Progress Towards Automatic Retrievals of Vertical Air Motions and DSD Parameters in Large-scale Precipitation

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Motivations

To automate retrievals of key precipitation parameters using existing/traditional ARM cloud radar systems:

- Toward the restructured ASR / VVFG goals of understanding precipitation processes.

- Cloud radar offers a potential for unparalleled and detailed study within light/moderate precipitation.

- Numerous applications for better understanding ground and satellite-based radar retrievals, dynamics and microphysical processes in precipitation.
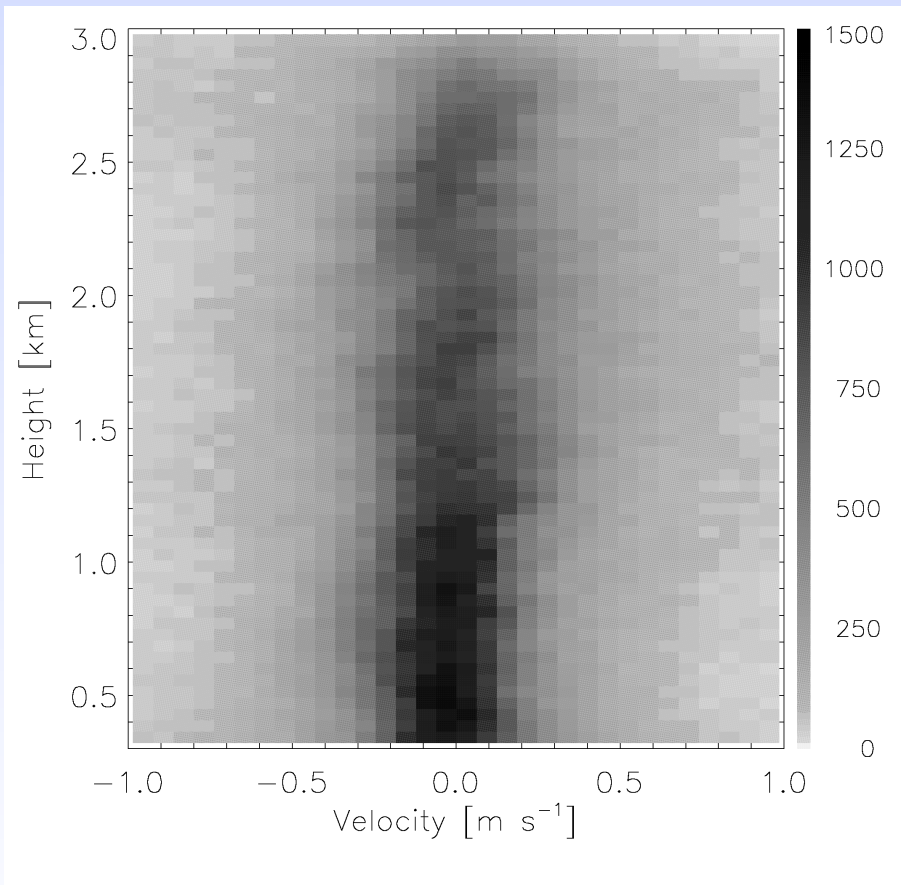
Where We Started

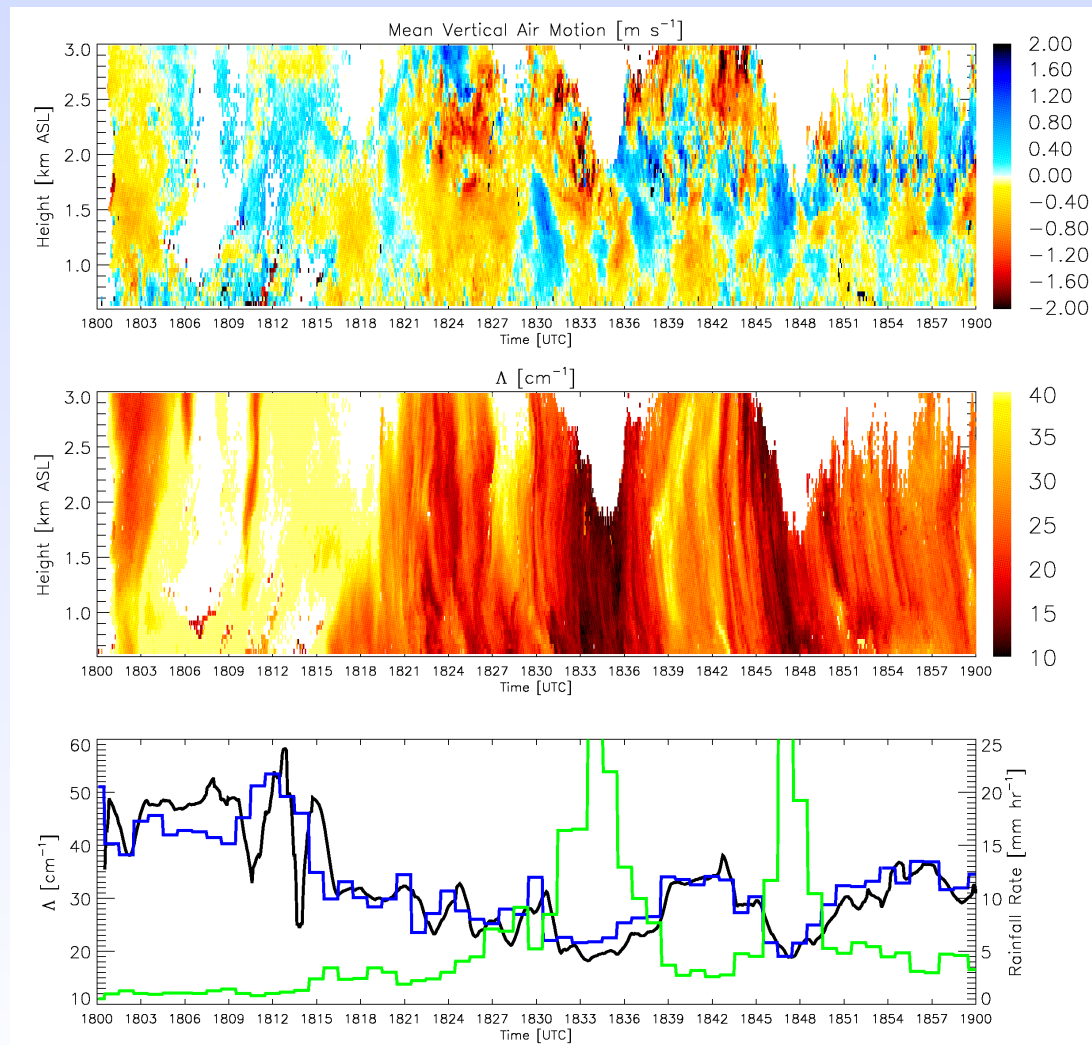Start with the ideas of Lhermitte (1987, 1988), Kollias 2002;

One Early Lesson: It's always difficult to go from 'a really good idea' to a fully functional and fool-proof automatic system.
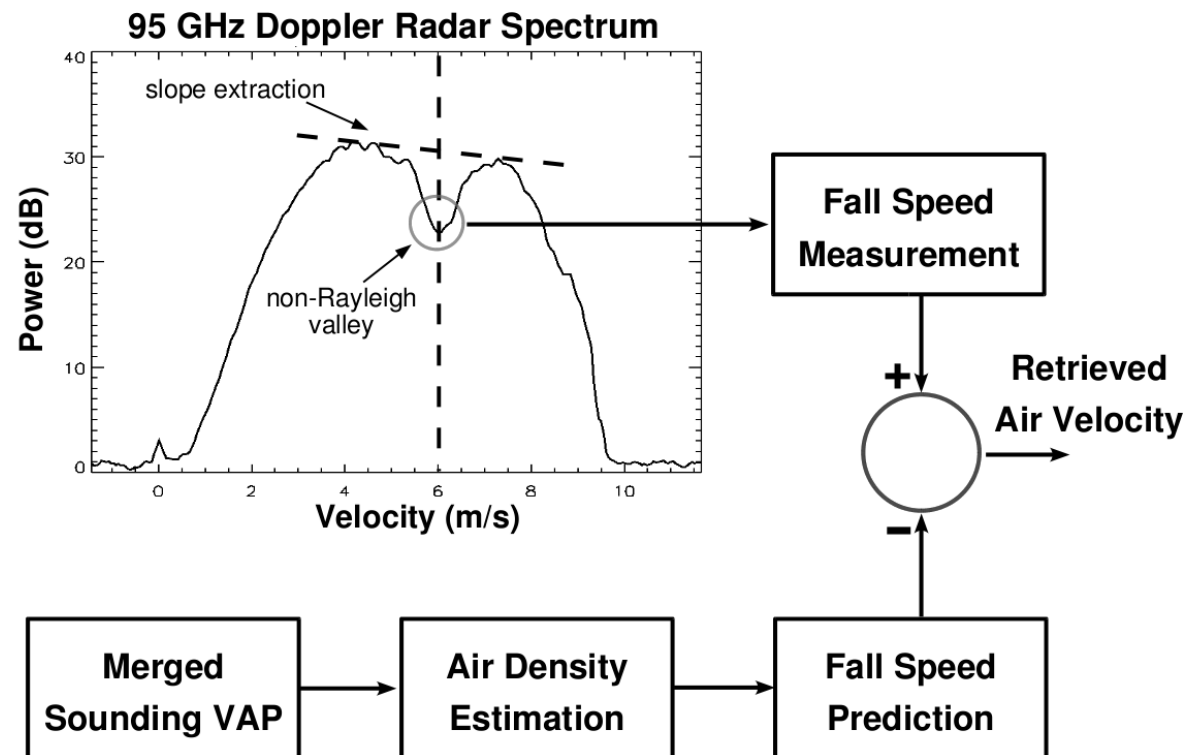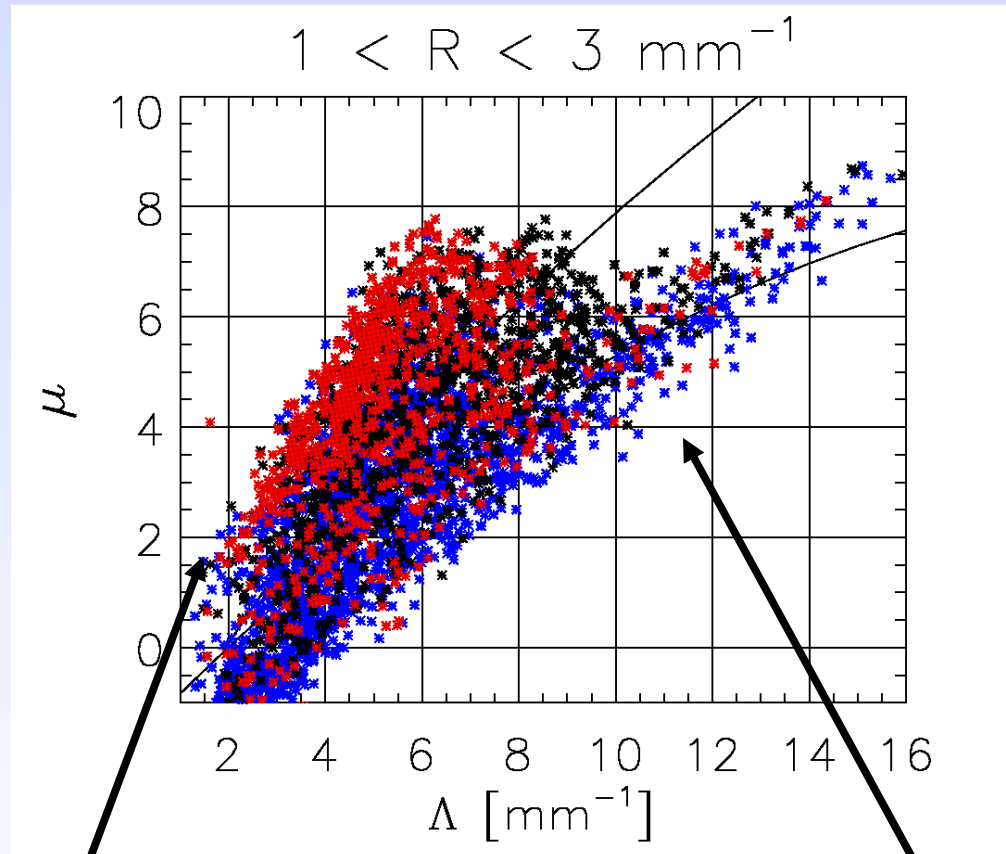
Advances Through The Peer Review Process

CFADs of all WACR vertical air motion retrieved for SGP during May 2007

An hour of retrievals from May 1st, 2007 between 18-19 UTC

$1 < R < 3 \ mm^{-1}$

Tropical Niamey (red): Bigger Drops
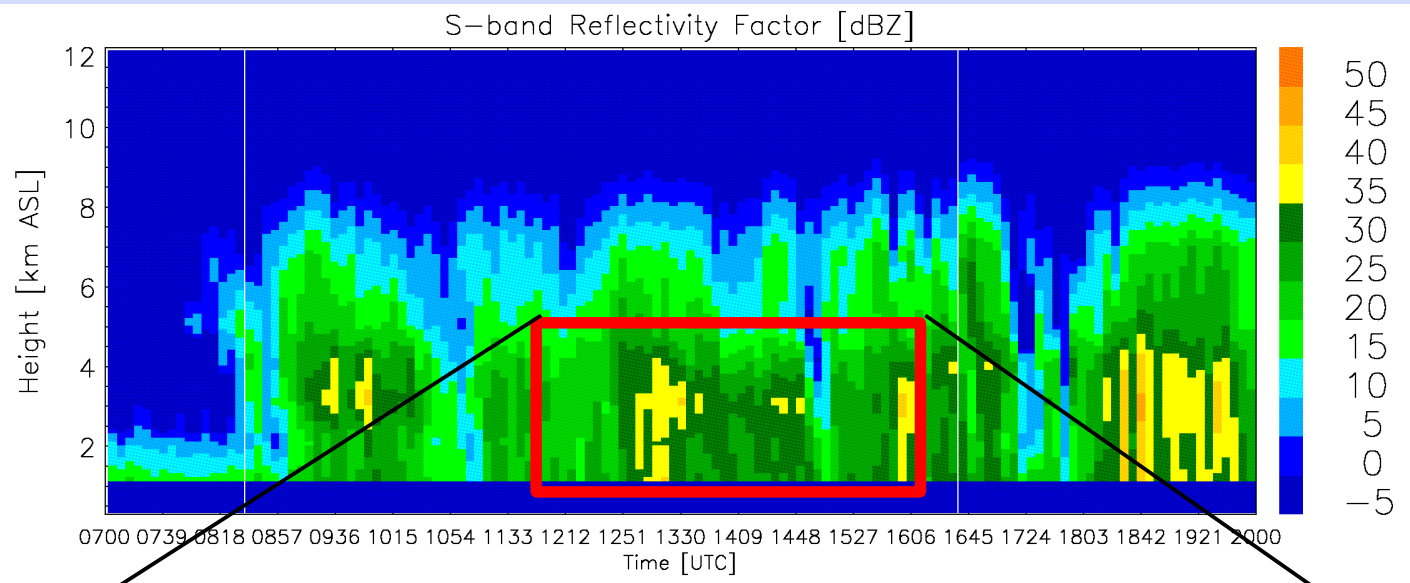
Orographic Germany (blue): Smaller Drops

Comparisons of precipitation parameters for the same rainfall rate as viewed across the retrievals from 3 different ARM/AMF WACR sites: SGP Lamont, Niamey and Black Forest Germany.
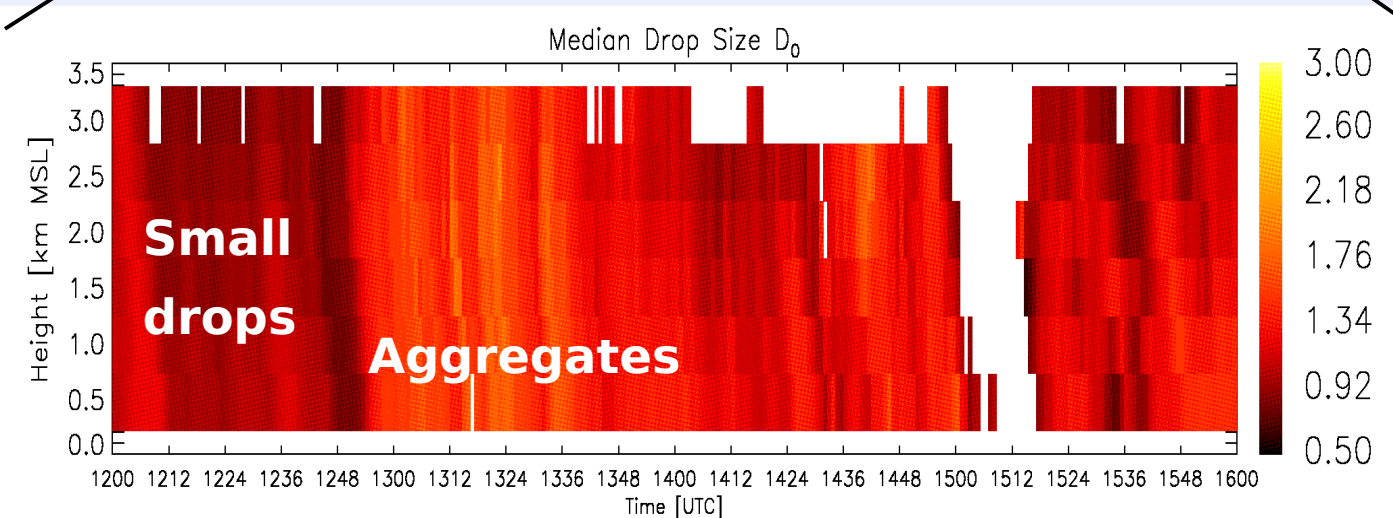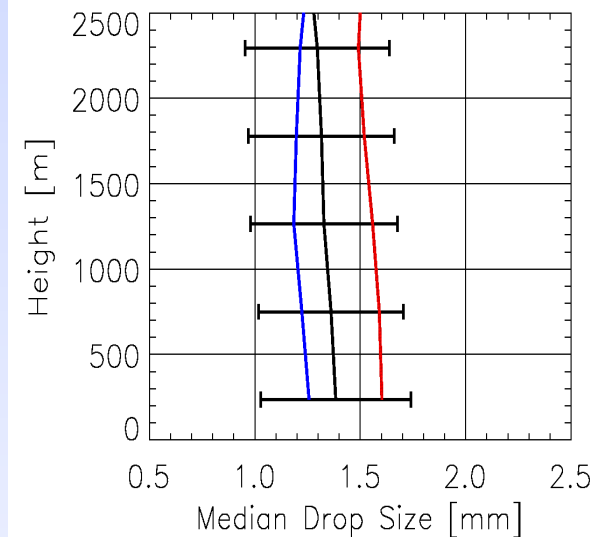
Advances Through The Peer Review Process

Bulk Profiles of Median Drop Size D_0 [mm]

S-band Reflectivity Factor [dBZ]

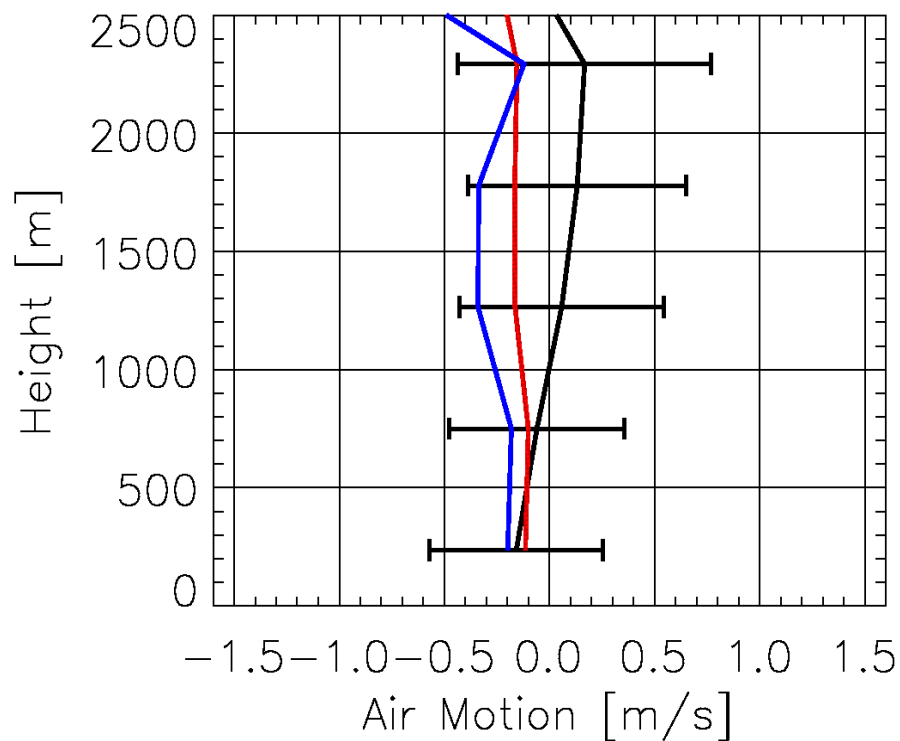Median Drop Size D_0

Small drops

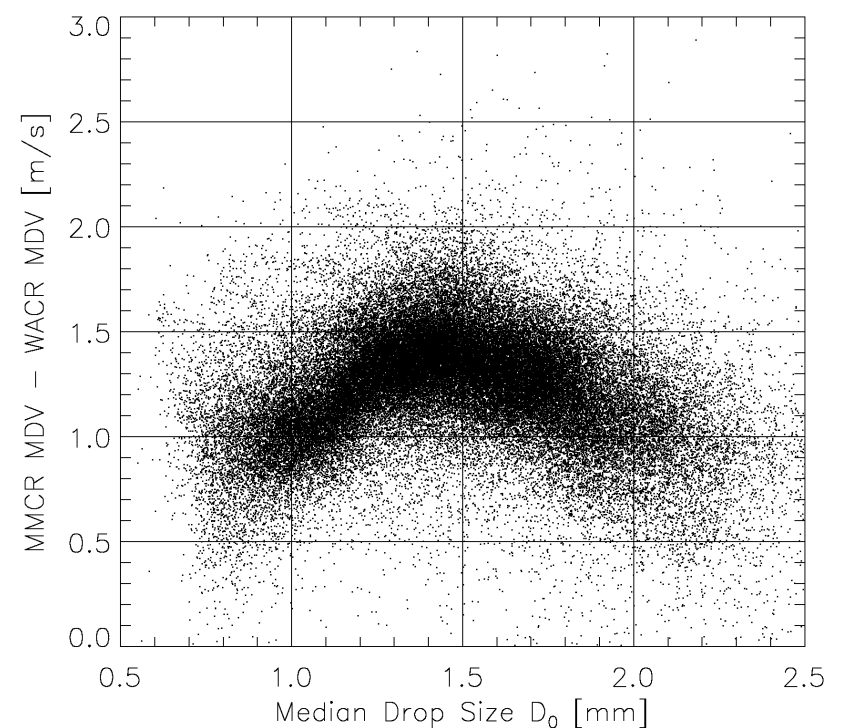Aggregates

Calculations of Median Drop Size D_0 [mm]

Here, resampled as would be viewed by a radar system with a native resolution of roughly 0.5 km².

Where We Are Headed
Support of Future Retrievals

Bulk air motion profiles for Germany (blue), Niamey (red), SGP (black) in light rain ~ 2 mm/hr.

Quick 'matched' (MMCR – WACR) Mean Doppler Velocity versus WACR retrieved Median Drop Size at SGP.