The NCAR HIAPER Cloud Radar (HCR)

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Specifications

- Melting layer detection
  Romatschke U., 2021: https://doi.org/10.3390/rs13091660.
- Convective/stratiform echo type
- Particle identification

Proposal: C-130 deployments

We propose to develop the capability to deploy HCR on the NSF/NCAR C-130 aircraft in an existing 29" under-wing pod.
- The C-130 currently shares the Wyoming Cloud Radar (WCR) with the Wyoming King Air aircraft. Shared use of one radar by two aircraft limits the number of field campaigns that can be supported by both aircraft.
- The C-130 has excellent low altitude performance and is ideal for studying the planetary boundary layer and lower to mid-troposphere.
- The HCR complements the Airborne Phased Array Radar (APAR) development on the C-130.

Proposal: Ka-band

We propose to develop a Ka-band radar for concurrent deployments with the W-band HCR on the GV, the C-130, and on the ground.
- Dual-wavelength observations allow for enhanced derived products enabling new insights into cloud microphysical processes.
- A Ka-band radar would suffer less attenuation than HCR allowing for deeper beam penetration into heavy precipitation.
- A second wavelength improves velocity unfolding.
- Two radars on one aircraft enable simultaneous zenith and nadir pointing operations.

Proposal: Ground deployments and X-band

We propose to make HCR and the Ka-band radar available for ground deployments and to build a ground-based vertical pointing X-band radar.
- Triple-wavelength observations are the future of cloud microphysical retrievals.
- Lessons learned from algorithms developed for ground-based observations will inform the algorithm development efforts for airborne observations collected by the same radars.
- Re-use of the X-band transmitters that were used by the now retired ELDORA radar significantly reduces the cost of the X-band development.

X-band specifications
- Wavelength 3.2 cm
- Frequency 9 GHz
- Antenna diameter 1.5 m
- Range resolution 20 m
- Max range 30 km
- Peak power 40 kW
- Beamwidth 1.42 deg
- Pulse repetition frequency (PRF) 5 kHz
- Sensitivity -21 dBZ
- Pulse width 0.25-1.0 us
- Nyquist velocity 40 m/s

Data
- Derived products
  - Melting layer detection
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