

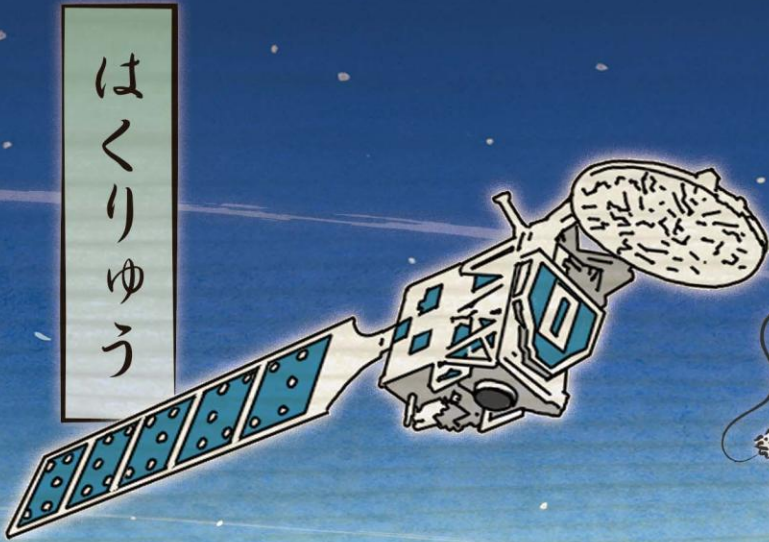
Validation of ALTID products based on dedicated underflights from NASA aircraft campaigns ARCSIX, PACE-PAX and NightBLUE

Diko Hemminga¹, Ping Wang¹, Gerd-Jan van Zadelhoff¹, Dave Donovan¹, Jonas von Bismarck², Johnathan Hair³, Amin Nehrir³, Richard Ferrare³, Chris Hostetler³, Taylor Shingler³, Marta Fenn³, Amy Jo Scarino³

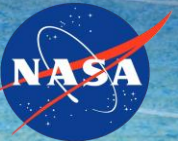
1. Royal Netherlands Meteorological Institute (KNMI)

2. European Space Agency

3. NASA Langley Research Center



Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat



EarthCARE Science and Validation Workshop 2025

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



NightBLUE

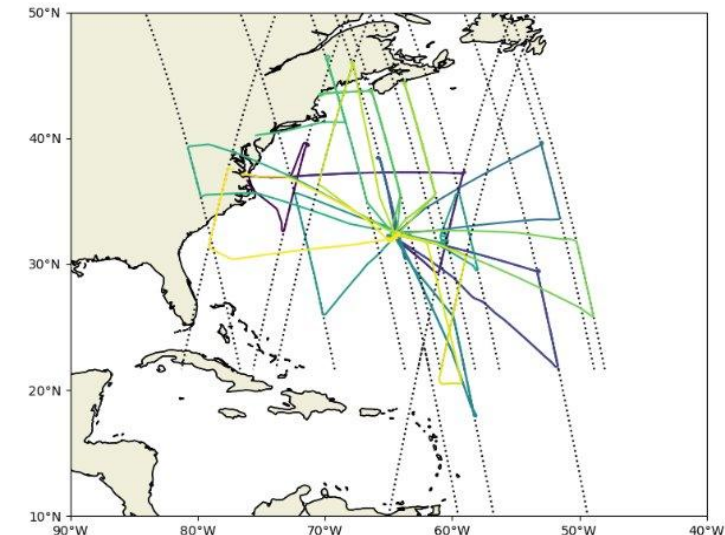
See also talks by Jonas von Bismarck (H324) and John Hair (H421)



- *What?* Lidar **U**nderflights of **E**arthCARE
- *When?* During **N**ight and day from 3rd to 25th of September 2025
- *Where?* From **B**ermuda, over North Atlantic Ocean and USA
- *How?* With the NASA G-III aircraft carrying the HSRL-2 instrument
- *What is the result?*
 - 11 nighttime and 5 daytime underflights
 - **Preliminary** HSRL-2 data from the field data archive
 - Operational EarthCARE data on baseline **BA**



Want to read more? NightBLUE:
Bermuda's late summer skies herald
huge milestone for EarthCARE





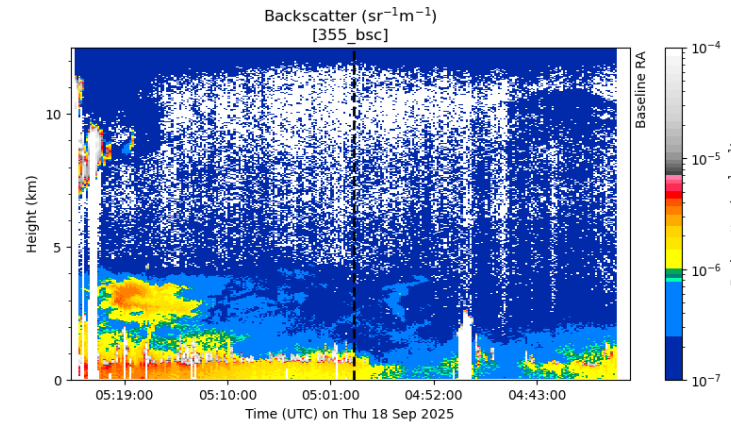
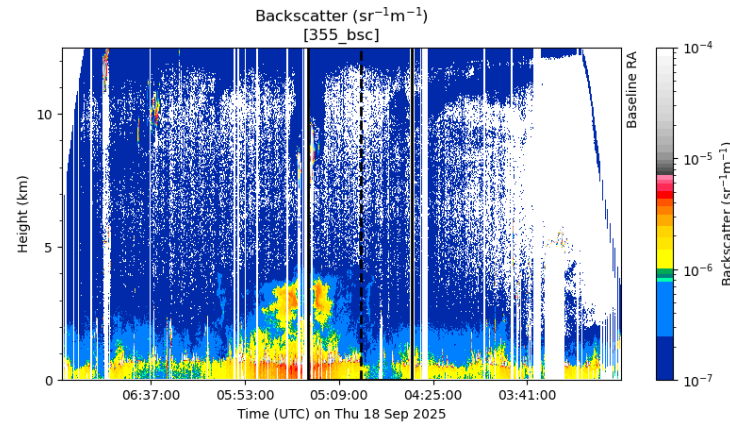
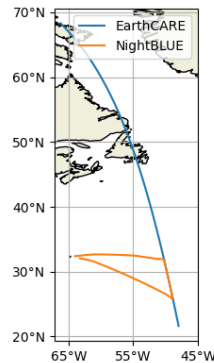
- Variety of atmospheric conditions
 - Dust cloud above sea salt aerosol layer
 - Multilayer aerosol *in the 100th EarthCARE validation underflight*
 - Elevated aerosol layer
- ATLID L2 A-EBD and A-AER products
 - Baseline BA
 - Low resolution for EBD: 100 km resolution
 - Quality status = 0 or 1: (likely) good
 - A-TC for context
- Collocation by distance and time difference: within 0.5 – 1.5 km, 30 – 60 min

Method for data comparison

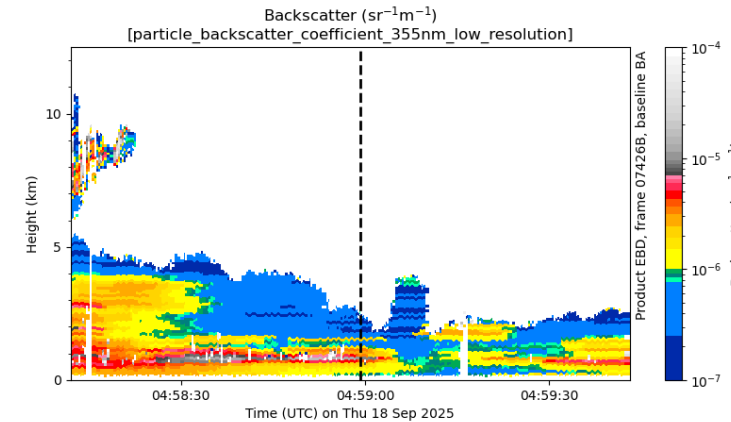
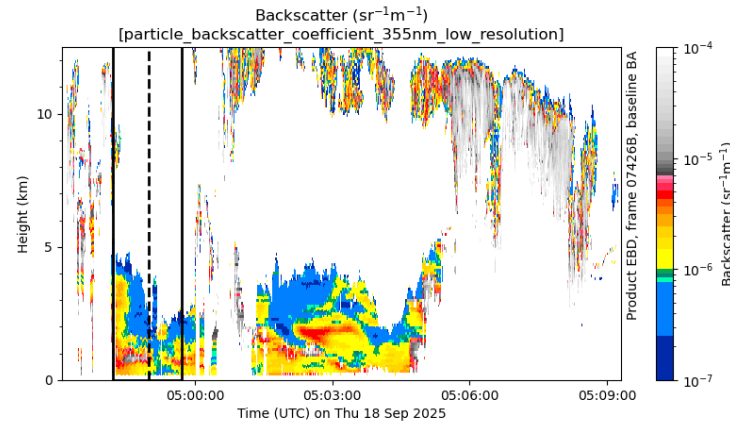
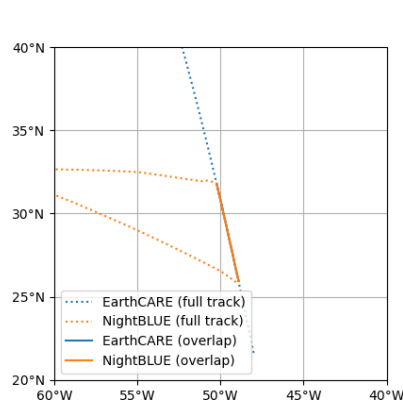
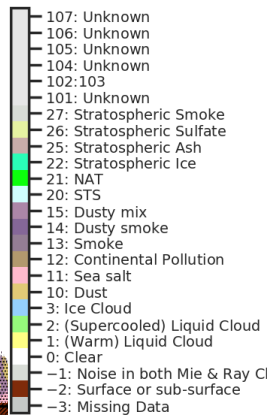


Preliminary HSRL-2 data

- September 18, 2025 (7426B), “Dust cloud above sea salt aerosol layer”



HSRL-2



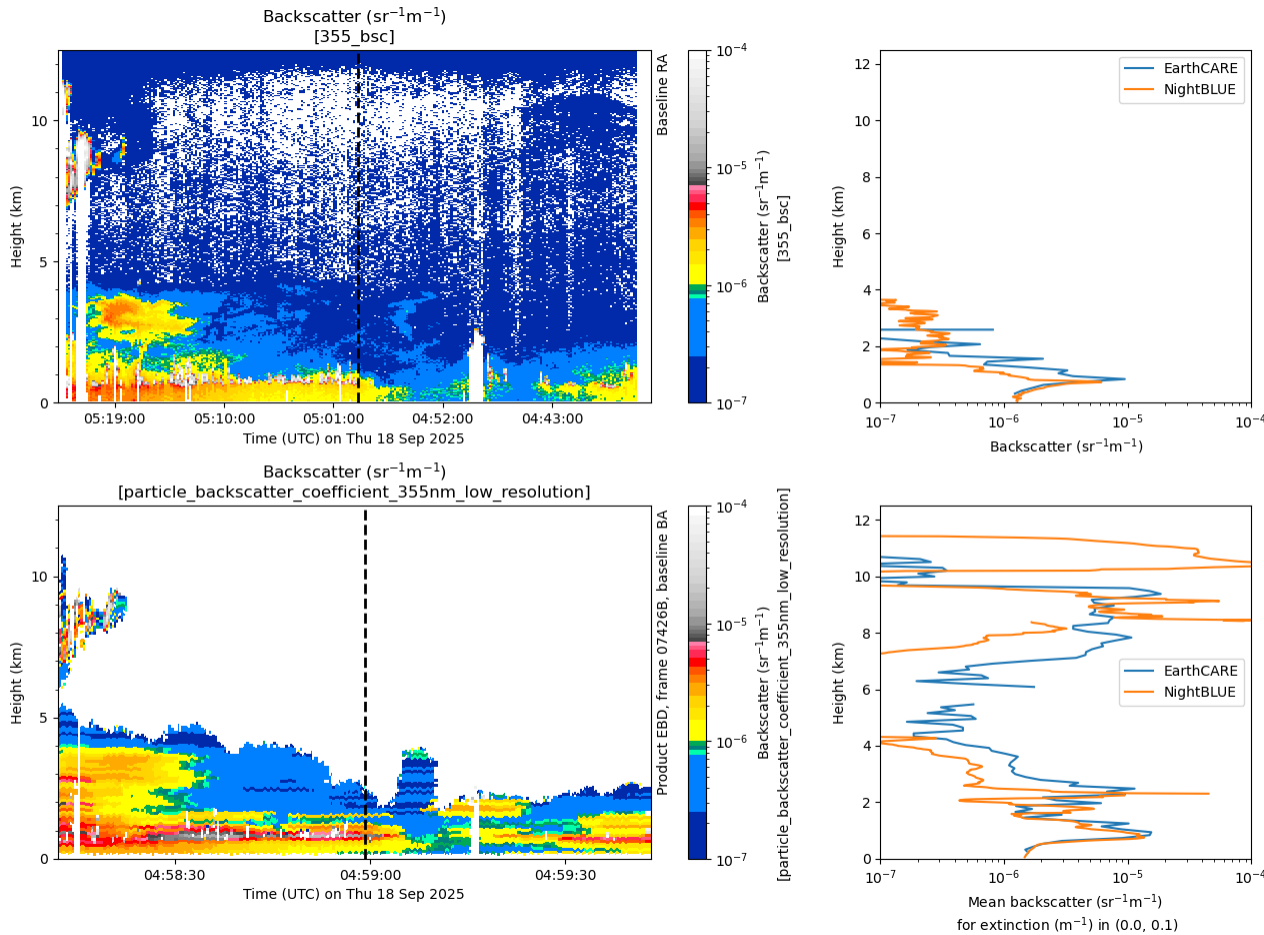
ATLID

Sep 18, 2025 (7426B): Dust cloud above sea salt

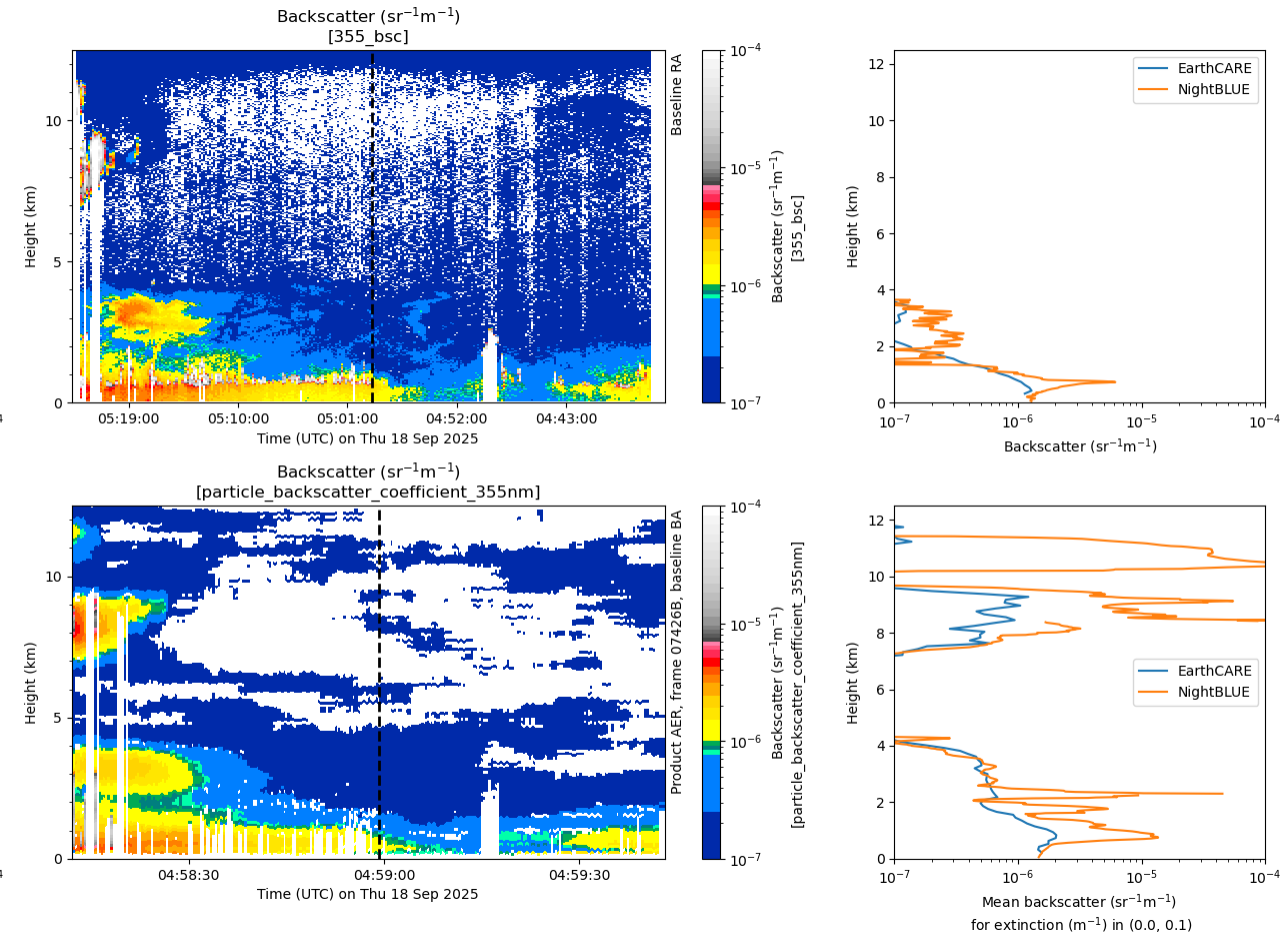


Preliminary HSRL-2 data

A-EBD

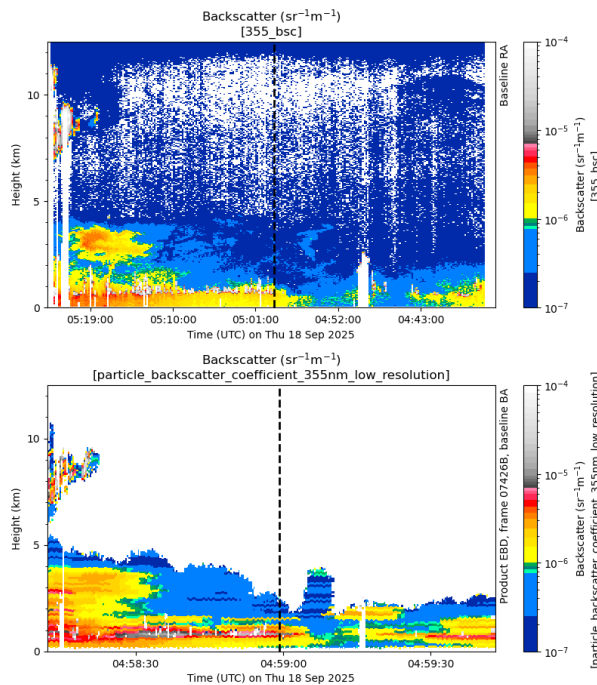


A-AER

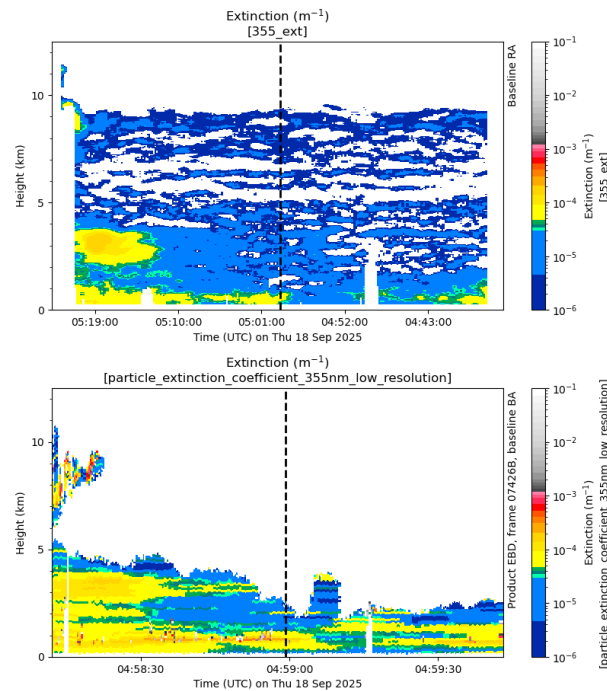




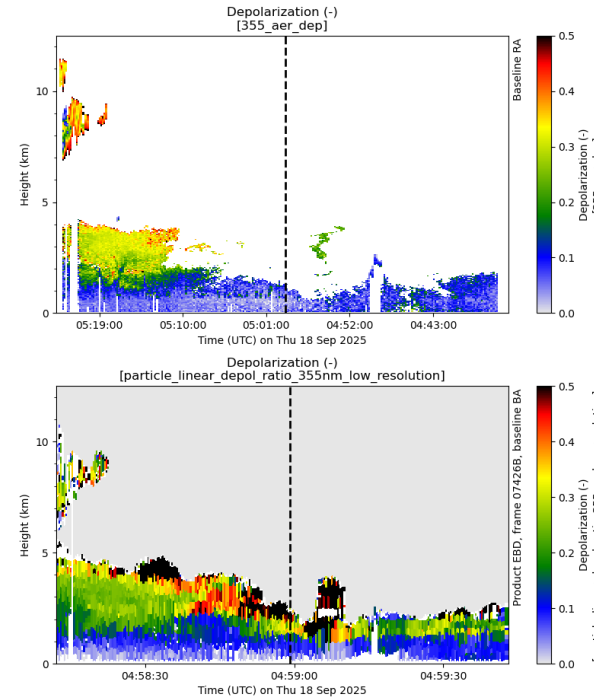
Backscatter



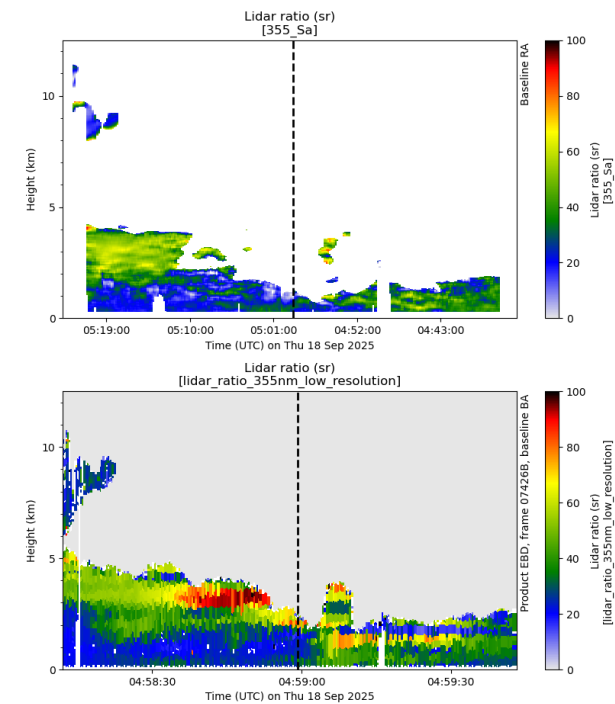
Extinction



Depolarization ratio



Lidar ratio



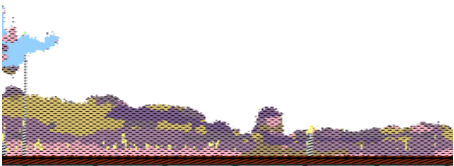
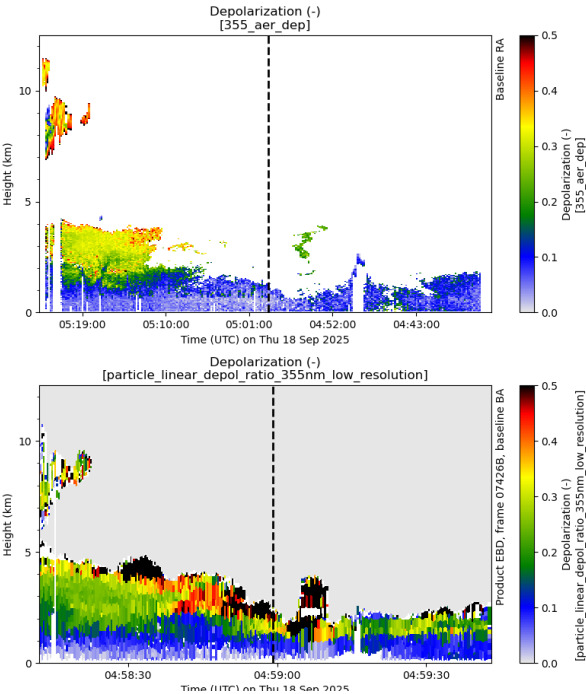
- A-EBD product, low resolution

Depolarization ratio

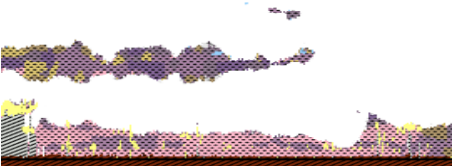
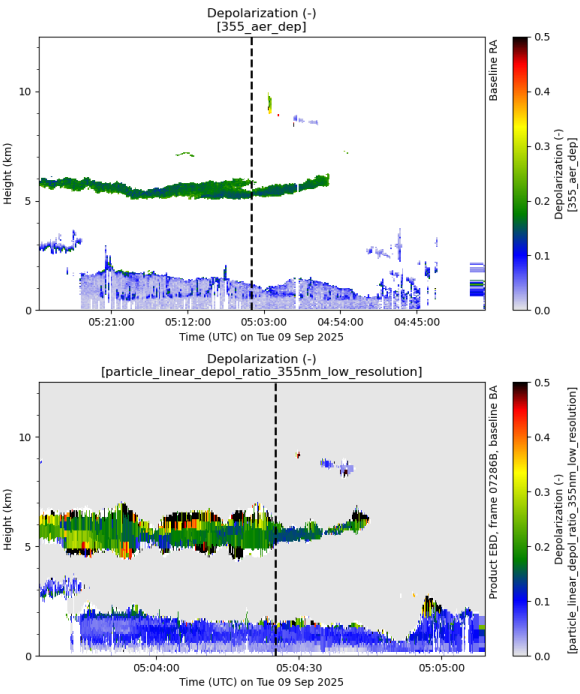


Preliminary HSRL-2 data

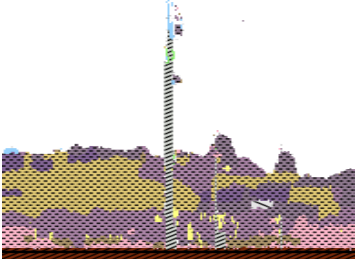
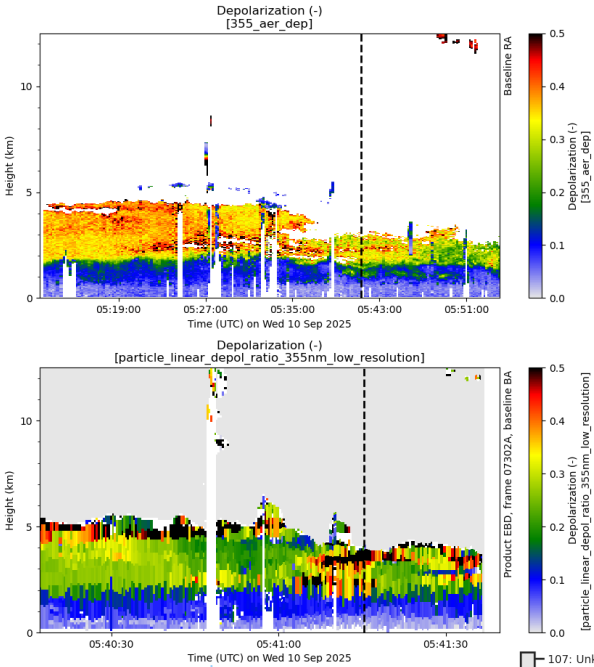
Sep 18, 2025 (7426B):
Dust cloud above sea salt



Sep 9, 2025 (7286B):
Elevated aerosol layer



Sep 10, 2025 (7302A):
Multilayer aerosol



- 107: Unknown
- 106: Unknown
- 105: Unknown
- 104: Unknown
- 102:103
- 101: Unknown
- 27: Stratospheric Smoke
- 26: Stratospheric Sulfate
- 25: Stratospheric Ash
- 22: Stratospheric Ice
- 21: NAT
- 20: STS
- 15: Dusty mix
- 14: Dusty smoke
- 13: Smoke
- 12: Continental Pollution
- 11: Sea salt
- 10: Dust
- 3: Ice Cloud
- 2: (Supercooled) Liquid Cloud
- 1: (Warm) Liquid Cloud
- 0: Clear
- 1: Noise in both Mie & Ray C
- 2: Surface or sub-surface
- 3: Missing Data



- NightBLUE: dedicated airborne lidar validation flights during night and day
- Measurements in a variety of aerosol and cloud conditions, today I've shown:
 - Dust cloud above sea salt aerosol layer
 - Multilayer aerosol *in the 100th EarthCARE validation underflight*
 - Elevated aerosol layer
- Preliminary comparison results
 - Good match in backscatter
 - Differences in extinction, likely due to differences in cloud screening
 - Depolarization compares well in some cases, less well in others

Acknowledgements



- NASA and ESA *for providing aircraft, instrument and funding for the campaign*
- ECMWF/CAMS *for the aerosol, cloud and weather forecasts essential to the flight planning*
- And thank you for listening!



Any questions?



Additional slides

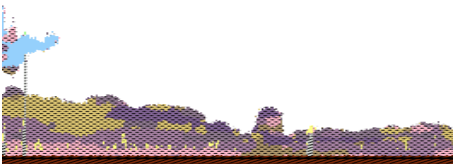
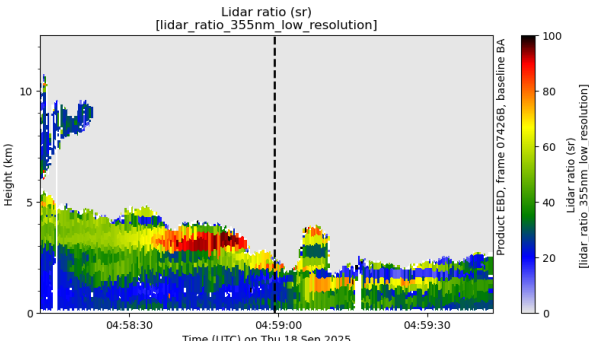
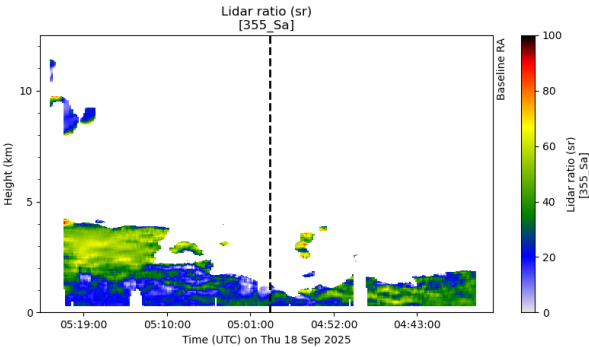


Lidar (extinction-to-backscatter) ratio

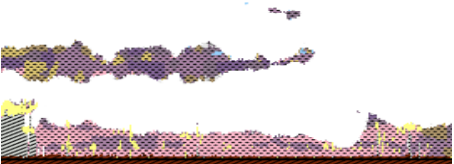
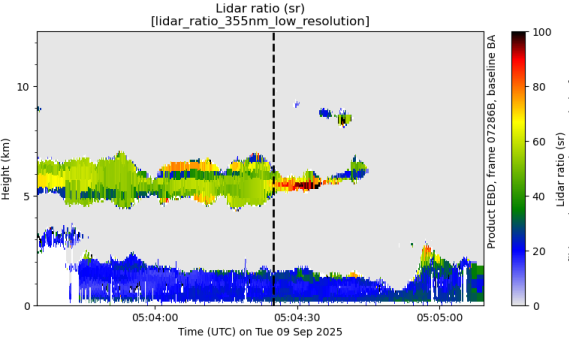
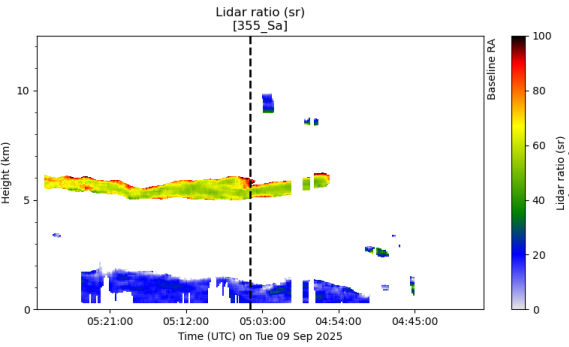


Preliminary HSRL-2 data

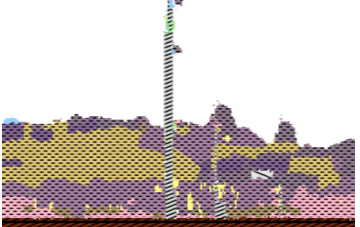
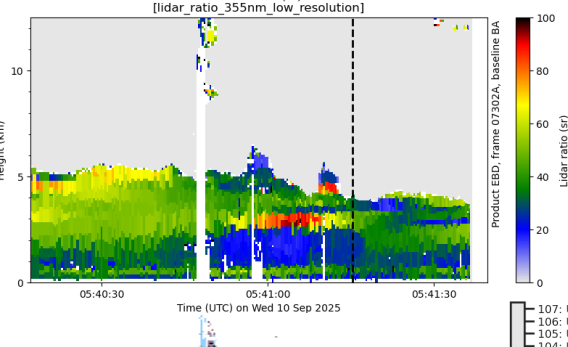
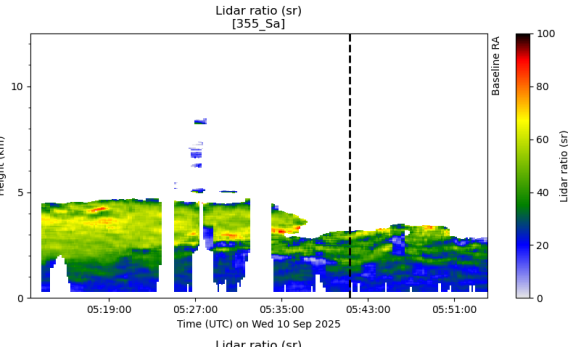
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