Assessment of ATLID stratospheric performance using ground-based lidars and satellite limb aerosol profiling

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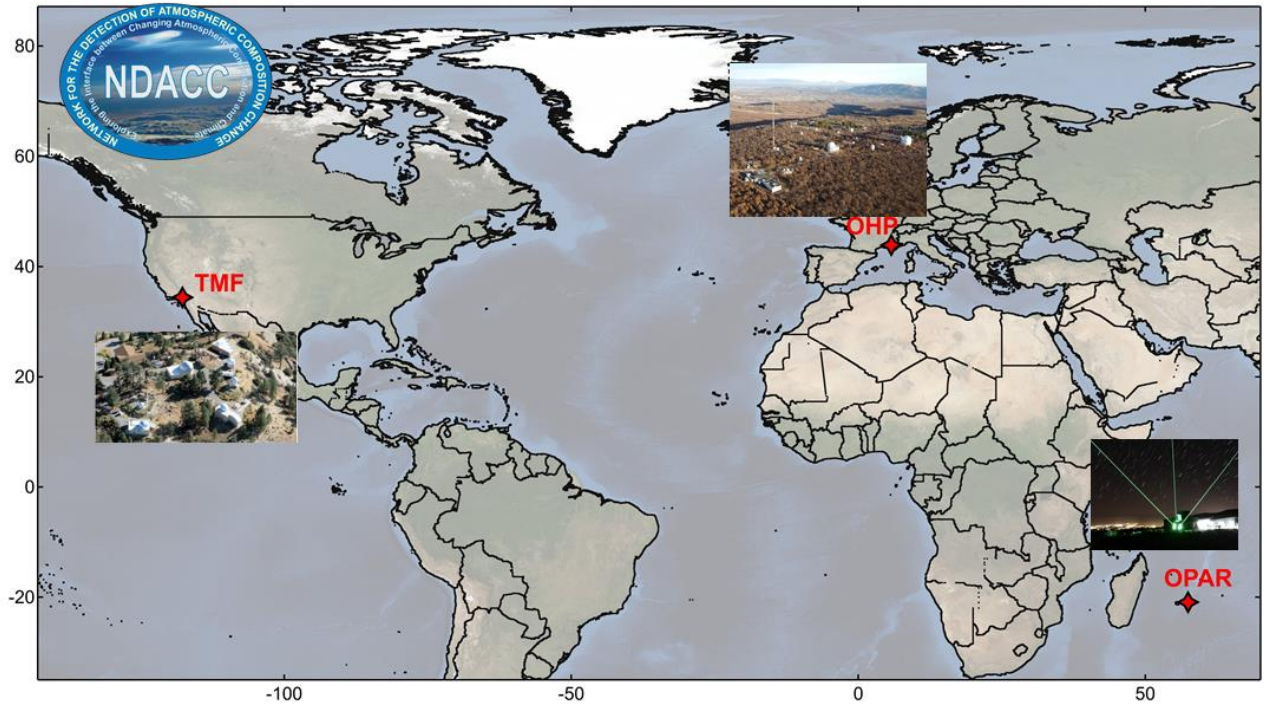
Cal/Val data sets and approach

Stratospheric aerosol lidars 355 nm (NDACC)

- OHP (Observatoire de Haute Provence)
- OPAR (Maido, La Reunion island)
- TMF (Table Mountain Facility, California)

➢ Regular operation with 2 – 5 measurement nights per week
➢ ATLID collocation criteria: 50 km radius, 12 h time window
➢ 18 collocations



Balloon-borne Aerosol Backscatter sonde (AZOR)

- Suborbital flights from Orleans, France

Satellite instruments (extinction profiling)

- OMPS-LP 869 nm (limb scattering)
- ISS SAGE III 384 nm (solar occultation)

ATLID L1B AC+AD baselines

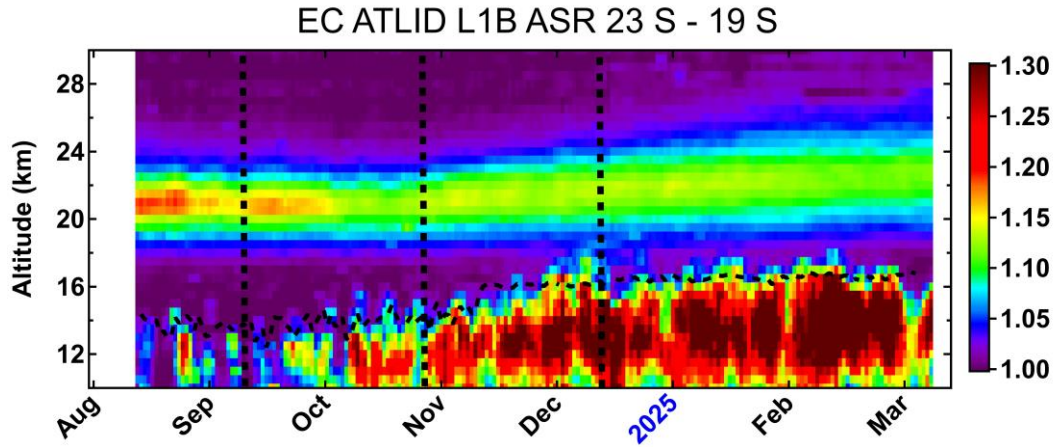
Attenuated Scattering Ratio

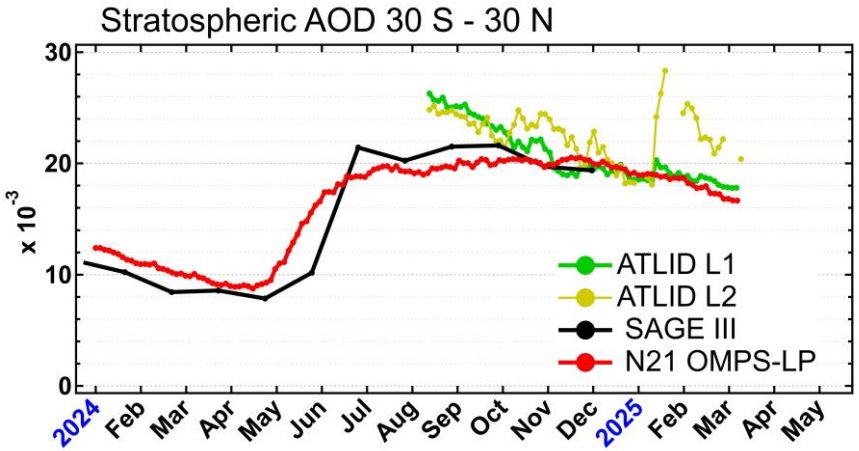
$$ASR = \frac{Mie_{copolar} + Mie_{crosspolar} + Rayleigh}{Rayleigh}$$

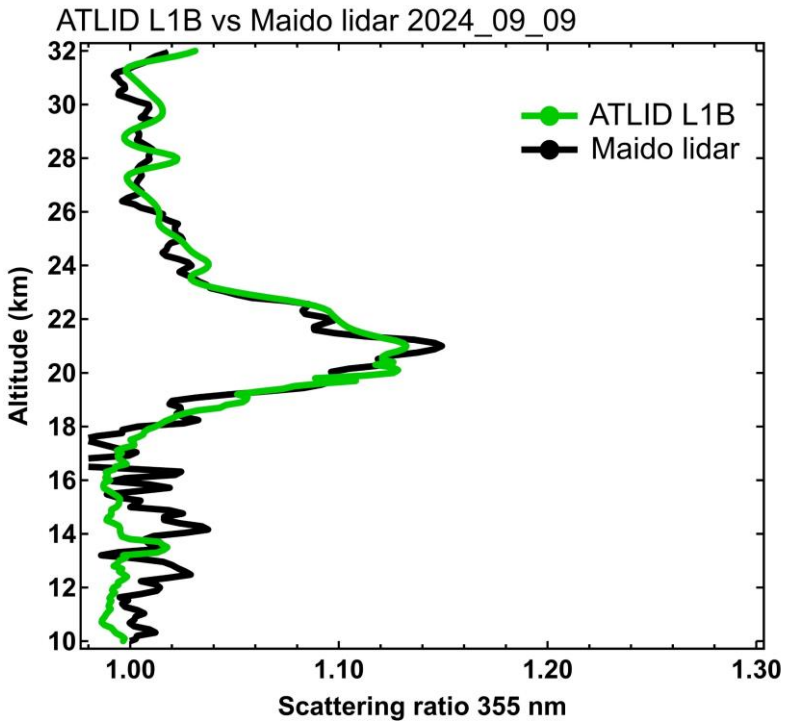
Stratospheric Aerosol Optical Depth

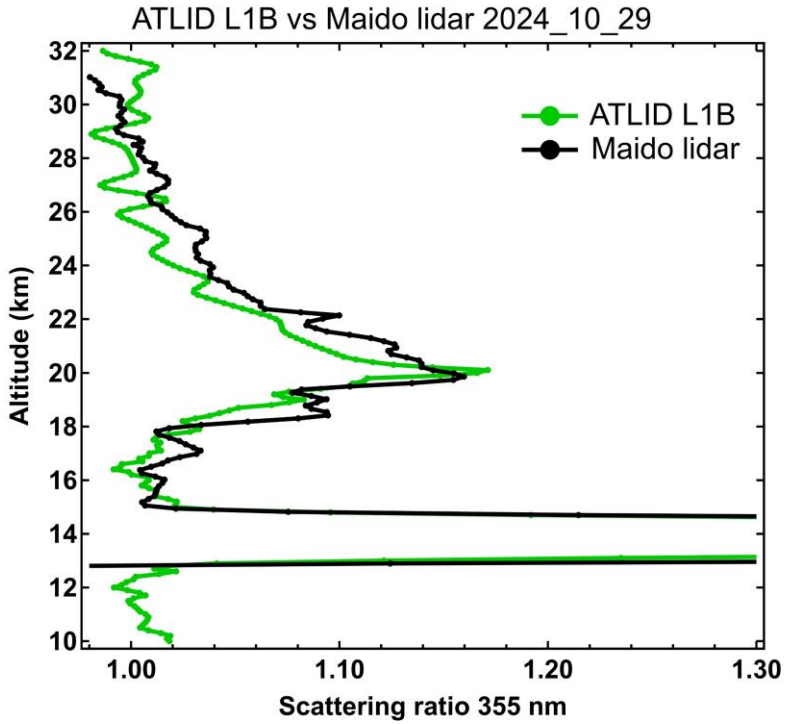
$$SAOD = LR \times \int_{Tropopause}^{30\,km} (Mie_{copolar} + Mie_{crosspolar})$$

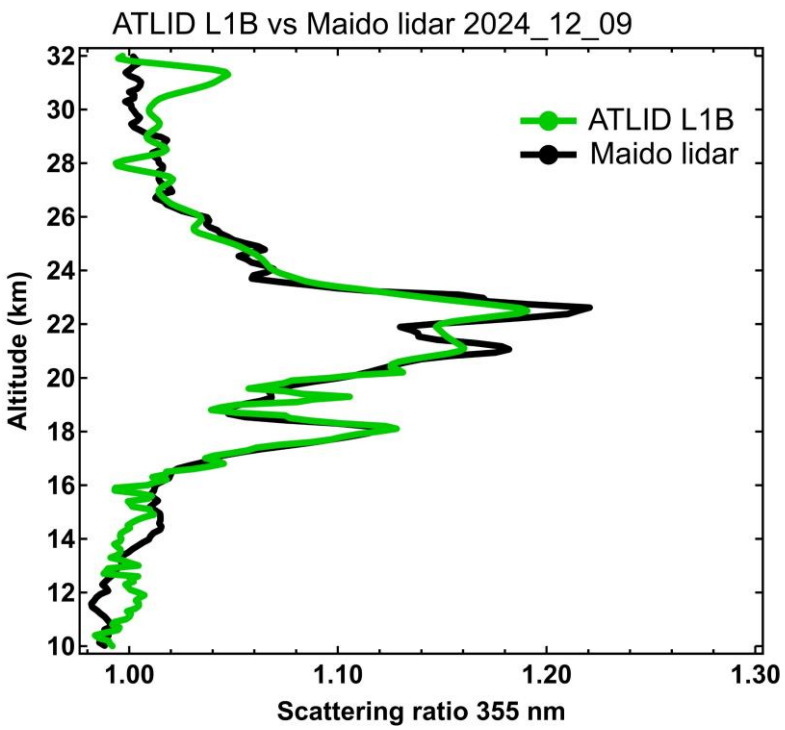
ATLID vs NDACC lidars: OPAR-Maido (21° S)



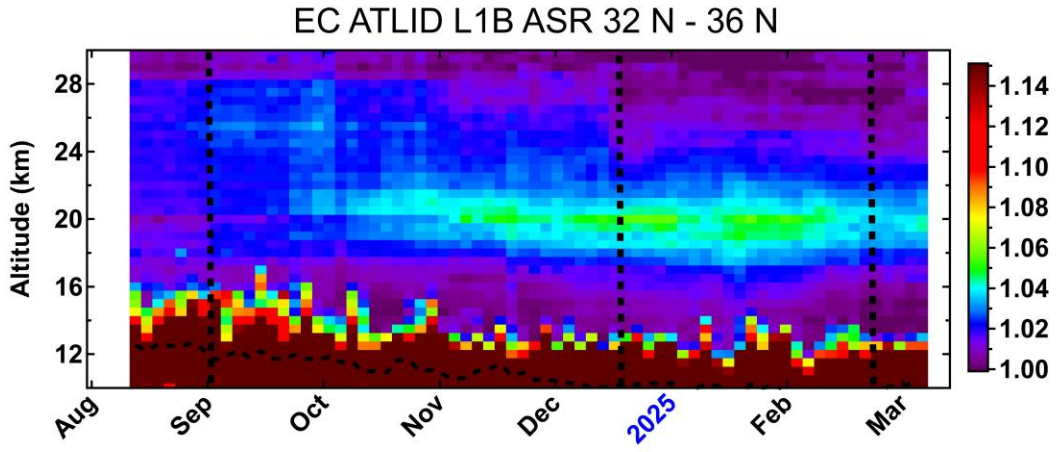


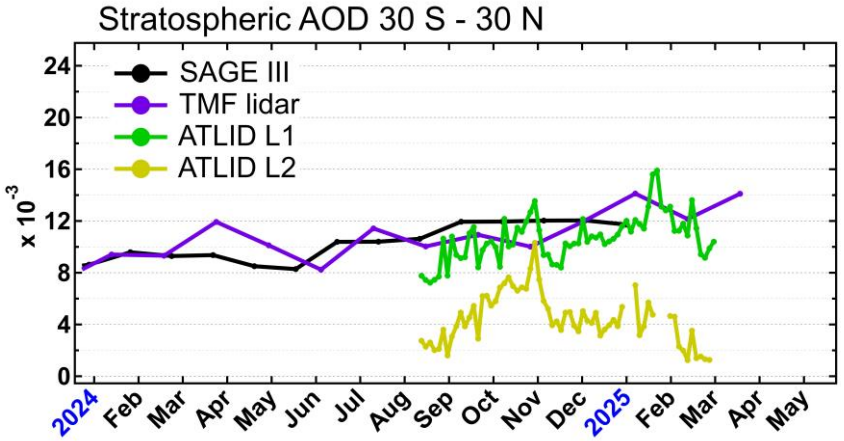


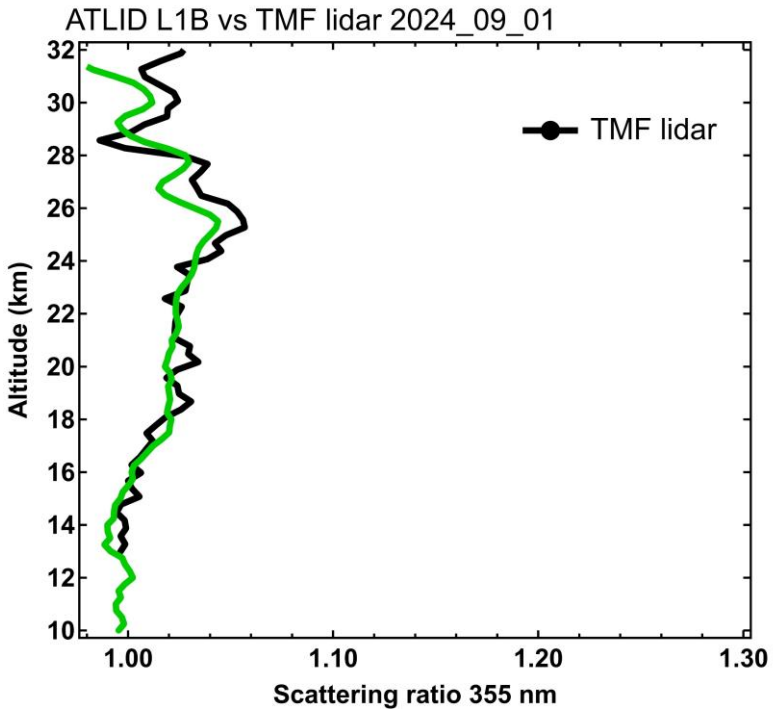


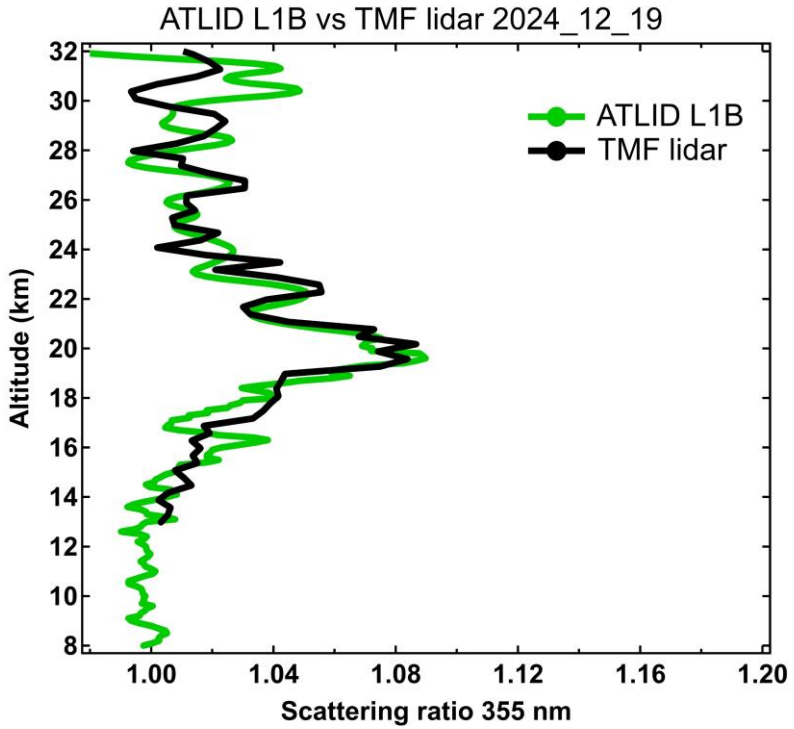


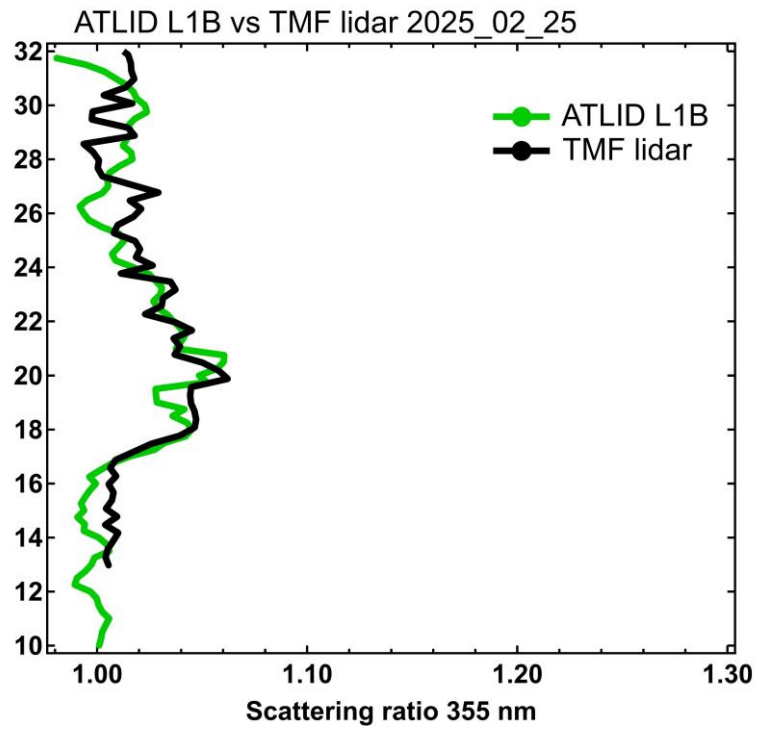
ATLID vs NDACC lidars: Table Mountain Facility (34° N)



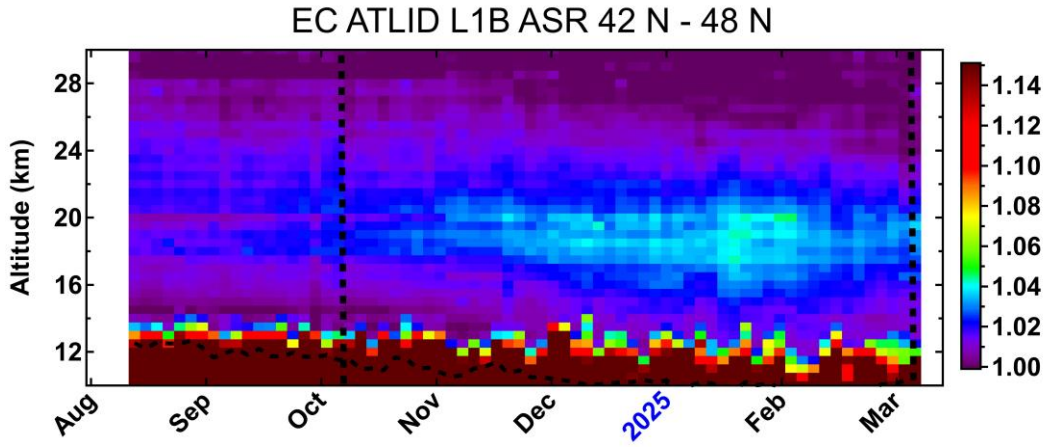




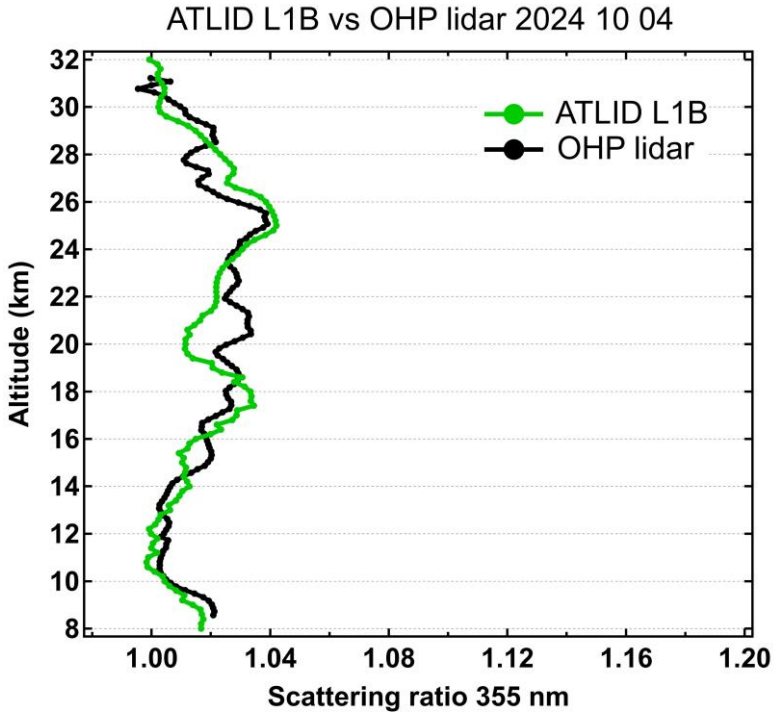


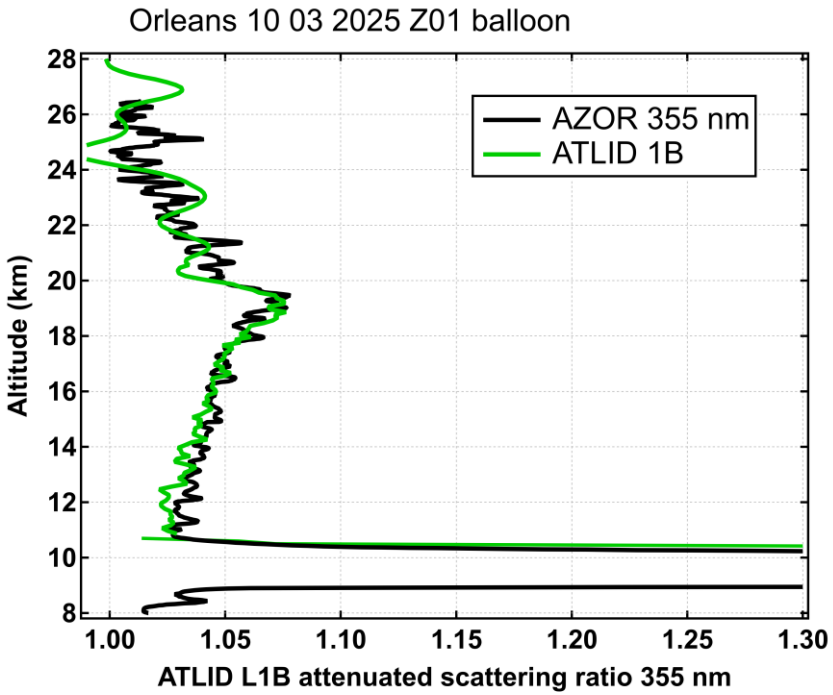


ATLID vs OHP lidar (44° N) and AZOR sonde (48° N)



- AZOR measures at 528 nm and 940 nm
- Conversion to 355 nm using BAE derived from the two wavelength





GSAW ATLID orbit click-look viewer

Global Stratospheric Aerosol Watch (GSAW)
https://aerosolstrato.projet.latmos.ipsl.fr

EarthCARE ATLID ground tracks and GEO ring maps

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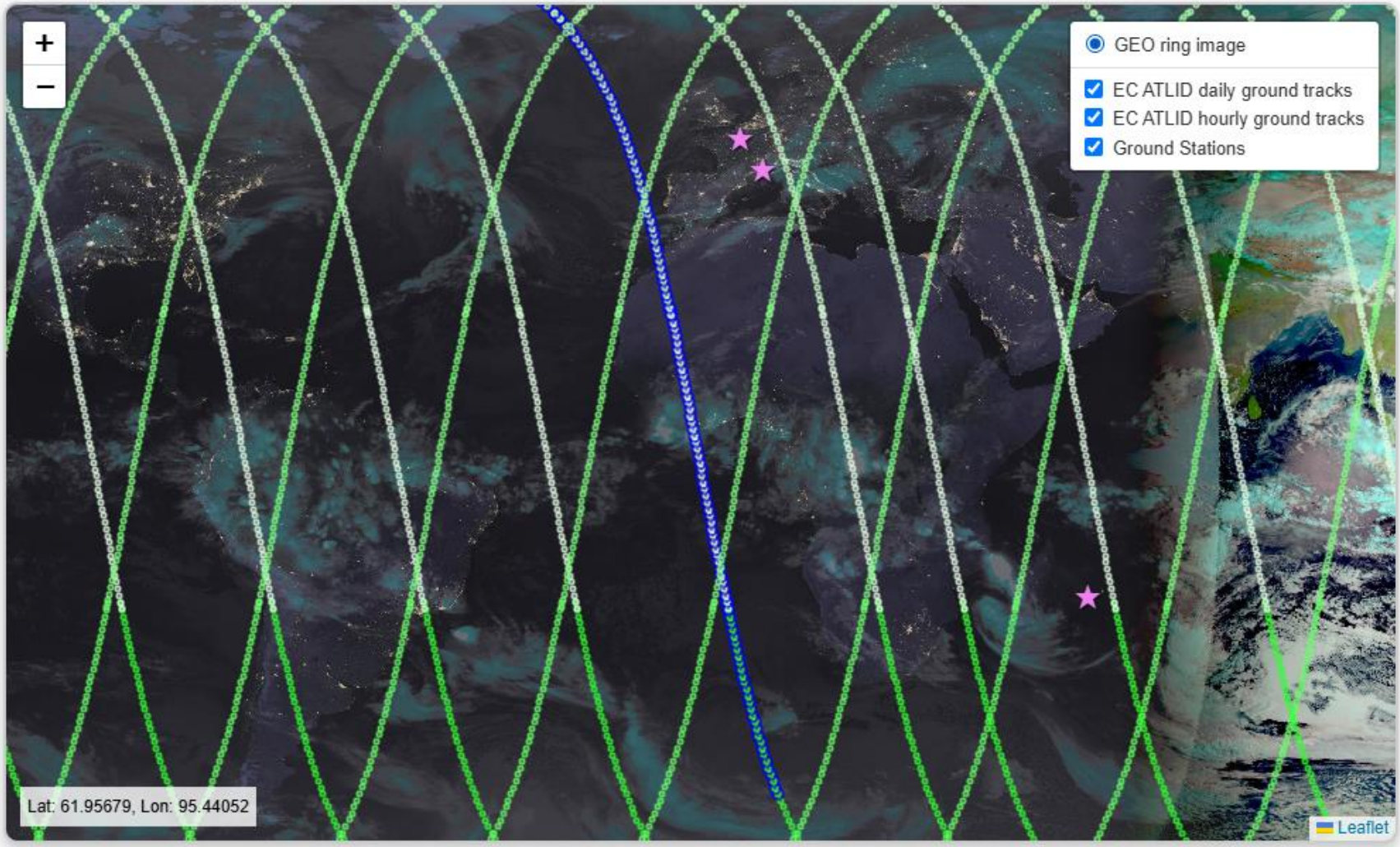


Previous Hour | 14/03/2025 | Next Hour

Previous Day | Next Day

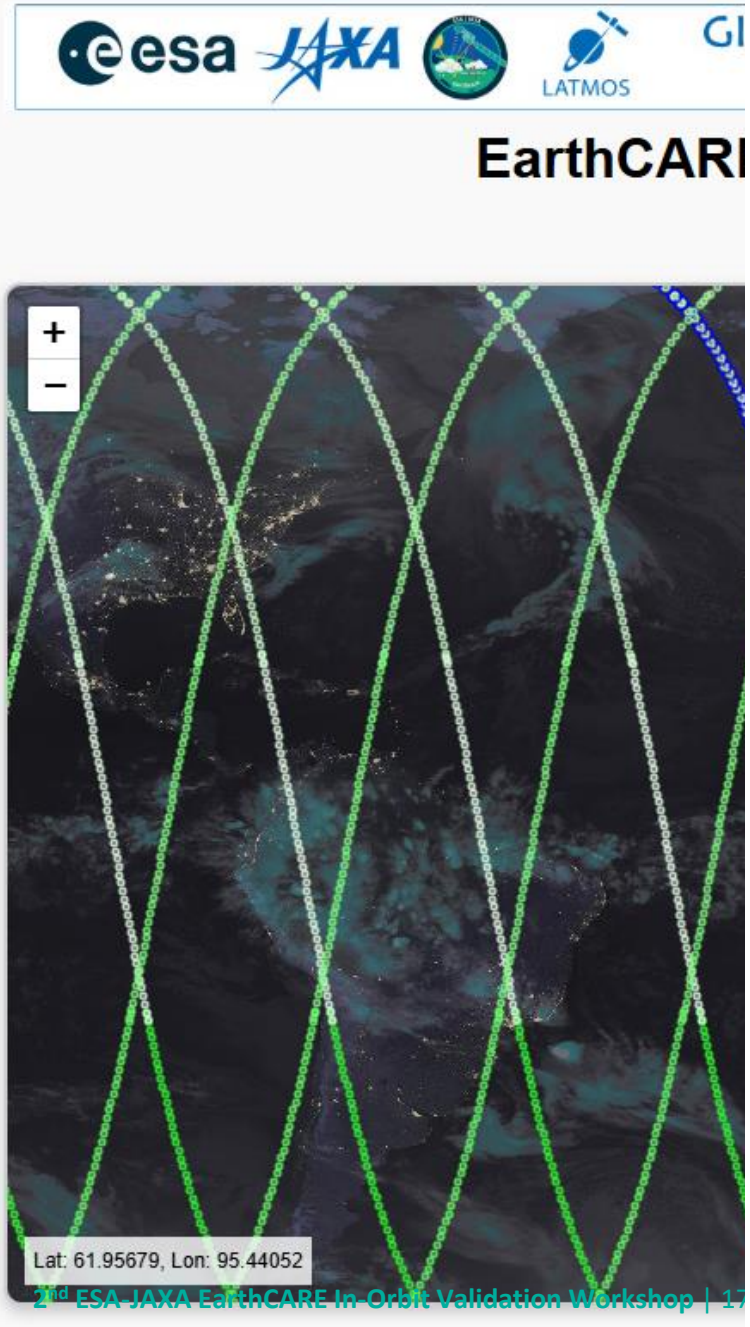
Previous Month | Next Month

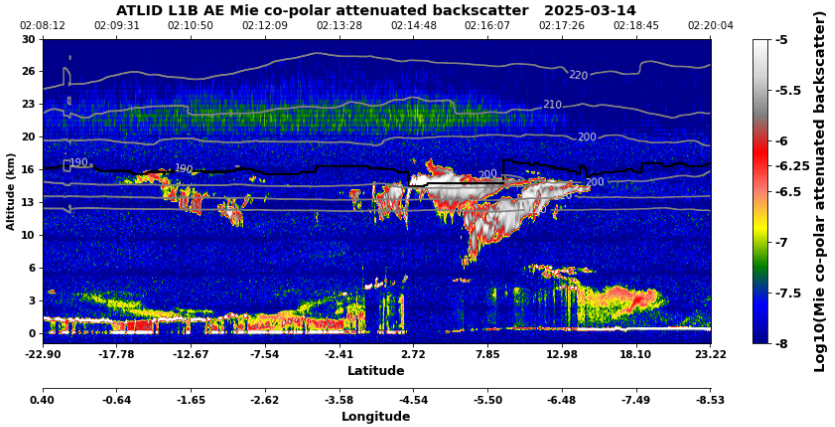
First Image | Animate Images | Last Image

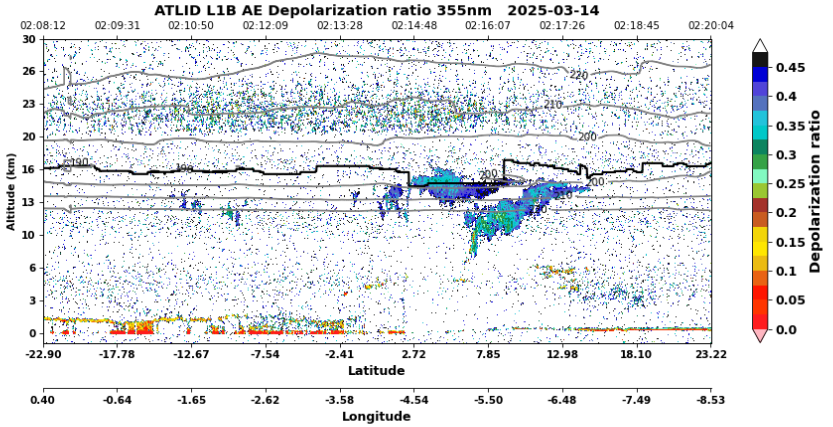
Animation Speed (ms): 700

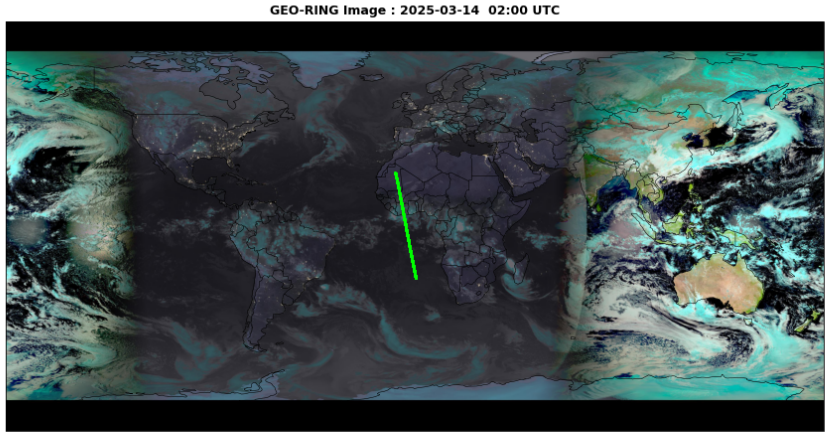
Animate Day

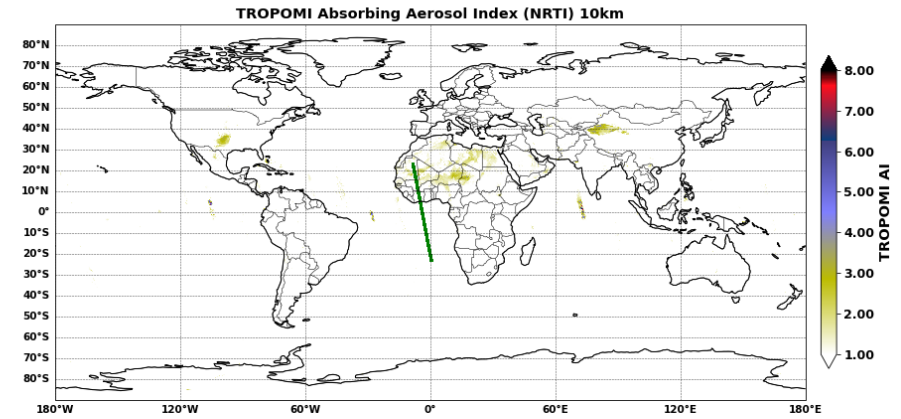
GSAW ATLID orbit click-look viewer

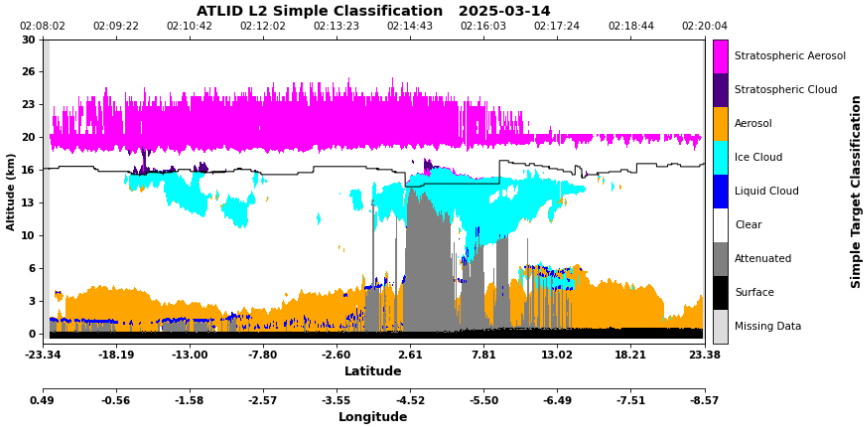


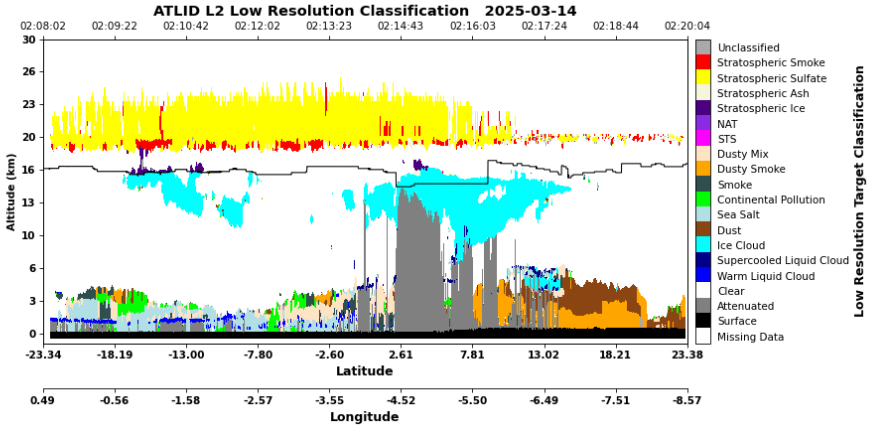












Key points

- Validation of ATLID L1B and L2A using NDACC 355 nm lidars, AZOR backscatter sonde and satellite limb profiling
- ATLID shows remarkable performance in the stratosphere
- Excellent agreement with suborbital measurements of SR
- Good agreement of L1B with satellite-derived SAOD
- SAOD derived from L2A extinction seem to have issues in pre-operational baselines

Arctic PSC outbreak 2025