IcePolCKa – A Review

G. Köcher[1], C. Heske[2], F. Ewald[2], T. Zinner[1], E. Tetoni[2], C.Knote[1,3], M. Hagen[2]

[1]Meteorologisches Institut, Ludwig-Maximilians-Universität, München
[2]Institut für Physik der Atmosphäre, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Oberpfaffenhofen, 82234 Wessling, Germany
[3]Medizinische Fakultät, Universität Augsburg, Germany

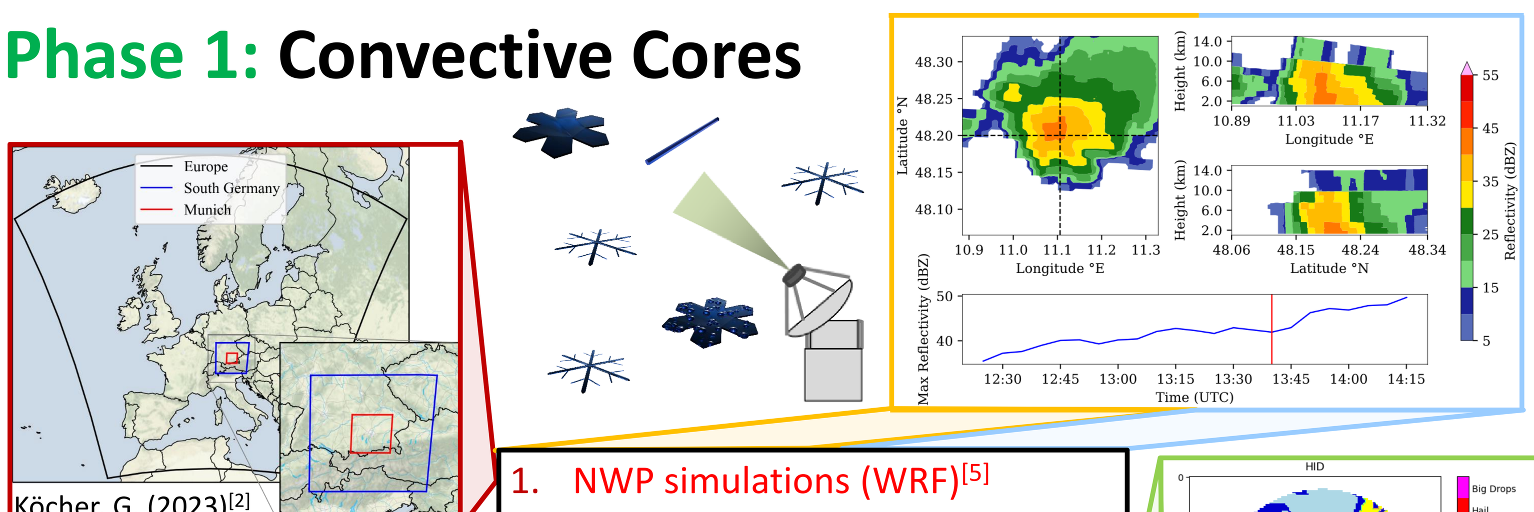
Contacts: **gregor.koecher@lmu.de, christian.heske@dlr.de**

Introduction

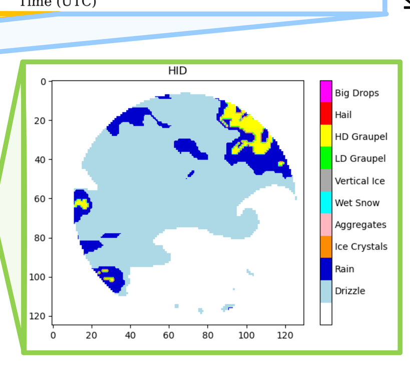
IcePolCKa is a joint project between the **DLR** in Oberpfaffenhofen and the **LMU** in Munich. The project is part of the German wide DFG priority programme 2115: **PROM**.

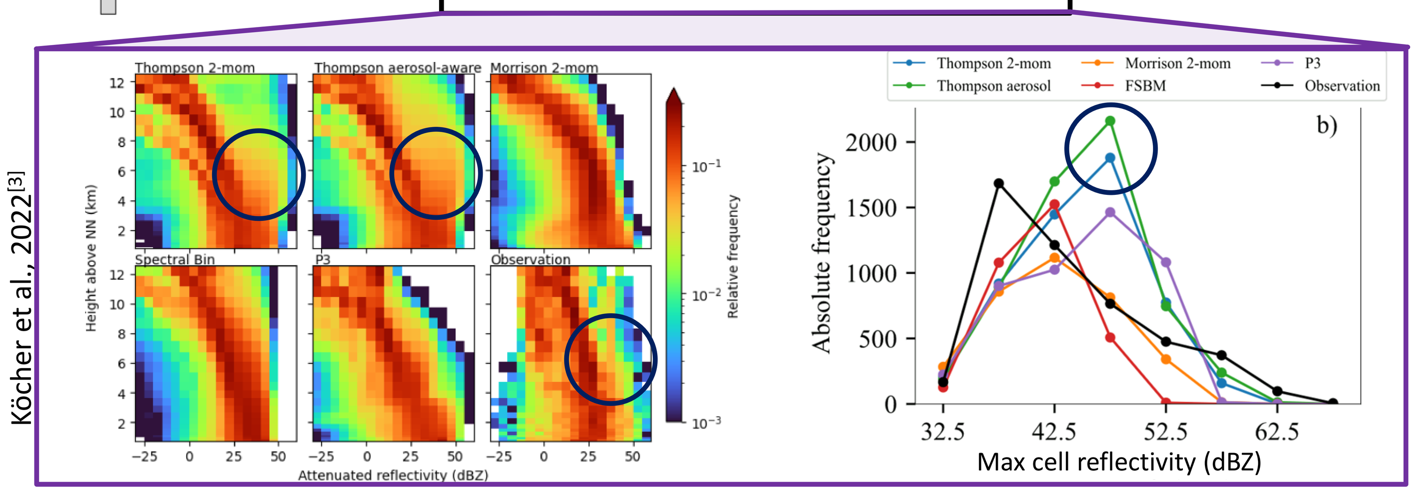
The goal of IcePolCKa is to explore the synergy between **polarimetric** radars at **dual-frequency**. The resulting data is used to develop an **ice particle size retrieval** and to **evaluate cloud microphysics** in a NWP model.

Phase 1: Convective Cores



1. NWP simulations (WRF)[5]
2. Forward simulations (CRSIM)[6]
3. Hydrometeor Classification[7]
4. Cell-tracking (TINT, TOBAC)[8, 9]
5. Statistic. evaluation of conv. cells

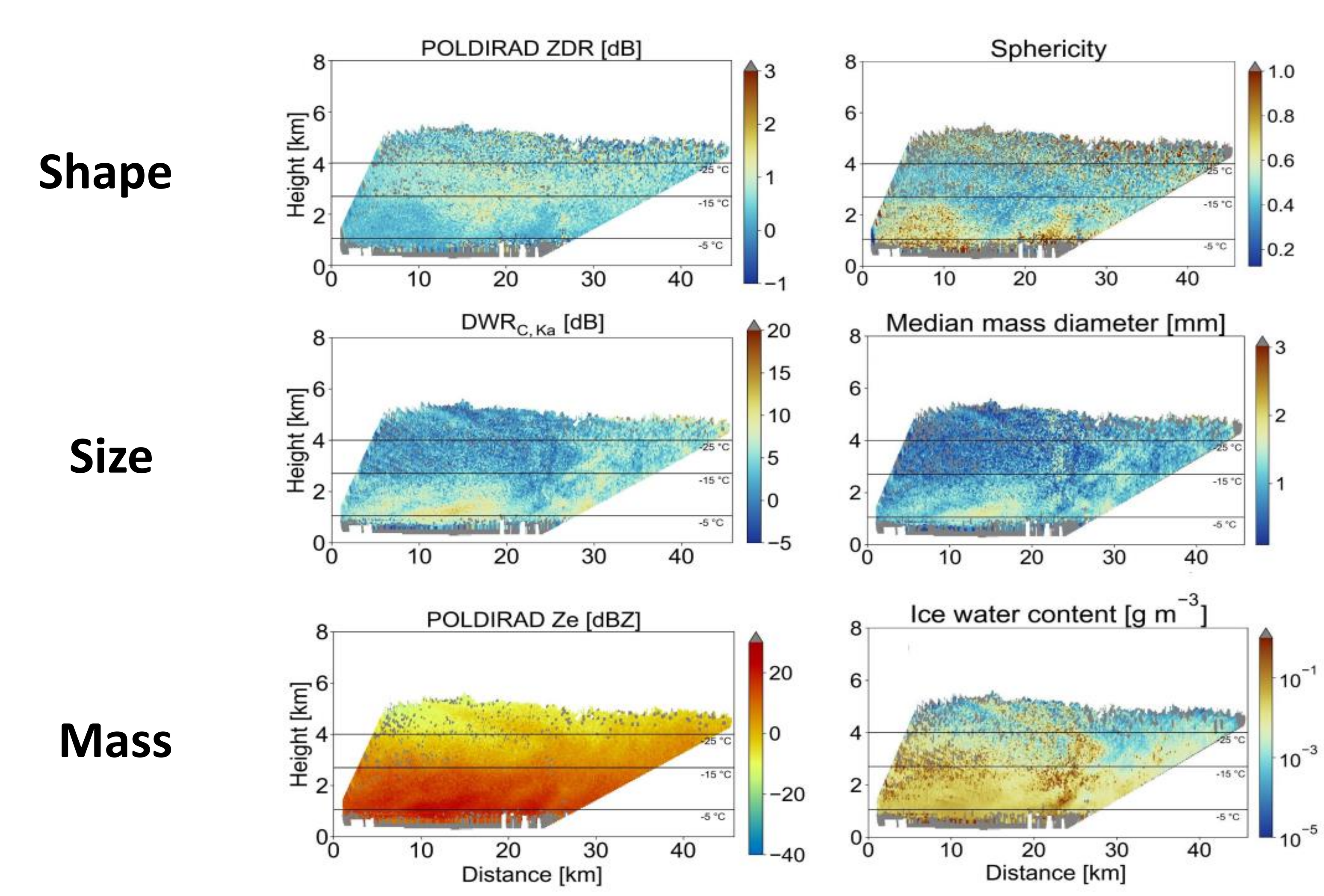




- H>4km: Reflectivity > 30 dBZ too frequent in both Thompson
- High peak at 47.5 dBZ max reflectivity in both Thompson

Reason: **Graupel**

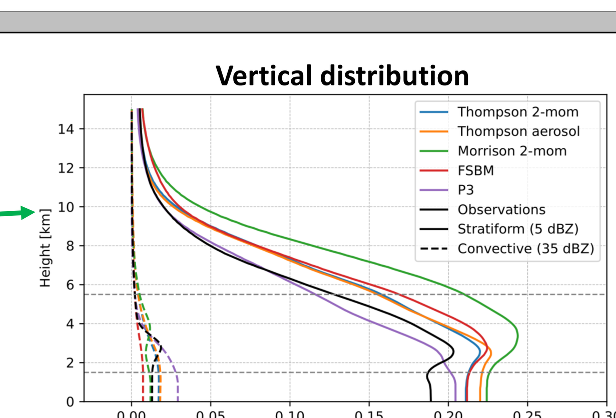
Phase 1: Microphysical retrieval

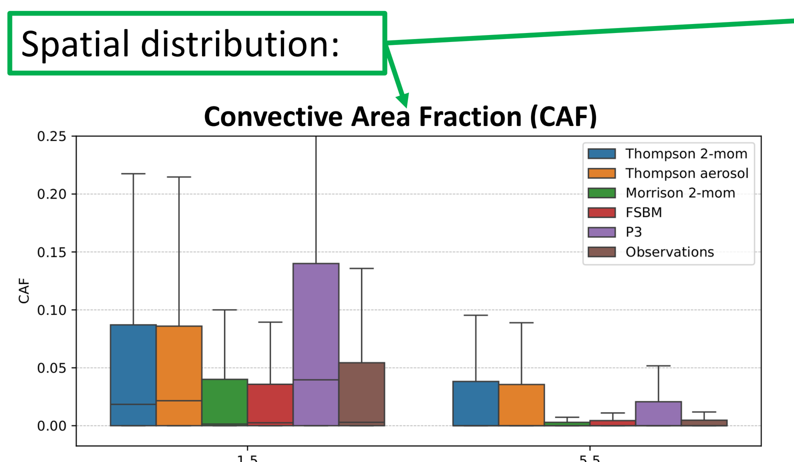


- Collocated RHIs between the two instruments shown above
- Combination of Ze, ZDR and DWR to retrieve ice particle shape, size and mass

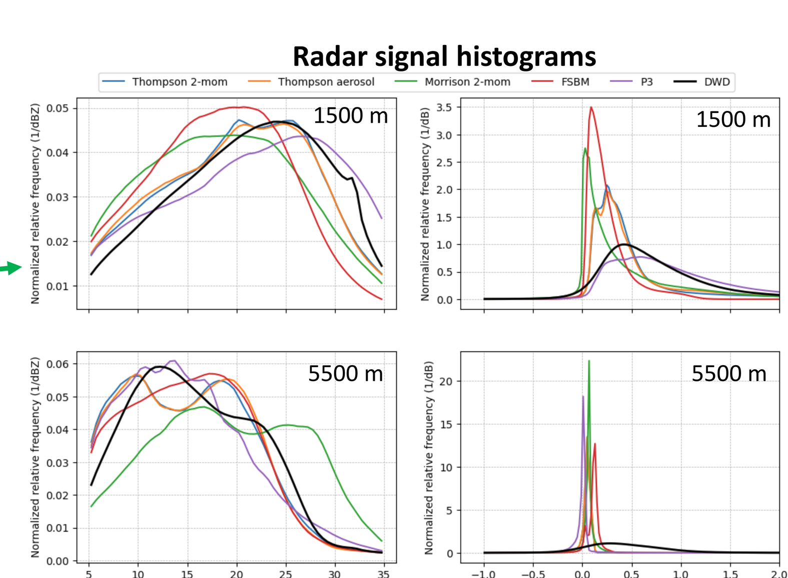
Phase 2: Spatial distribution

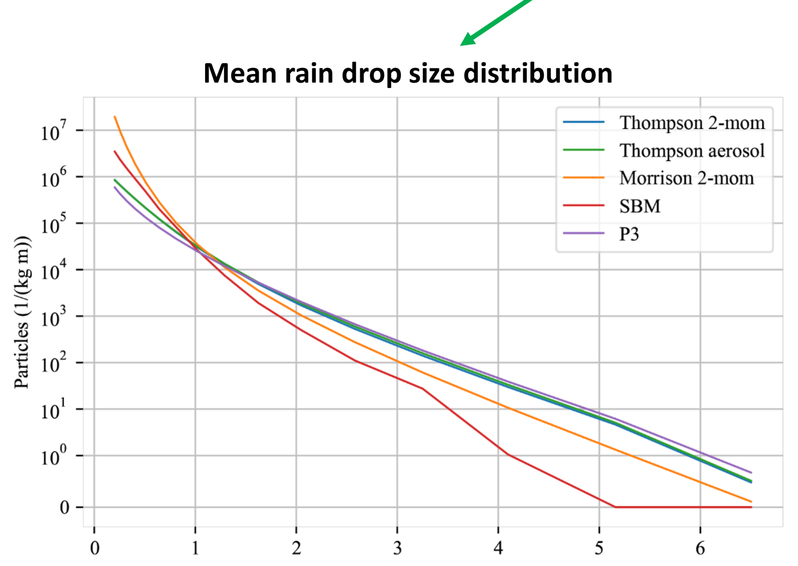
Spatial distribution:





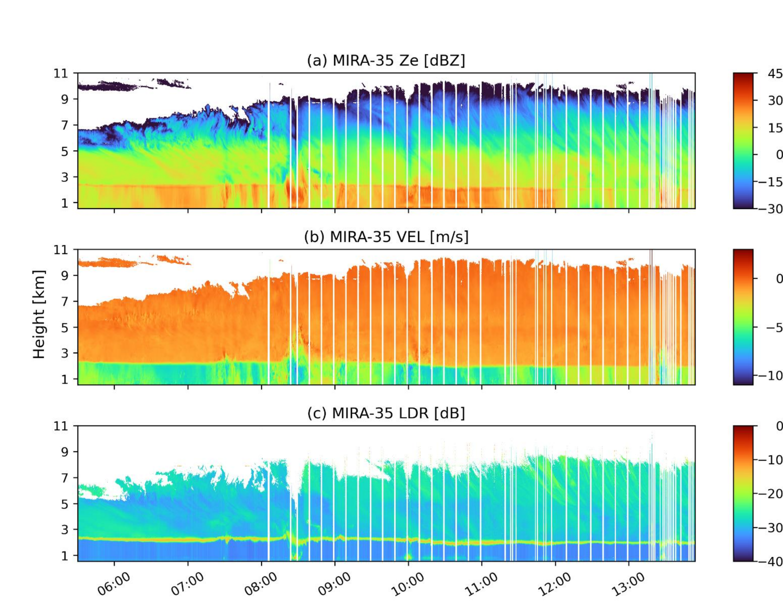
Particle size distribution issues:

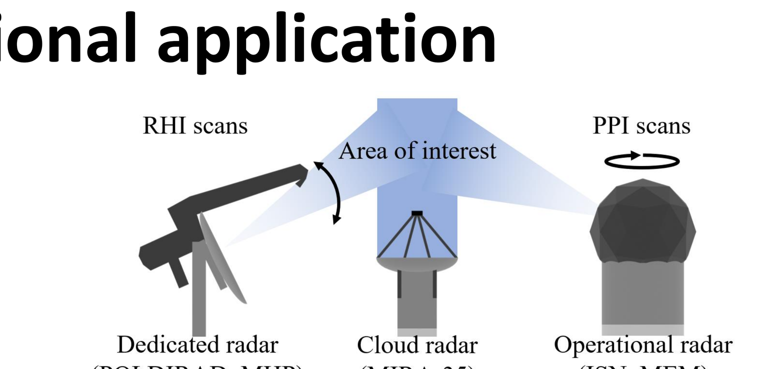




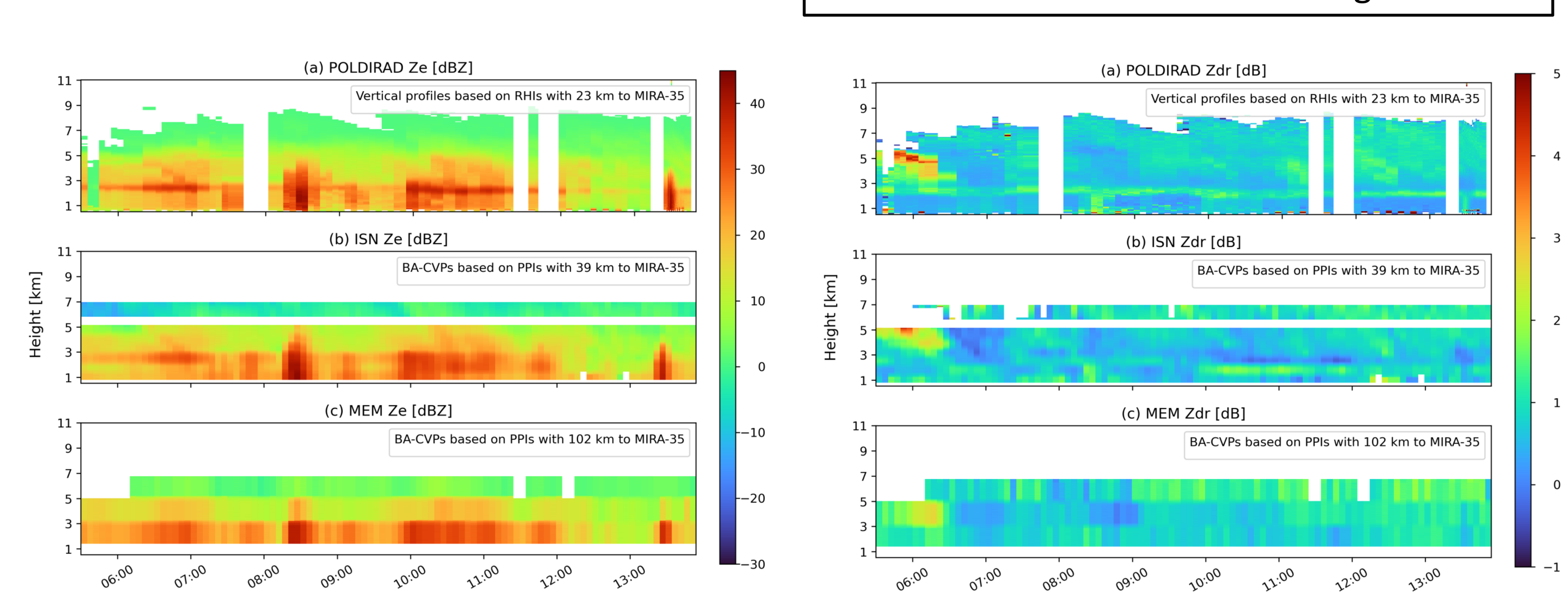
- Except **P3**: too much stratiform precipitation coverage at all heights
- **FSBM** and **Morrison** schemes: too many small rain drops
- At 5500 m: **Morrison** exhibits high reflectivity bias

Phase 2: Towards operational application





- Polarimetric, oblique looking radars (beam-aware columnar vertical profiles of operational PPI scans vs. virtual profiles of dedicated RHI scans
- Vertically looking cloud radar (MIRA-35)
- Availability of Ze, DWR, ZDR, LDR, MDV radar variables to reduce ambiguities



Conclusions

- Developed method for **rigorous statistical evaluation** of cloud microphysics schemes with dual-frequency polarimetric radar observations (**Phase 1**)
- Issues were found in **spatial precipitation distribution** and simulated **particle sizes**, varying with the microphysics scheme (**Phase 2**)
- **Successful retrieval** of cloud ice properties, but some ambiguities remain (**Phase 1**)
- Inclusion of **operational radar** data and usage of **additional radar variables** to reduce remaining ambiguities (**Phase 2**)

References

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