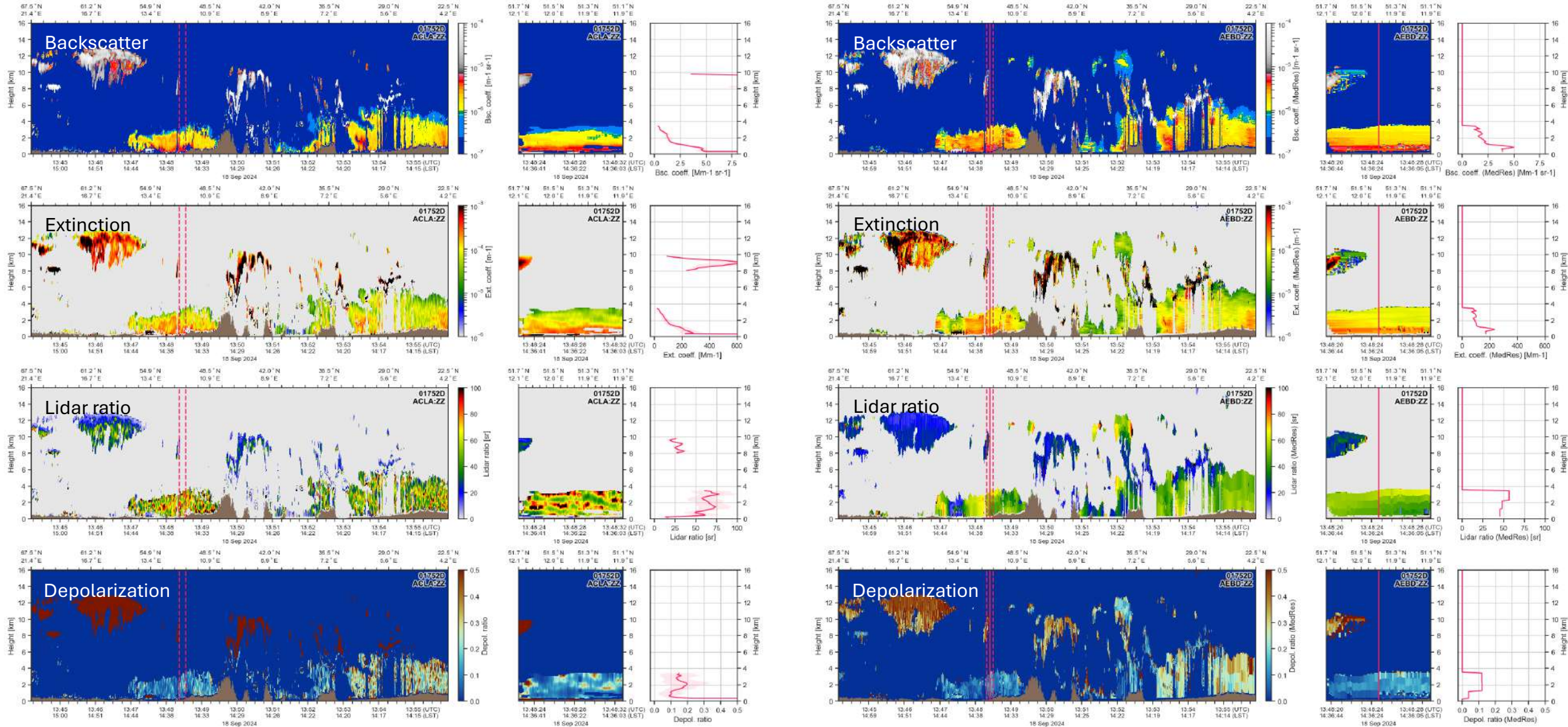


Leipzig, 18 September 2024, day, 50 km radius

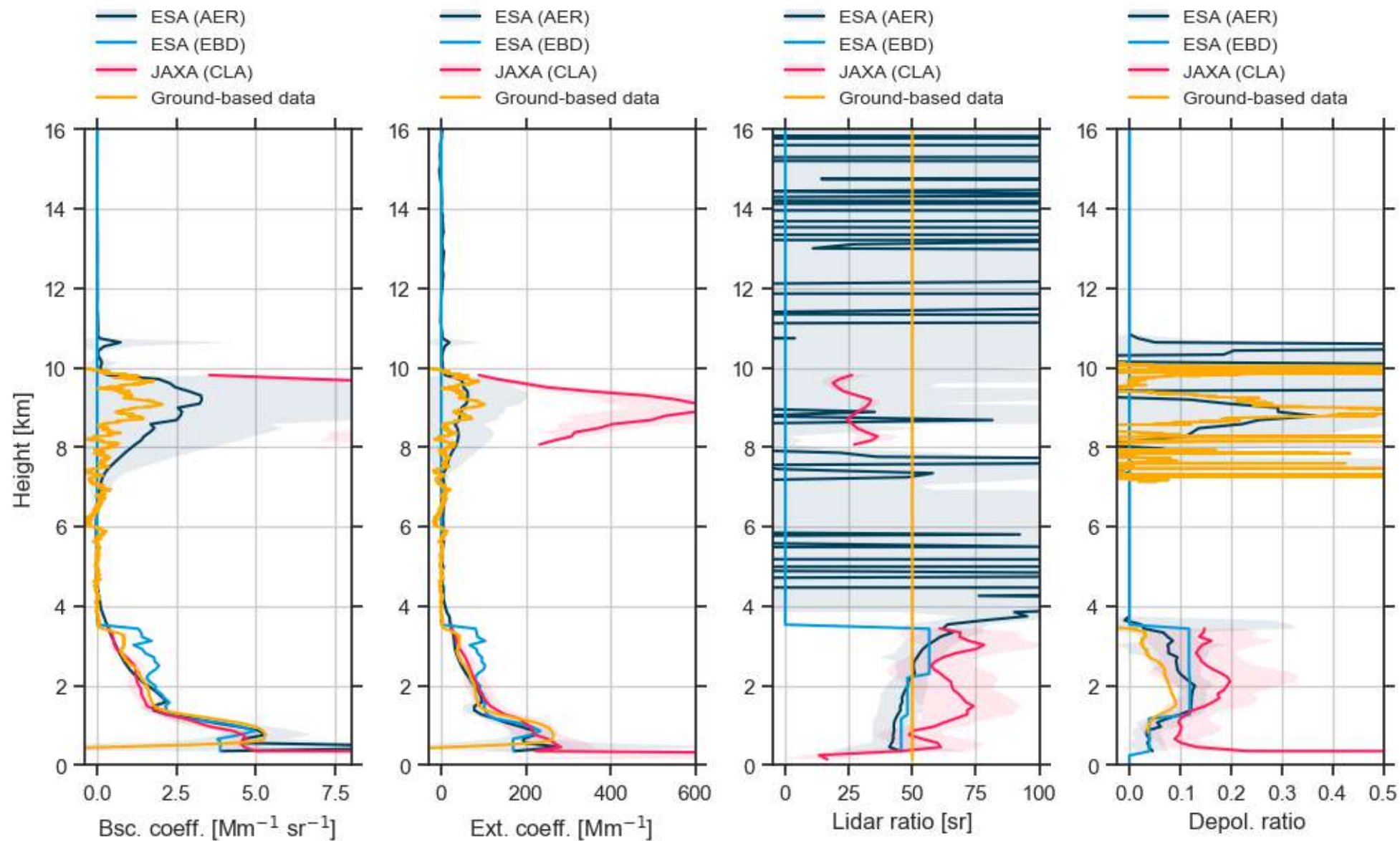
01752D

JAXA ATL_CLA - AOP

ESA A-EBD medium res.



Leipzig, 18 September 2024, day, 50 km radius, med. res.
01752D

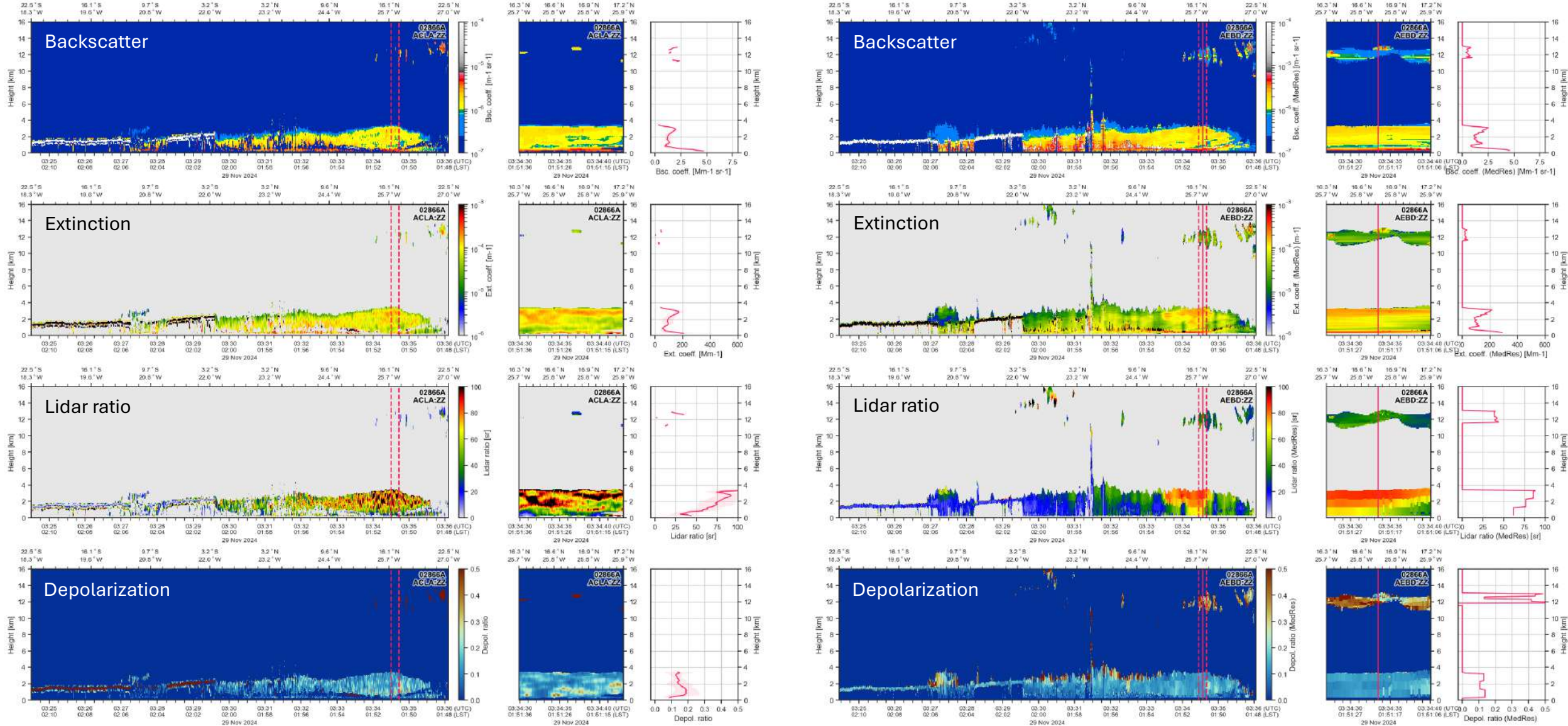


Mindelo, 29 November 2024, night, 100 km radius

02866A

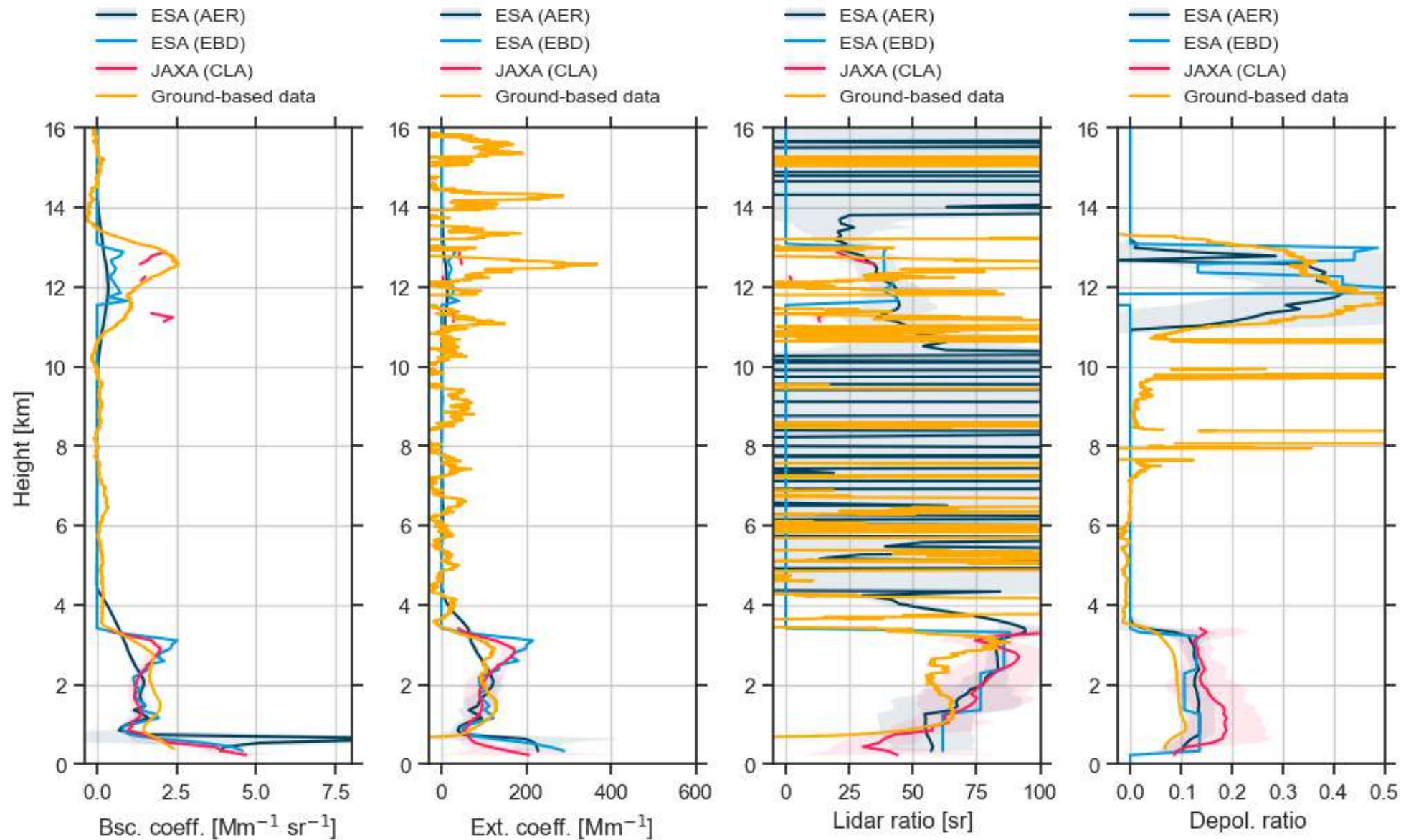
JAXA ATL_CLA - AOP

ESA A-EBD medium res.



Mindelo, 29 November 2024, night, 100 km radius, med. res.

02866A

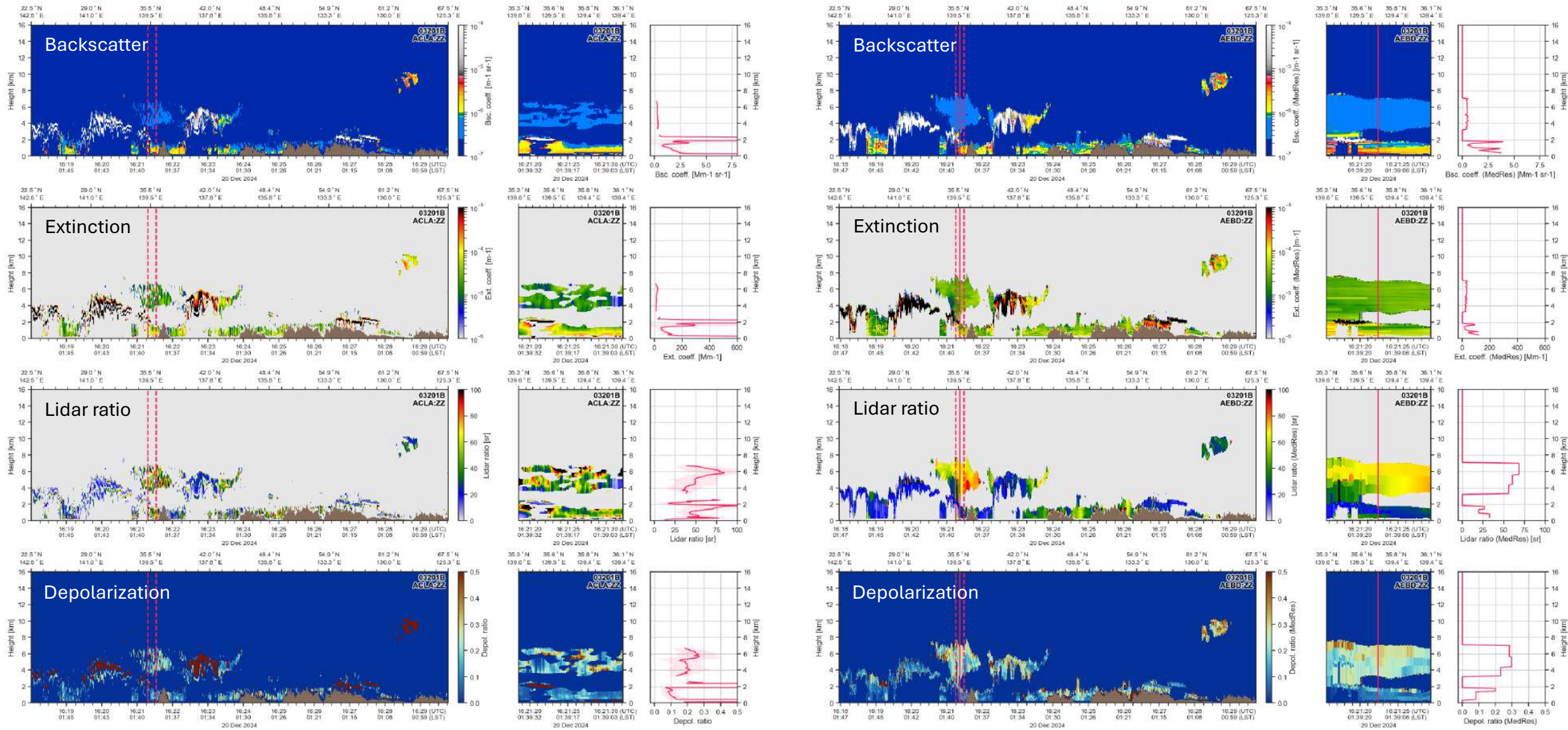


Koganei, 20 December 2024, night, 50 km radius

03201B

JAXA ATL_CLA - AOP

ESA A-EBD medium res.



Koganei, 20 December 2024, night, 50 km radius, med. res.

03201B

