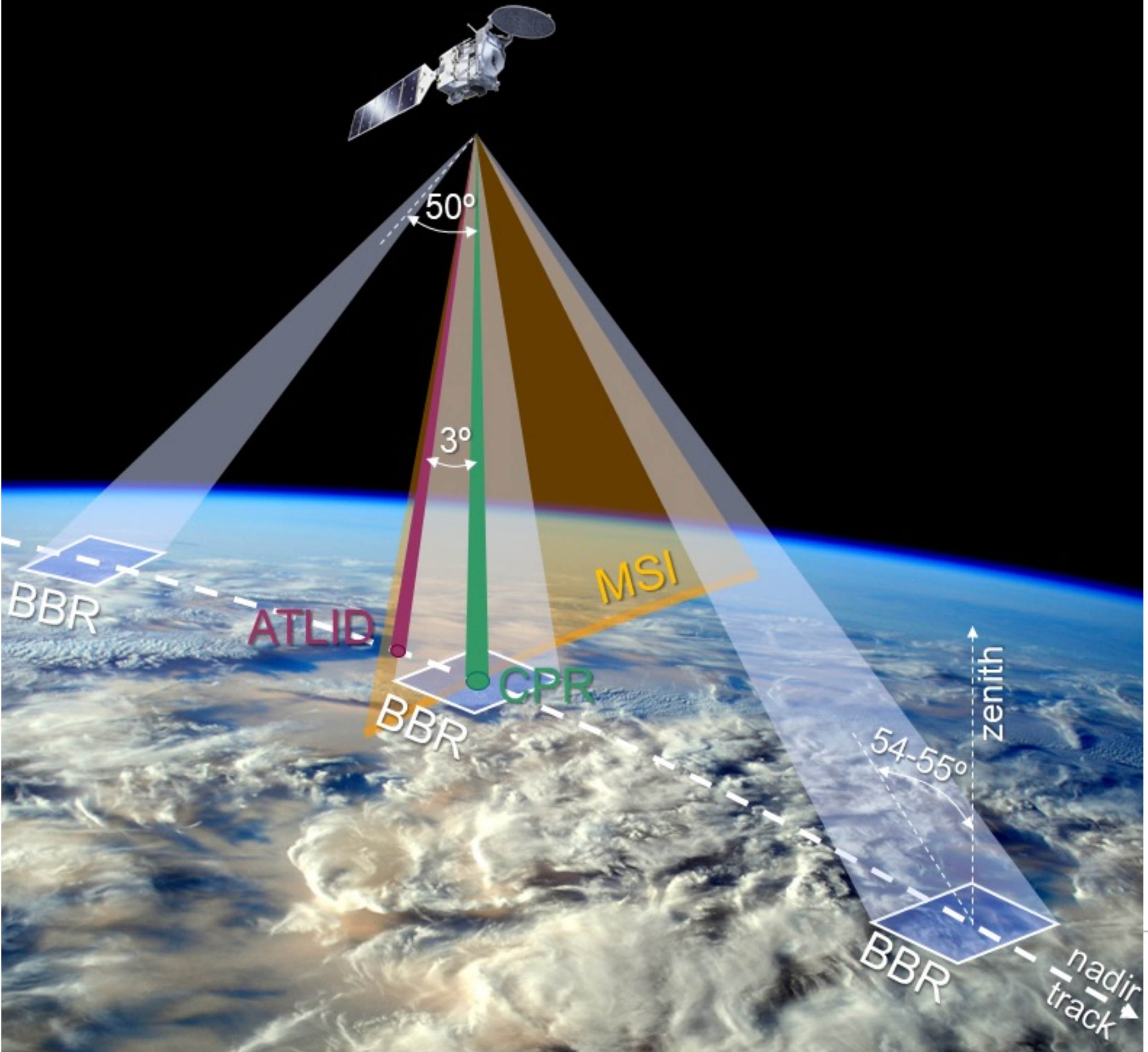
EarthCARE instrumentation:

BBR – Broad Band Radiometer
MSI – Multi-Spectral Imager (7 chenals)
CPR – Cloud Profiling Radar (profiler at 94 GHz)
ATLID – Atmospheric Lidar (HSRL at 355 nm)



ACTRIS
CCRES

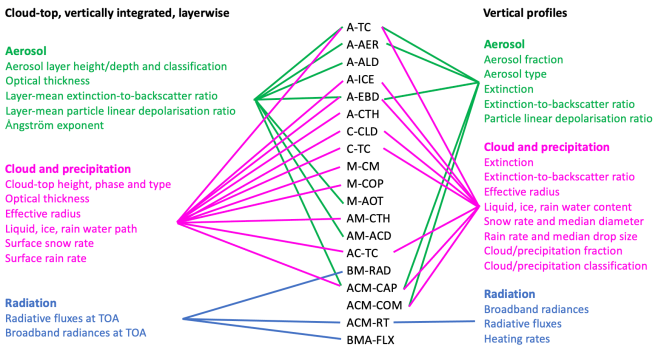
EarthCARE
Mission overview & CCRES Cal/Val

Lukas Pfitzenmaier
Nathan Feuillard, Felipe Toledo Bittner,
Ewan O'Conner, Simo Tukiainen,
and many more…

CCRES/CLU Training school, Munich, 2-5 Sept. 2025

Content

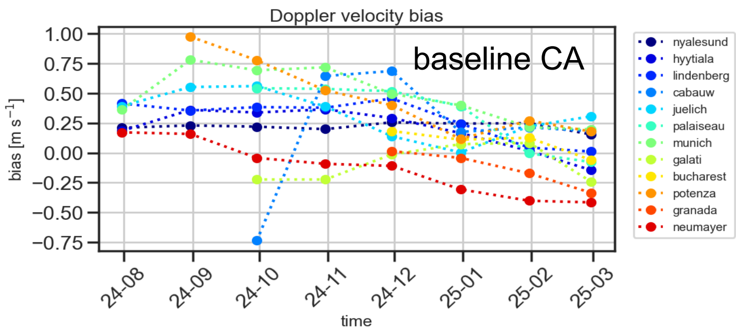
EarthCARE overview:



Status
Instrumentation
Data products
Synergy to ACTRIS
Open validation questions

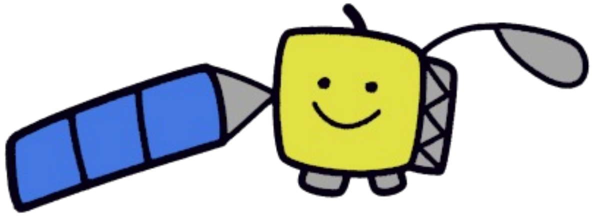
Tobias Wehr et al., 2023, AMT

CCRES validation activities



CPR validation of
Reflectivity and
Doppler velocity

Summery and outlook



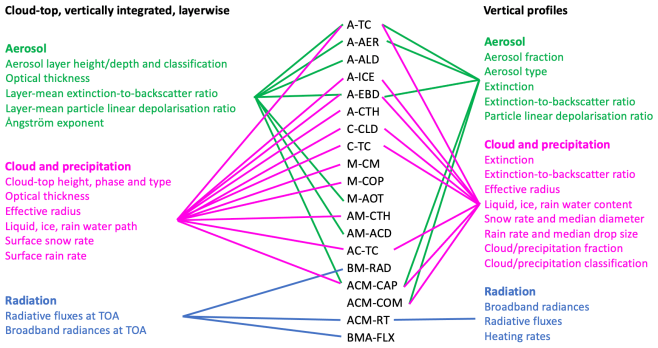
Information
Tools
Links

<u>L2 validation?</u>

https://www.earthcarescience.net

Content

EarthCARE overview:



Status
Data products
Open questions

Tobias Wehr et al., 2023, AMT

EarthCARE instrumentation

ACTRIS CCRES

BBR

- 3 different views – zenith and 50° off zenith front and back
- Footprint 10 x 10 km every 1 km along track

MSI

- 7 channels - 0.67, 0.865, 1.65, 2.21, 8.8, 10.8, and 12.0 µm
- Swath - 115 km (right) 35 km (left)
- Footprint nadir – 0.5 x 0.5 km
- Distribute zenith information along swath pixels
  - radiation closure

CPR

- 94 GHz profiling radar
- Footprint 800m - L1: 0.5 km and L2 1 km along track integration
- 100 m range resolution – 500 m pulse oversampling – noise correlation
- Doppler velocity SNR ok down to -20 /-21 dBZ – no Doppler below in L2!

ATLID

- Impressive performance – "a milestone for future space-borne Lidars" (NASA)
- Footprint – L1 ~ 30m for L2 up to 20 km depends on product
- Range resolution lower 20 - 40 km

Instrument	Characteristics	Example products and synergy
Atmospheric lidar (ATLID) 355 nm	Transmits 38 mJ pulses at 51 Hz. High-spectral-resolution receiver with Rayleigh and Mie copolar and total cross-polar channels. Telescope diameter 0.62 m. Beam divergence 45 µrad, ground footprint about 30 m. Receiver field of view 65 µrad. Pointing 3° off-nadir along track to avoid specular reflection from ice crystals. Vertical-resolution 103 m from –1 to 20 km in height and 500 m from 20 to 40 km. Horizontal resolution 285 m (two shots).	Aerosol products: profiles of extinction, backscatter, depolarization ratio, lidar ratio (all with uncertainties), and aerosol type. Cloud products: IWC, effective radius, cloud-top height, cloud and aerosol synergy products with CPR and MSI.
Cloud profiling radar (CPR) 94.05 GHz	2.5-m antenna. Nadir pointing. 0.095° (3 dB) beam width; 660-m ground footprint. Extended Interaction Klystron (EIK), 3.3-µs pulses. Pulse repetition frequency 6100–7500 Hz. Doppler capability. 500-m vertical resolution, oversampled at 100 m down to 1 km below the surface. Horizontal sampling 500 m.	Cloud and vertical motion products. Synergy with ATLID and MSI: narrow swath profiles of liquid and ice-cloud content and extinction, particle size and concentration, and precipitation rates (all with uncertainties).
Multispectral imager (MSI)	Nadir pushbroom imager with seven channels: 0.670, 0.865, 1.65, 2.21, 8.80, 10.80, and 12.00 µm. To reduce sunglint the swath is tilted to right of ground track looking forward along the orbit, so it is 115 km to the right, 35 km to the left. Sampling 500 m × 500 m at nadir.	Cloud and aerosol products. Radiances used to construct 3D cloud–aerosol scenes around narrow swath of retrieved profiles, leading to estimates of radiative flux and heating rate profiles.
Broadband radiometer (BBR)	Channels: 0.25–50 µm, 0.25–4 µm; three fixed telescopes: nadir, forward, and backward (at 50° viewing zenith angles). Radiometric accuracy: SW 2.5 W m^{-2} sr^{-1}; LW 1.5 W m^{-2} sr^{-1}. Mean radiances averaged to 10 km × 10 km will be oversampled and reported every ~1 km along track.	Observed solar and thermal radiances and their derived fluxes are compared with those predicted by radiative transfer models applied to 3D constructed scenes.

Level 0 (L0) product	Raw instrument science packets, ordered in time, with duplicates removed, annotated with quality flags and time stamps related to the data acquisition at the ground station. For expert users only, not distributed.
Level 1b (L1b) product	Calibrated instrument data processed to physical units, with error bars, quality flags and geolocations.
Level 1c (L1c) product	MSI-only: L1b data re-sampled onto the grid of one selected MSI reference channel.
Level 1d (L1d) product	Special/auxiliary products created to support higher-level processing of EarthCARE products. (The only L1d product is the joint standard grid.)
Level 2 (L2) product	Derived geophysical variables, either at the same resolution and location as L1b data ("native grid") or re-sampled to a common grid (joint standard grid), with error bars, quality flags and geolocations.
Level 2a (L2a) product	(EarthCARE-specific definition) L2 product derived from one single EarthCARE instrument.
Level 2b (L2b) product	(EarthCARE-specific definition) L2 product synergistically derived from two or more EarthCARE instruments.

Tobias Wehr et al., 2023, AMT, & Illingworth et al., 2015, BAMS

EarthCARE status

ACTRIS CCRES

BBR

- Works well
- Validation needs

MSI

- Calibration issues for VNS bands - diffuser does not work as expected
    - ad-hoc vicarious calibration of MSI solar bands has been implemented for baseline (BA)
    - further updates will be developed based on vicarious calibration, e.g. additional information/satellites cross-validation or development of new techniques (needs time, people, money)
- L1 and further L2 products require careful handling – please read the documentation.

CPR

- Doppler velocity can be used down to -20 /-21 dBZ
- Doppler velocity bias varies with time
    - CPR antenna heating by solar radiation (Publication by B. Puigdonènech Treserras et al., AMTD, 2025)

ATLID

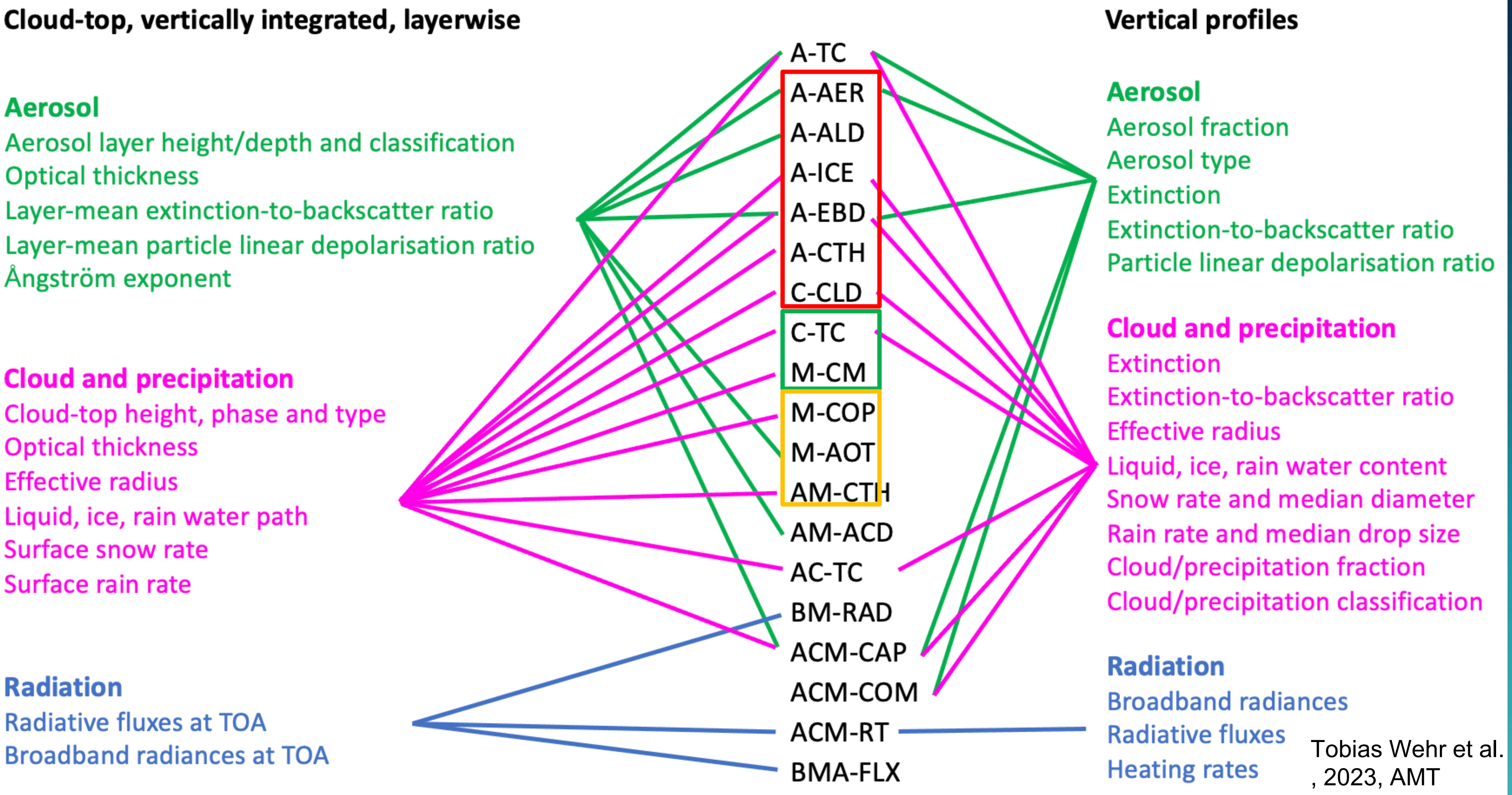
- Impressive performance – “a milestone for future space-borne Lidars” (NASA)
- Lots of extinction products for different purposes – more explanation needed
- Read the documentation!

EarthCARE product overview ESA

Overview of the L2 product chain from ESA

singles sensor products
ATLID red box
CPR greed box
MSI yellow box

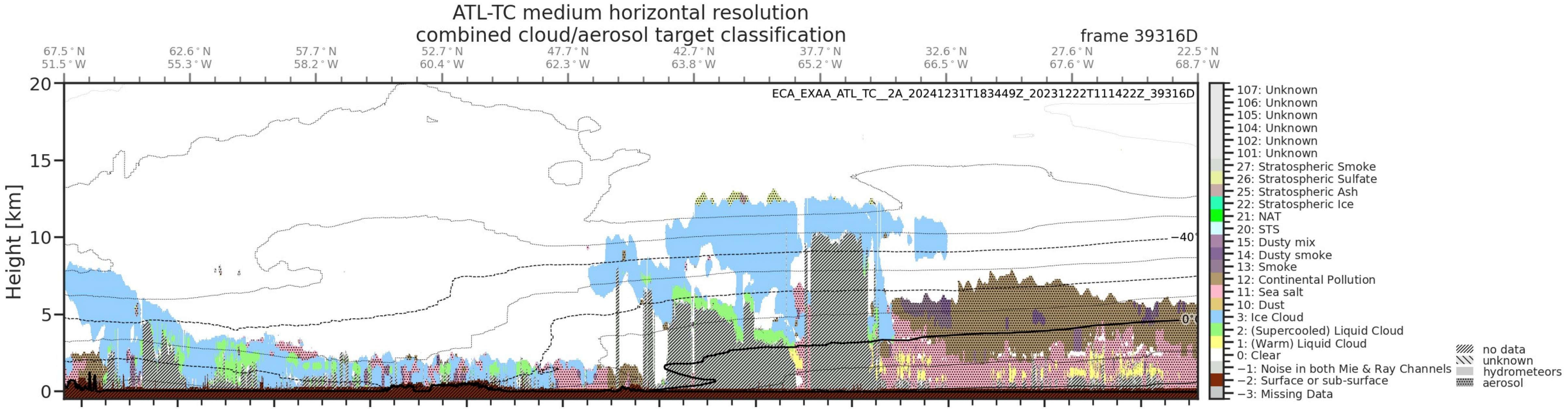
Combined products
AM = ATLID + MSI
AC = ATLID + CPR
BM = BBR + MSI
ACM = ATLID + CPR + MSI
BMA = BBR + MSI + ATLID

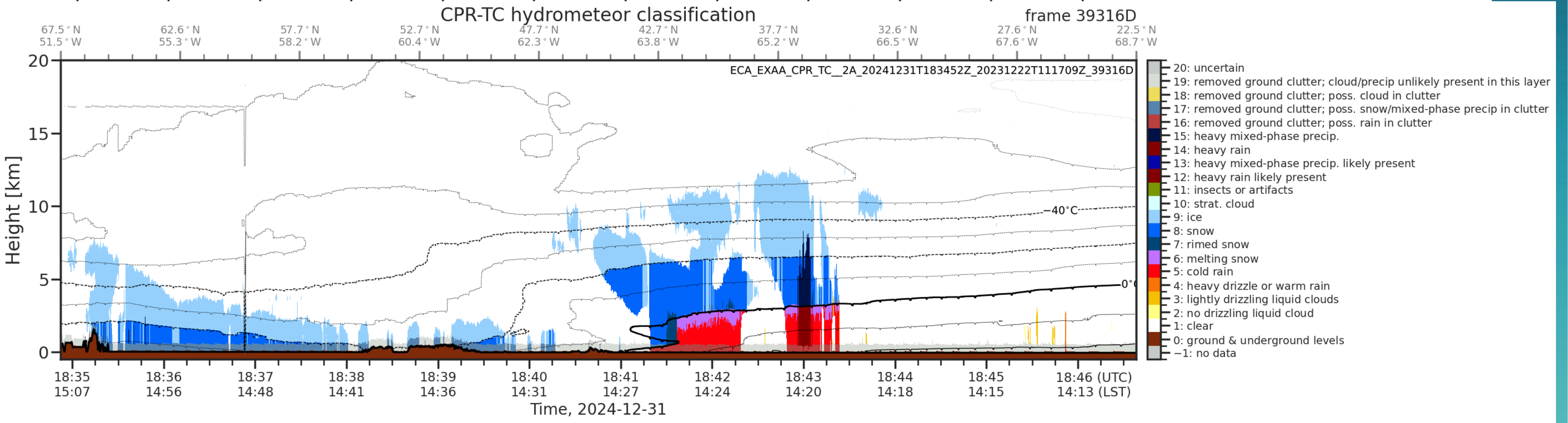


Tobias Wehr et al., 2023, AMT

EGU special issue
https://amt.copernicus.org/articles/special_issue1156.html

Example ESA Target Classification





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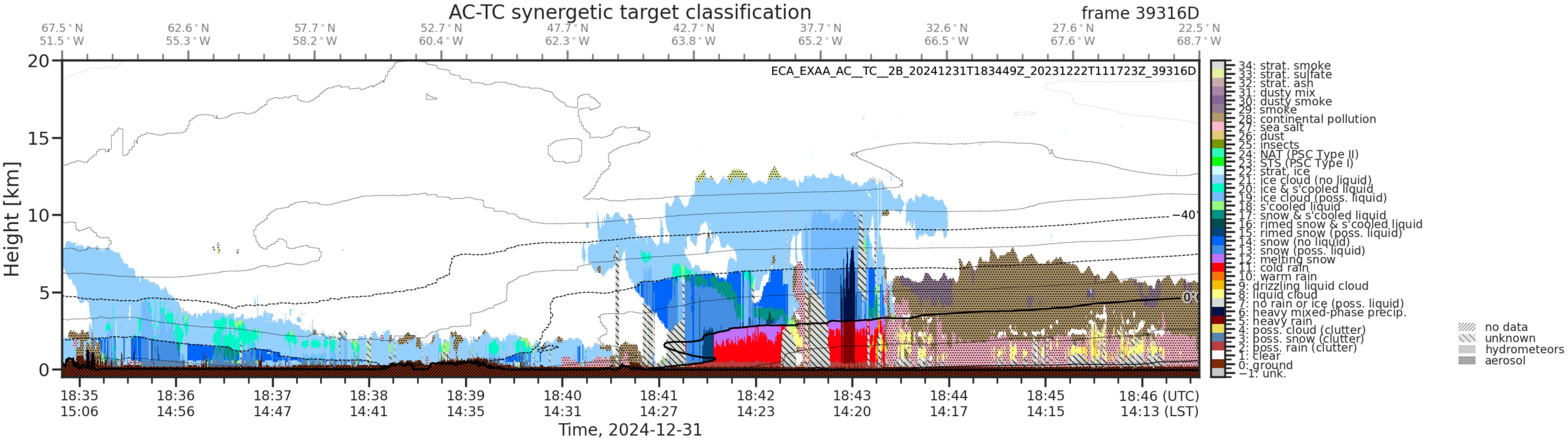
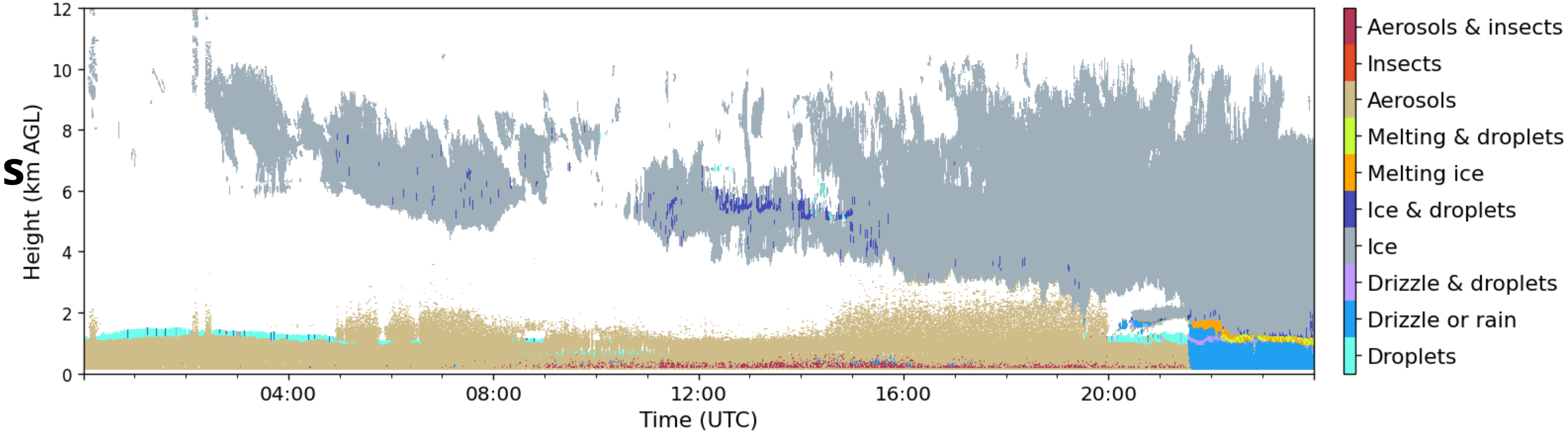


Differences in the classifications from ground and space

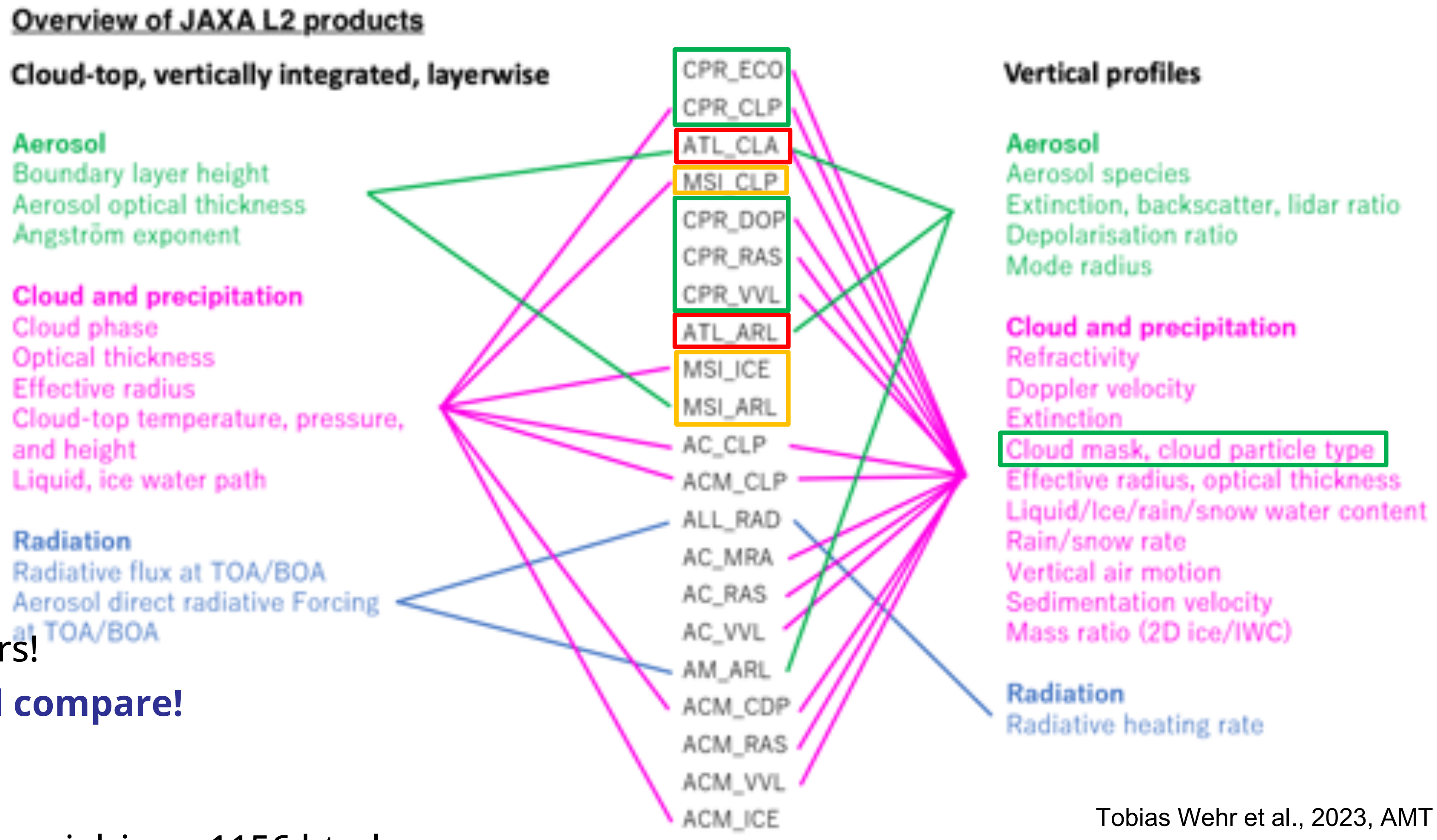


EarthCARE product overview ESA

Overview of the L2 product chain from JAXA

singles sensor products
ATLID red box
CPR greed box
MSI yellow box

AM = ATLID + MSI
AC = ATLID + CPR
BM = BBR + MSI
ACM = ATLID + CPR + MSI
BMA = BBR + MSI + ATLID

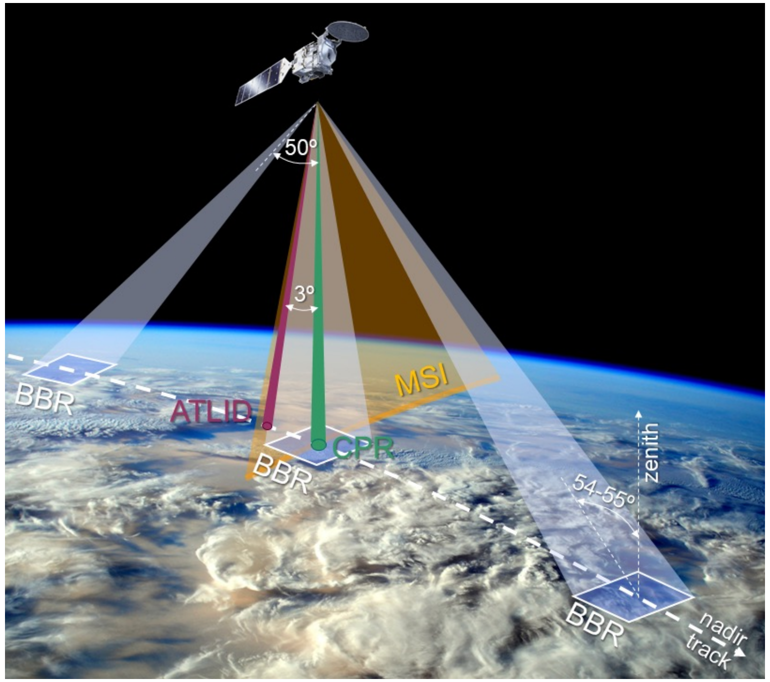


Tobias Wehr et al., 2023, AMT

Different products!
Different retrievals!
Sometimes even different parameters!
Lots of possibilities to validate and compare!

EGU special issue
https://amt.copernicus.org/articles/special_issue1156.html

EarthCARE status validation possibilities



- Operating since July 2024
- L1 and L2 data available
- Download ESA server: https://earth.esa.int/eogateway/missions/earthcare/data
- Download tool ESA: https://github.com/koenigleon/oads-download

Similar Instrumentation
EarthCARE = ACTRIS
site from space

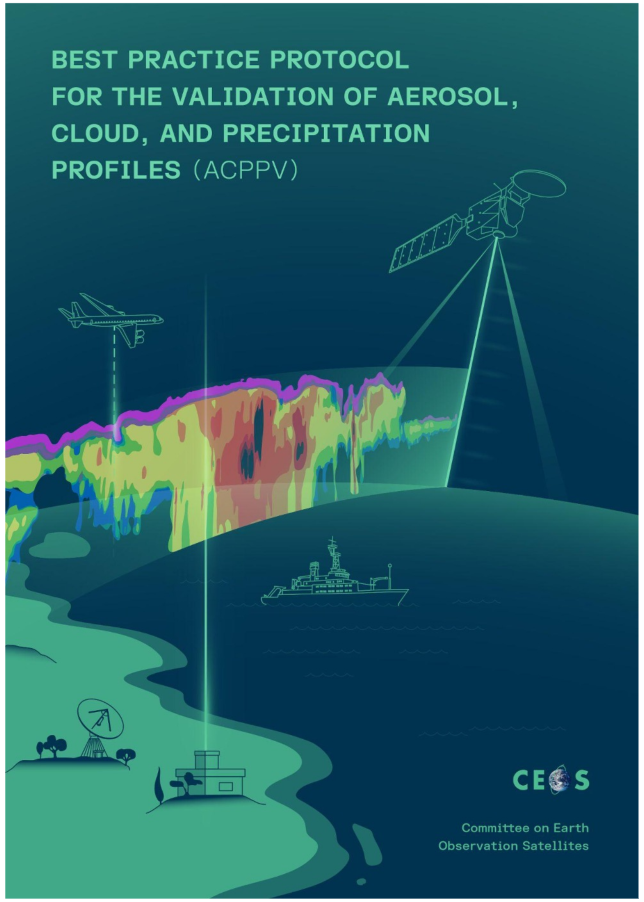
ACTRIS Cloud Remote Sensing
- Centralised homogeneous processing
- Data Quality control
- Good geographical coverage
- Cloudnet classification →L2 ready?

- Database for EarthCARE validation
  - Case study
  - Statistical comparison

- 25 fixed sites + mobile facilities
- sites operate 35 and/or **94 GHz** radars

Best practice protocol for validation

ACTRIS
CCRES



DOI assignment in Zenodo:

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97 authors from 58 institutions

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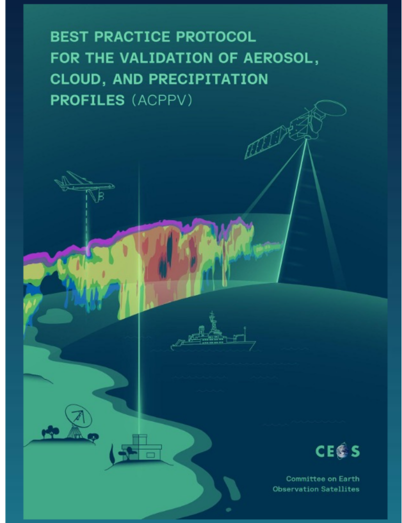
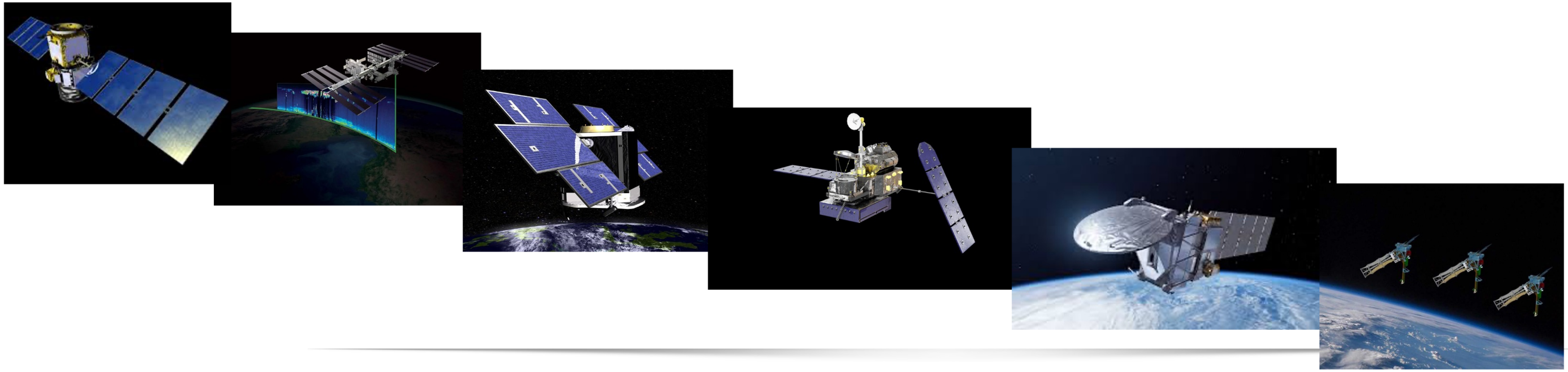


chapter 1: Introduction *[Contact: Vassilis Amiridis, Dan Cecil]*

- Overview of past, present, and future space missions
- Validation objectives for space profilers
- Cal/Val definitions/nomenclature and validation metrics

Chapter 2: Validation needs for Space Profilers *[Contact: Luca Baldini, Tristan l'Ecuyer, Hajime Okamoto]*

- Detailed list of products from space profilers (CALIOP, CATS, CloudSat, GPM, EarthCARE ATLID & CPR, INCUS)
- Validation needs from the product developer's perspective



Best practice protocol for validation

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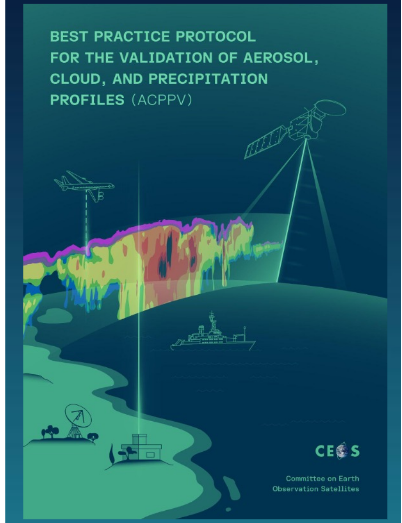
CCRES



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Chapter 3: Survey of validation measurements [Contact: Jens Redemann, Silke Gross, Franco Marenco]

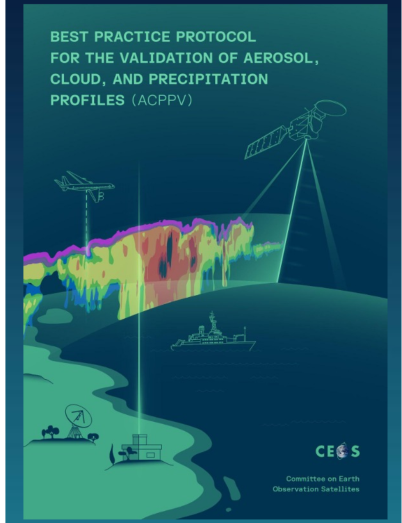
- Types of validation instruments & specific instruments
- Spatiotemporal representativeness, scene homogeneity and co-location criteria for correlative measurements
- Quality of measurements

Chapter 4: Correlative metadata and data format [Contact: Ewan O'Connor, Ann Mari Fjæraa]

- Guidelines on a proper definition of metadata and data formats for Cal/Val archives

Best practice protocol for validation

ACTRIS
CCRES



Chapter 5: Guidance for the validation of lidar and aerosol products [Contact: Eleni Marinou, Holger Baars]

- Guidelines for validation of different lidar and aerosol products with ref. on past studies

Chapter 6: Guidance for validation of radar, cloud, and precipitation products [Contact: Dmitri Moisseev, Simone Tannelli]

- Guidelines for validation of different radar, cloud, and precipitation products with ref. on past studies

Chapter 7: Statistical validation [Contact: Jason Tackett]

- Near-instantaneous comparisons
- Climatological comparisons

Chapter 8: Near-real time validation through data assimilation [Contact: Mark Fielding, Marta Janisková]

- Key considerations and data quality principles
- Demonstrations of data quality monitoring

Chapter 9: Gaps and Challenges [Contact: Holger Baars]

EarthCARE status validation possibilities

Radiation measurements
- Many sites have radiation sensors

Microwave Radiometer
- 14-channel HatPro and possible passive channels from RPG radar

Cloud Radar
- Minimum one frequency
- Doppler spectra delabializing → Doppler velocity validation!

Ceilometer / Lidar
- Attenuation from the ground

EarthCARE instrumentation:

BBR – Broad Band Radiometer
MSI –7 chenals
CPR – zenith at 94 GHz
ATLID –HSRL at 355 nm

Questions/Discussion:
- Quantify convection in the cloud!
- Missing ice particle characterisation within Cloudnet?
- Measure the inhomogeneity of a cloud and in cloud fields?
- Detection of mixed-phase layers from the ground?

- Retrieval of particle sedimentation velocities → validation with EarthCARE *(Kim et al, 2025, EGU discussion)*
- Explore and implement multiple frequency approaches
- Explore and implement scans
- Use AI ML methods to improve microphysical understanding and targeting

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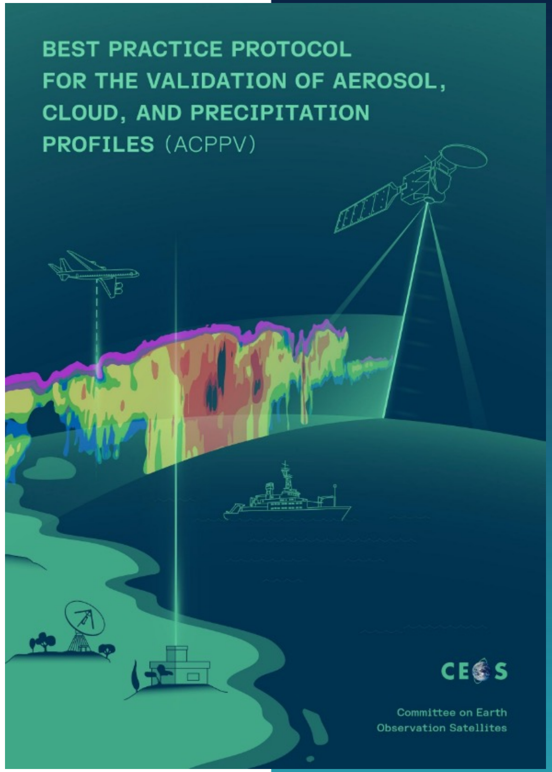
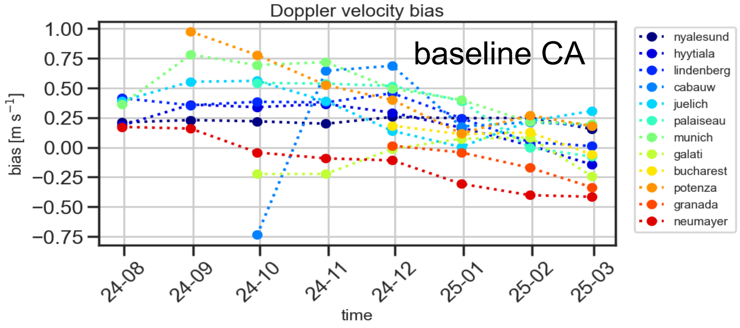


→ Discussion: CCRES and the community how and what we want to address…

Content

CCRES validation activities

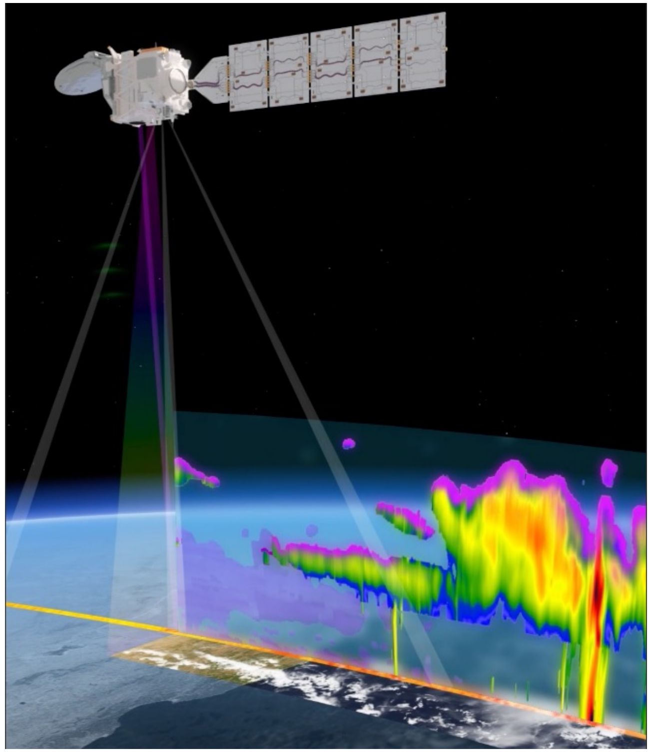


CPR validation of Reflectivity and Doppler velocity

L2 validation?

Why and what we validate?

ACTRIS
CCRES



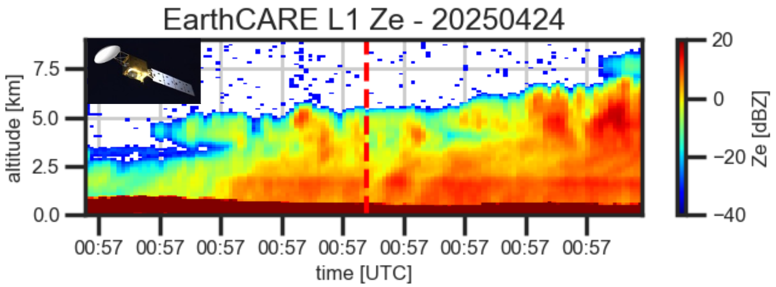
Use the **ground-based** instrumentation to **validate the satellite.**

If instrumentation is comparable, we can ask.

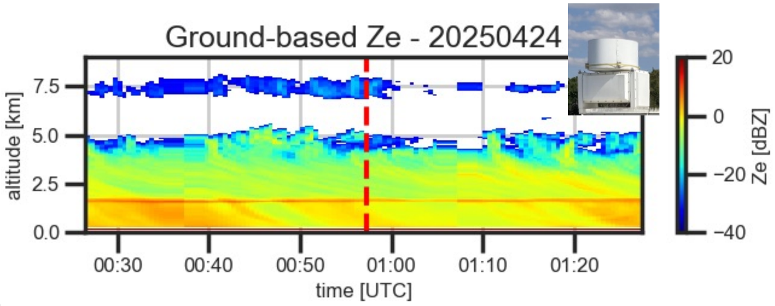
1) Do the instruments measure the same?

Do the values agree?

2) Can we also compare retrieved properties?



?



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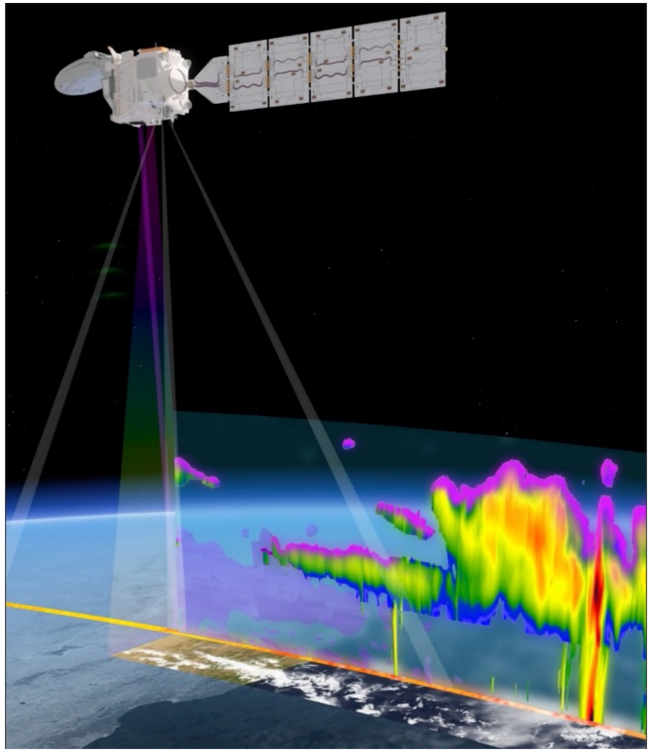

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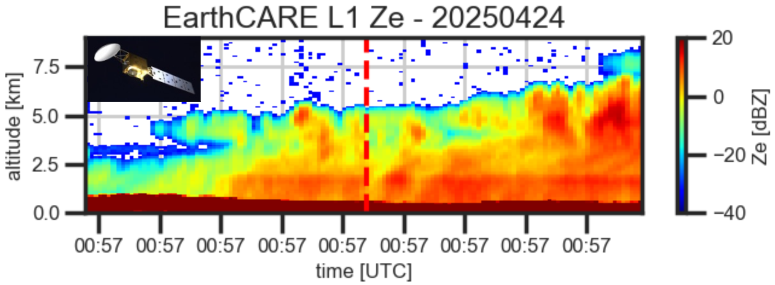
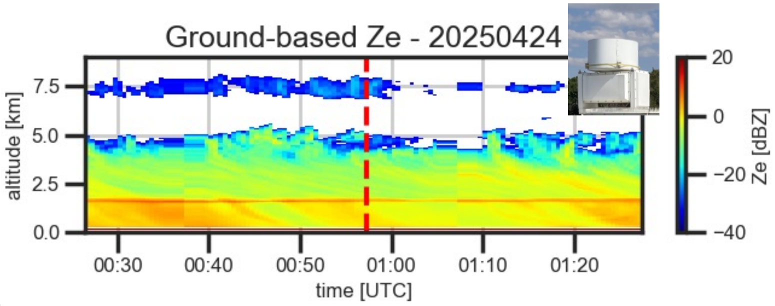




EarthCARE reflectivity validation – case study

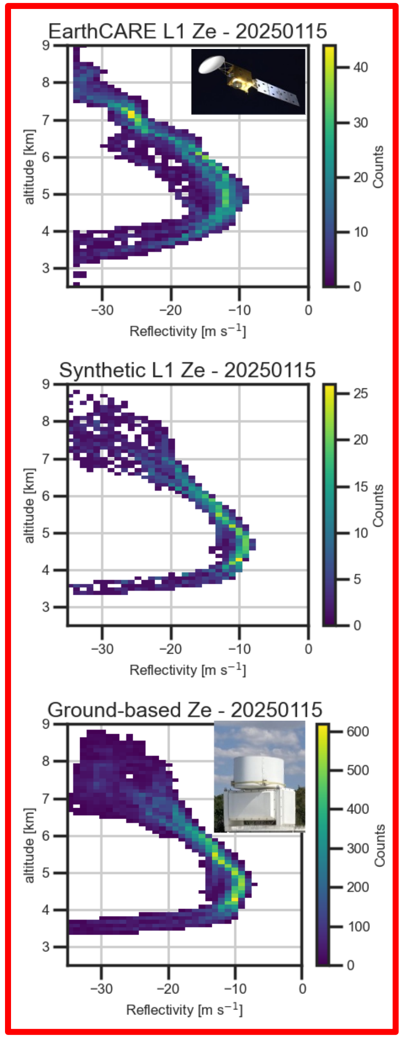
EarthCARE overpass >2 km to the site
(15.01.25, Ny-Ålesund)

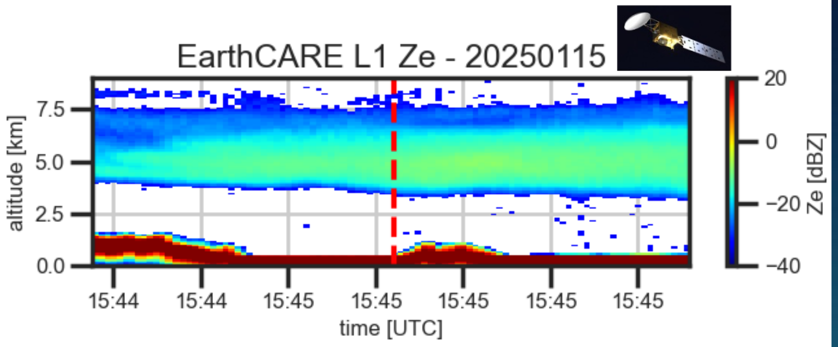
“Golden case”:
- Excellent Ze comparison
- Ze offset estimate ~ 3 dBZ

General remarks:
- Ze-comparison to the W-band
- EarthCARE Ze is calculated with a different dielectric constant
- Range averaging: mimic the correct pulse response functions

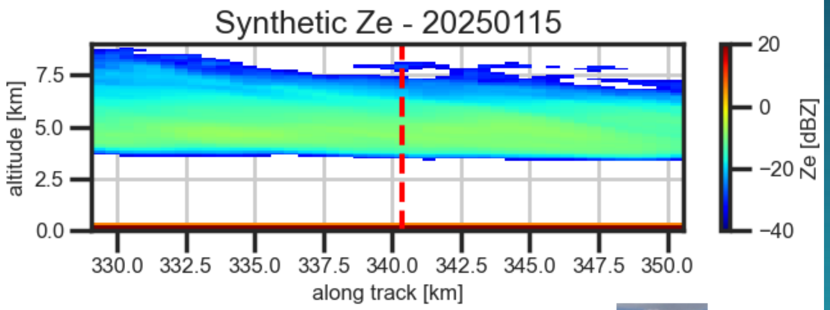
Conversions are implemented in the “orbital radar” tool running on CLU

But “Golden Cases” are rare

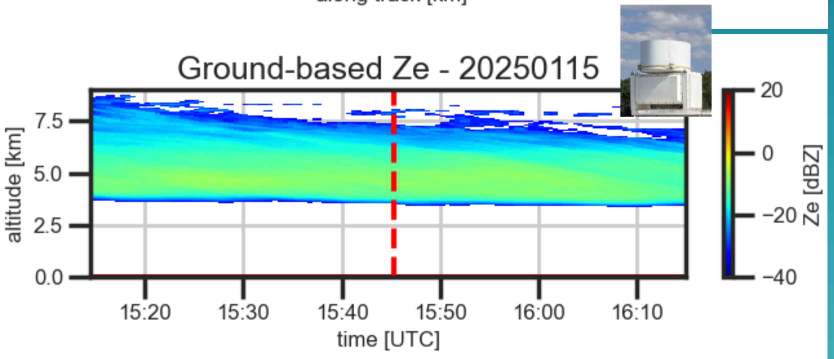




EarthCARE +/-25 km distance from site



Orbital radar tool +/-25 min around overpass



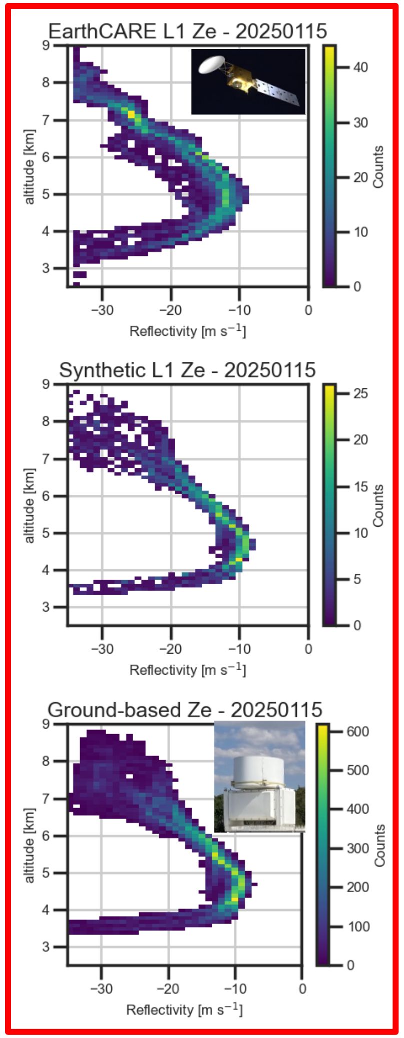
ACTRIS radar +/-25 min around overpass

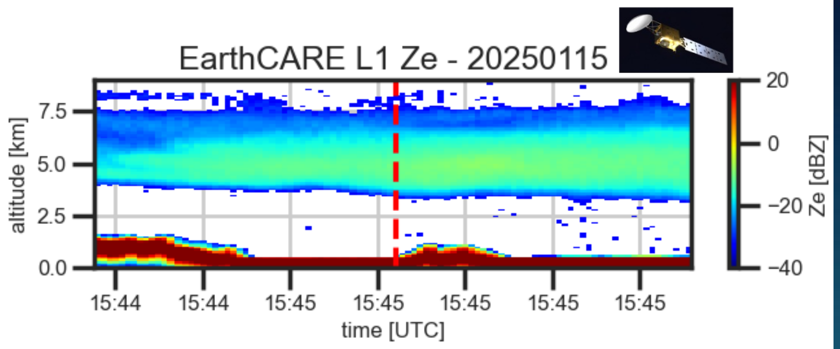
EarthCARE reflectivity validation – case study

EarthCARE overpass >2 km to the site
(15.01.25, Ny-Ålesund)

But “Golden Cases” are not usual cases

ACTRIS, a statistical approach is used:
- Method based on Protate et al. 2010
  - EarthCARE data:
    Within a defined radius to the site
  - Ground-based data:
    Time window around the overpass





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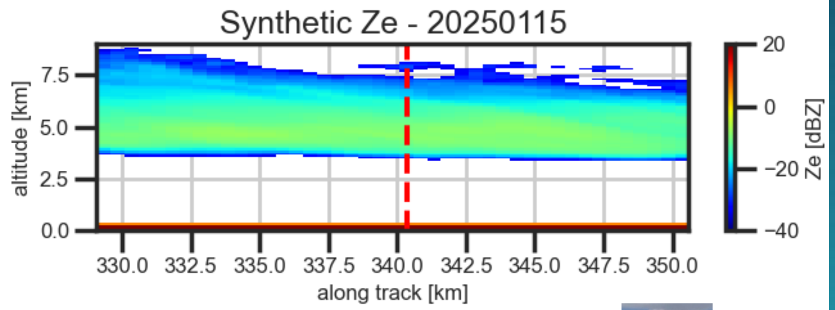

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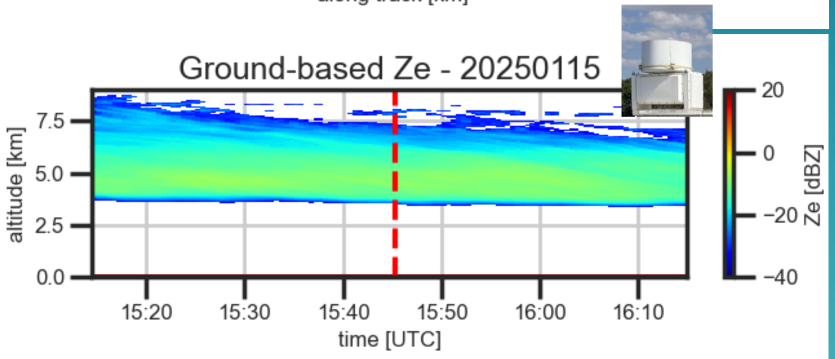


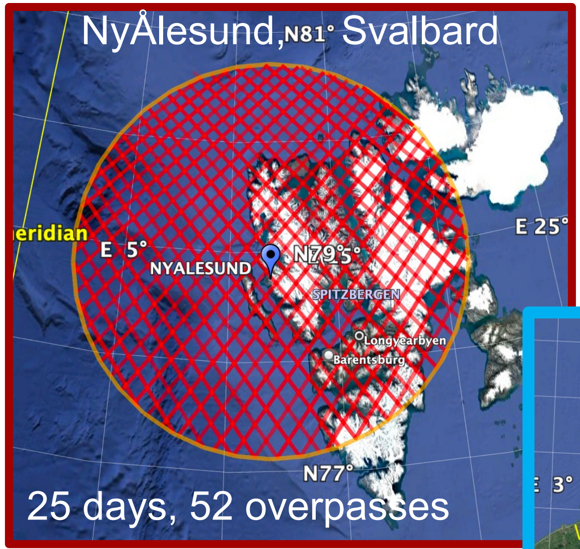
ACTRIS radar +/-25 min around overpass

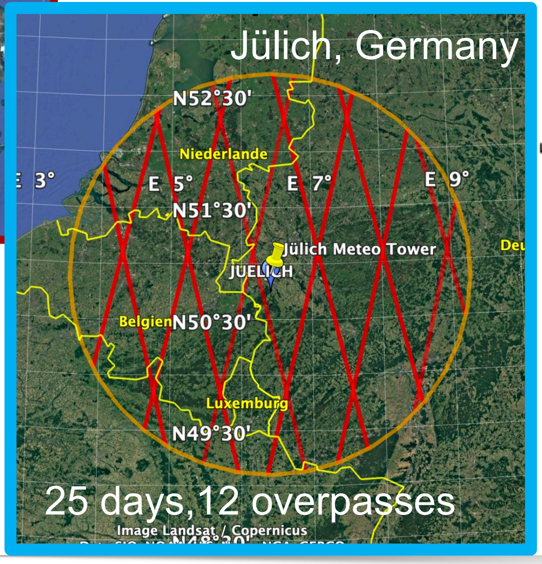
EarthCARE reflectivity validation – statistical approach

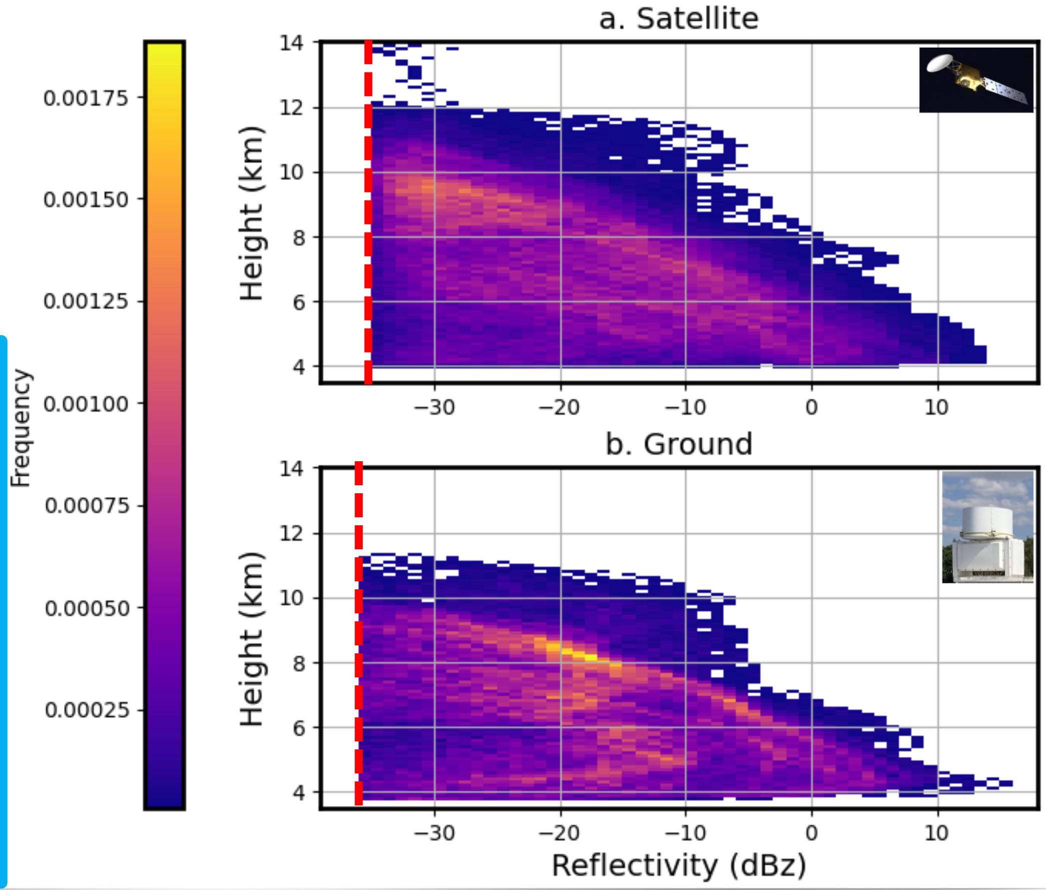
Nathan Feuillard, Felipe Toledo Bittner, Lukas Pfitzenmaier, Ulrich Löhnert, Ewan O'Conner

Filter the data before the comparison:

- avoid liquid attenuation – only ice clouds
- Adjust sensitivities of the data sets







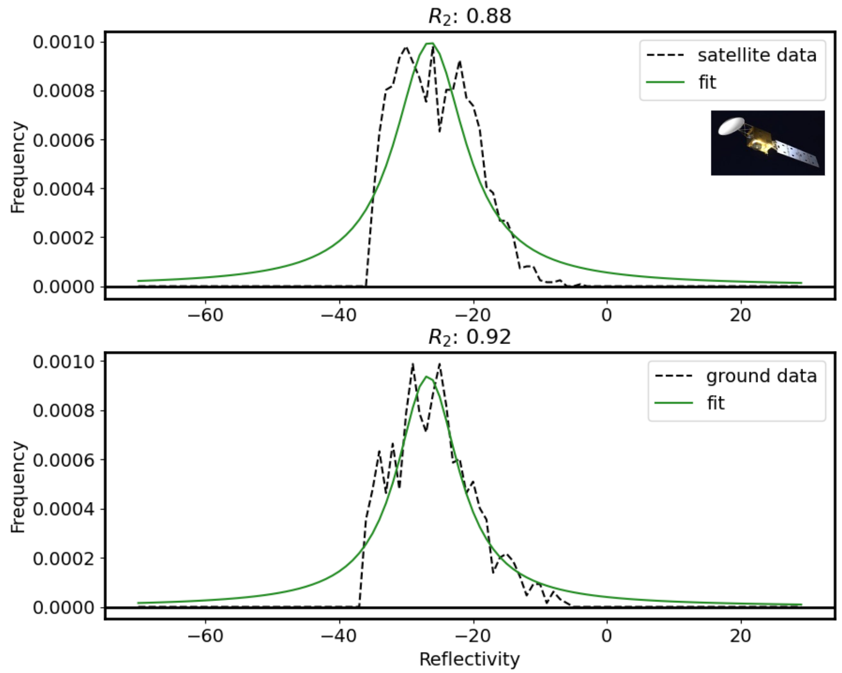
EarthCARE reflectivity validation – statistical approach

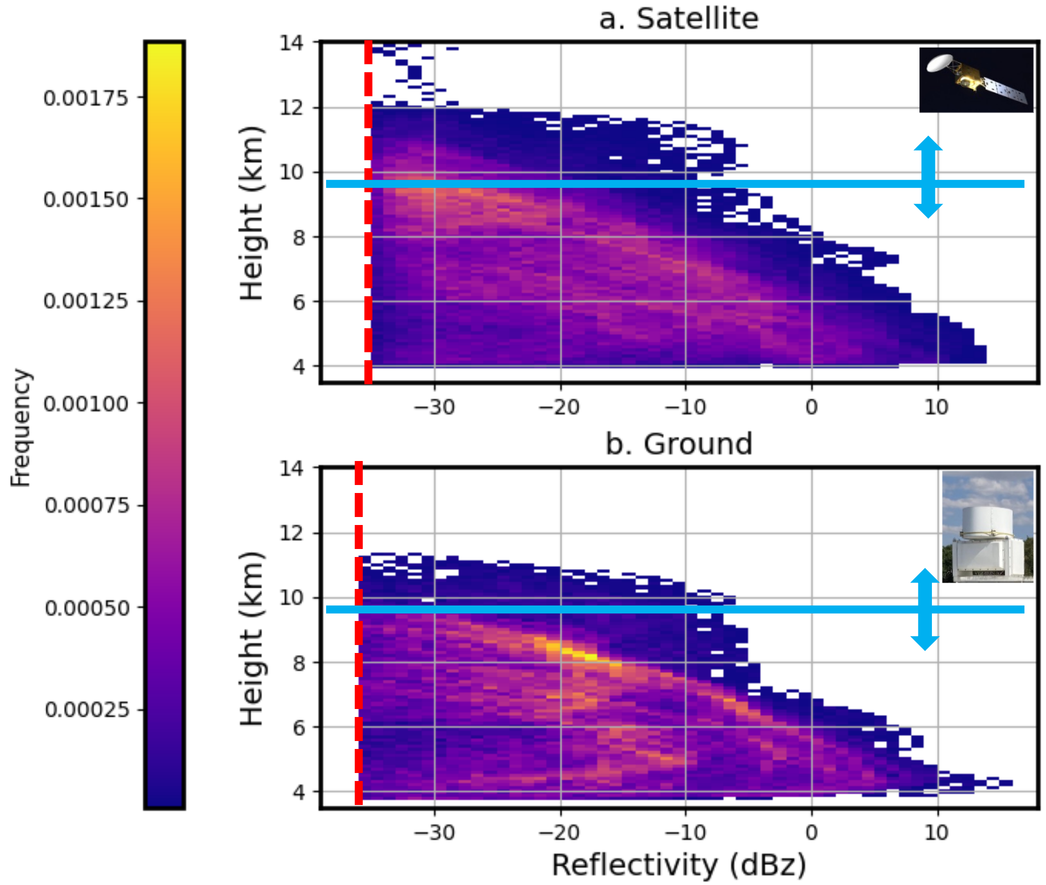
ACTRIS CCRES

cnes IPSL FMI

Filter the data before the comparison:

- avoid liquid attenuation – only ice clouds
- Adjust sensitivities of the data sets
- statistical test to select comparable data for each height bin





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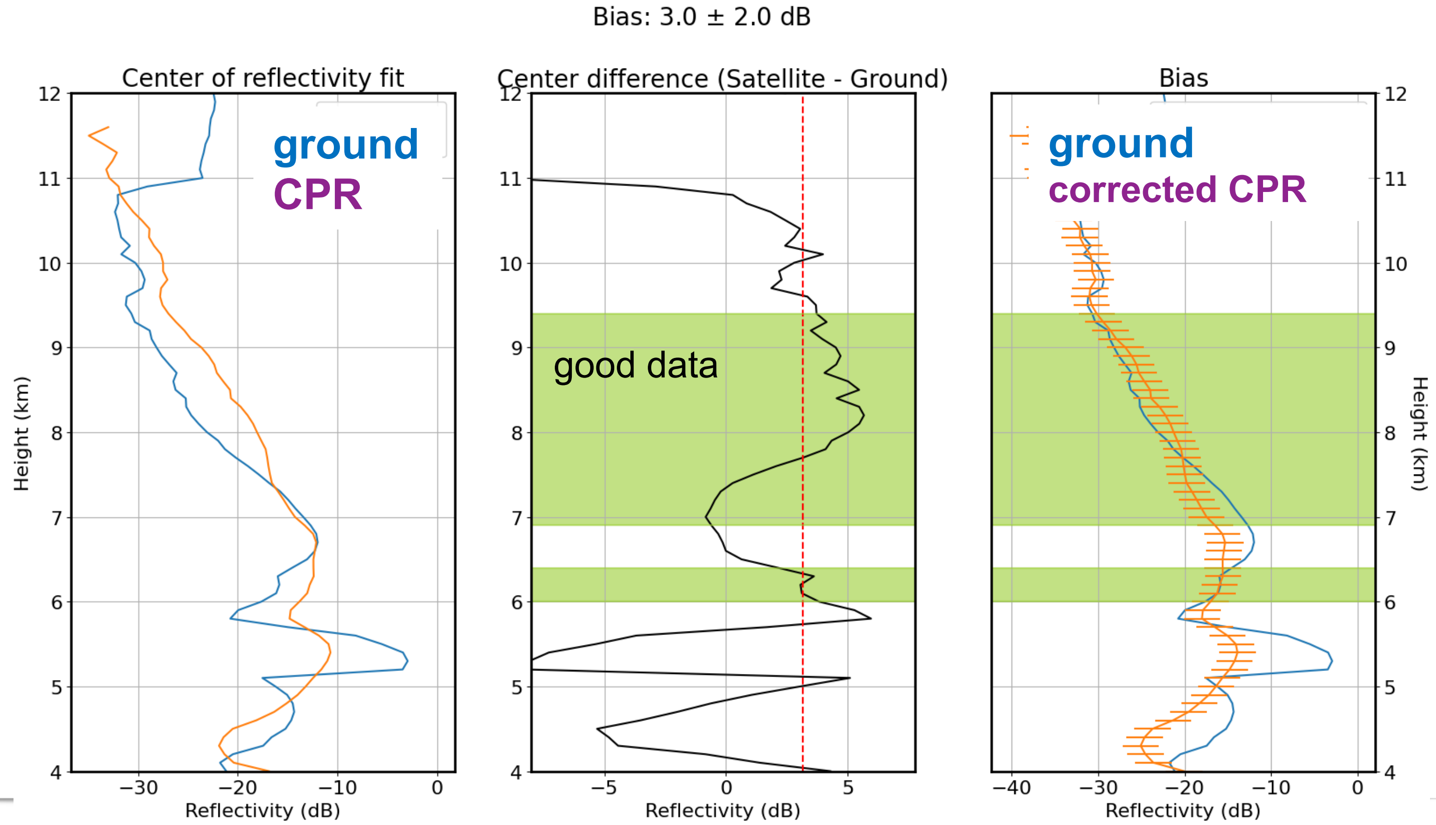


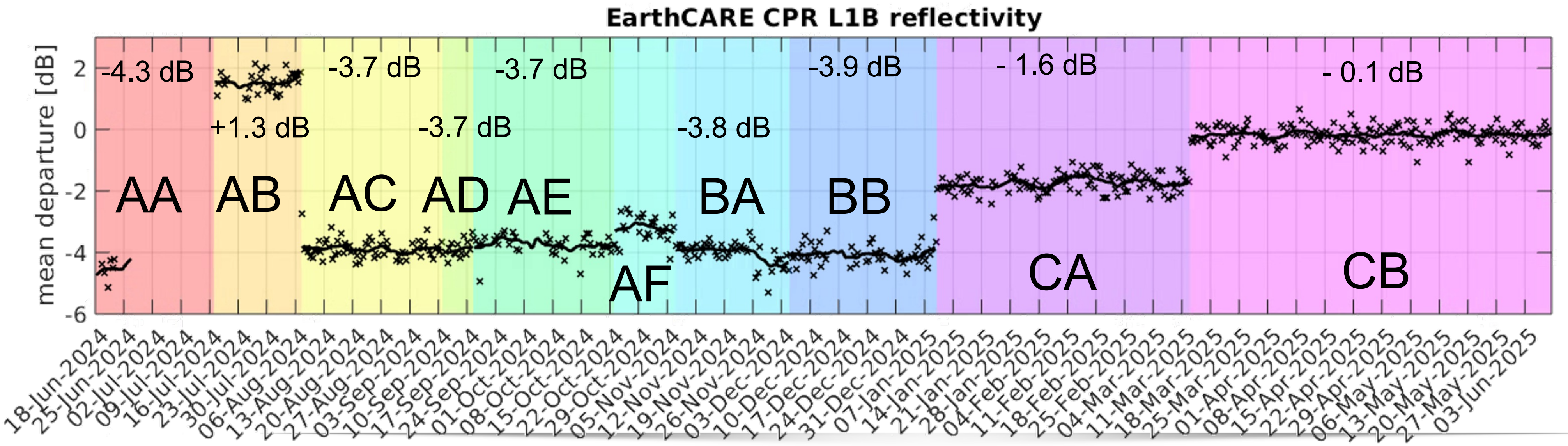
EarthCARE reflectivity validation – statistical approach

Filter the data before the comparison:

- avoid liquid attenuation – only ice clouds
- statistical test to select comparable data

Results are stable over time.

- Excellent agreement with Ze-offsets obtained using other methods (return of the sea surface, ECMWF model comparison, our radars…)



Plot by Mark Fielding, ECMWF

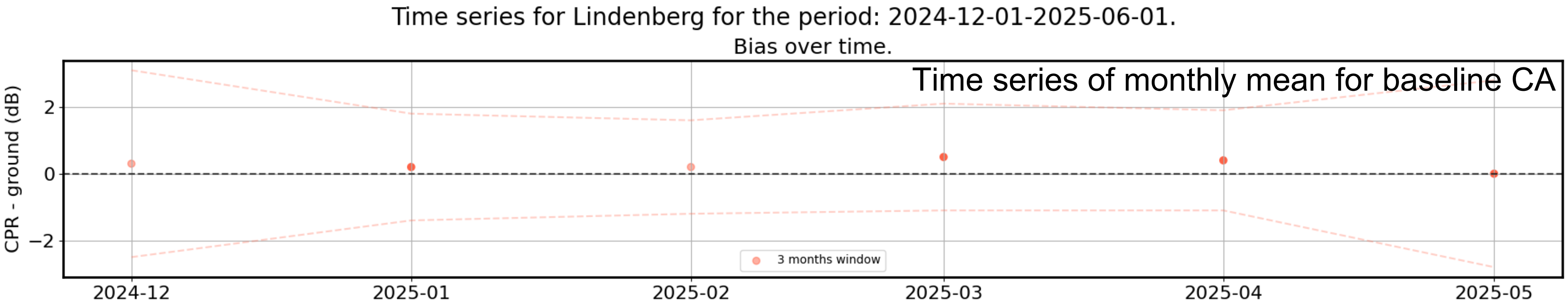
EarthCARE reflectivity validation – statistical approach

Filter the data before the comparison:

- avoid liquid attenuation – only ice clouds
- statistical test to select comparable data

Results are stable over time.

- Excellent agreement with Ze-offsets obtained using other methods (return of the sea surface, ECMWF model comparison, our radars…)
- Displays consistent Ze offset over time



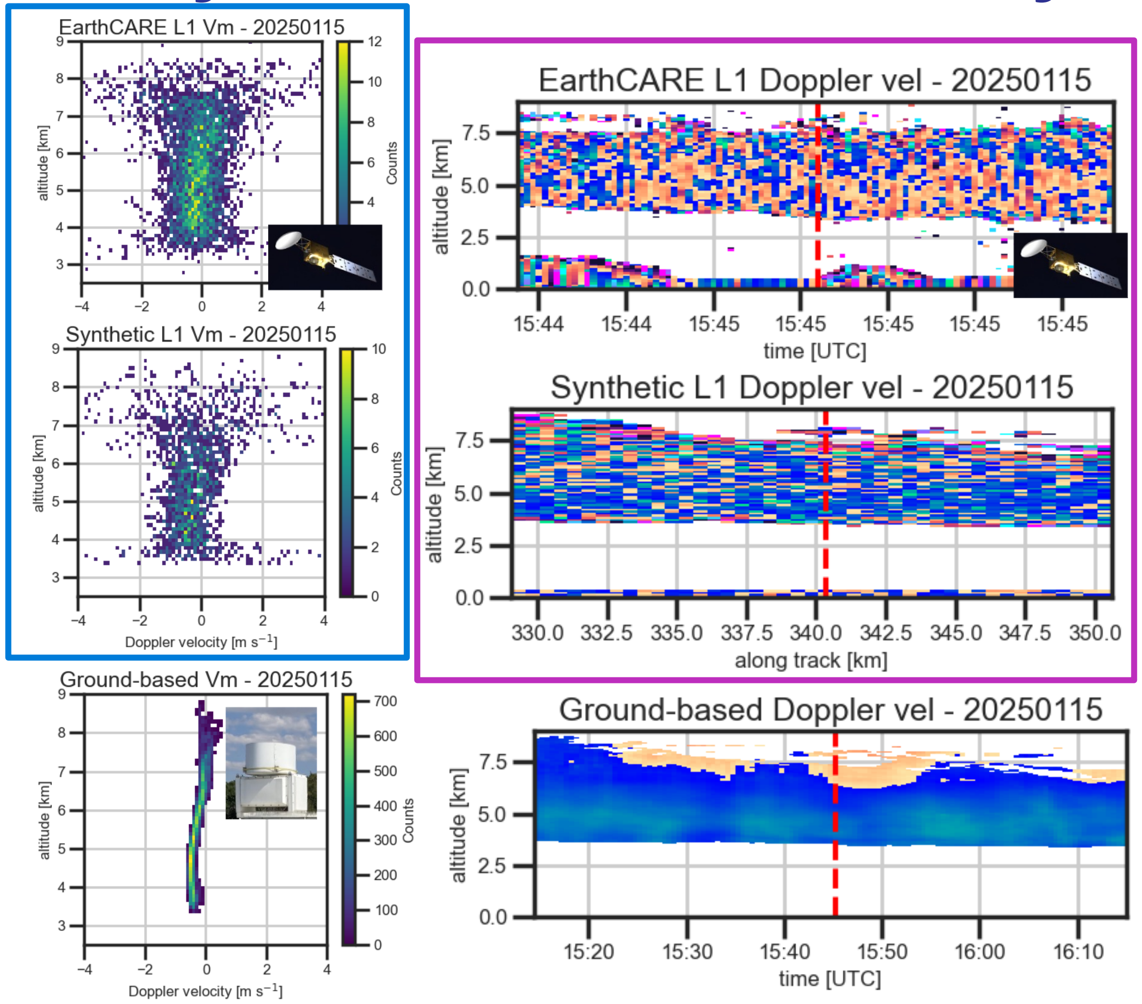
All depends on the clouds sampled – might be different results for different seasons.

EarthCARE Doppler velocity validation – case study

EarthCARE overpass
(15.01.25, Ny-Ålesund)

"Golden case":

- "Orbital radar" tool shows realistic noise characteristics
- Noise along range is less correlated
- Bias L1 to Synthetic ~ 0.1 m s^{-1}



EarthCARE L1 +/-25 km distance from site

Orbital radar tool +/-25 min around overpass

ACTRIS radar +/-25 min around overpass

EarthCARE Doppler velocity validation – case study

EarthCARE overpass
(15.01.25, Ny-Ålesund)

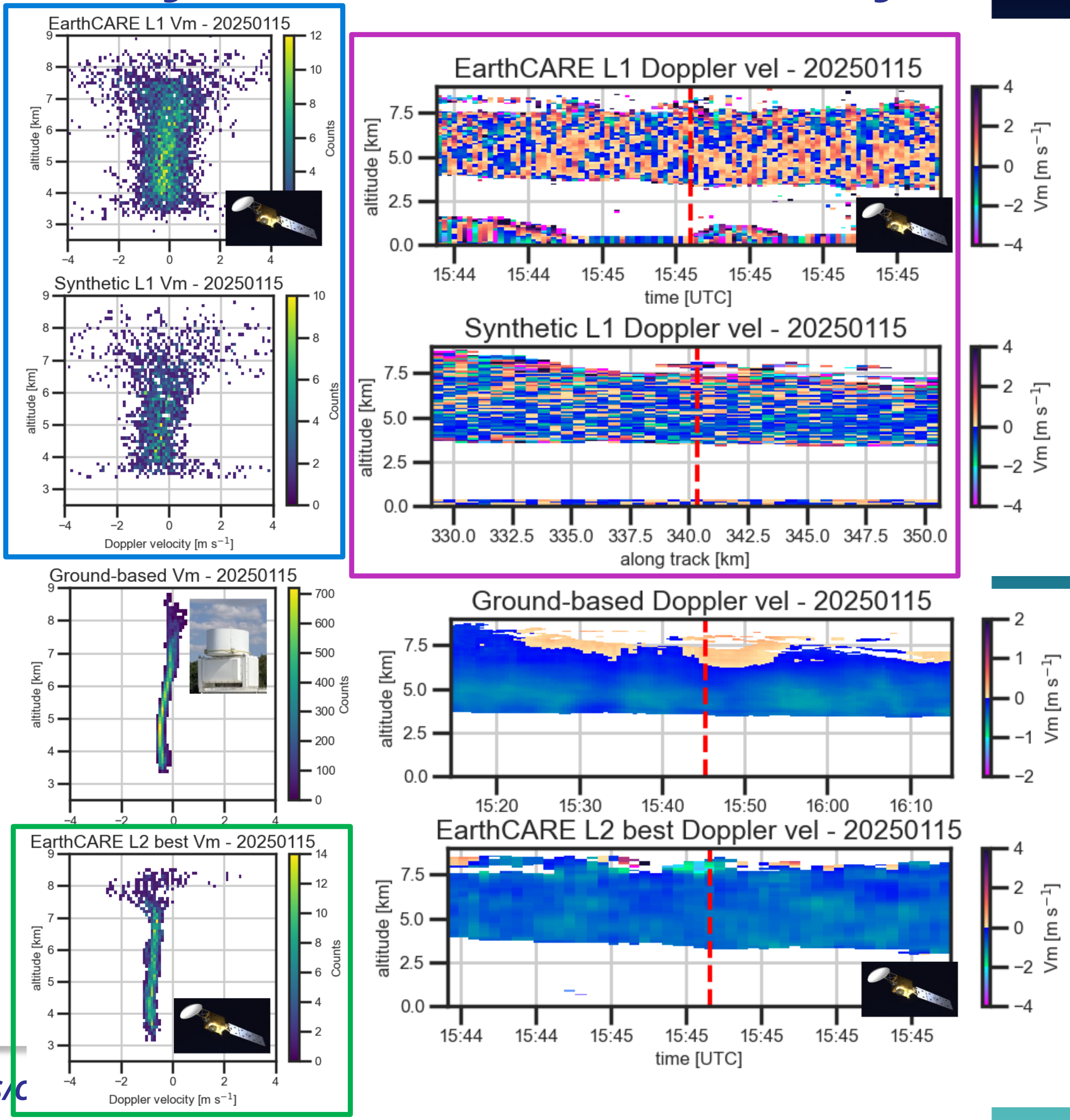
“Golden case”:

- “Orbital radar” tool shows realistic noise characteristics
- Noise along range is less correlated
- Bias L1 to Synthetic ~ 0.1 m s^{-1}
- Bias L2 to Synthetic ~ 0.65 m s^{-1}

Missing references to validate bias!

But “Golden Cases” are not usual cases

ACTRIS, the statistical approach based on Protat et al. 2010 is adjusted for Doppler velocities.



EarthCARE L1
+/-25 km distance from site

Orbital radar tool +/-25 min around overpass

ACTRIS radar
+/-25 min around overpass

EarthCARE L2
+/-25 km distance from site

EarthCARE Doppler velocity validation - statistical approach

Lukas Pfitzenmaier, Nathan Feuillard, Felipe Toledo Bittner, Ulrich Löhnert, Ewan O'Conner

ACTRIS CCRES

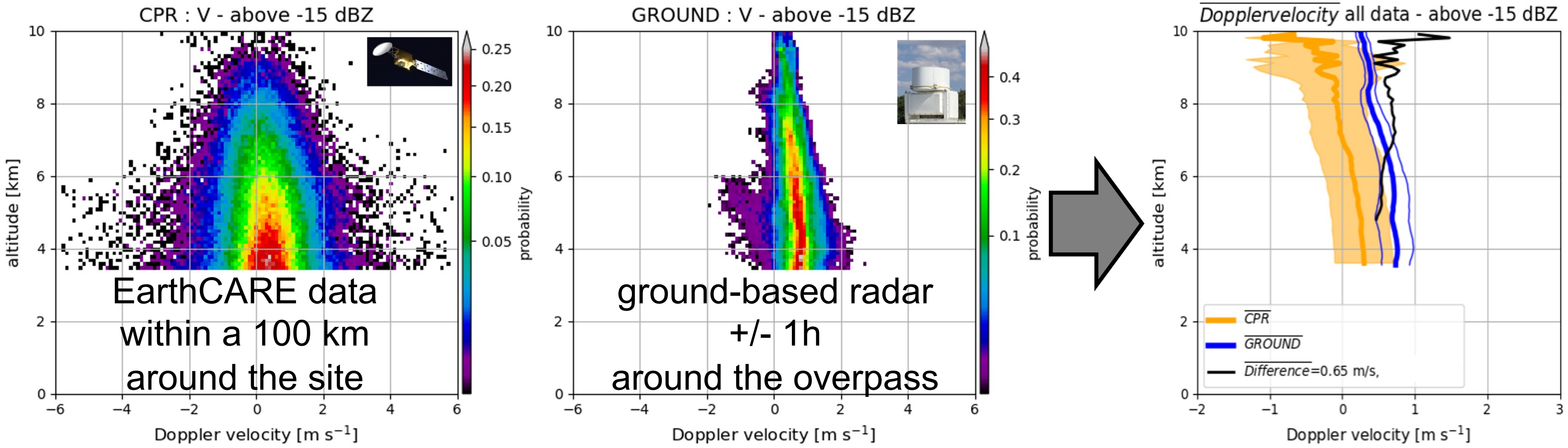
Adopt the method from Protate et al. 2010

Apply filtering to homogenise data:

- With a high noise characteristic → only Vm where Ze > -15 dBZ
- Doppler velocity folding
- Orographic effects

} Site and height dependent filtering (work in progress)

Example ~60 overpasses: Ny-Ålesund, and EarthCARE Baseline BA



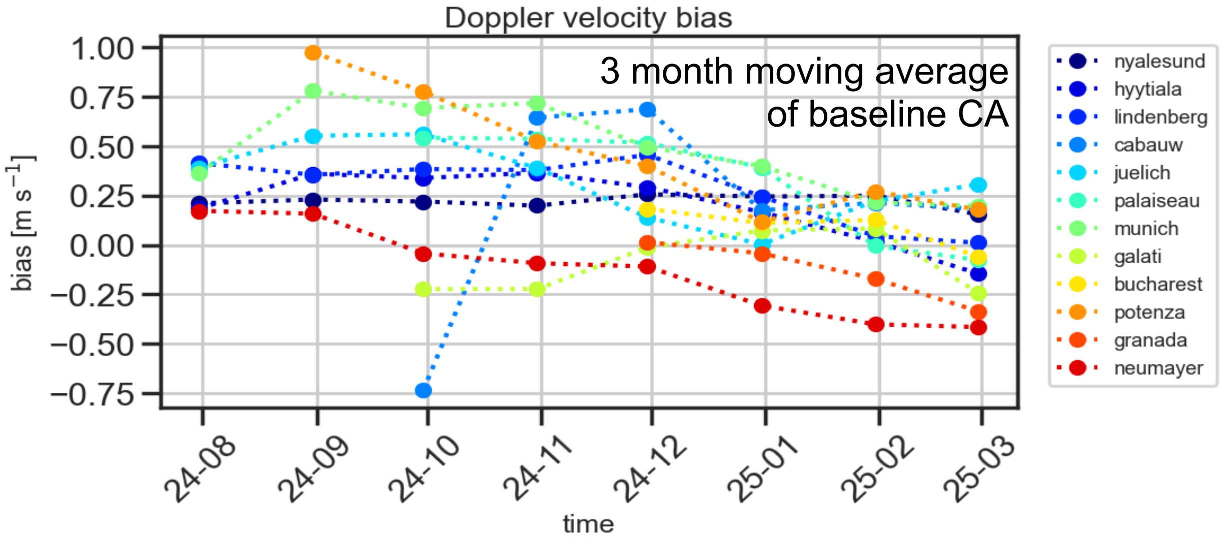
EarthCARE Doppler velocity validation - statistical approach

Adopt the method from Protate et al. 2010

Apply filtering to homogenise data:

- With a high noise characteristic
- Doppler velocity folding
- Orographic effects

Temporal evolution of Doppler velocity bias

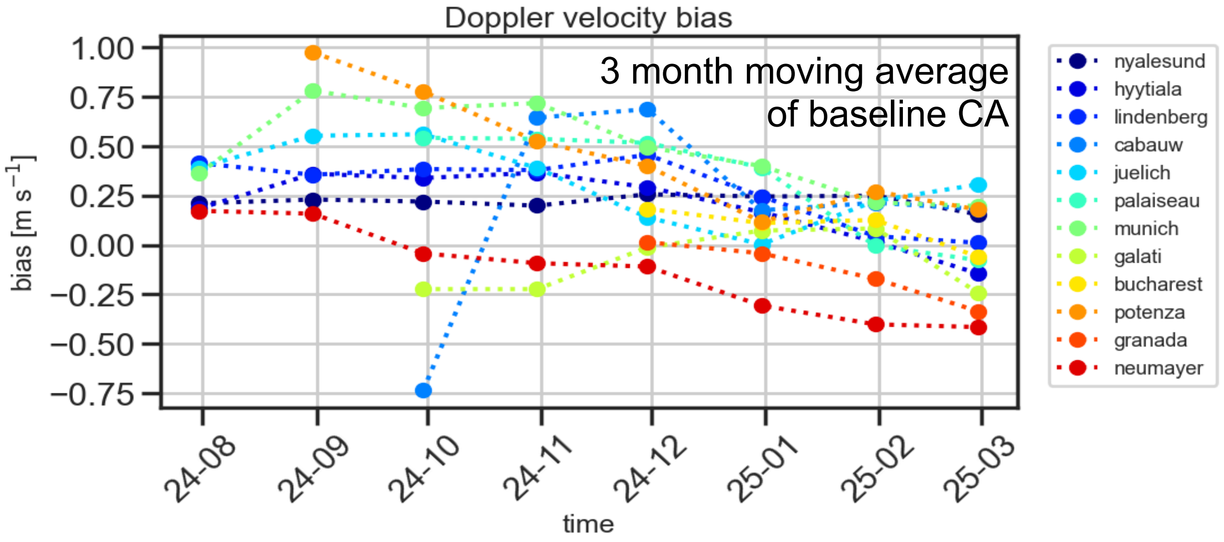


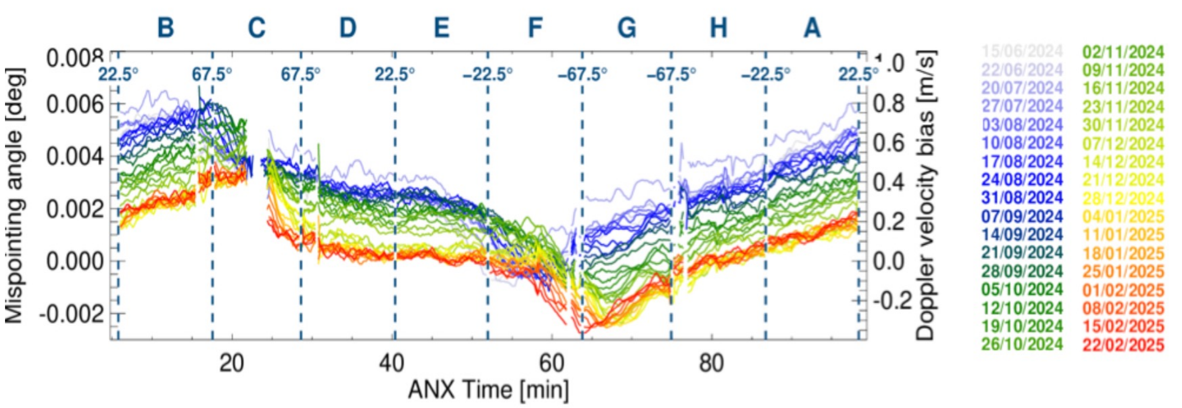
EarthCARE Doppler velocity validation - statistical approach

Temporal evolution of Doppler velocity bias

- Solar radiation heats the CPR antenna → deformation → Doppler velocity bias
- Monitoring based on sea surface velocity

Figure 4 from Puigdomènech Treserras et al., 2025, EGUsphere shows the **Doppler velocity bias** caused by mispointing, which **depends on the amount of solar radiation heating the CPR antenna.**





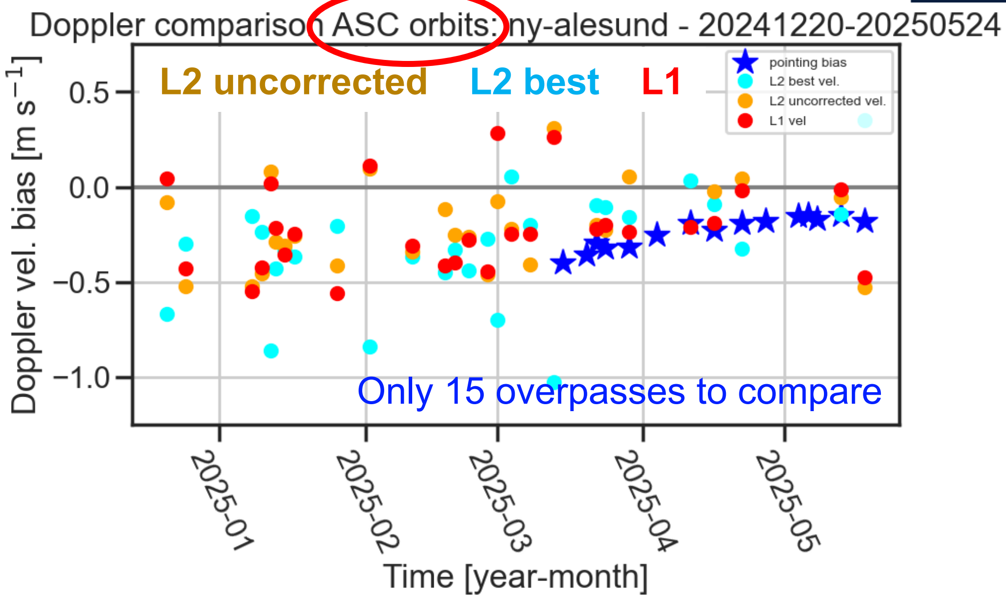
EarthCARE Doppler velocity validation - statistical approach

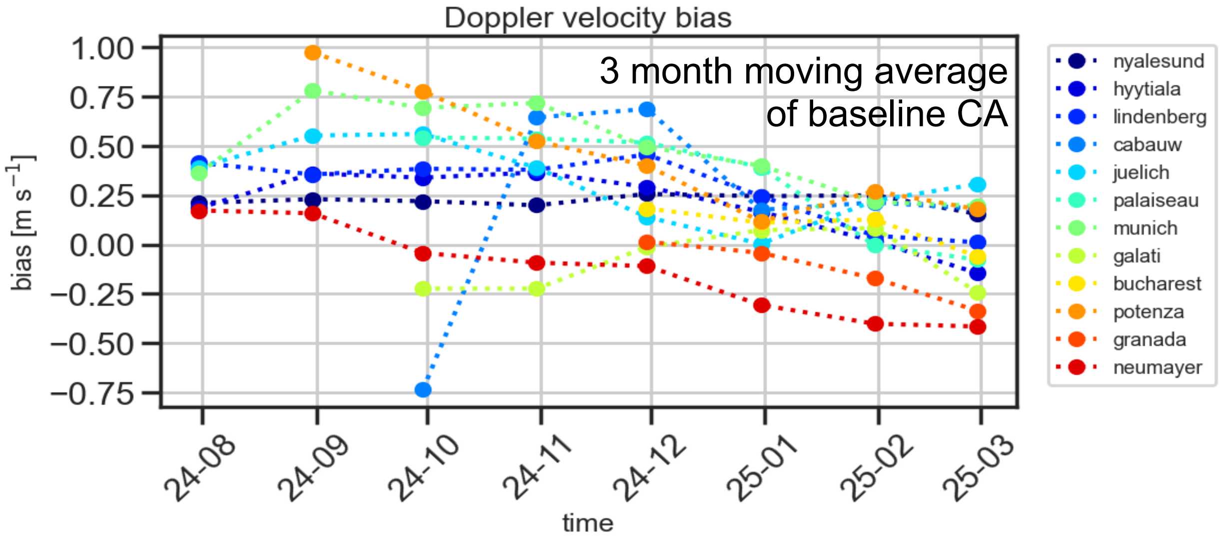
Temporal evolution of Doppler velocity bias

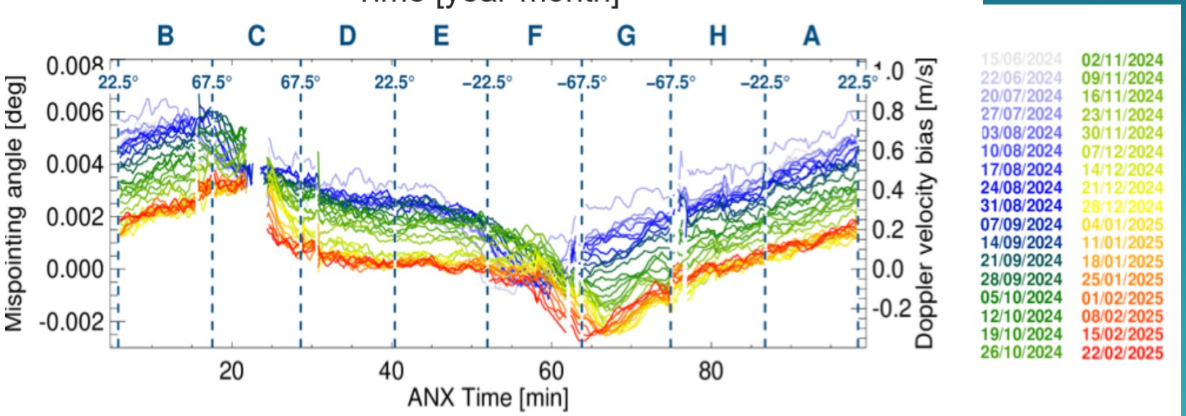
- Solar radiation heats the CPR antenna → deformation → Doppler velocity bias
- Monitoring based on sea surface velocity

ACTRIS monitoring of pointing bias:

- In development
- Differences between ascending and descending







EarthCARE Doppler velocity validation - statistical approach

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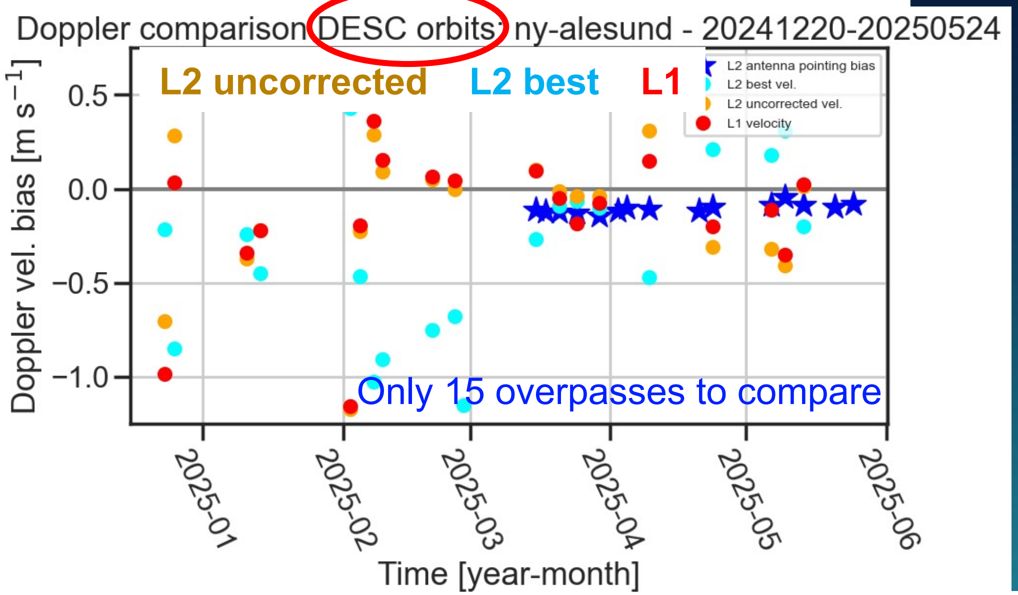
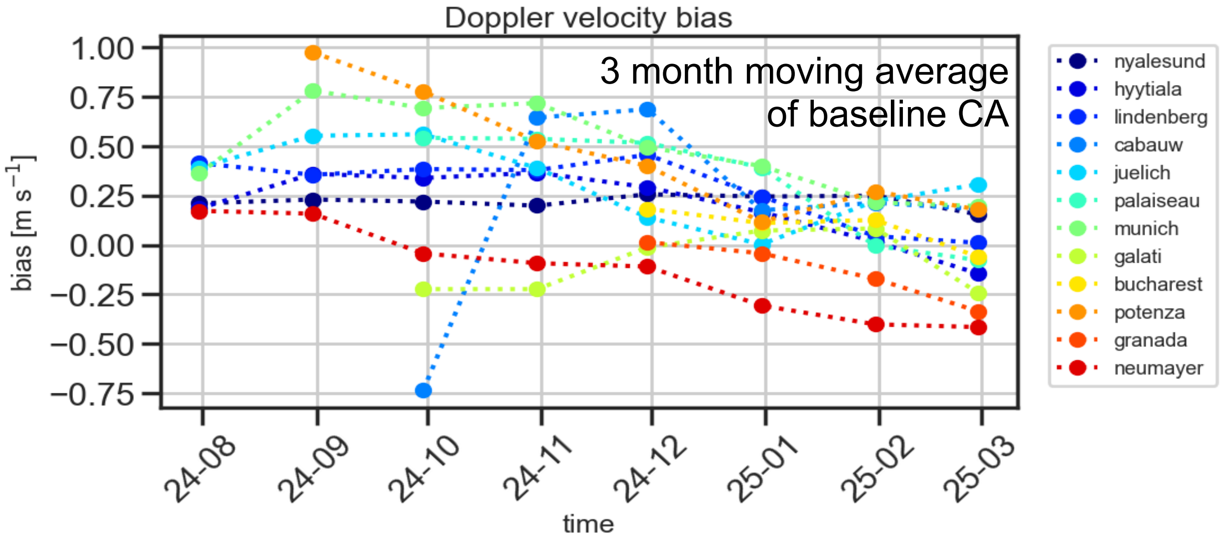
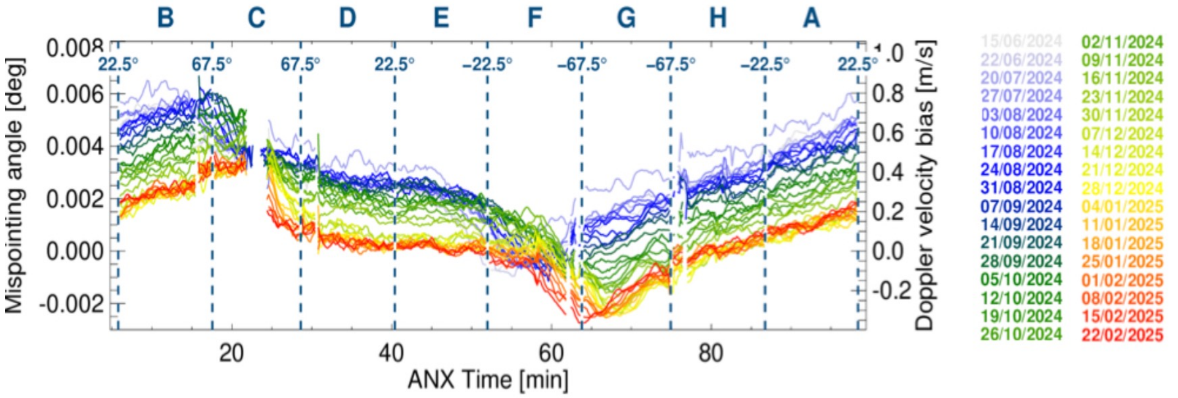
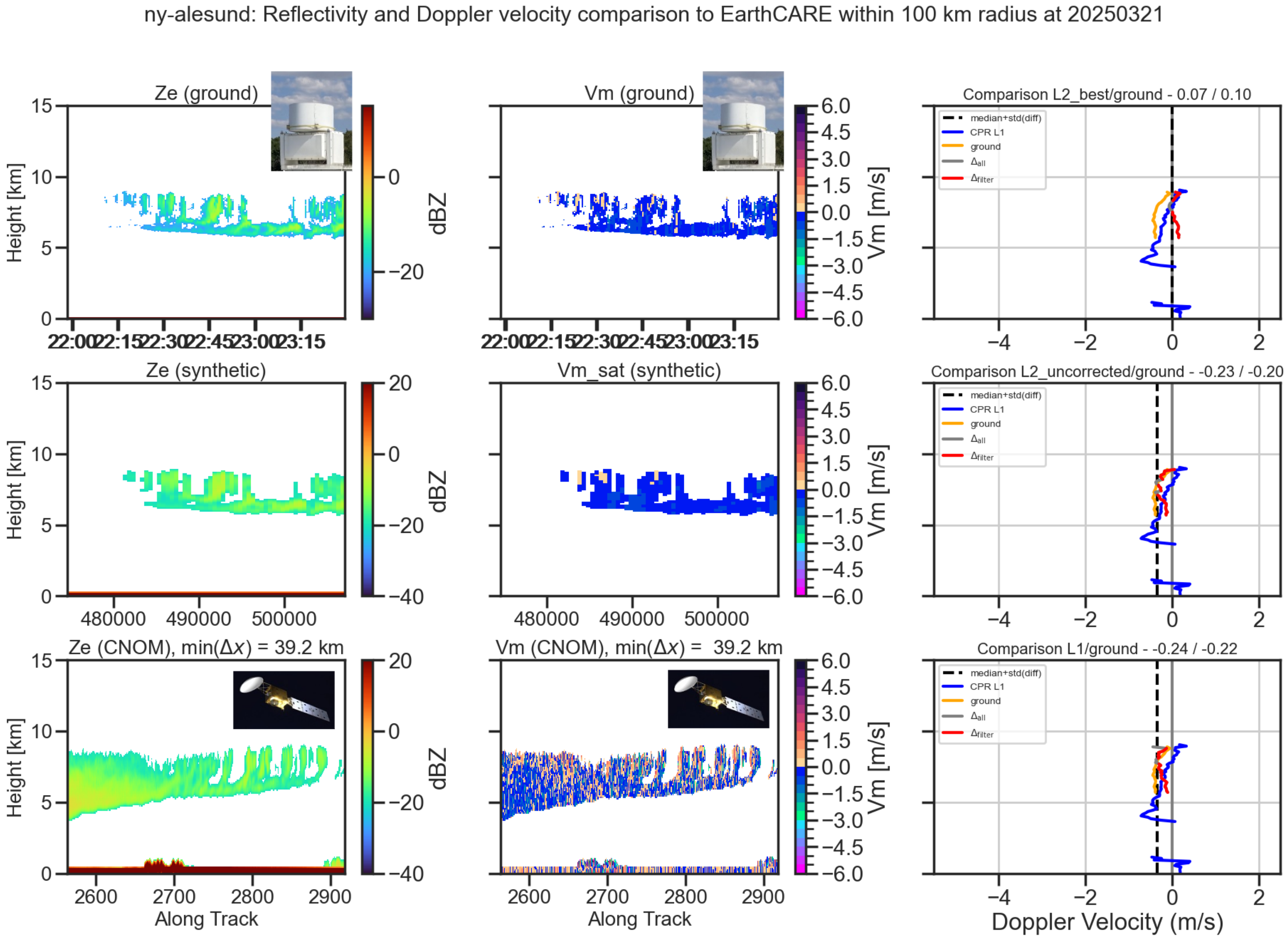


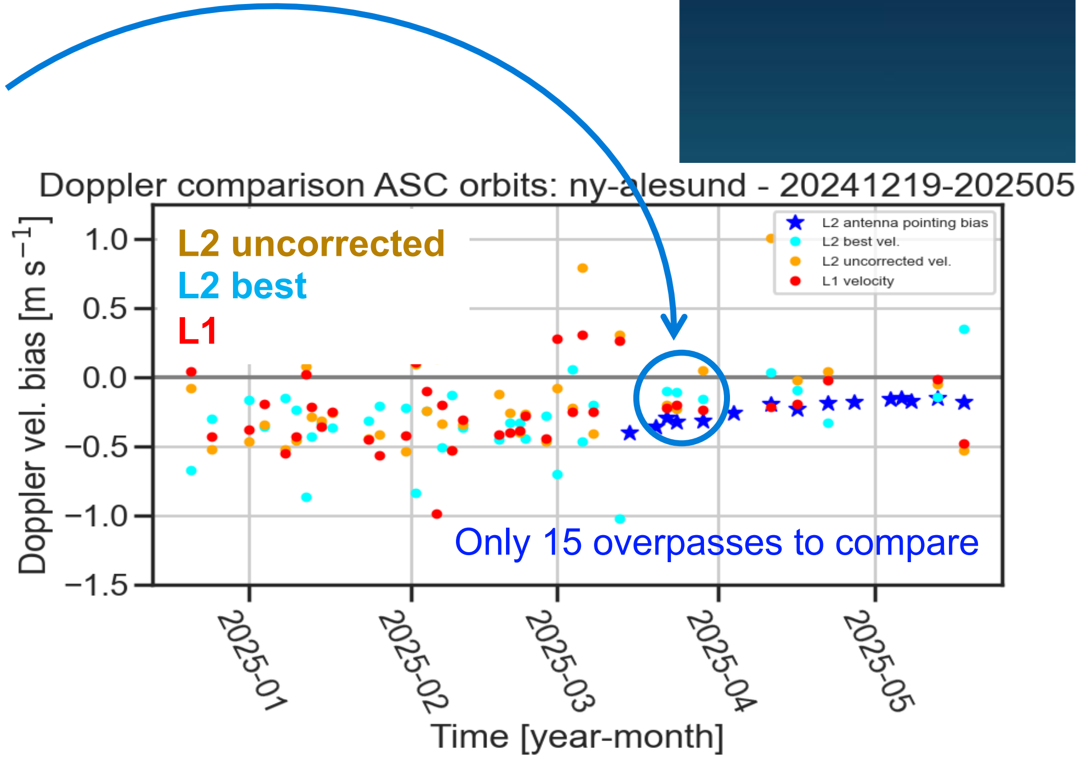




EarthCARE Doppler velocity validation - statistical approach

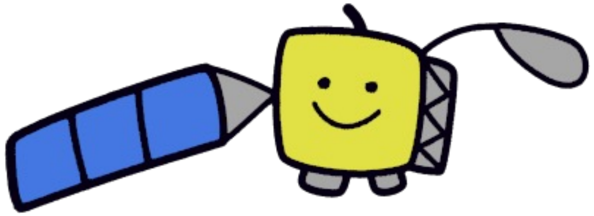
Work in progress: Identify good and bad cases – adjust filtering of Doppler data – ect





L2 ground
L1 CPR
bias filtered
bias unfiltered

Summery and outlook

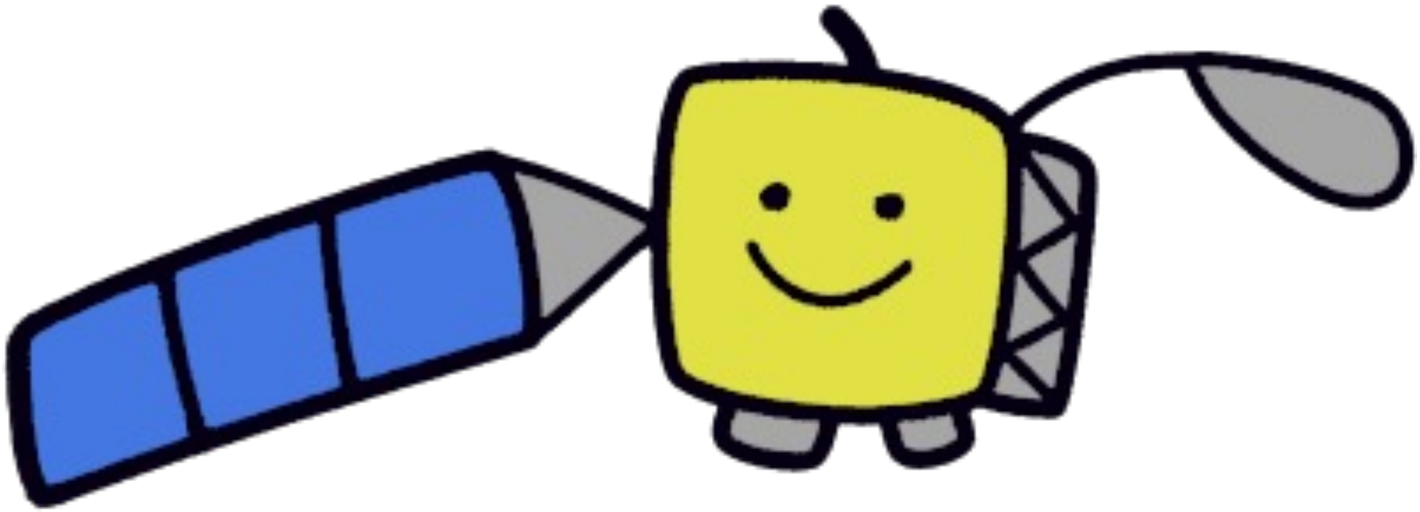


Information
Tools
Links

L2 validation?

https://www.earthcarescience.net

Summery and outlook



ESA announced at the Living Planet Symposium, that

EARTHCARE will fly for at least 10 years!

EarthCARE CPR tool → synthetic CPR data for all ACTRIS site

ACTRIS CCRES

Geosci. Model Dev., 18, 101–115, 2025
https://doi.org/10.5194/gmd-18-101-2025

Geoscientific Model Development
Open Access
EGU

Model description paper

Orbital-Radar v1.0.0: a tool to transform suborbital radar observations to synthetic EarthCARE cloud radar data

Lukas Pfitzenmaier[1], Pavlos Kollias[1,2], Nils Risse[1], Imke Schirmacher[1], Bernat Puigdomenech Treserras[3], and Katia Lamer[4]

[1]Institute for Geophysics and Meteorology, University of Cologne, Cologne, Germany
[2]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY, USA
[3]Department of Atmospheric and Oceanic Sciences, McGill University, Montreal, Canada
[4]Environmental and Climate Sciences Department, Brookhaven National Laboratory, Upton, NY, USA

Correspondence: Lukas Pfitzenmaier (l.pfitzenmaier@uni-koeln.de)

Received: 8 July 2024 – Discussion started: 3 September 2024
Revised: 30 October 2024 – Accepted: 4 November 2024 – Published: 14 January 2025

Abstract. The Earth Cloud, Aerosol and Radiation Explorer (EarthCARE) satellite developed by the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA) launched in May 2024 carries a novel 94 GHz cloud profiling radar (CPR) with Doppler capability. This work describes the open-source instrument simulator Orbital-Radar, which transforms high-resolution radar data from field observations or forward simulations of numerical models to CPR primary measurements and uncertainties. The transformation accounts for sampling geometry and surface effects. We demonstrate Orbital-Radar's ability to provide realistic CPR views of typical cloud and precipitation scenes. The presented case studies show small-scale convection, marine stratus clouds, and Arctic mixed-phase cloud cases. These results provide valuable insights into the capabilities and challenges of the EarthCARE CPR mission and its advantages over the CloudSat CPR. Finally, Orbital-Radar allows for evaluating kilometre-scale numerical weather prediction models with EarthCARE CPR observations. So, Orbital-Radar can generate calibration and validation (Cal/Val) data sets already prelaunch. Nevertheless, an evaluation of synthetic CPR output data to accurate EarthCARE CPR data is missing.

1 Introduction

Spaceborne radars offer a unique opportunity to monitor clouds and precipitation globally. For instance, the National Aeronautics and Space Administration (NASA) CloudSat Cloud Profiling Radar (CloudSat CPR; Stephens et al., 2008, 2018) enabled several advances in cloud and precipitation physics (Rapp et al., 2013; Stephens et al., 2018; Battaglia et al., 2020b). In 2024, the next-generation CPR in space was launched on board the Earth Cloud, Aerosol and Radiation Explorer (EarthCARE) satellite (Illingworth et al., 2015; Wehr et al., 2023). The EarthCARE CPR is the first Doppler radar in space, thus providing the first set of global Doppler velocity measurements (Kollias et al., 2022). In addition to the Doppler capability, the EarthCARE CPR has higher sensitivity than its predecessor (−35 dBZ vs. −30 dBZ) as well as a smaller footprint (0.8 km vs. 1.4 km) and shorter along-track integration (500 m vs 1.1 km).

Spaceborne radars operate from platforms that orbit the Earth at speeds that exceed 7 km^{-1} and employ relatively long pulses to map the vertical structure of hydrometeors in the atmosphere. The strongest echo a spaceborne radar detects is from the Earth's surface. Instrument simulators are a well-established methodology for accounting for the effects of the observing system sampling geometry on its performance (i.e. detection limit, measurement uncertainty). For example, Lamer et al. (2020) developed an instrument forward simulator to evaluate the impact of different spaceborne CPR configurations on our ability to detect low-level clouds

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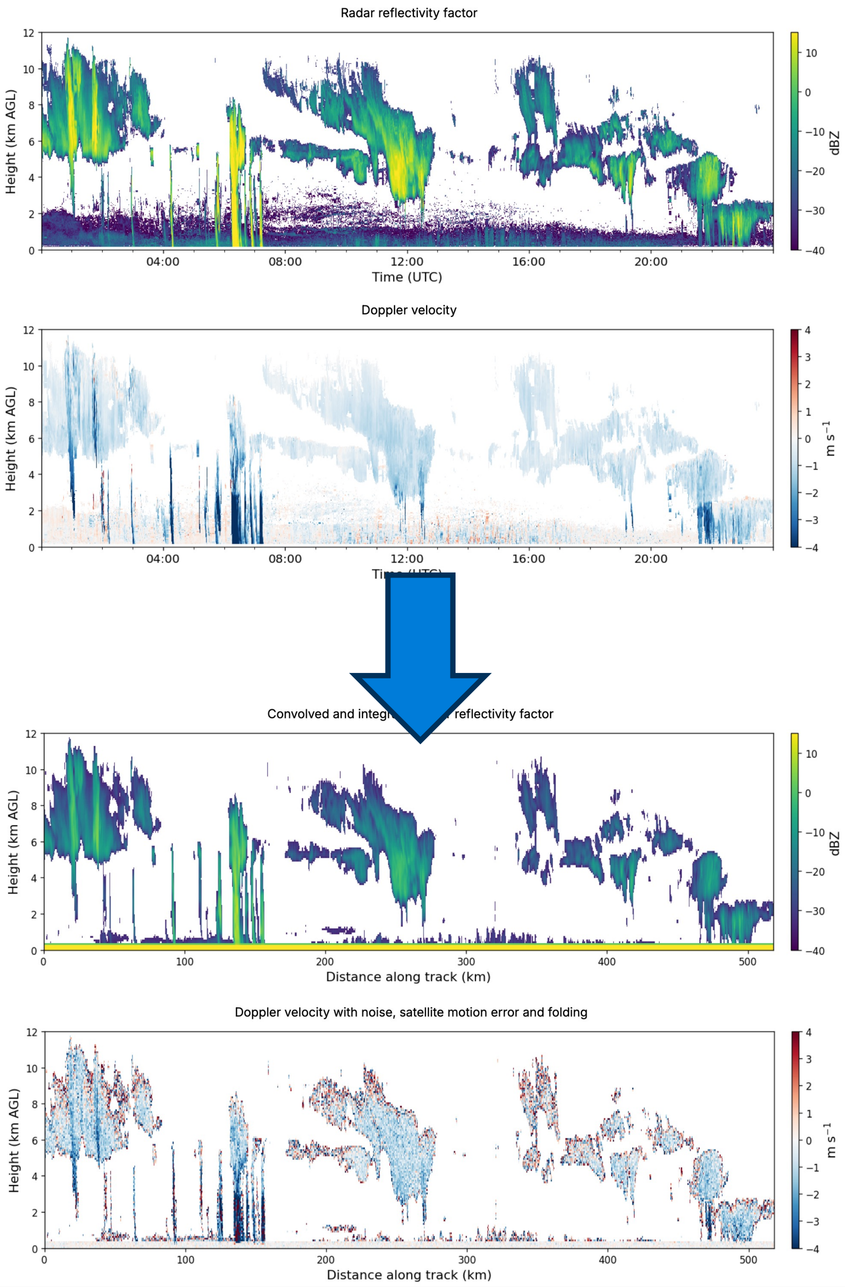

EarthCARE CPR tool → synthetic CPR data for all ACTRIS site


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Geoscientific Model Development
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[2]School of Marine and Atmospheric Sciences, Stony Brook University, Stony Brook, NY, USA
[3]Department of Atmospheric and Oceanic Sciences, McGill University, Montreal, Canada
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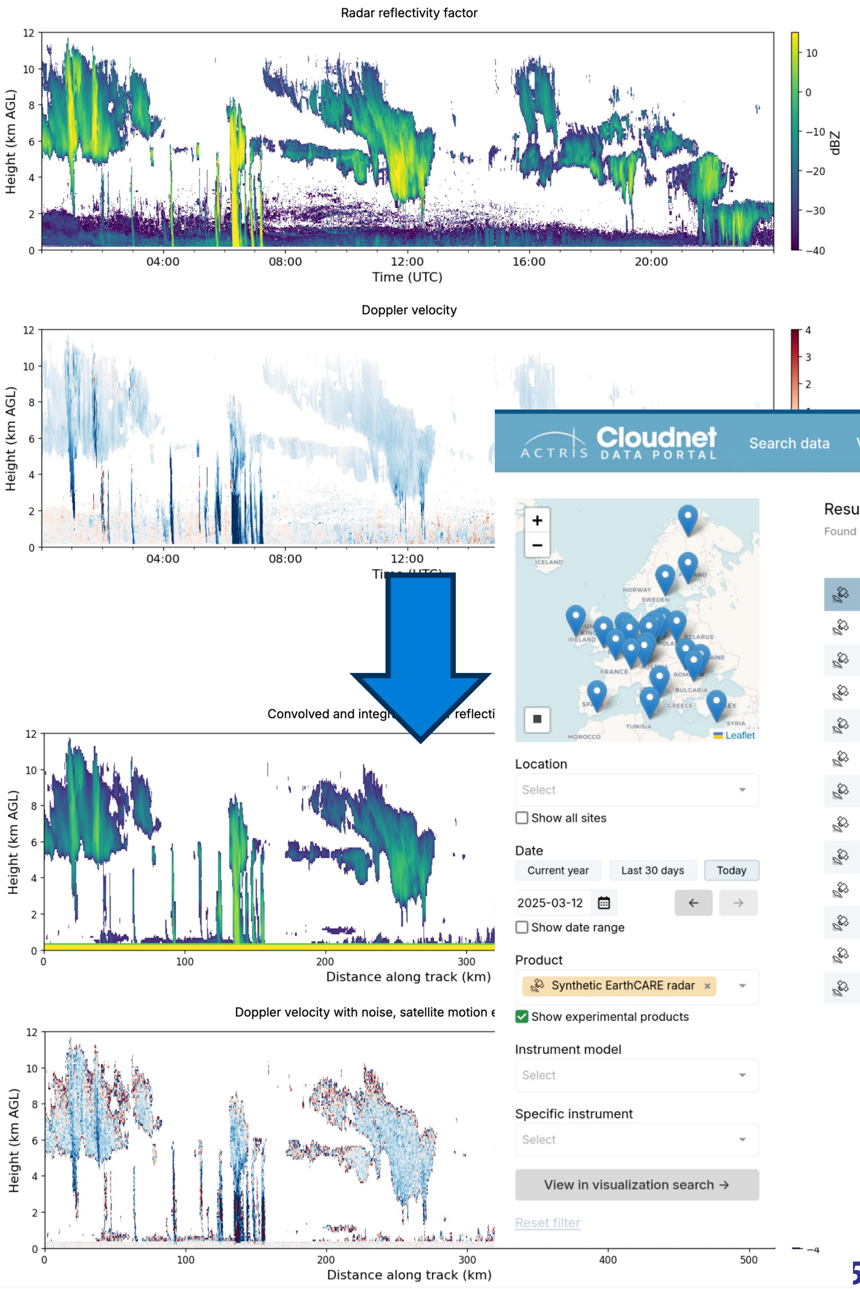

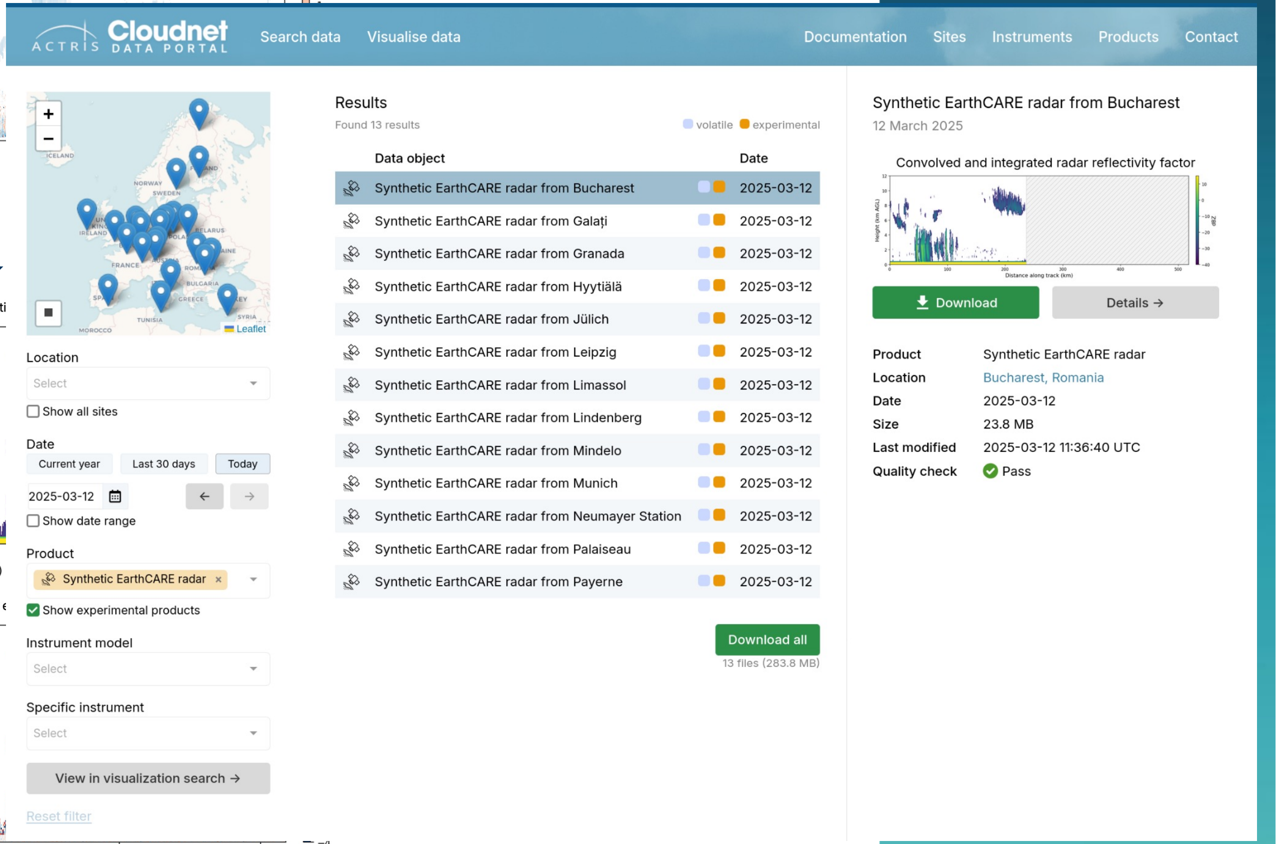

EarthCARE tools – software:

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oads-download – (L. König, TROPOS, python)

- Download scripts for all ESA products – JAXA might come in the future
- Select data per time, orbit, area,…
- select products, baselines,…
- https://github.com/koenigleon/oads-download

ectools – (s. Mason, ECMWF, python)

- Data reader and plotting tool for ALL ESA products
- https://bitbucket.org/smason/ectools

Atmosphere Virtual Lab – (ESA)

- Virtual environment of ESA
- No data download necessary – ACTRIS and EarthCARE data are on the server
- https://atmospherevirtuallab.org/earthcare

https://www.earthcarescience.net

EarthCARE tools – data viewer:

ACTRIS
CCRES

MAAP EarthCARE Timeline Viewer **–** (KNMI, online)

- ATLID and MSI data (others coming soon)
- https://portal.maap.eo.esa.int/ini/earthcare/timelineviewer/viewer/

ATLID and MSI data (others coming soon) **–** (McGill, online)

- Monitoring of ATLID and CPR geolocation & CPR antenna pointing
- Lots of CPR QA/QC parameters are plotted
- https://web.meteo.mcgill.ca/EarthCARE/

JAXA EarthCARE Quicklooks **–** (JAXA, online)

- ATLID, CPR, MSI and BBR products from JAXA
- No legends for the products
- https://www.eorc.jaxa.jp/EARTHCARE/Quicklook/index.html?date=20250901&orbit=07163&frame=B

https://www.earthcarescience.net

CCRES validation possibilities

ACTRIS CCRES

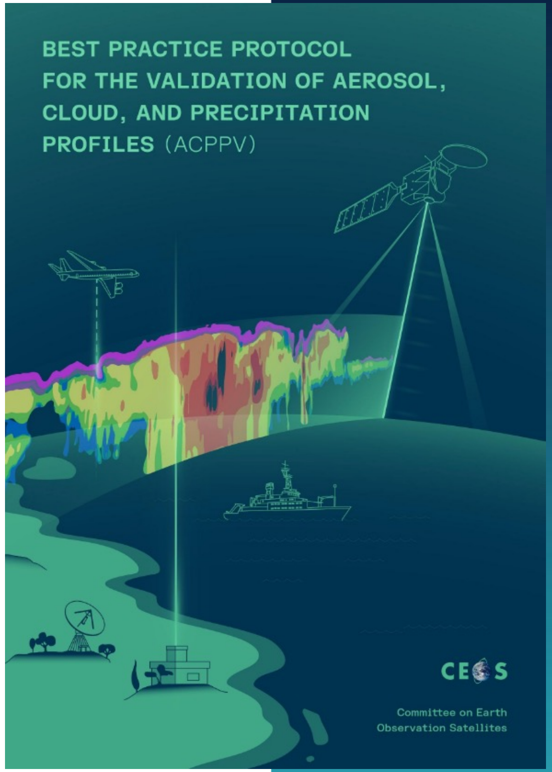
Questions/Discussion:

- Quantify convection in the cloud!
- Missing ice particle characterisation within Cloudnet?
- Measure the inhomogeneity of a cloud and in cloud fields?
- Detection of mixed-phase layers from the ground?

- Retrieval of particle sedimentation velocities → validation with EarthCARE *(Kim et al, 2025, EGU discussion)*
- Explore and implement multiple frequency approaches
- Explore and implement scans
- Use AI ML methods to improve microphysical understanding and targeting

→ CCRES and the community on how and what we want to address…

https://zenodo.org/records/15025627



Outcome Living Planet Symposium

ACTRIS
CCRES

Usage of Datasets for AI training!

- “Do you have any suggestions for a training data set?”
- No question related to what the data set is, only about data sets!
- Do we need a **best practice user guide** for all the ACTRIS CCRES data
  - Explain errors and uncertainties?
- Because: **No cloud remote sensing experts take data for AI**
  - What will the algorithms create?
  - We need careful validation.

Discussion?

Extra Slides

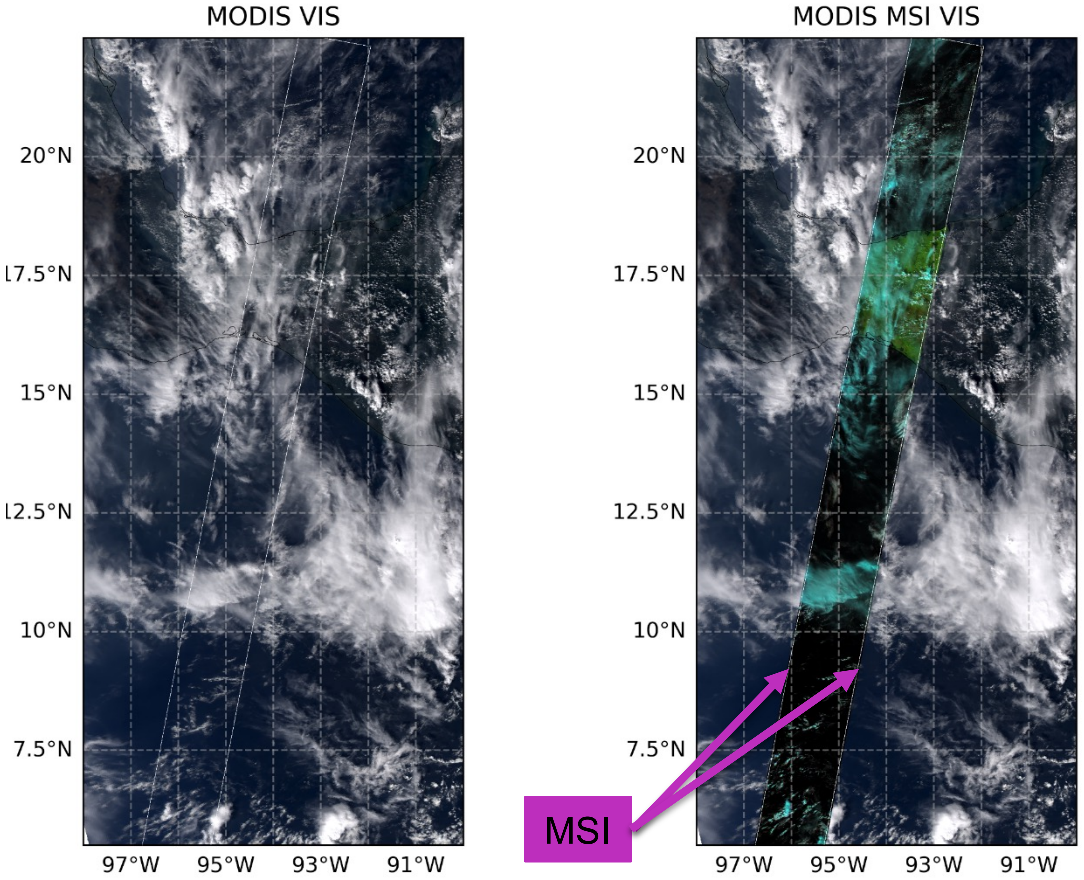
measurement examples for MSI and ATLID

please contact authors of the work for information

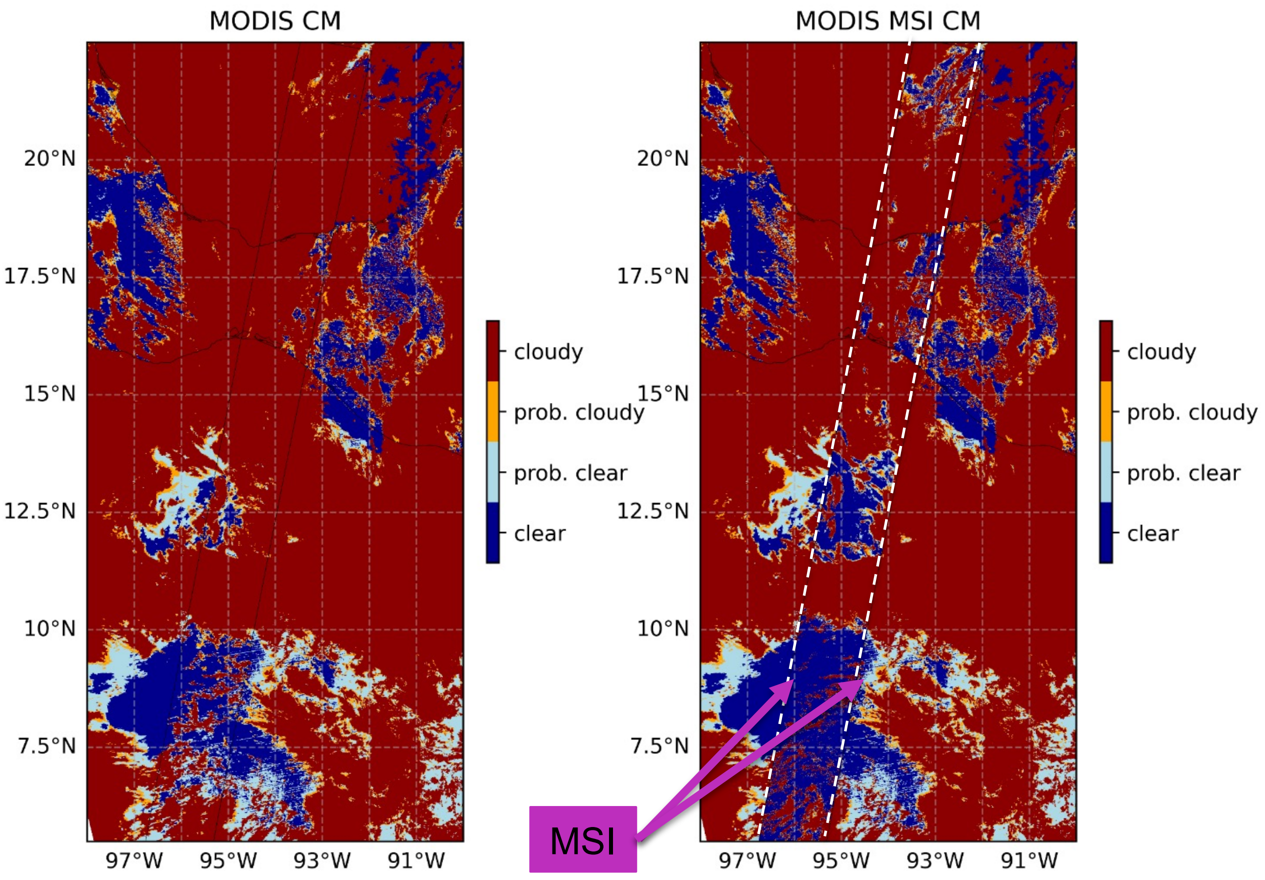
MSI example: M-CM vs MODIS
1st EarthCARE in orbit Cal/Val work shop

Geostationary SEVIRI/ polar orbiting MODIS (Aqua 30min differences)

30min difference between the overpasses



Comparing the cloud masks

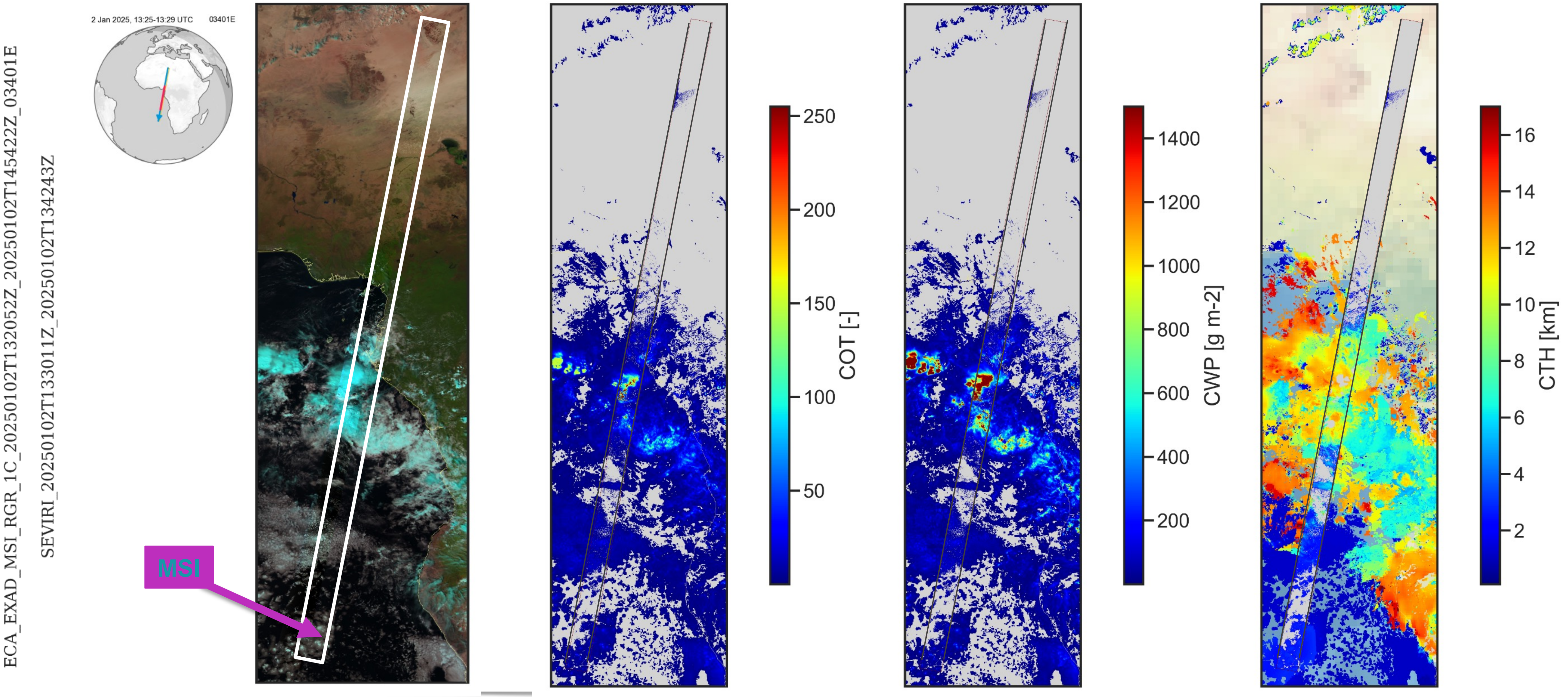


01/01/2025 frame 03390E

Thanks to Anja Hünerbein and their colleagues from TROPOS for sharing

MSI example: M-COP vs SEVIRI
1st EarthCARE in orbit Cal/Val work shop

ACTRIS
CCRES



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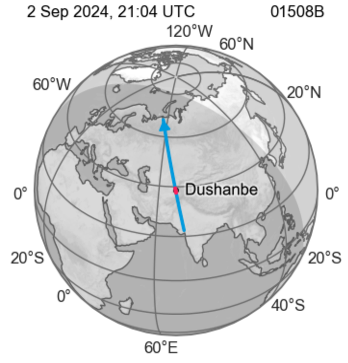
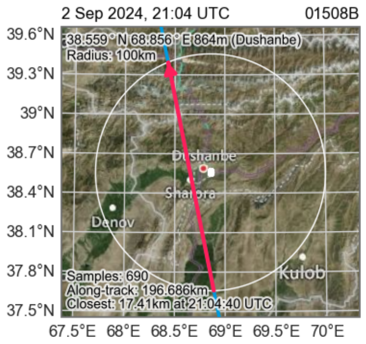
ATLID example:
1st EarthCARE in orbit Cal/Val work shop

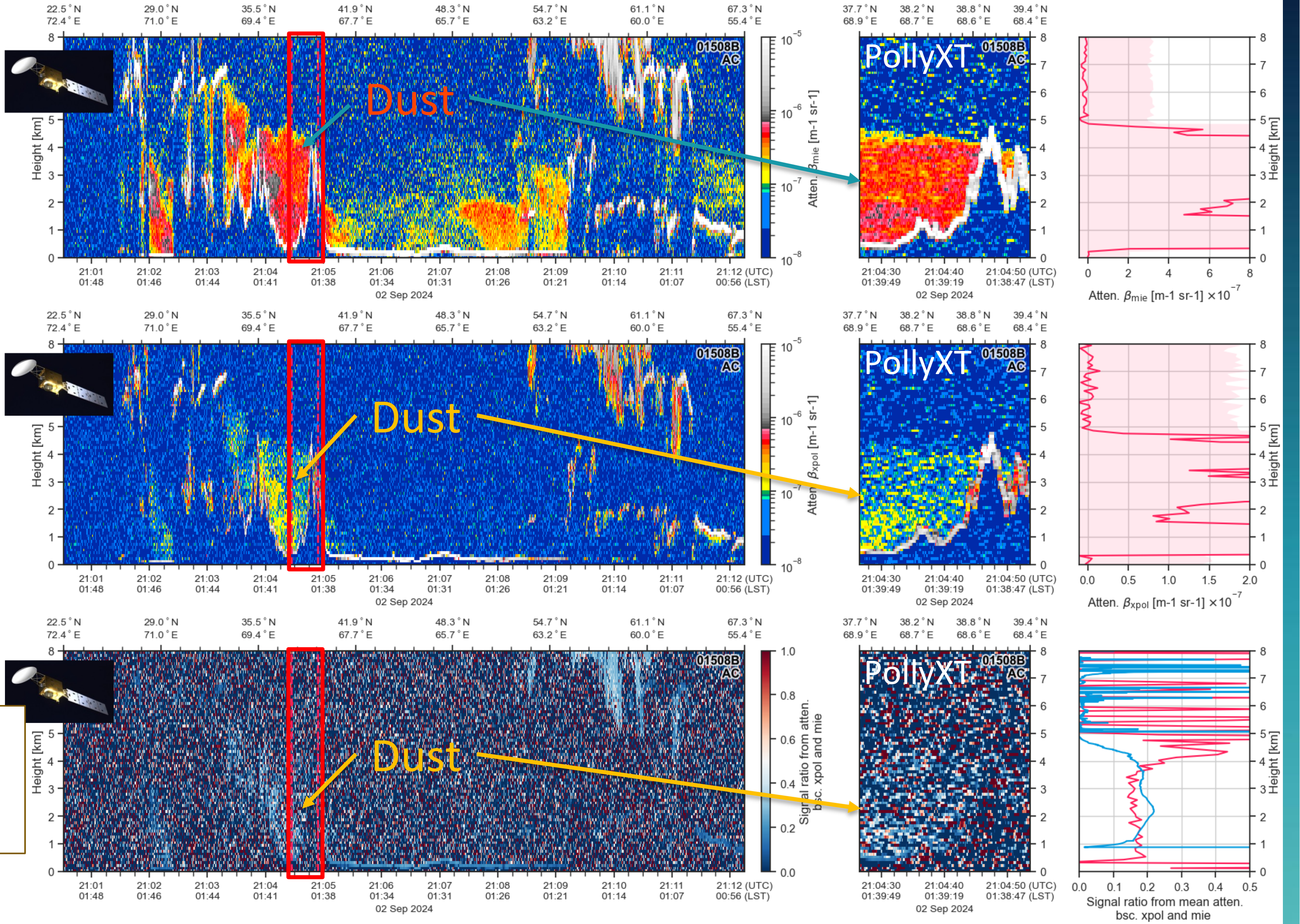
ACTRIS CCRES

Frame 1508B
Overpass over PollyXT at Dushanbe, Tajikistan



ATLID nicely observes the optically thick dust layer

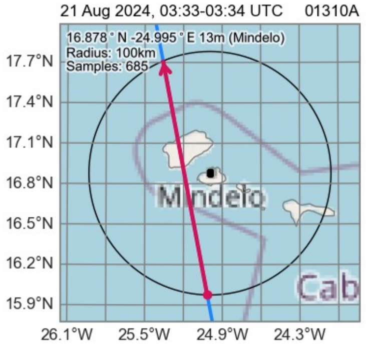




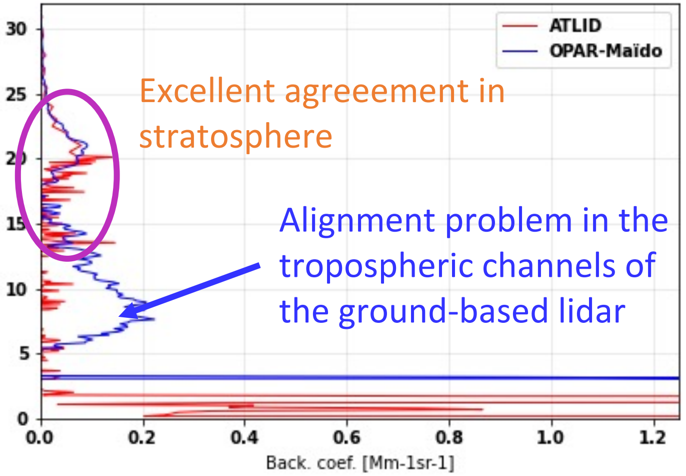
Thanks to Holger Baars and Moritz Haarig and the colleagues from TROPOS for sharing!!!

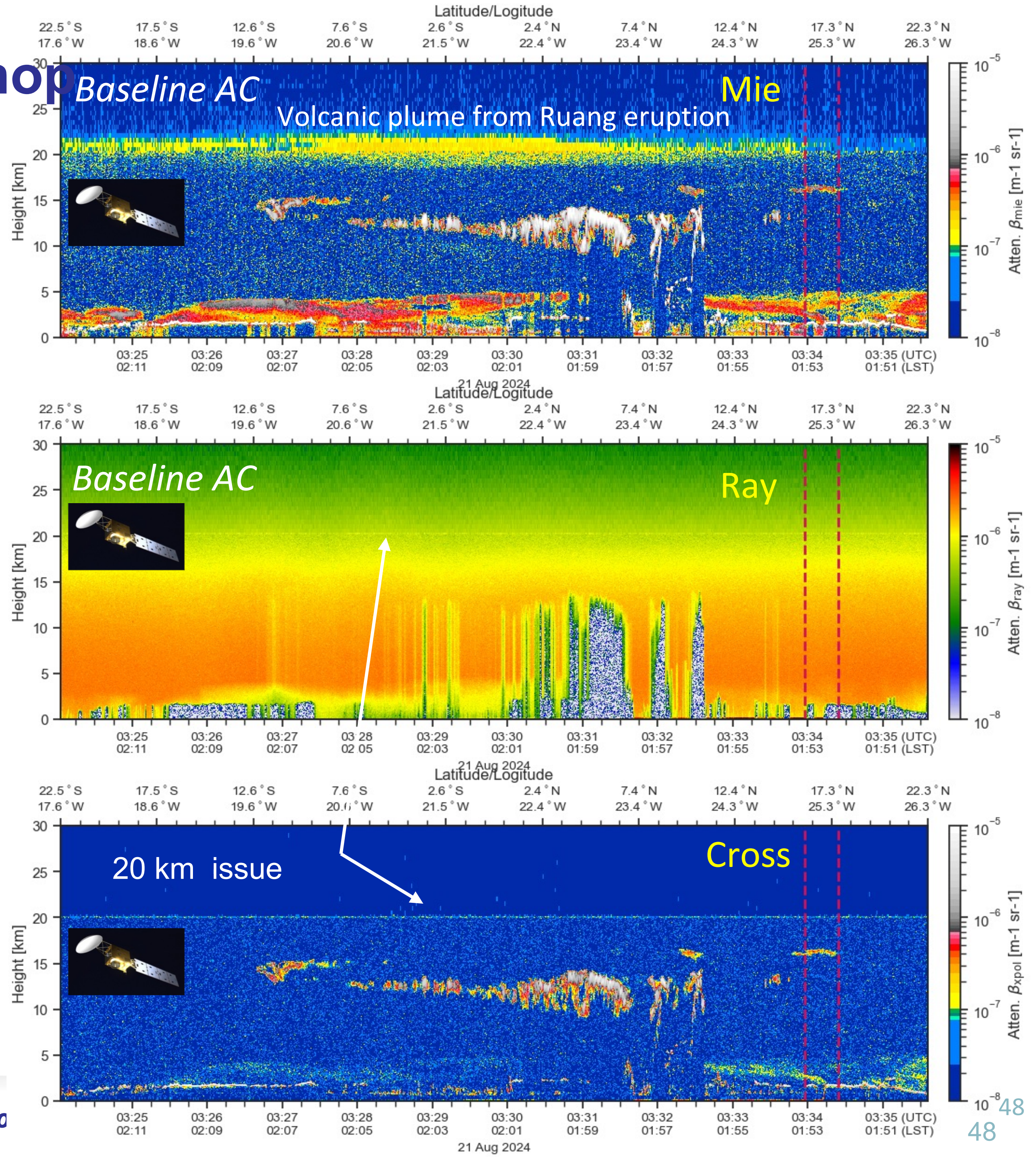
ATLID example:
1st EarthCARE in orbit Cal/Val work shop

21. 08.2024
- Nighttime



Early EarthCARE overpass over ACTRIS supersite at Mindelo, Cabo Verde during Orchestra Validation Campaign





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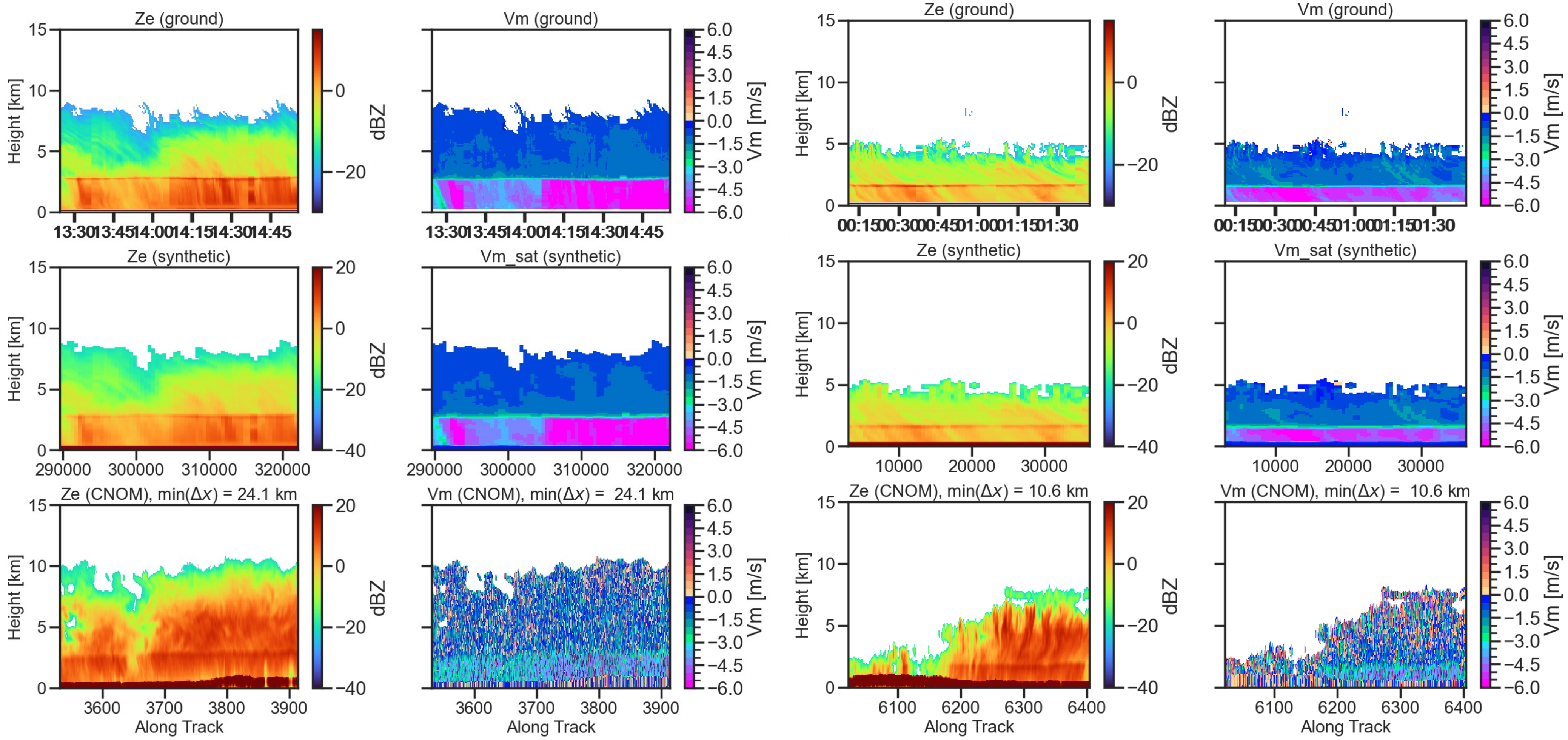
ACTRIS

CCRES

Thank you !



Ze (ground)
Vm (ground)
Ze (synthetic)
Vm_sat (synthetic)
Ze (CNOM), min(Δx) = 24.1 km
Vm (CNOM), min(Δx) = 24.1 km
Ze (CNOM), min(Δx) = 10.6 km
Vm (CNOM), min(Δx) = 10.6 km
Height [km]
dBZ
Vm [m/s]
Along Track
13:30 13:45 14:00 14:15 14:30 14:45
00:15 00:30 00:45 01:00 01:15 01:30
290000 300000 310000 320000
10000 20000 30000
3600 3700 3800 3900
6100 6200 6300 6400