

Validation of ATLID's L1/L2 optical data using airborne lidar measurements during the PERCUSION campaign

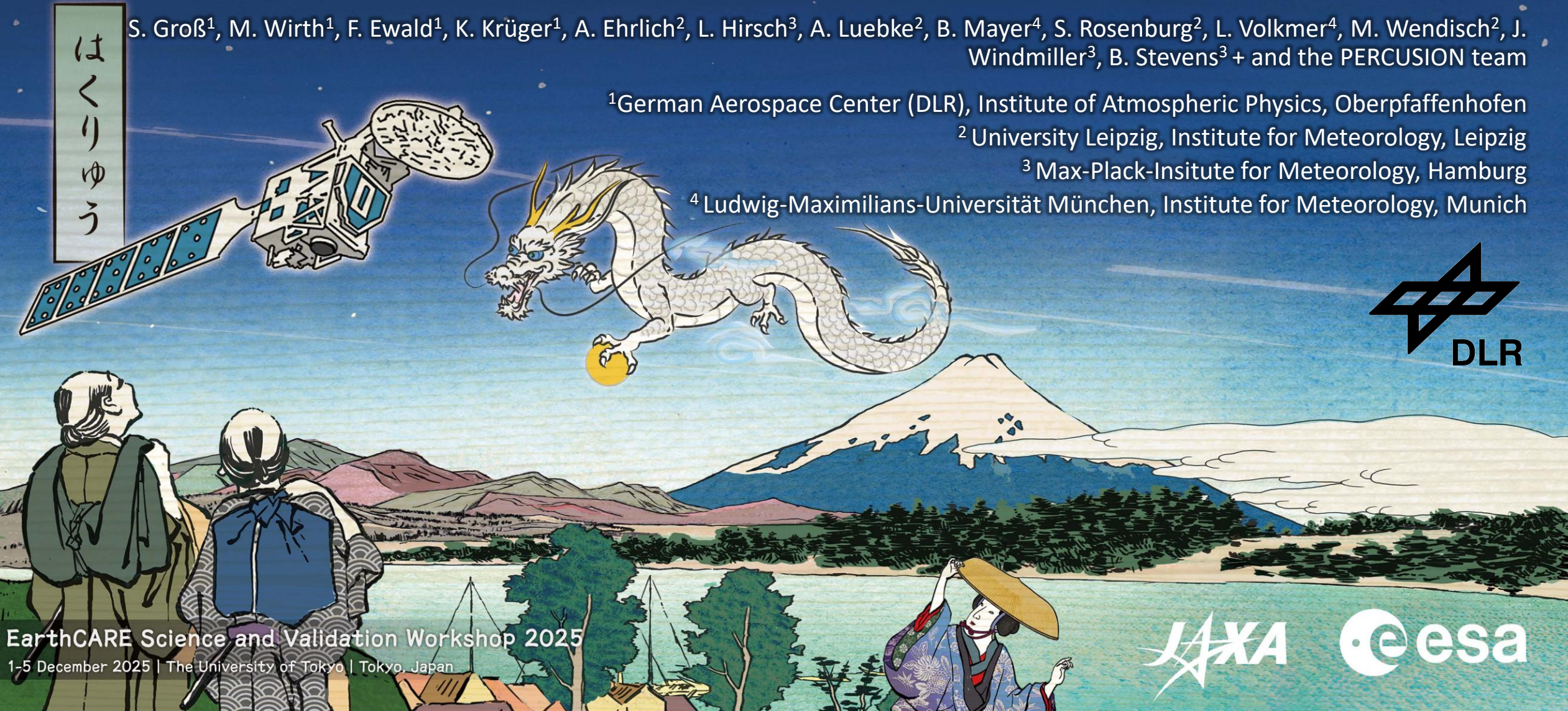
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EarthCARE Science and Validation Workshop 2025

1-5 December 2025 | The University of Tokyo | Tokyo, Japan

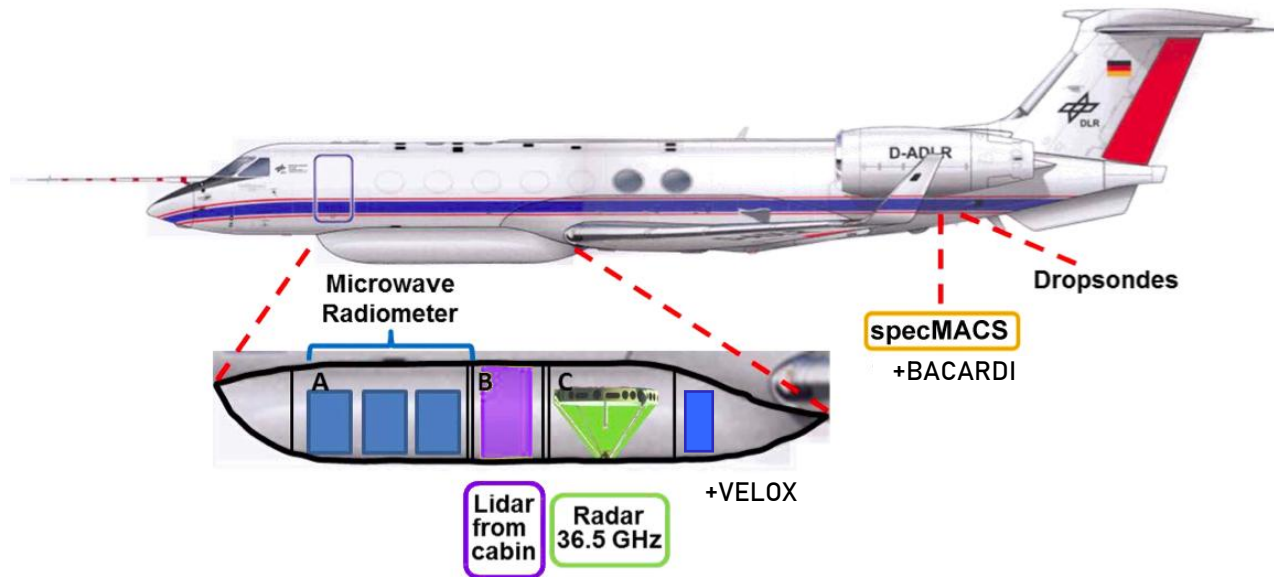




EarthCARE-like payload on HALO



- G550, max. alt 16 km / max. range: 8000 km
- In operation since 2012
- operated by DLR



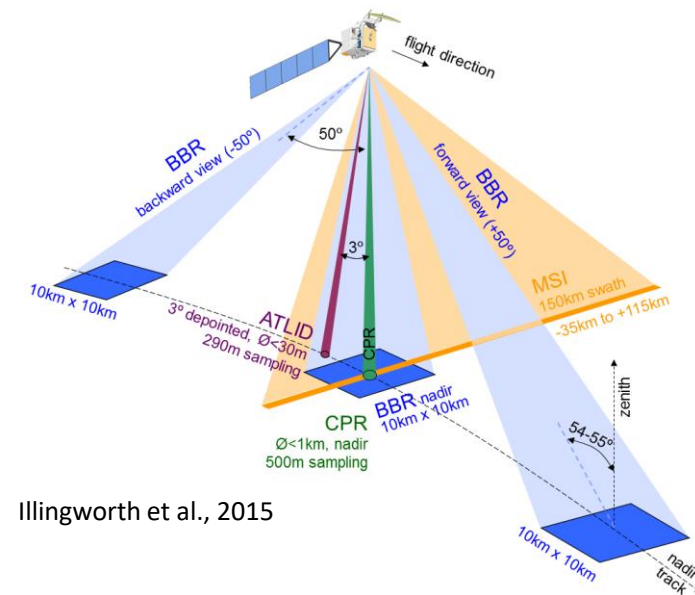
Scientific Instruments

HSRL-Lidar (WALES, 532 nm – Wirth et al. 2009)

Cloud Doppler Radar (MIRA, 35 GHz – Ewald et al. 2019)

Hyper-Spektral Imager (specMACS – Ewald et al. 2016)

Broadband Aircraft Radiometer (BACARDI – Ehrlich et al. 2023)



Illingworth et al., 2015

Instrumentation

HSRL-Lidar (ATLID)

Cloud-Profiling Radar (CPR)

Multi-Spektral Imager (MSI)

Broadband Radiometer (BBR)



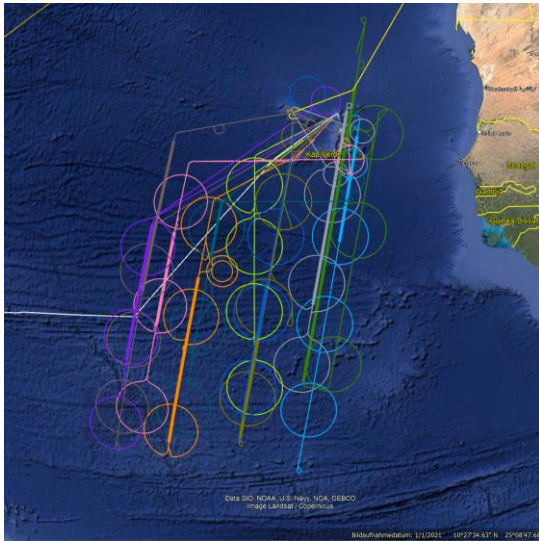
HALO PERCUSION campaign

Persistent EarthCARE underflight studies of the ITCZ and organized convection



Most comprehensive campaign for EarthCARE validation

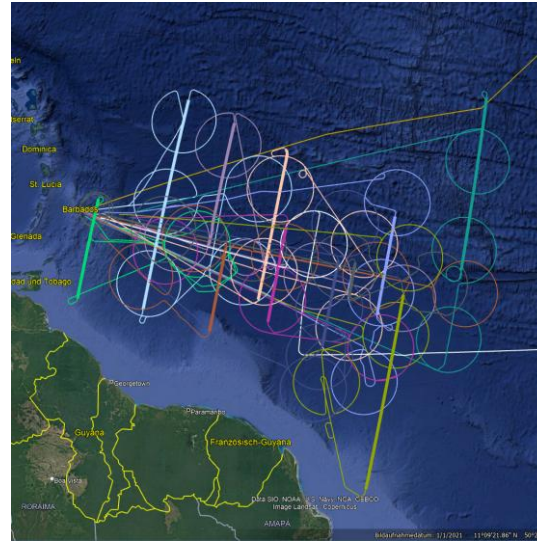
Sal, Cape Verde



8 August – 6 September 2024

- 10 EC underflights
- Coordination with
 - Mindelo ground station
 - ATR and King Air (in-situ)
 - RV METEOR

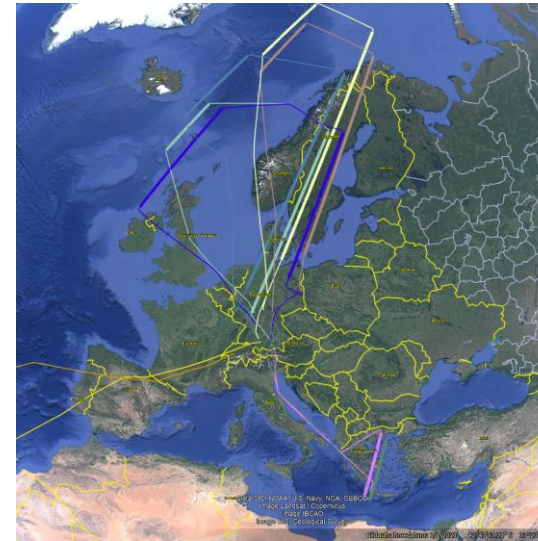
Barbados



6 – 29 September 2024

- 11 EC underflights
- Coordination with
 - BCO ground station
 - RV METEOR

Oberpfaffenhofen



5 – 19 November 2024

- 12 EC underflights
- Coordination with
 - ACTRIS ground stations
 - BAe (FAAM)

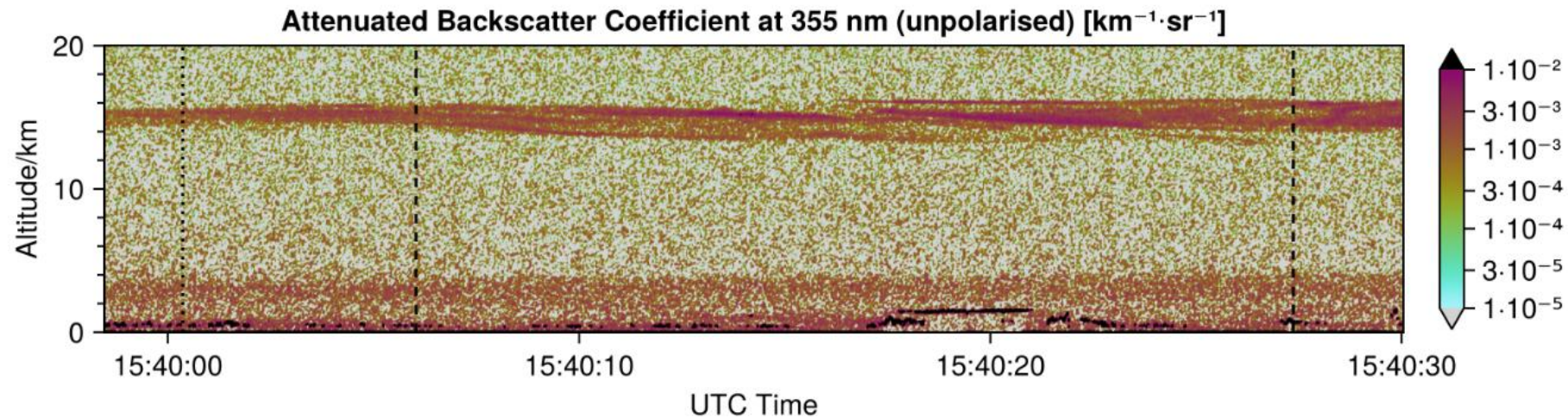
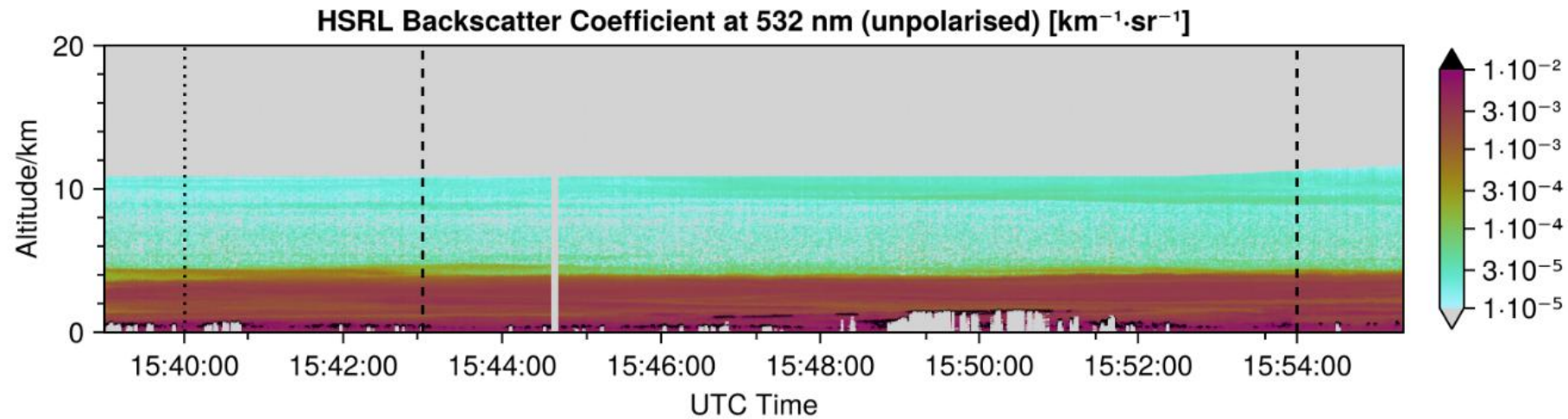
**3 Location
30 Flight
33 Underpasses
290 Flight hours**

<https://orcestra-campaign.org/operation/halo.html>





ATLID L1 (A-NOM) comparison with WALES – Example 13 Aug. 2024



OF: 01193E



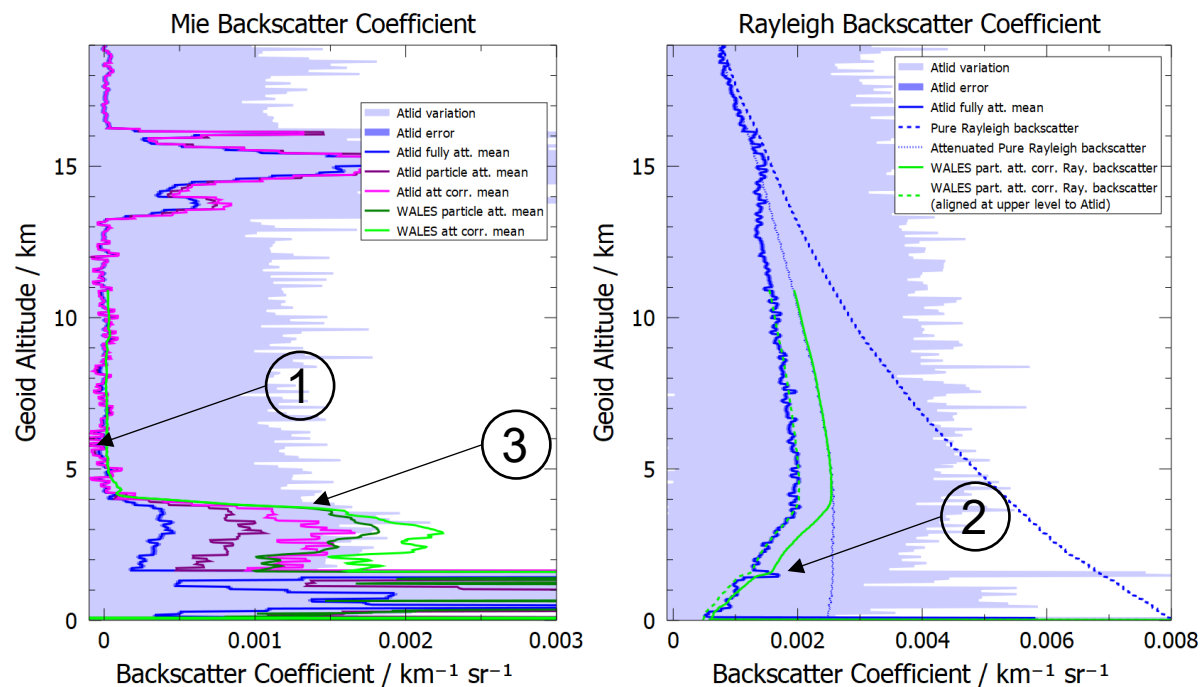


ATLID L1 comparison with WALES – Example 13 Aug. 2024

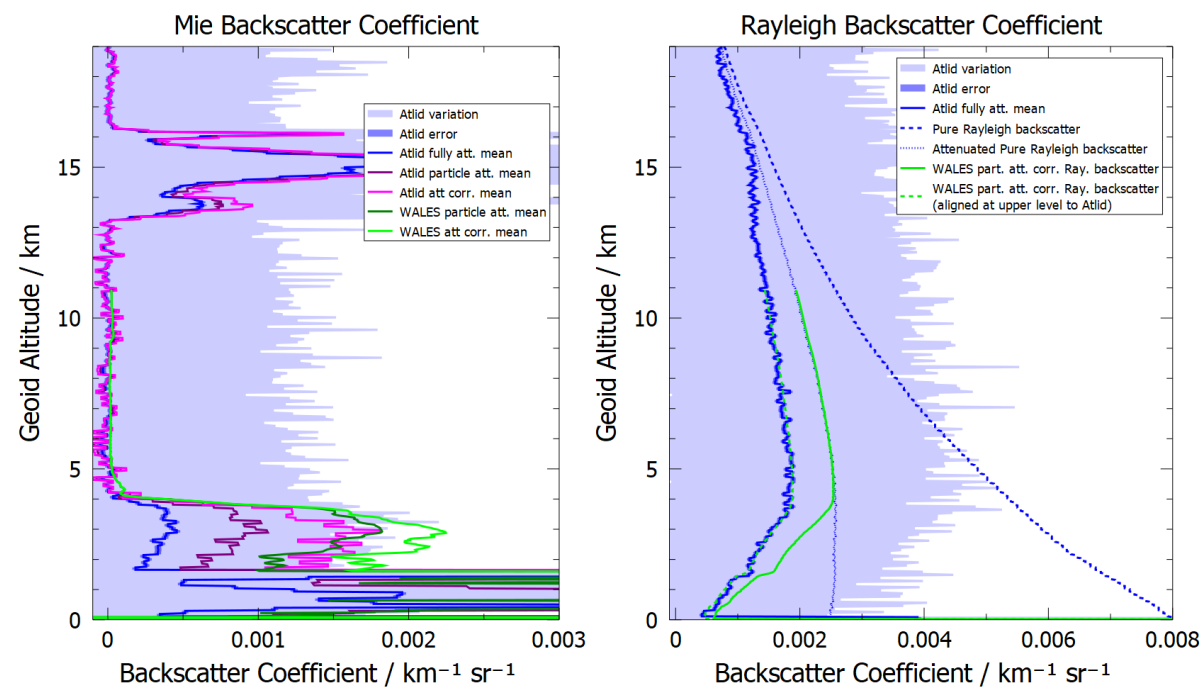


ATLID: original data (BL: AA OF: 01193E)

ATLID: released data (BL: AD OF: 01193E)



1. Mie signal slightly below zero in clean atmosphere region
2. Rayleigh signal shows cross talk (boundary layer clouds)
3. Lower backscatter within dust layer



1. Still: Mie signal slightly below zero in clean atmosphere
2. Improvement: Cross talk significantly improved
3. Improvement: Increased backscatter within dust layer

The present work includes preliminary data (not fully calibrated/validated and not yet publicly released) of the EarthCARE mission that is developed by the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA). The analysis has been performed in the context of the EarthCARE Validation Team.

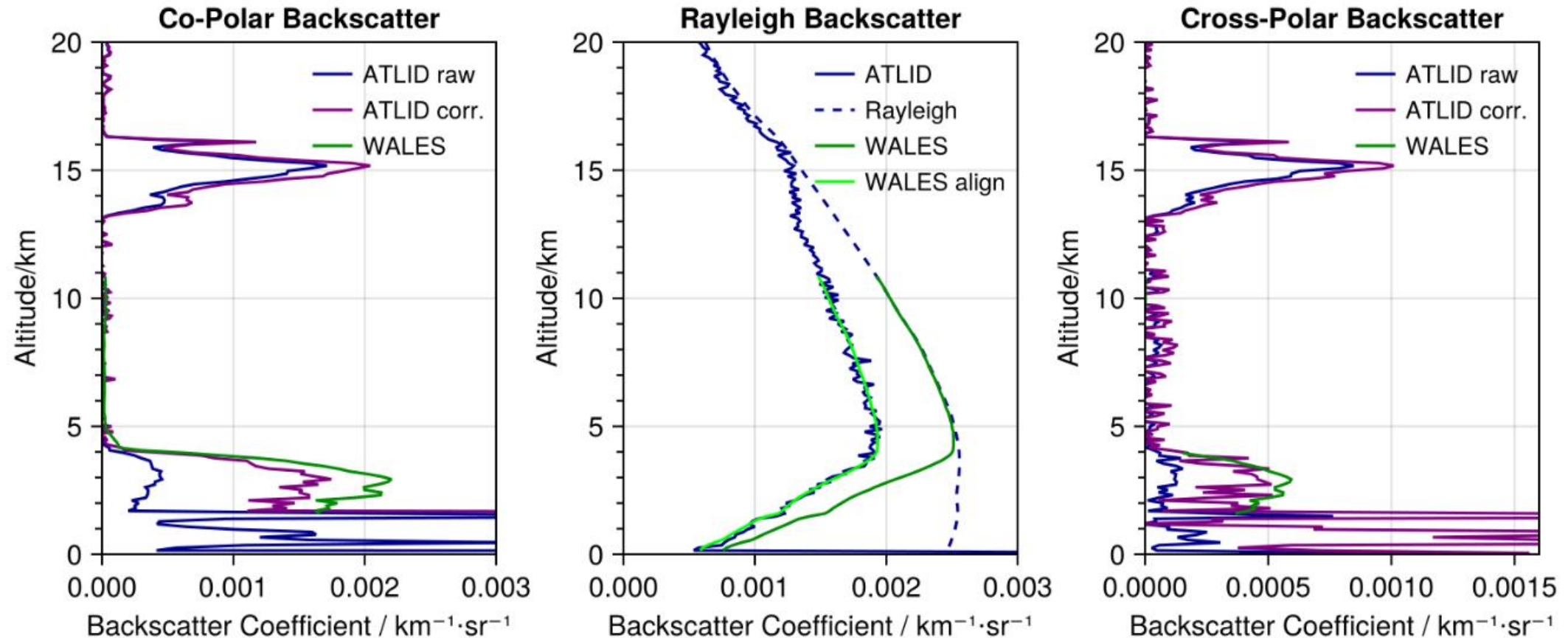




ATLID L1 comparison with WALES – Example 14 Nov. 2024



ATLID: released data (BL: BA OF: 01193E)



Direct comparisons of airborne and spaceborne measurements let to **corrections** and **algorithm improvements** already in the **commissioning phase**.

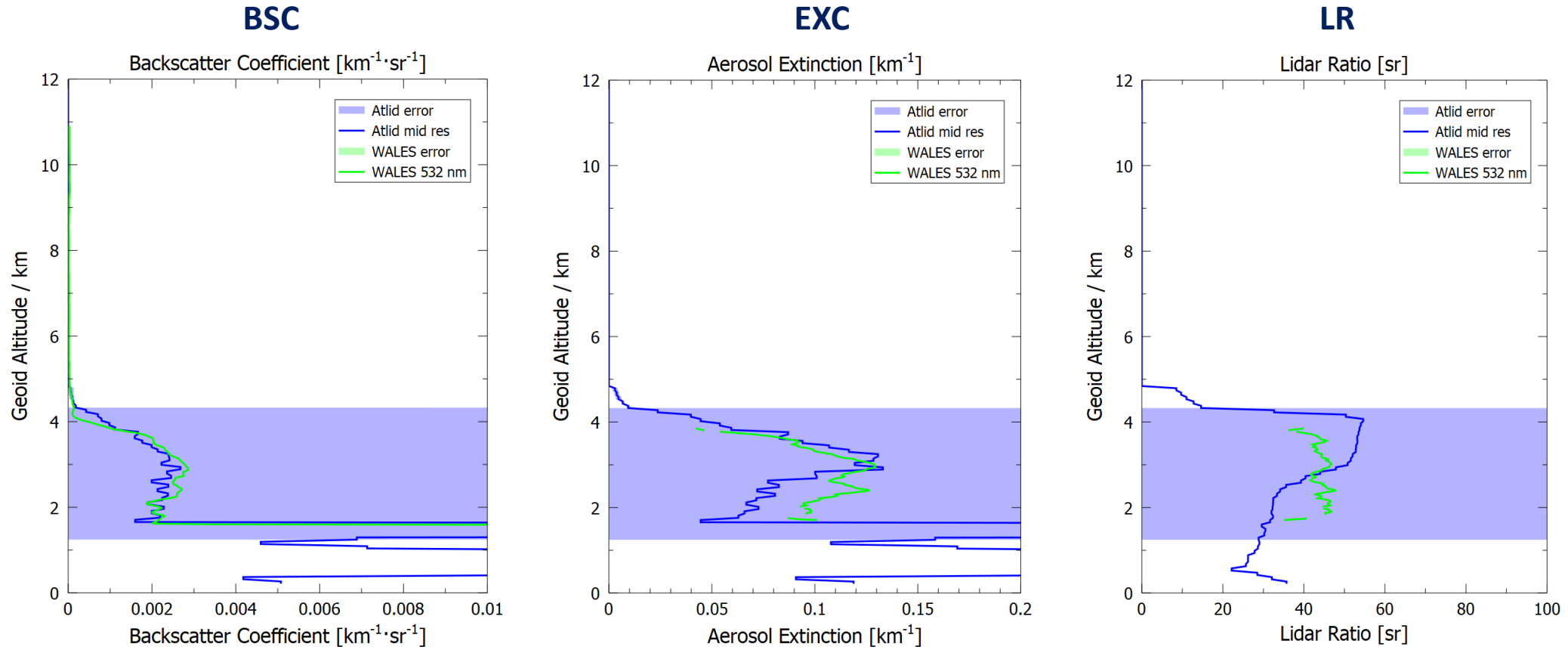




ATLID L2 optical properties comparison with WALES – Example 13 Dec. 2024



ATLID L2 EBD data BL: AD OF: 02640D



The present work includes preliminary data (not fully calibrated/validated and not yet publicly released) of the EarthCARE mission that is developed by the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA). The analysis has been performed in the context of the EarthCARE Validation Team.

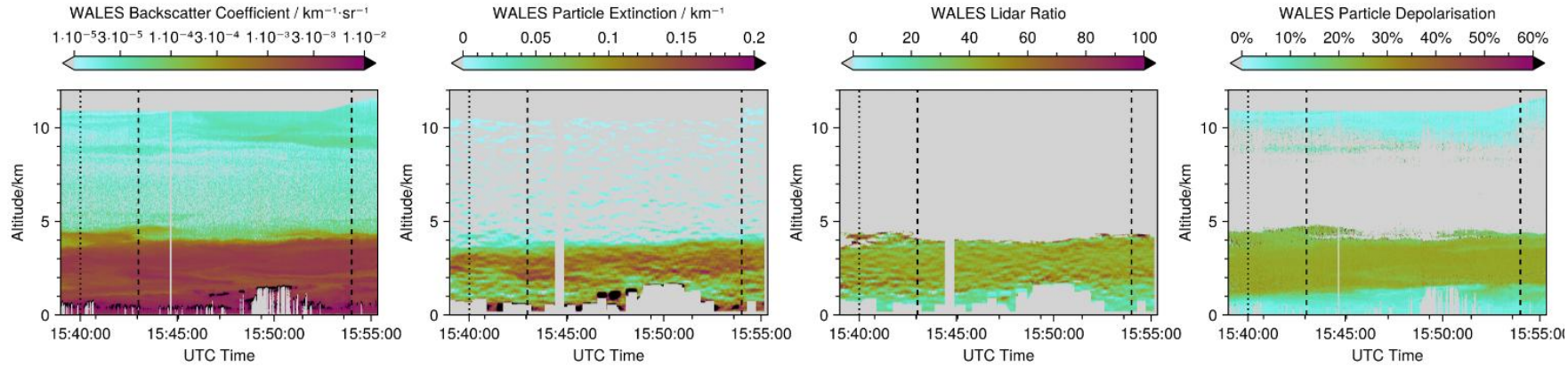




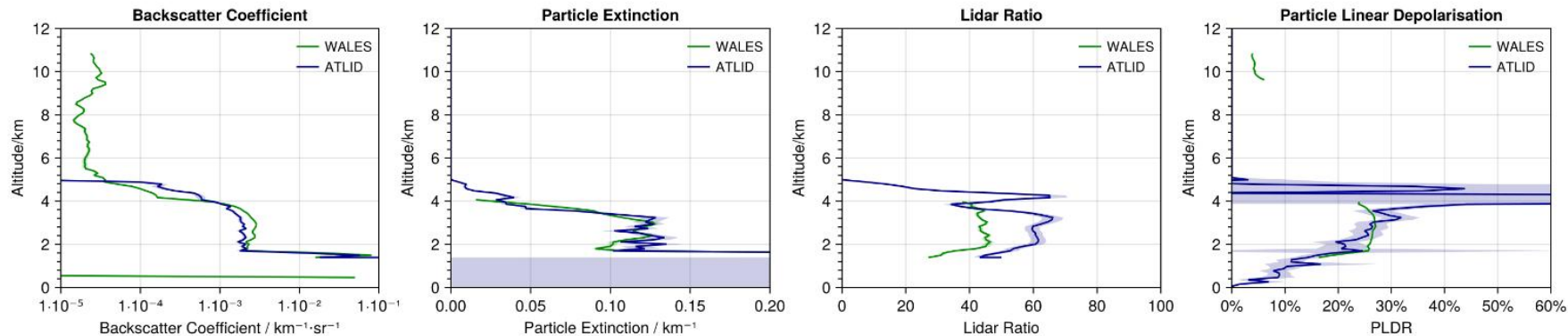
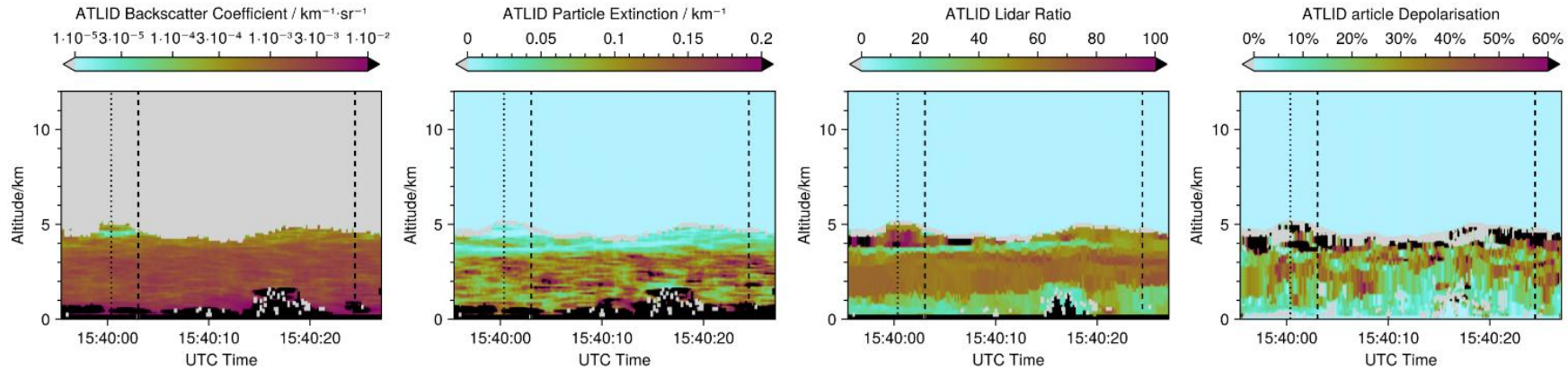
ATLID L2 optical properties comparison with WALES – Example 14 Nov. 2024



WALES



ATLID





Summary



- Airborne remote sensing measurements for validation performed in summer and fall 2024
 - Well characterized payload **to mimic EarthCARE**
 - Covering most of **target scenes** identified for validation
- EarthCARE – PERCUSION comparisons let to **improvements of ATLID data** products
 - Strength of airborne measurements to **fully characterize measurement scene**
- **Coordination with other platforms** (ground-based, ship, aircraft) for cross-calibration

→ 2 EarthCARE-related Sessions at EGU2026, Vienna, 3–8 May 2026 (**deadline for Abstract submission 15 January 2026**)

GI4.2

Lidar remote sensing of the atmosphere ▶

Co-organized by AS5/PS7/ST3

AS3.11

EarthCARE's Second Year in Orbit: Advances in Cloud, Aerosol and Radiation Science ▶

Co-organized by GI4



MAX-PLANCK-INSTITUT
FÜR METEOROLOGIE

