Validating from within: early Level 2 product intercomparison from CELLO-ORCESTRA

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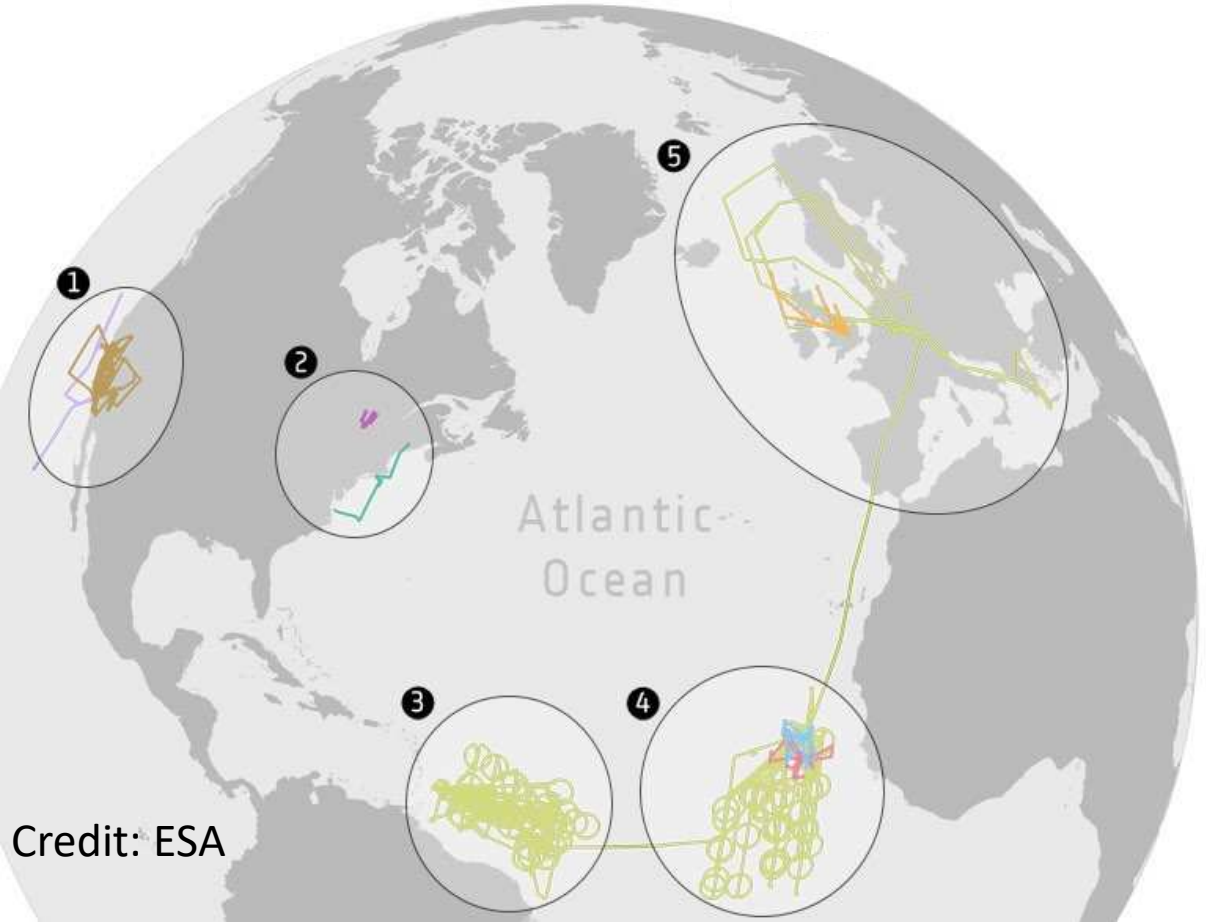
2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop

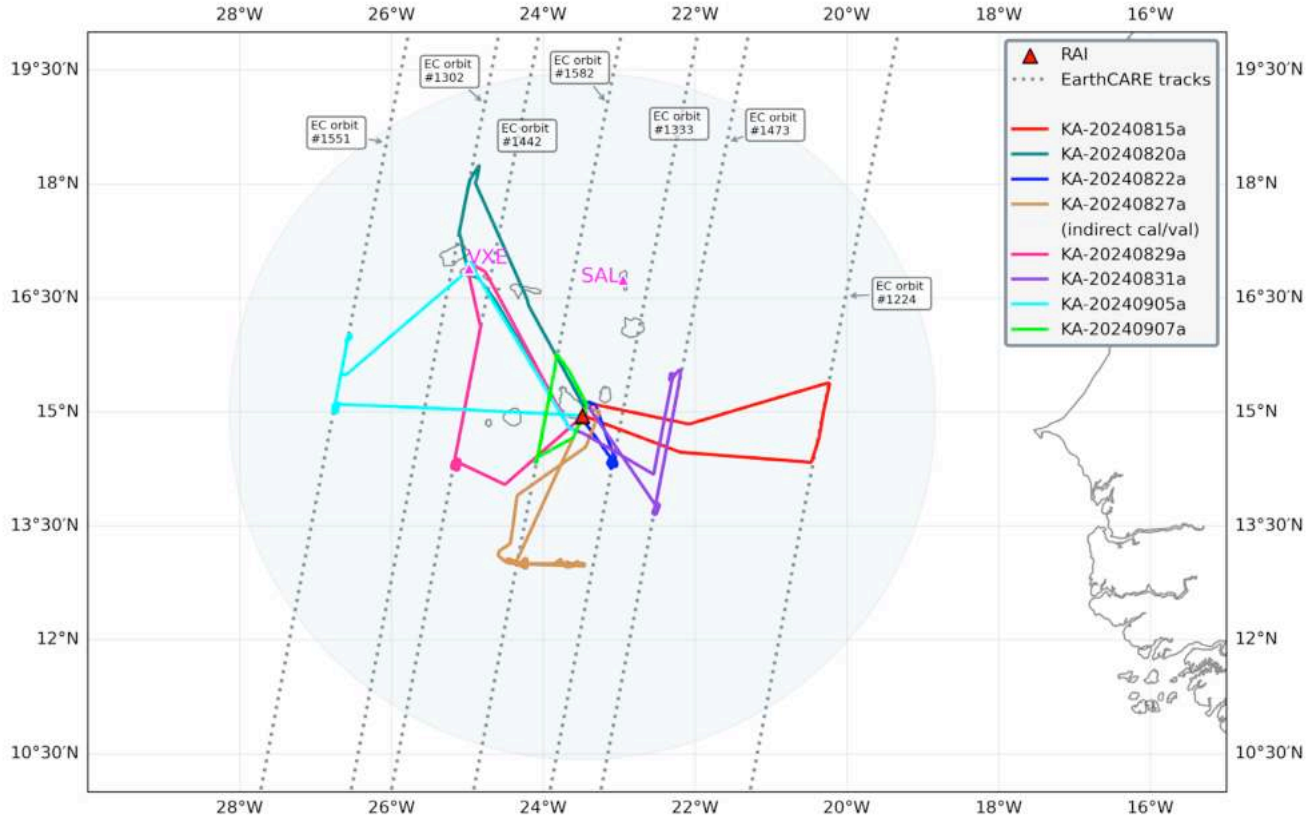
17 – 20 March 2025 | ESA-ESRIN | Frascati (Rome), Italy

ORCESTRA

BOWTIE CELLO CLARINET MAESTRO PERCUSION PICCOLO SCORE STRINQS



Credit: ESA



Research flights

7 targeted EarthCARE orbits
2 flights for indirect cal/val

3 aerosol flights underneath EarthCARE

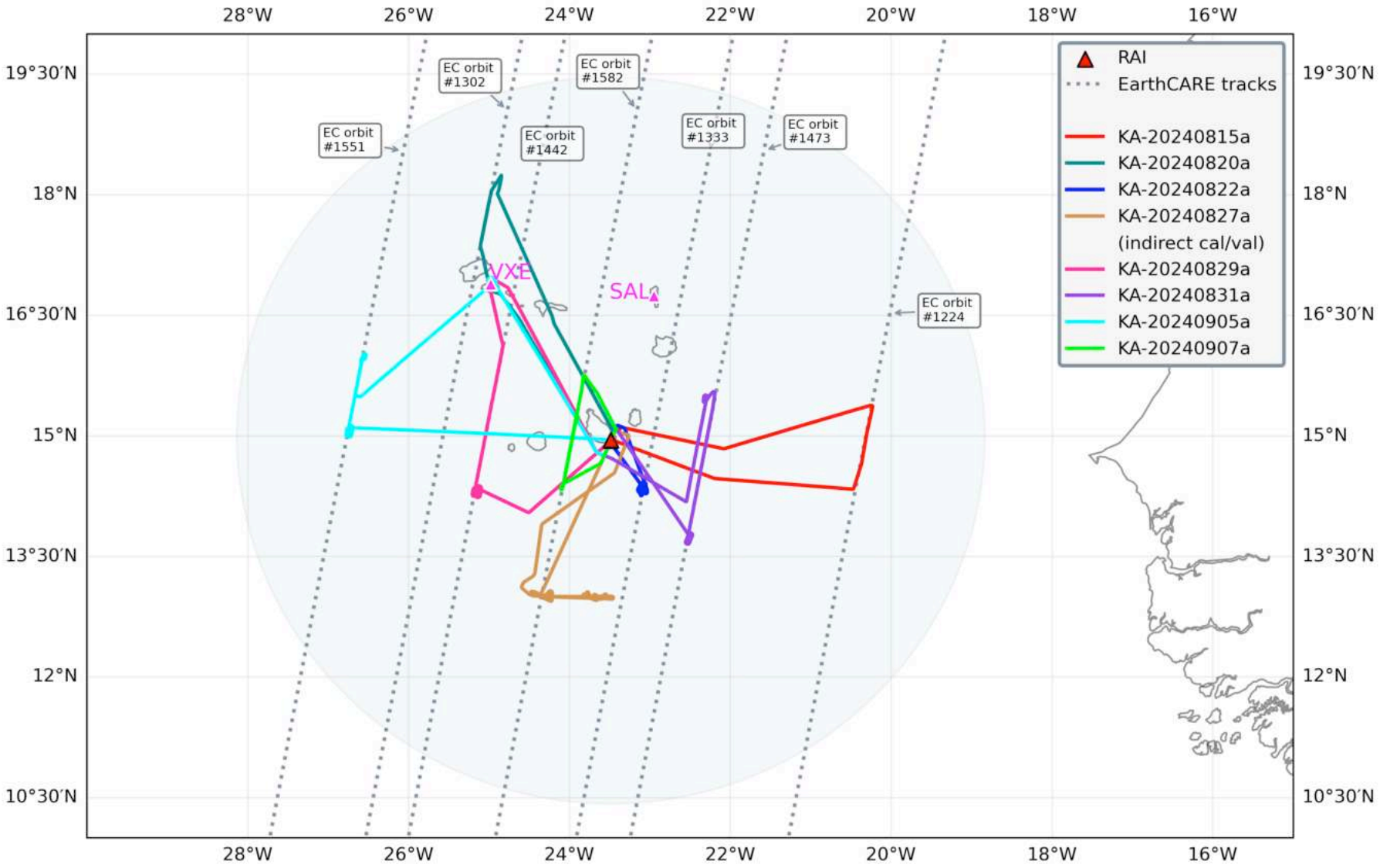
4 flights with in-cloud data underneath EarthCARE

- Liquid-only clouds
- Mixed-phase clouds (down to -19°C)

Coordination

- HALO (4 flights)
- ATR-42 (4 flights)
- Mindelo (3 flights)
- RV Meteor (1 flight)

August-September 2024



Instrumentation on the King Air


The King Air at Praia (Cabo Verde)

Aircraft specifics:

- Range: 2000 km (4-5 hours)
- Science speed: 70 m/s
- Transit speed: 125 m/s

In situ probes: SPEC Hawkeye, DMT CAPS

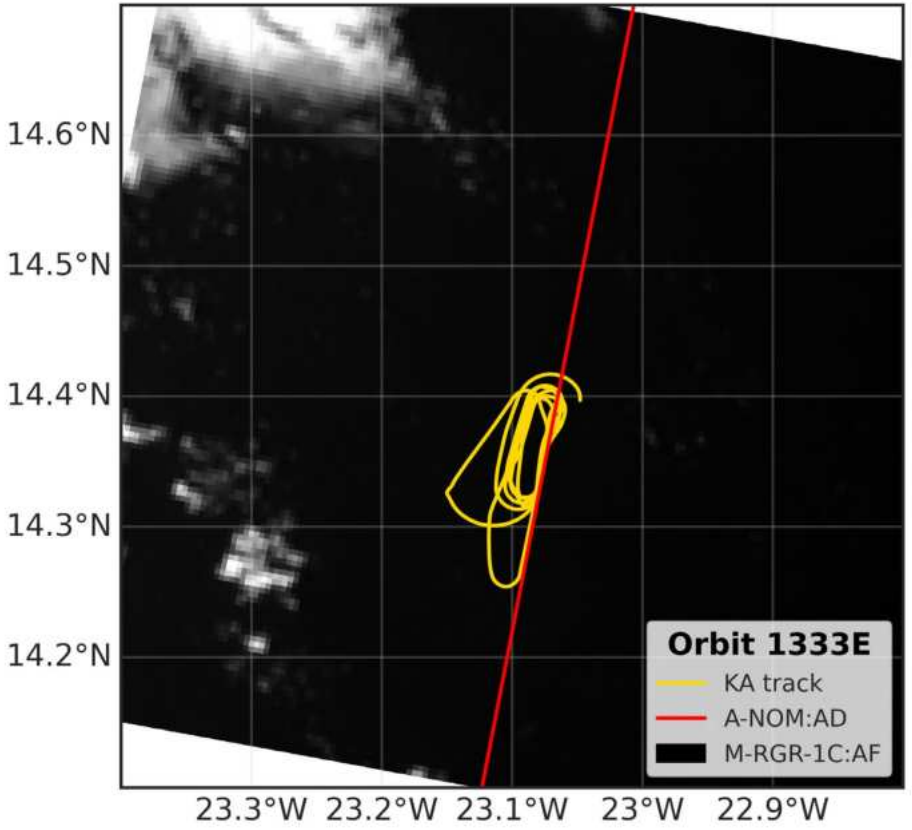
- Cloud droplets (2-50 µm)
- Ice crystals (up to 1.5 mm)
- Aerosols (>0.61 µm)

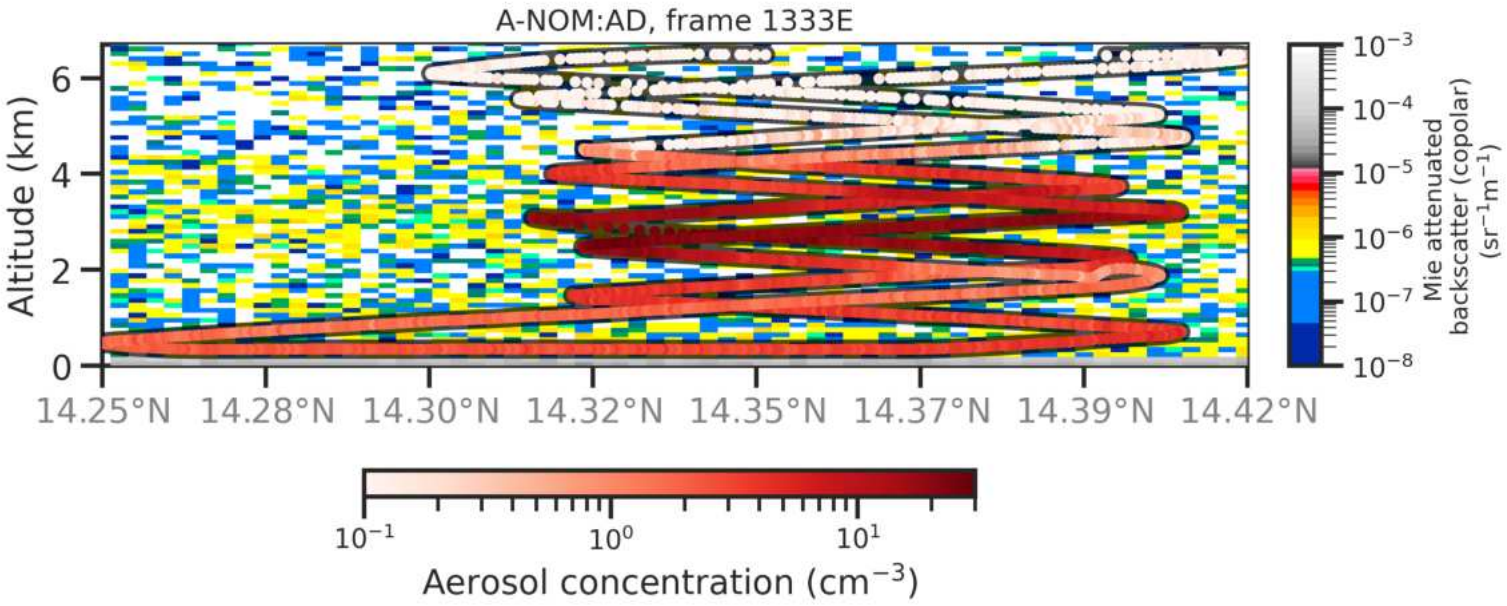
DMT CAPS probe

SPEC Hawkeye probe

Quicklook of cloud droplets and ice crystals during the flight

Validating ATLID target classification

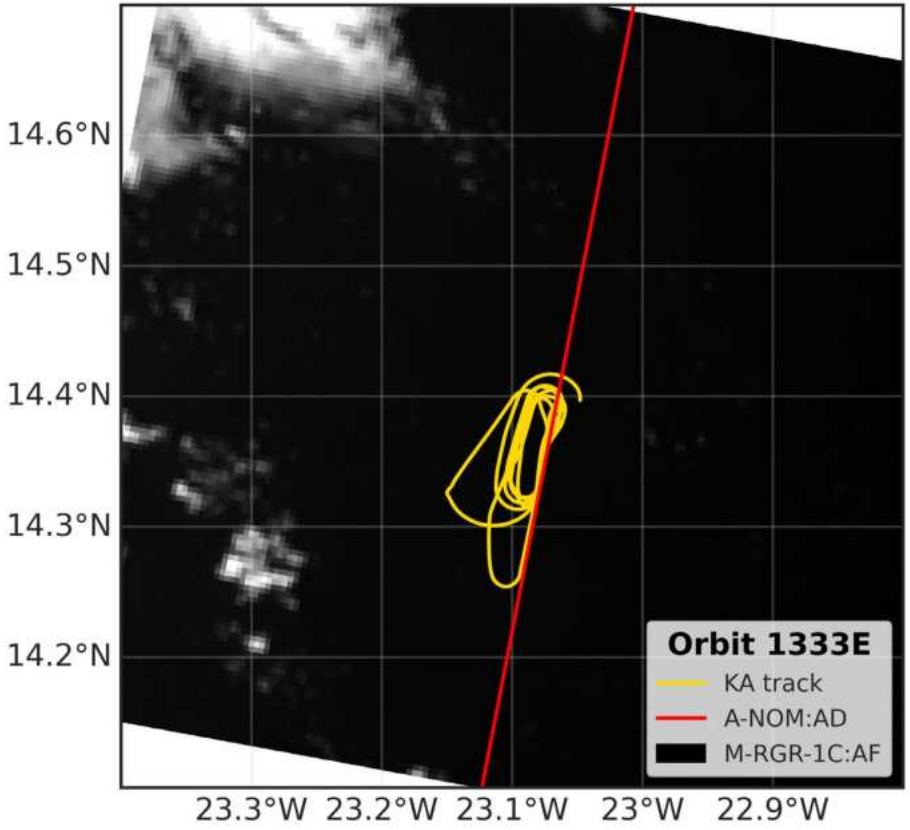


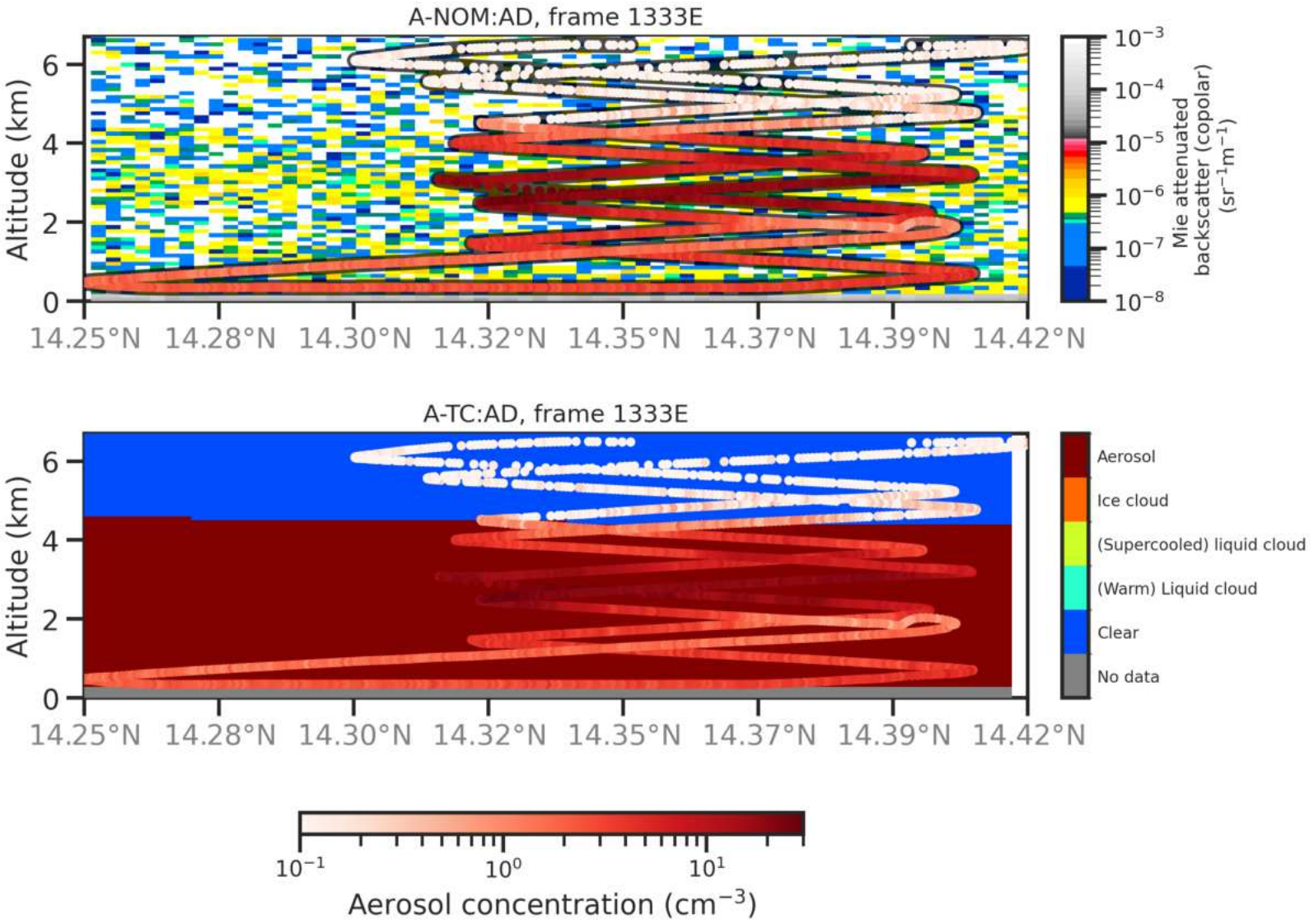


Flight on 22nd August 2024:
target orbit #1333

Strategy:
EarthCARE overpass (aerosol spirals)
Collocation with ATR-42 and HALO

Validating ATLID target classification





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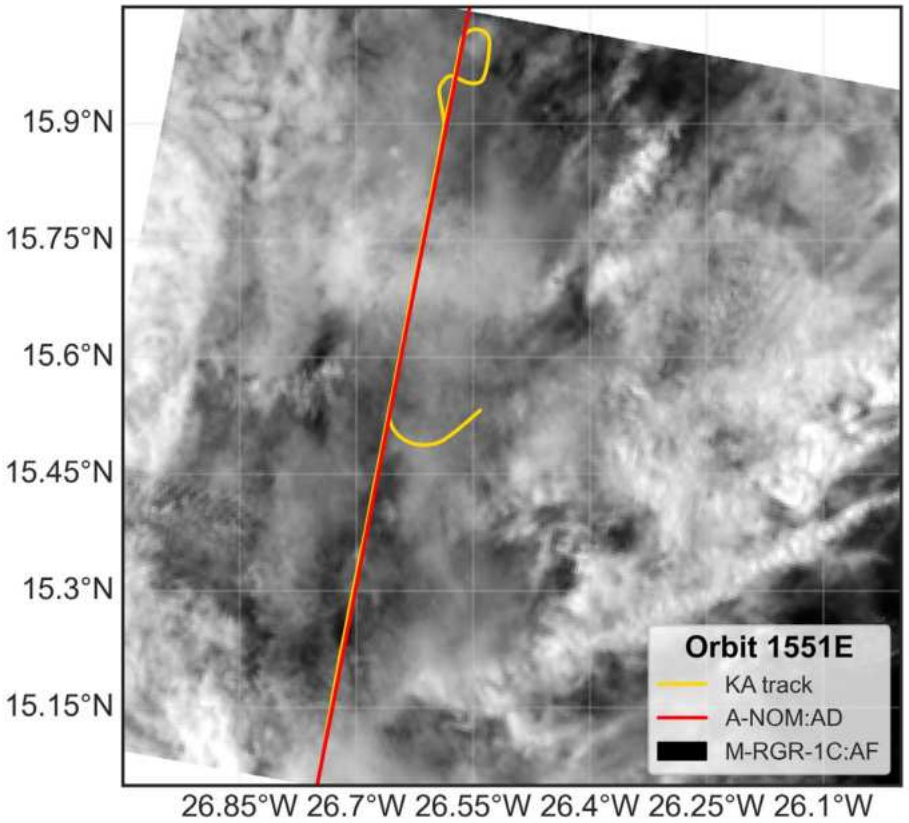
Strategy:
EarthCARE overpass (aerosol spirals)
Collocation with ATR-42 and HALO

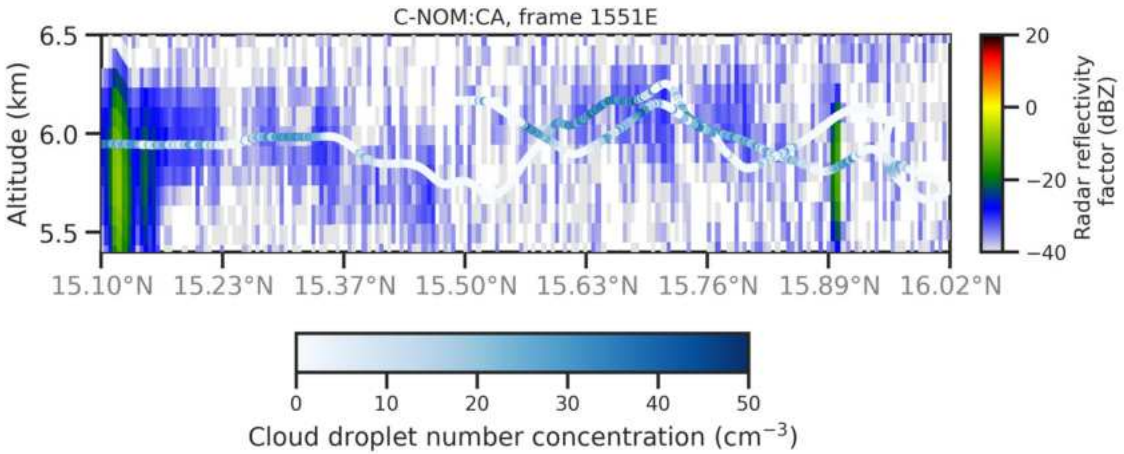
Probing a thin liquid cloud



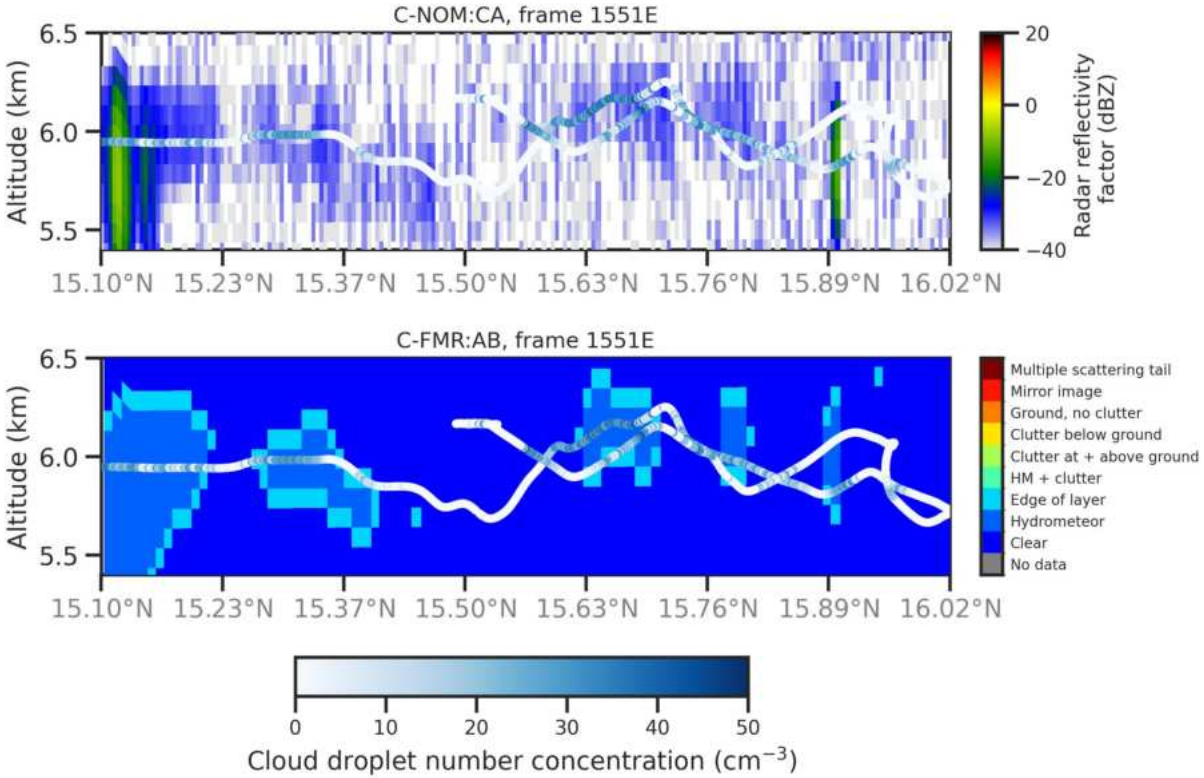
Flight on 5th September 2024:
target orbit #1551

Strategy:
EarthCARE overpass
Porpoising to envelop cloud deck

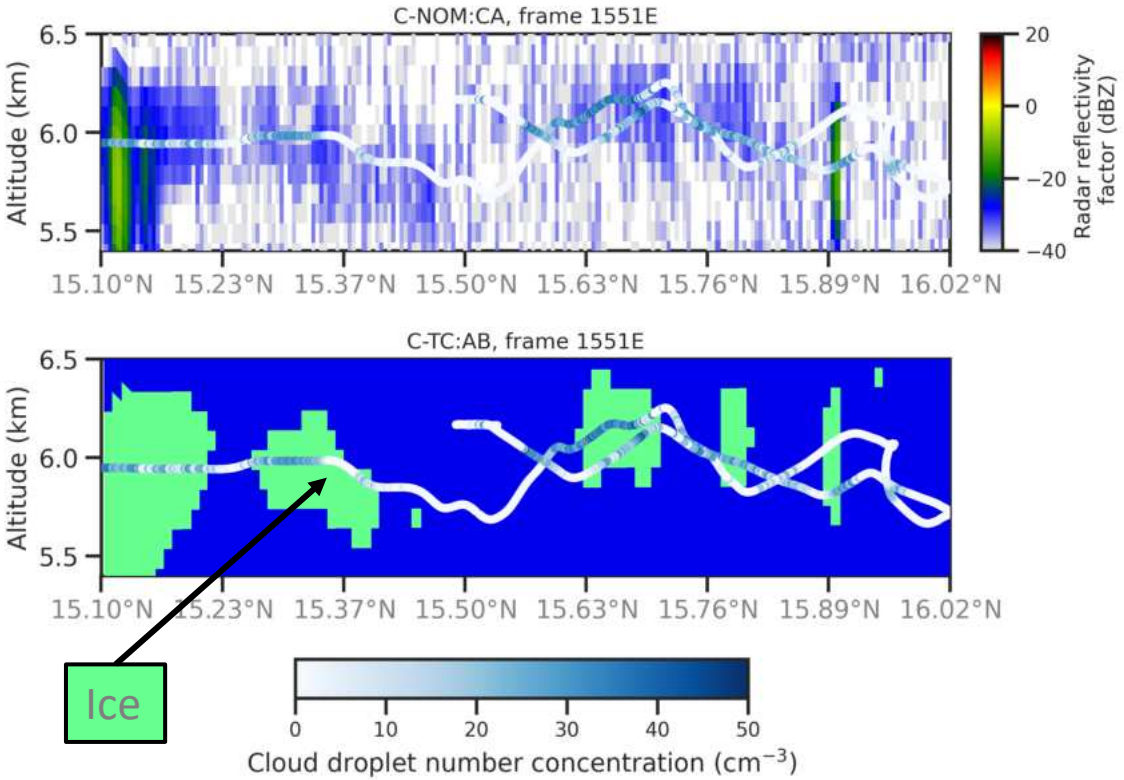
Probing a thin liquid cloud



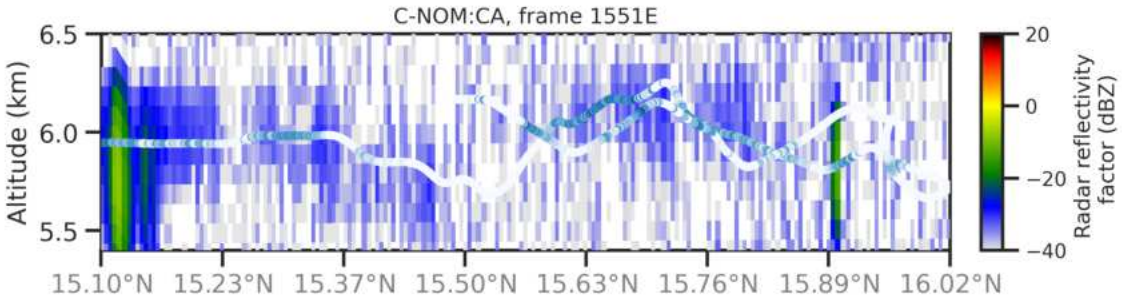
Probing a thin liquid cloud

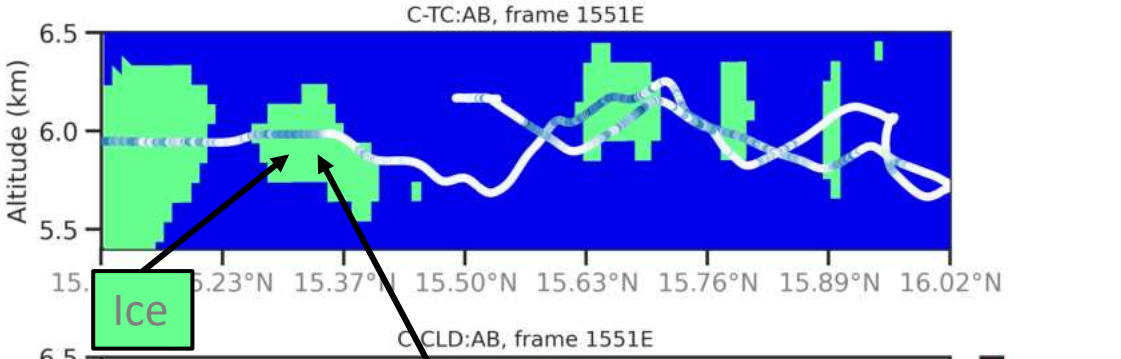


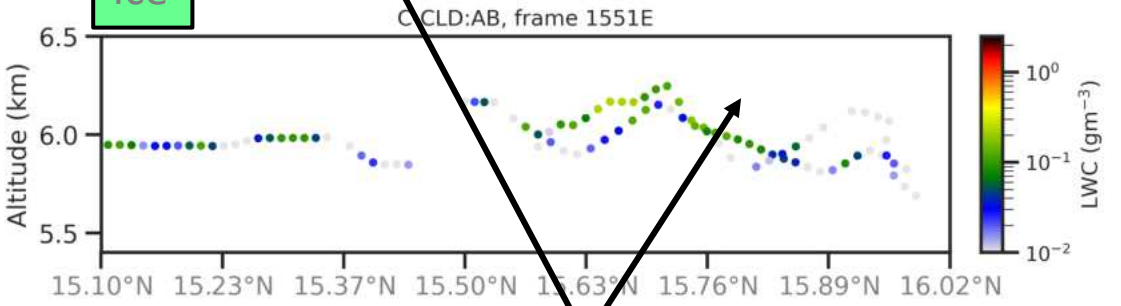
Probing a thin liquid cloud



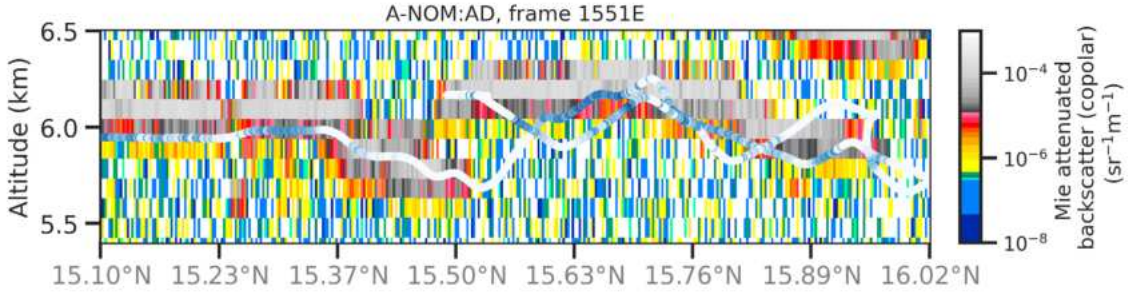
Probing a thin liquid cloud

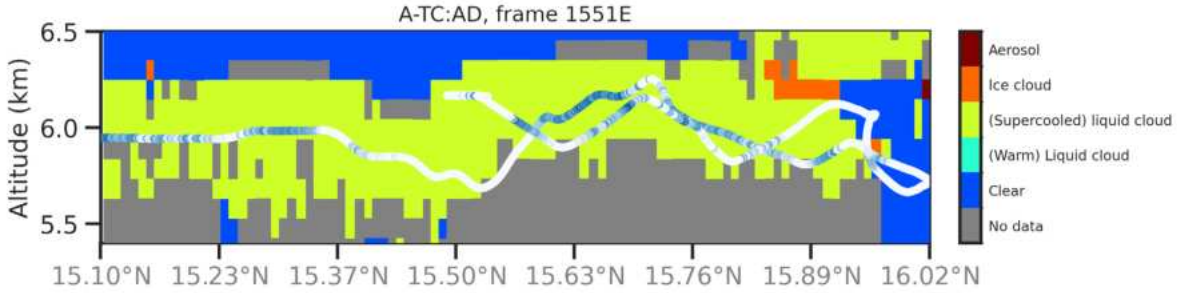


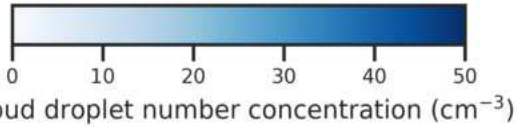




Retrieval status
-2 = Retrieval not applied
(hydrometeor **not** present)







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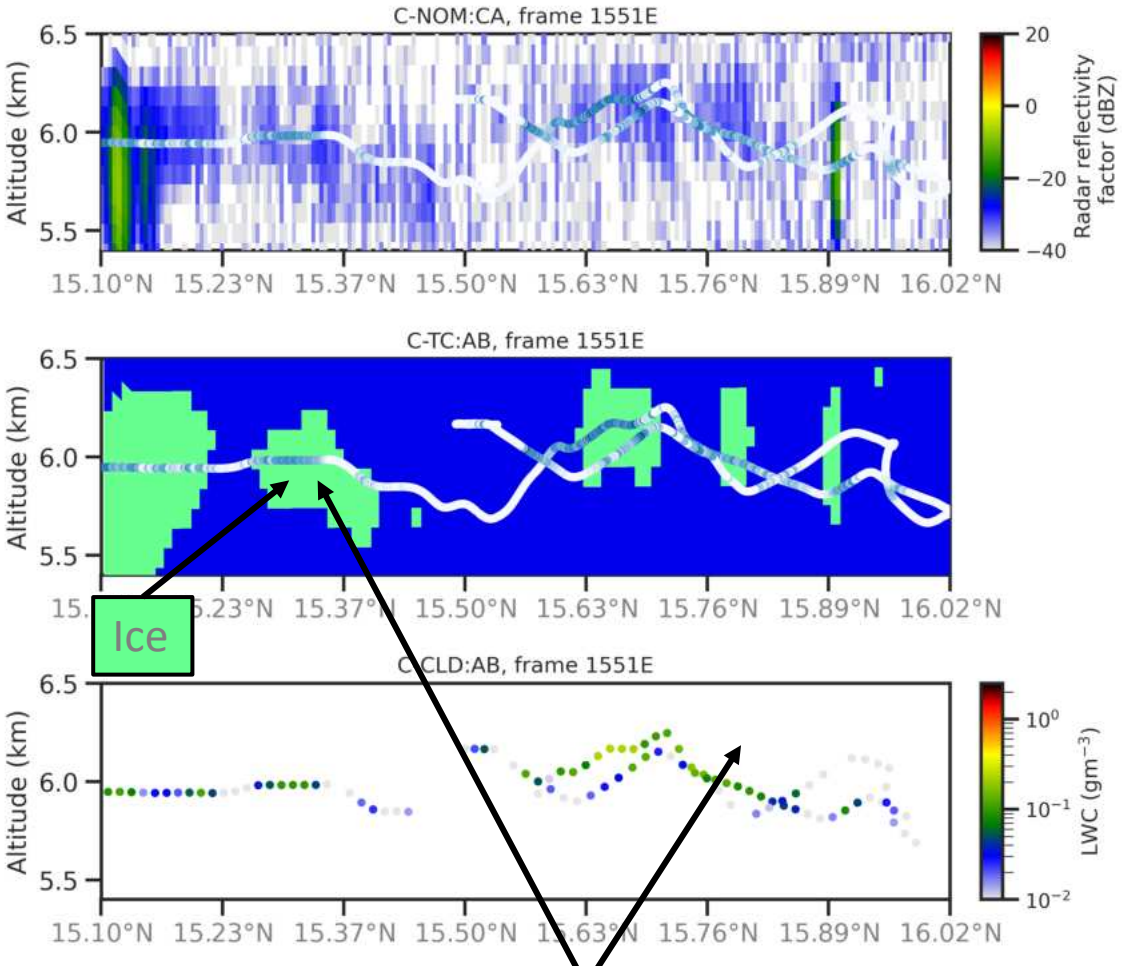

Ice

Retrieval status
-2 = Retrieval not applied
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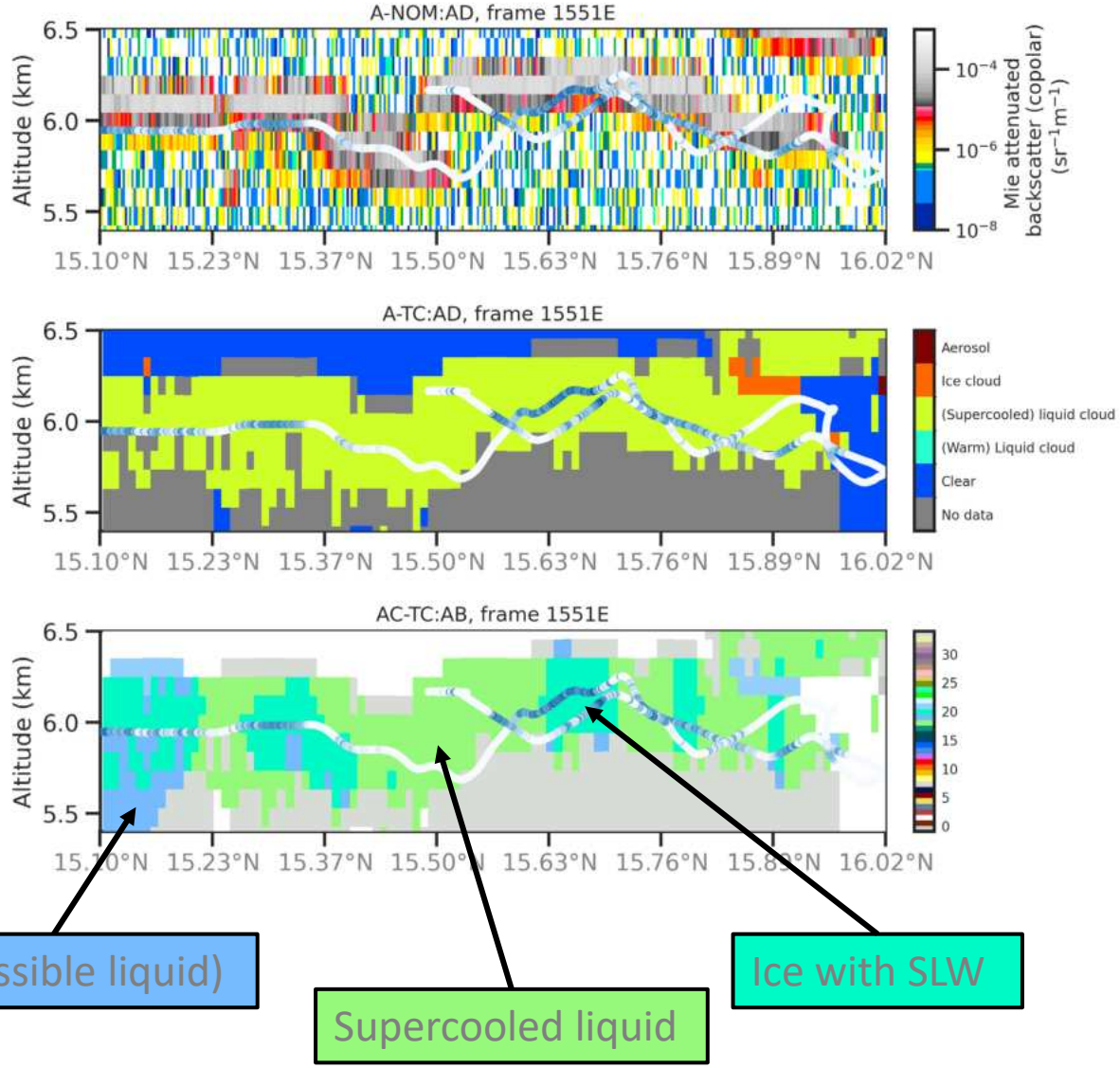
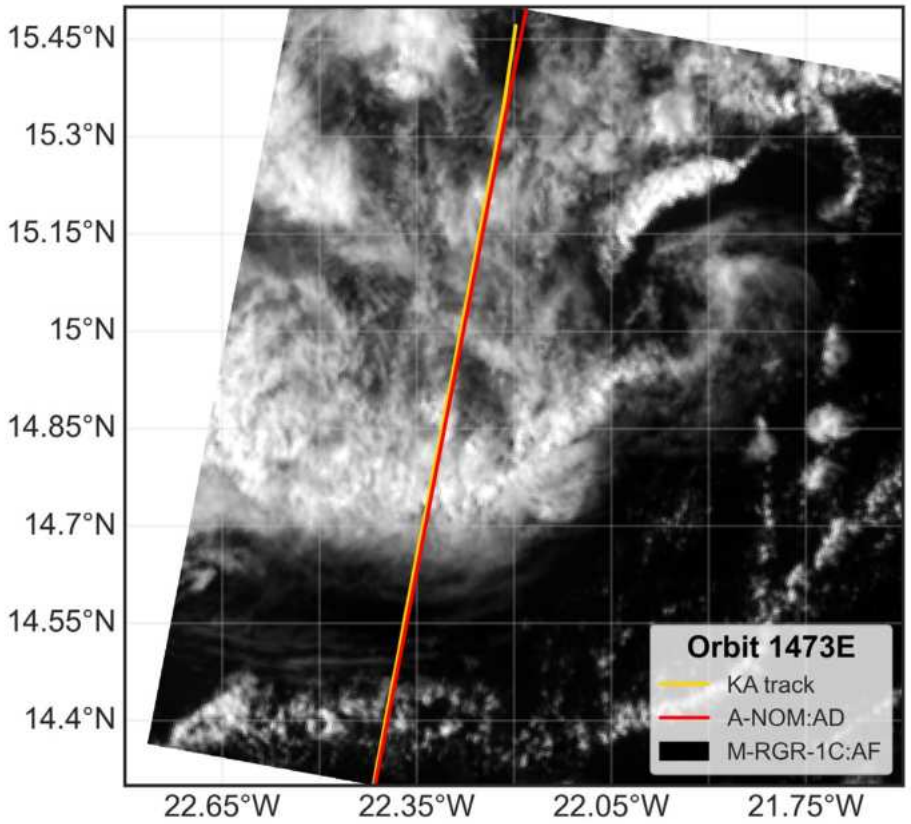


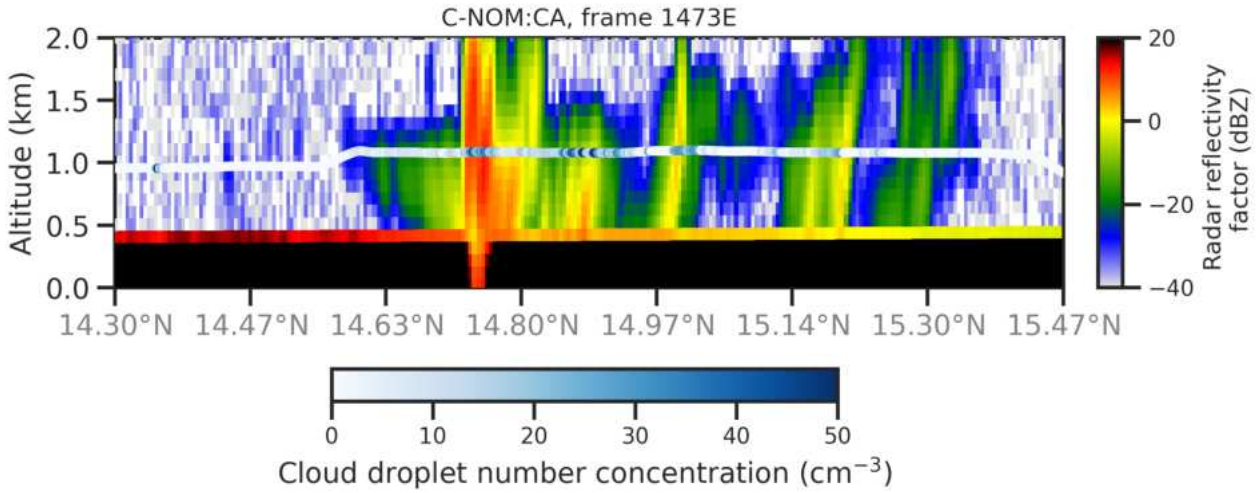
Ice (possible liquid)

Supercooled liquid

Ice with SLW

Probing a convective cloud

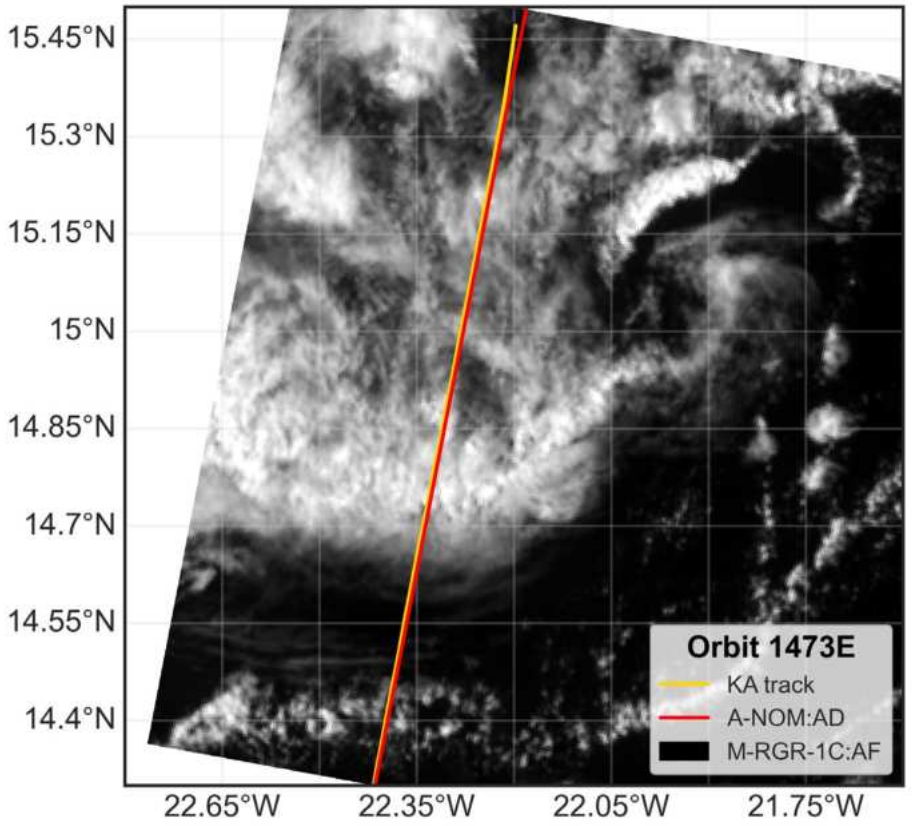


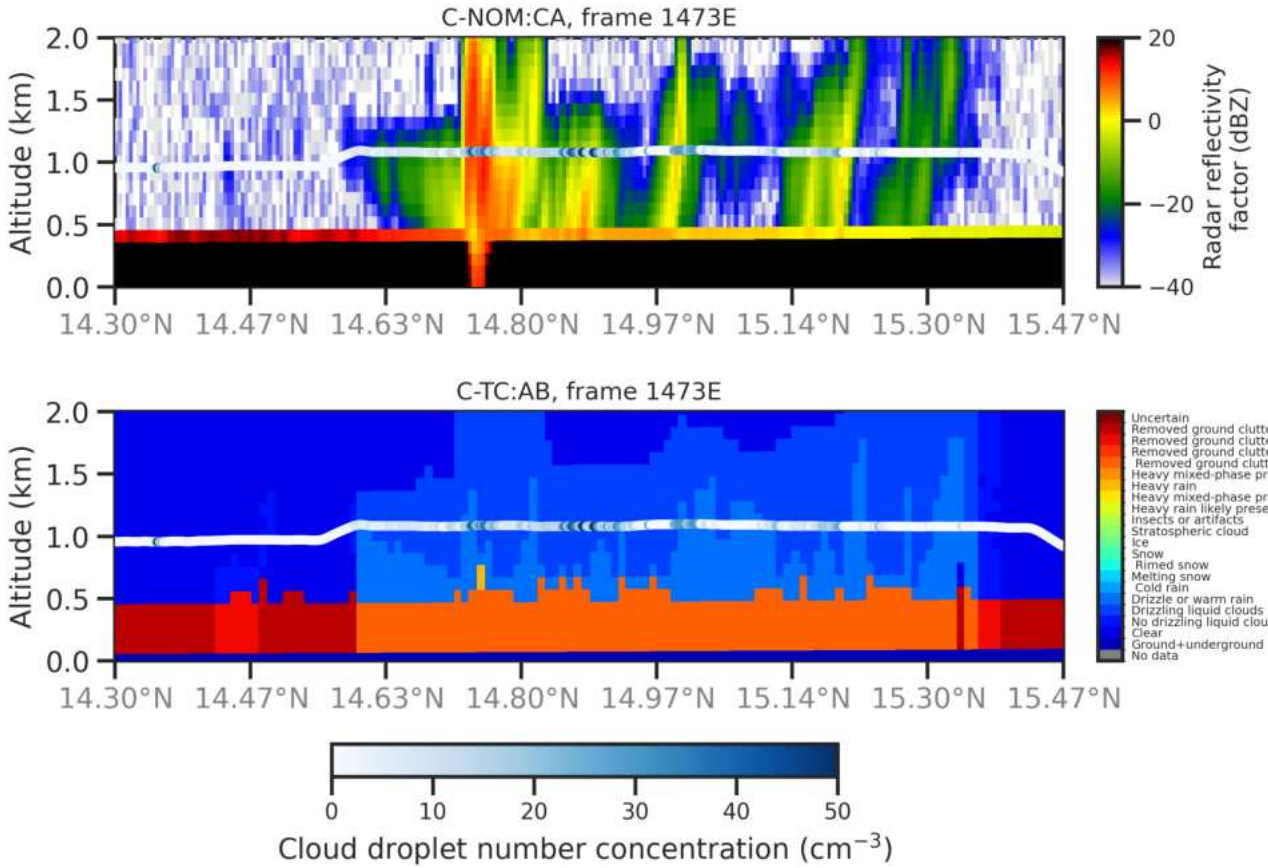


Flight on 31st August 2024:
target orbit #1473

Strategy:
EarthCARE overpass
Constant altitude leg below ATR-42

Probing a convective cloud





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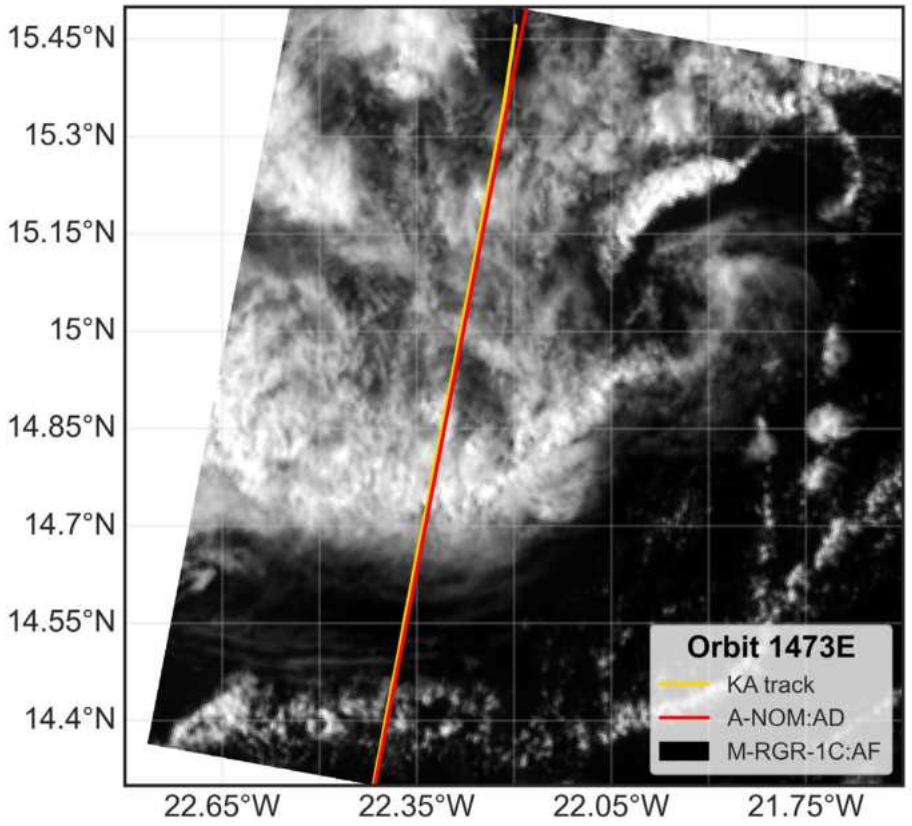

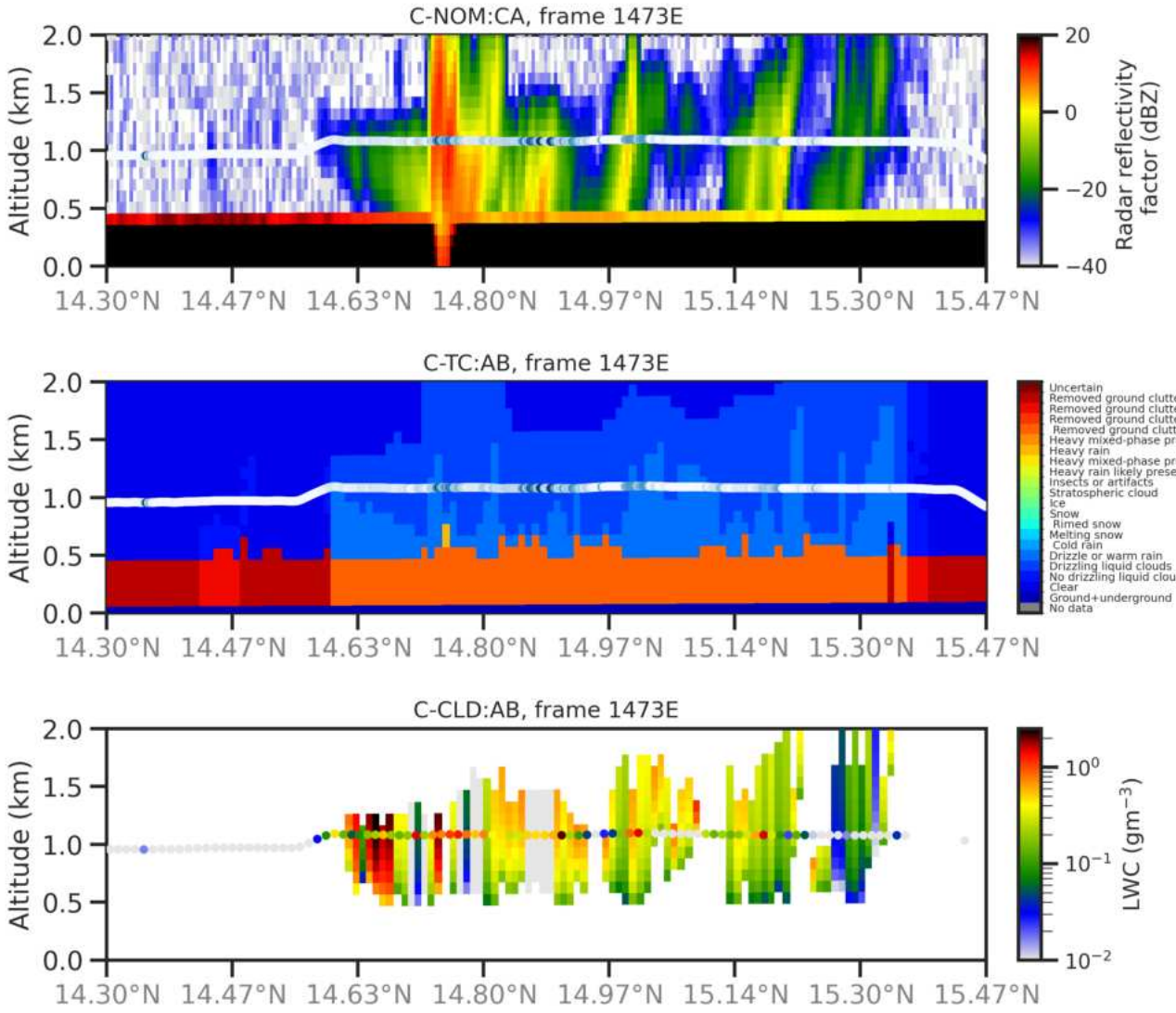

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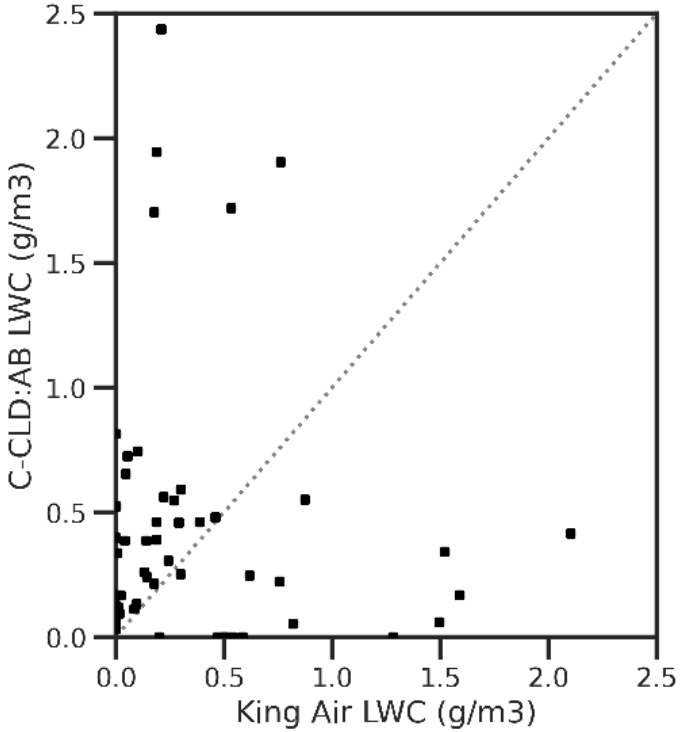

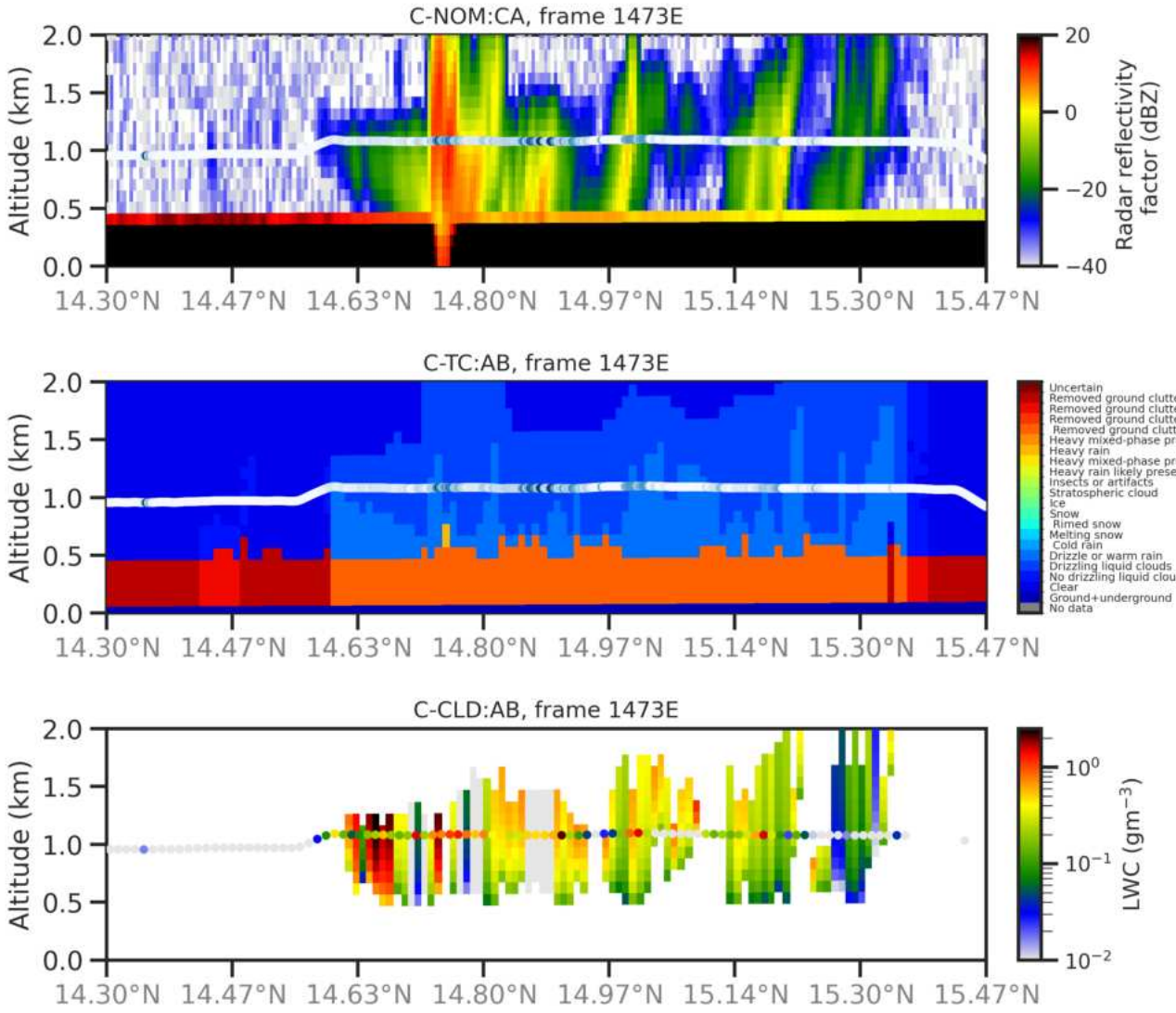

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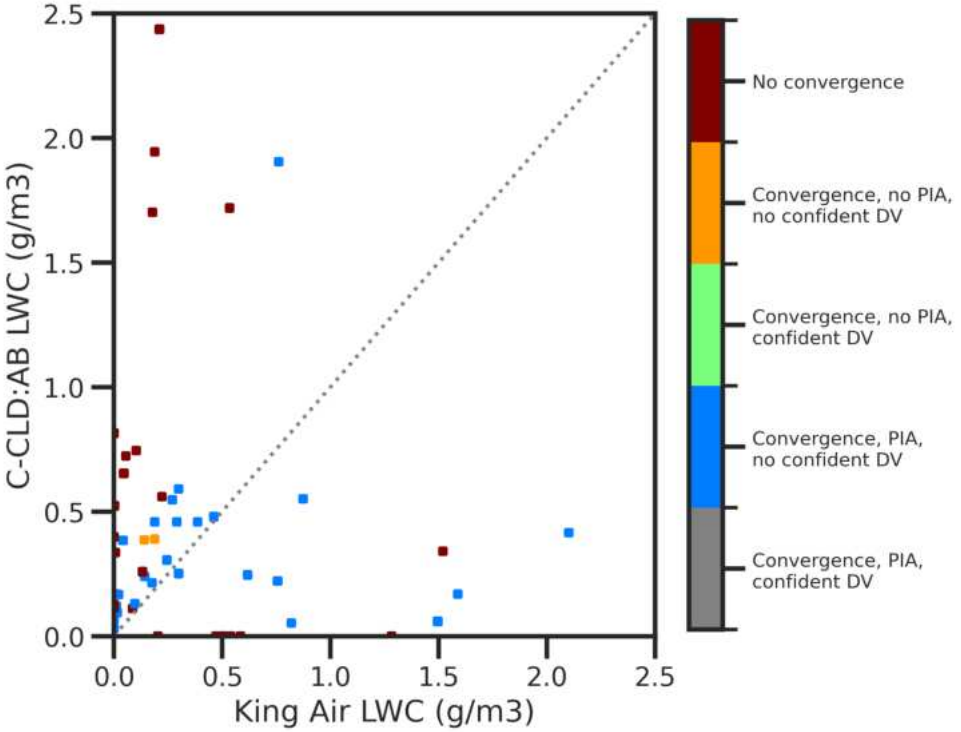

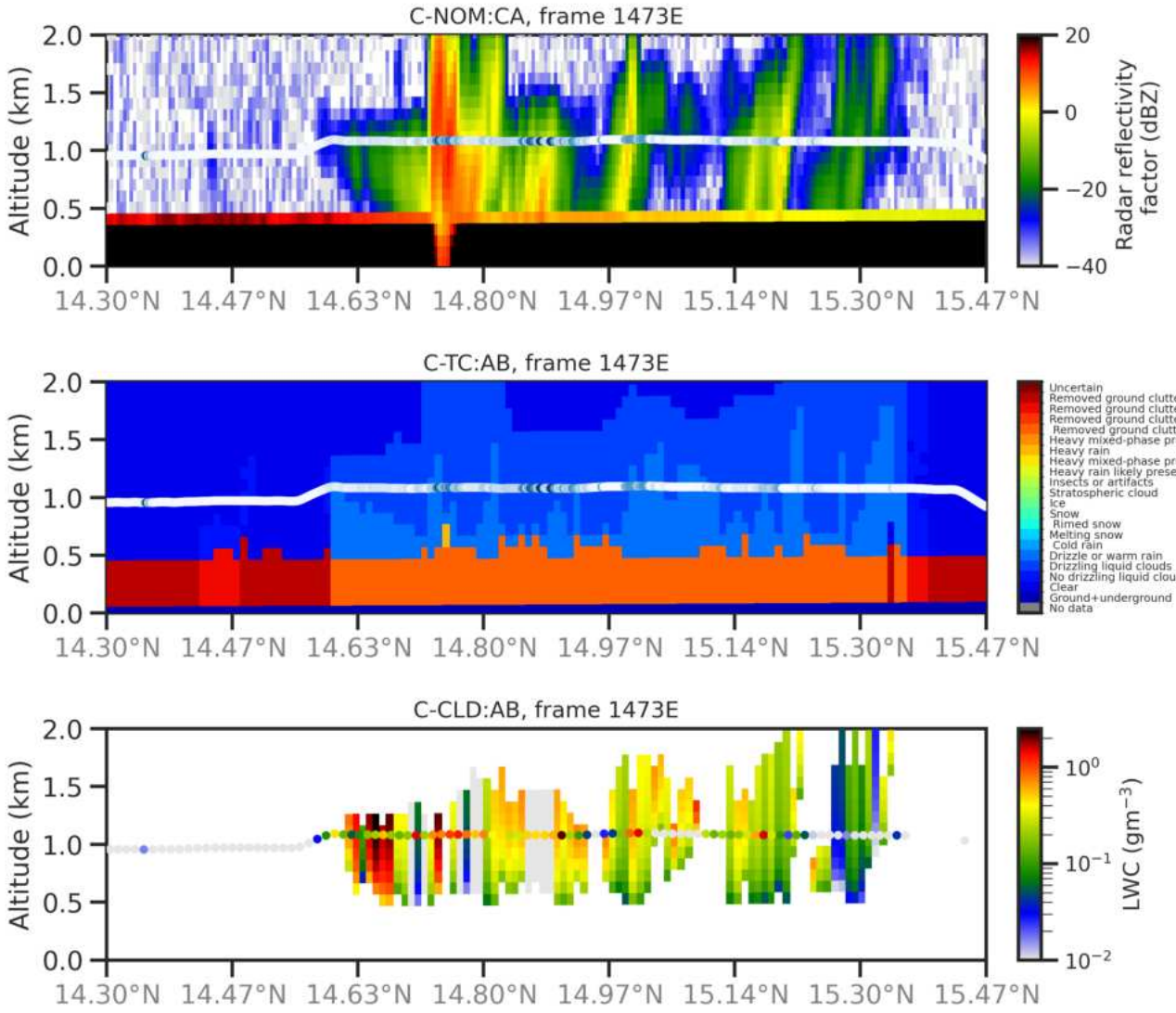

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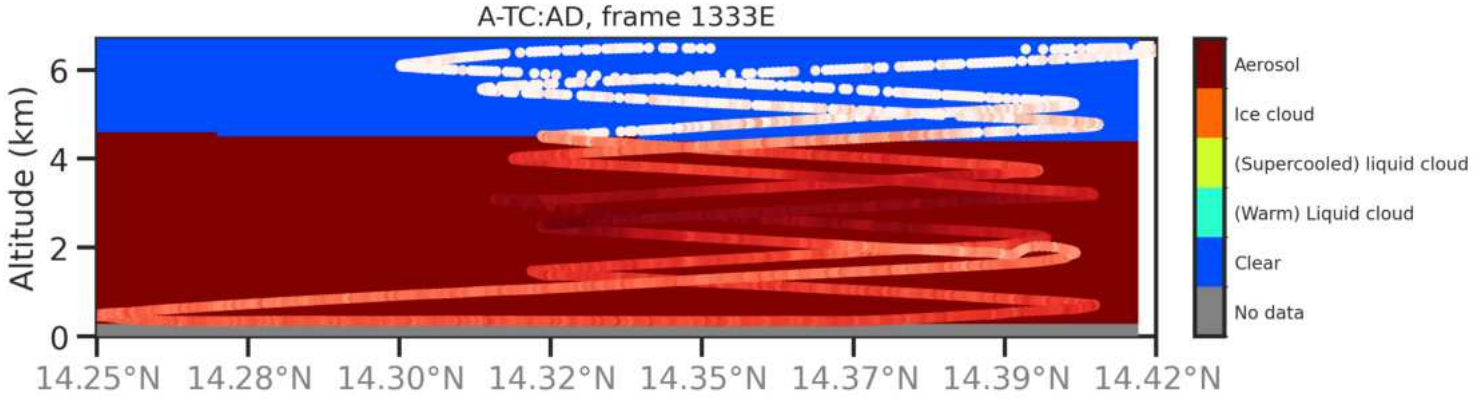
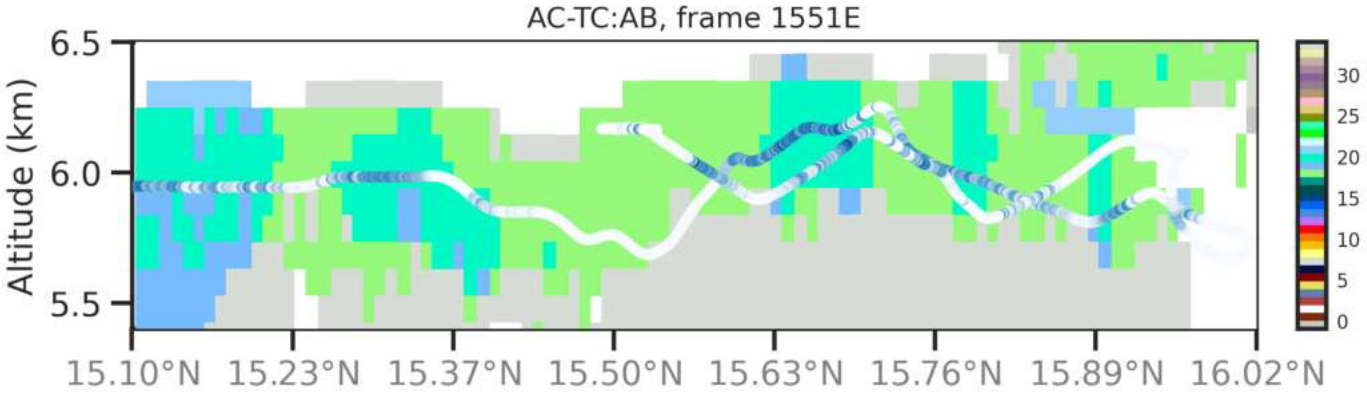
Preliminary takeaways

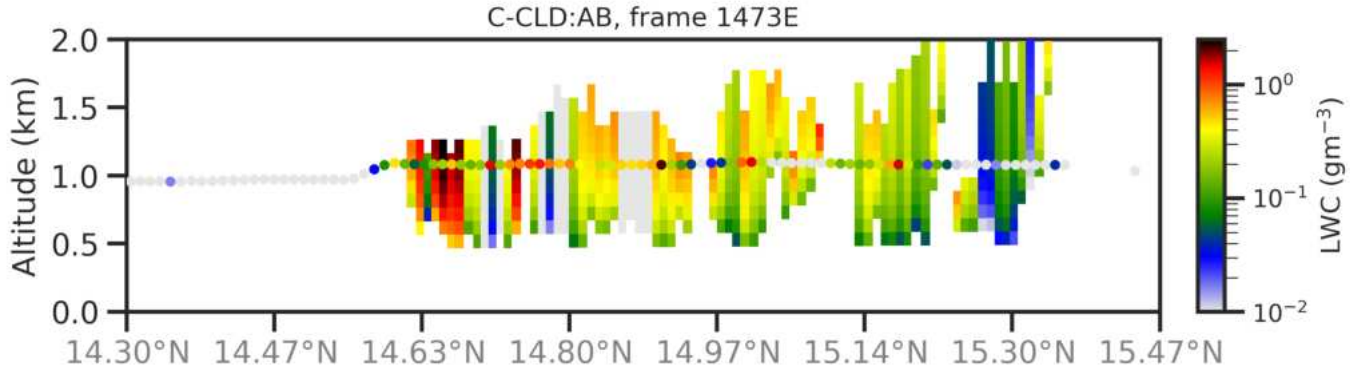
Aerosol layer height from A-TC:AD matches in-situ observations.



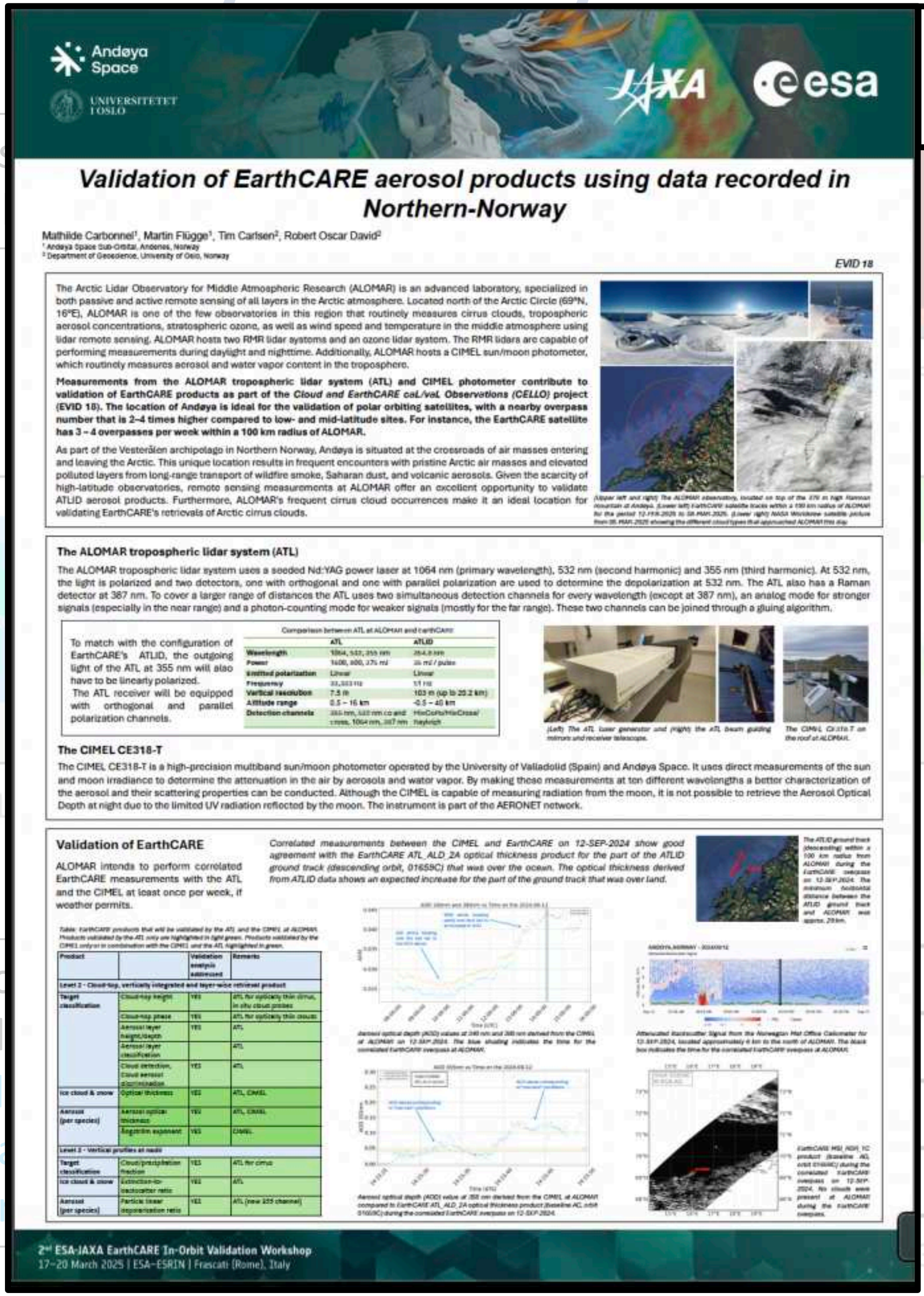


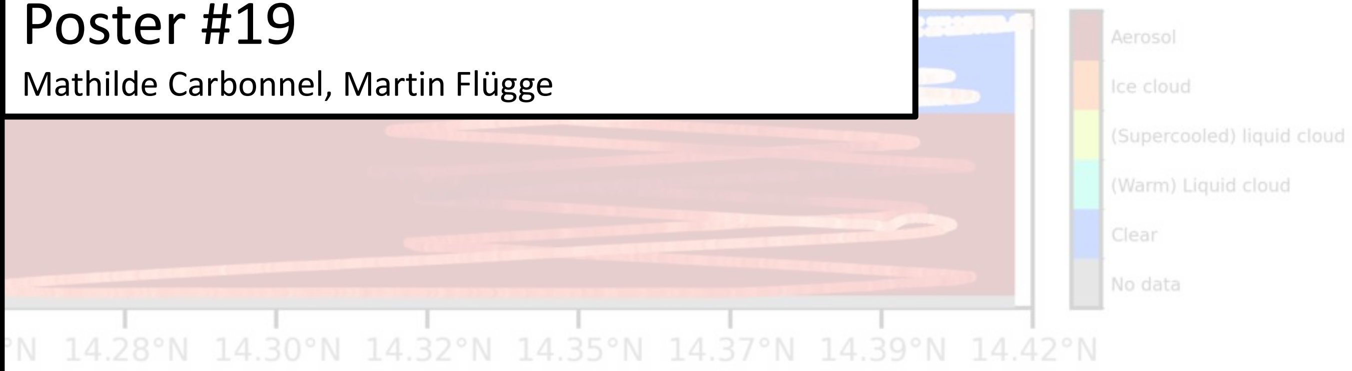
CPR and ATLID retrieve **thin cloud.**
C-TC:AB classifies supercooled liquid cloud as ice, corresponding C-CLD:AB retrieves no water content.

Discrepancy between observed and retrieved C-CLD:AB LWC.
Collocation?
Measurement uncertainty?
Retrieval status?



Preliminary takeaways





Poster #19

Mathilde Carbonnel, Martin Flügge

Thanks to Shannon Mason (**ectools**) and Leonard König (**oads-download**)