Low-level cloud as seen by EarthCARE Cloud Profiling Radar, validation against Jülich and NyÅlesund data (EVID03)

Lukas Pfitzenmaier[1], Ulrich Löhnert[1], Kerstin Ebell[1], Mario Mech[1], Pavlos Kollias[1,2]

[1] Institute of Geophysics and Meteorology, University of Cologne, [2]Stony Brook University, Stony Brook, NY, USA

1. Motivation

- Low clouds cover large global areas
  - Important for global radiation budget
- EarthCARE: observational challenge
  - Near-ground → ground echo blind zone
  - Low reflectivity values
  - Small-scale conversion at the edge for EarthCARE IFOV
- Question:
  - Which low-level clouds can EarthCARE CPR measure?
  - What can we gain from EarthCARE Doppler velocity and Doppler velocity products?
  - Can we distinguish cloud and precipitation near the ground?
  - Is a statistical comparison of ground and CPR possible for these clouds?
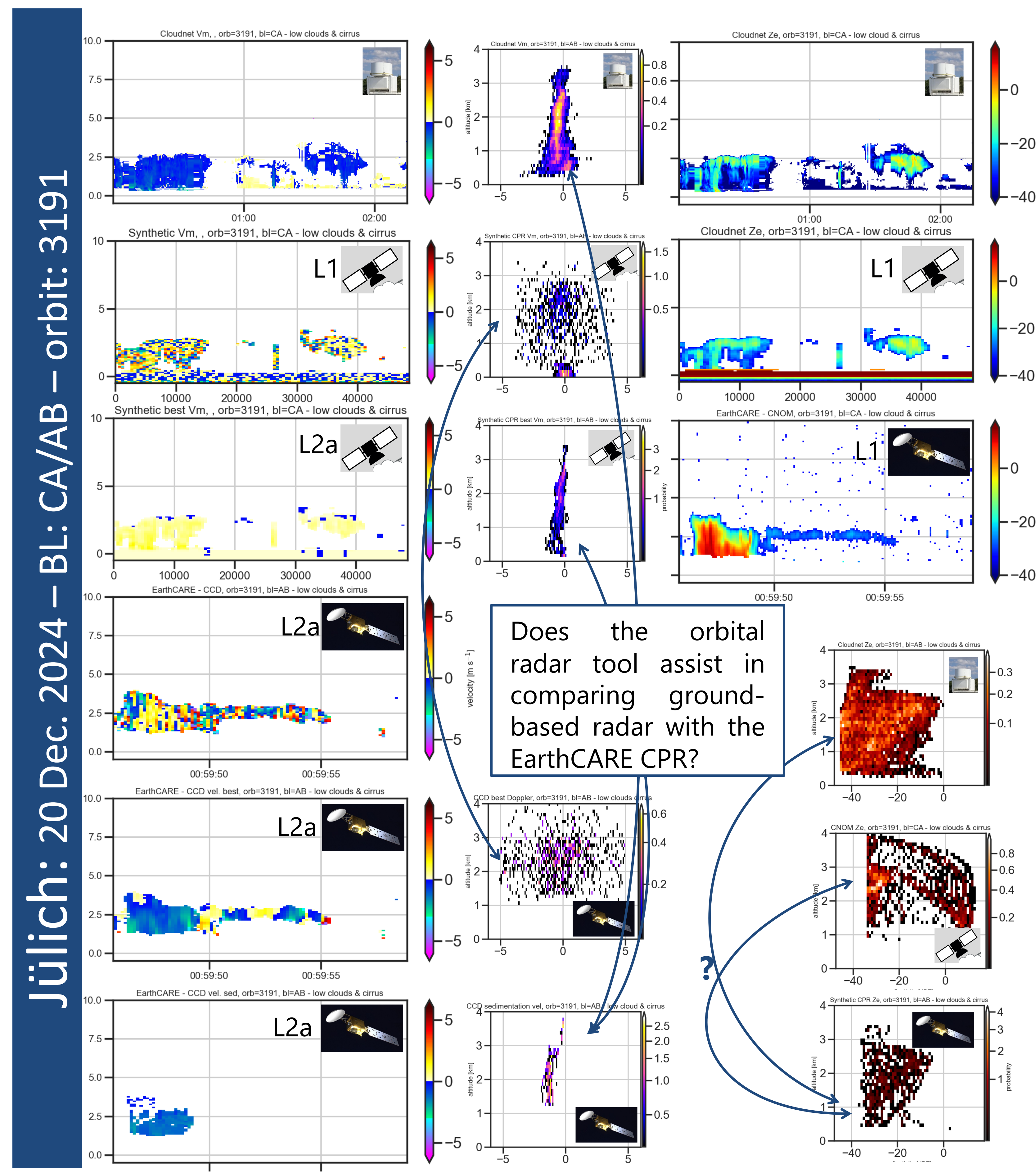
3. Data and methodology

- Ground-based ACTRIS cloud radar data
- EarthCARE CPR data
  - L1: CNOM – Ze and Vm
  - L2a: CCD – Vm$_{Doppler\ best\ estimate}$ (Vb), V$_{sedimentation}$ (Vs)
- Orbital-radar tool to simulate CPR L1 measurements [3]
  - Vm and Vm$_{Doppler\ best\ estimate}$
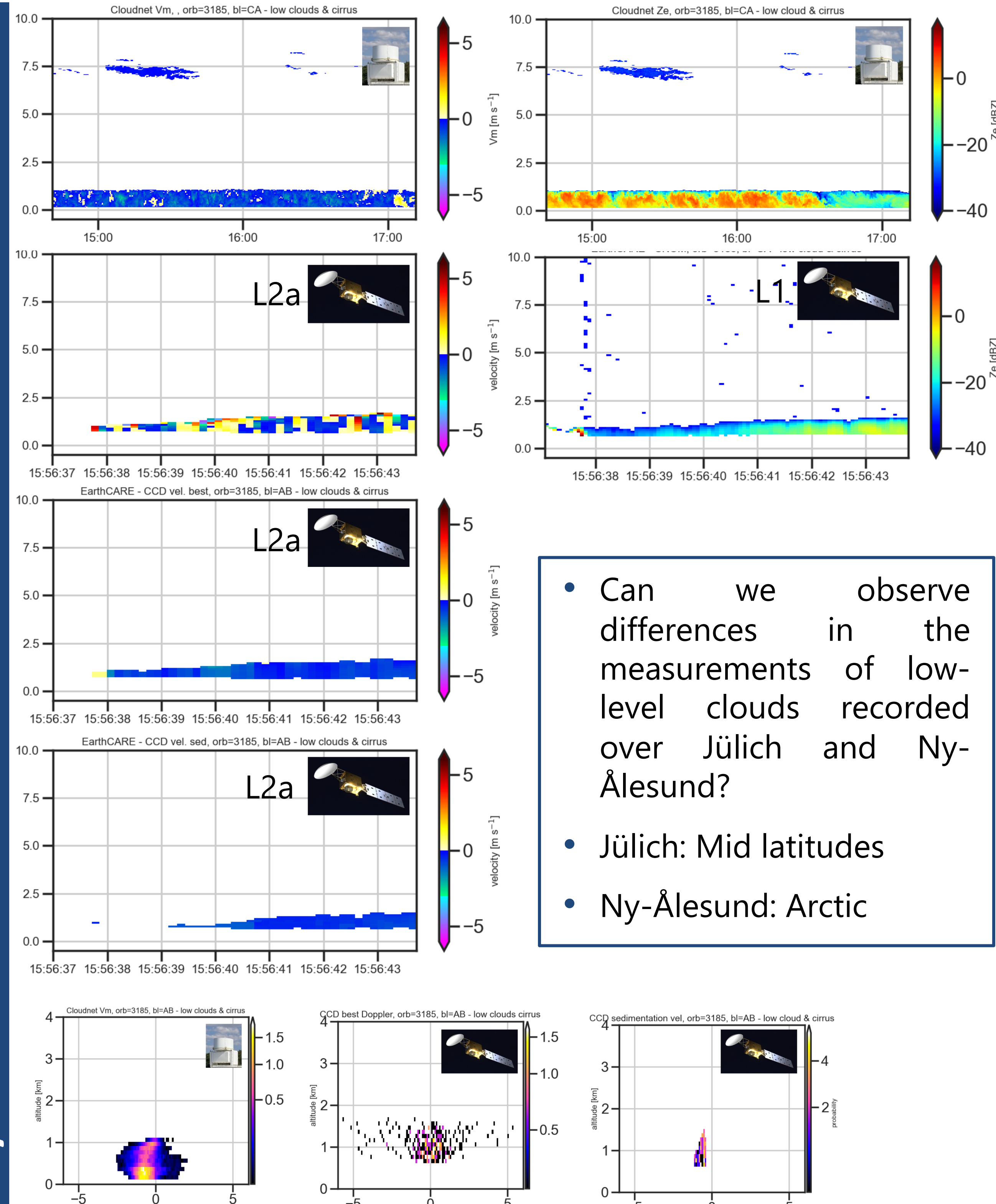- Filter data set for low clouds, clouds below 2.5 km [1]

Further plans:

- Cloudnet target classification to create clusters of ground-based data and synthetic CPR data
- Compare to more EarthCARE CPR L2a and in the future also to L2b

Discussion of the plots:

- Analyzing case studies: What can we learn?
- Which variables are comparable best?
- Does the orbital radar tool assist with the comparison?

Jülich: 20 Dec. 2024 – BL: CA/AB – orbit: 3191

NyÅlesund: 19 Dec. 2024 – BL: CA/AB – orbit: 3185

Does the orbital radar tool assist in comparing ground-based radar with the EarthCARE CPR?

- Can we observe differences in the measurements of low-level clouds recorded over Jülich and Ny-Ålesund?
- Jülich: Mid latitudes
- Ny-Ålesund: Arctic

5. Conclusion & Outlook

- Analysing case studies of low-level clouds in Jülich (mid-latitudes) and NyÅlesund (Arctic)
- Compare the low clouds at the two sites:
  - Arctic, NyÅlesund: mixed-phase clouds, liquid precipitation
  - Mid Latitudes, Jülich: small-scale convection, low-level stratus
- Limited comparison statistics of the two sites:
  - Currently, focus on case study analysis
  - More data is needed to perform statistics (L2 data missing)
  - Use of synthetic data sets for method development

References:

[1] Gierens, R., Kneifel, S., Shupe, M. D., Ebell, K., Maturilli, M., and Löhnert, U.: Low-level mixed-phase clouds in a complex Arctic environment, Atmos. Chem. Phys., 20, 3459–3481, https://doi.org/10.5194/acp-20-3459-2020, 2020.

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contact - l.pfitzenmaier@uni-koeln.de