

# Prospects of Cloud Volume Imaging with the WSR-88D Radar

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## Motivation

Observational sampling of 3D cloud fields has been a longstanding goal of ARM.

Cloud fields required for 3D radiative transfer calculations

Evaluation/formulation of overlap assumptions for statistical cloud schemes

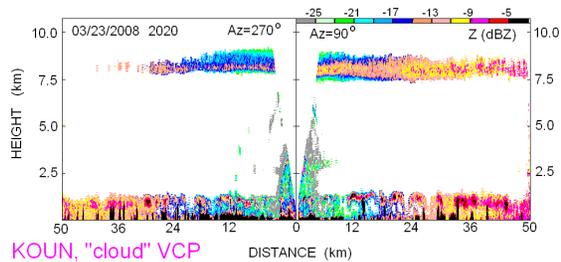
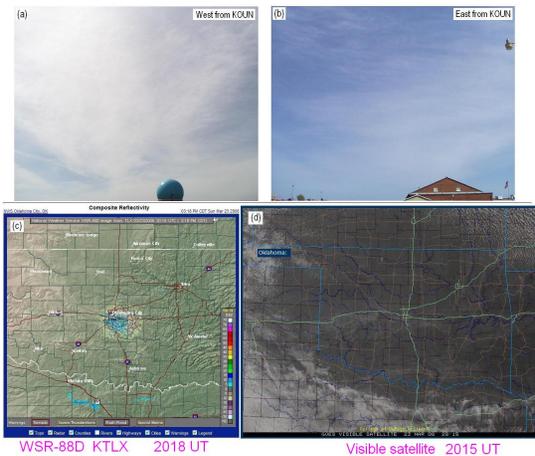
The 157 WSR-88D weather radar sites exhibit a wide range of climatic regimes

## Challenges

Can the WSR-88D weather radar be used for cloud sounding?

Reflectivities of -25...-30 dBZ @ 10 km should be observed with a radar. Can this sensitivity be achieved with the WSR-88D?

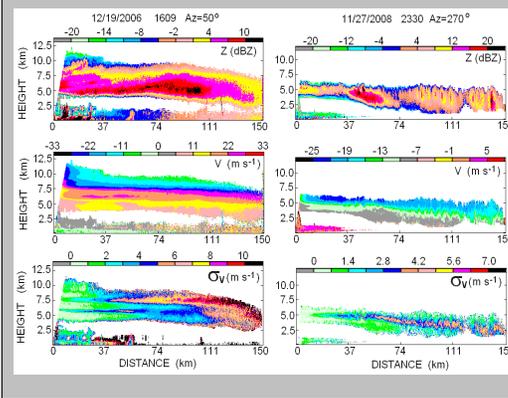
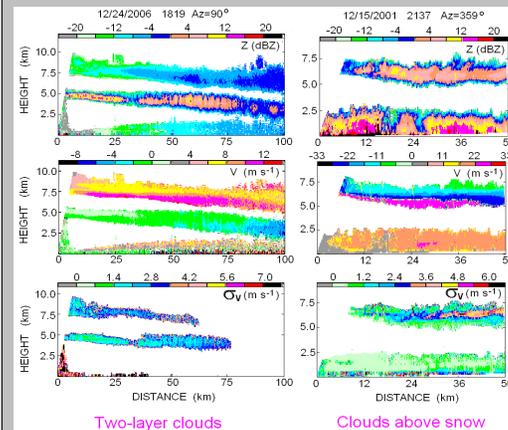
## Sensitivity of the WSR-88D with the 'cloud' signal processing



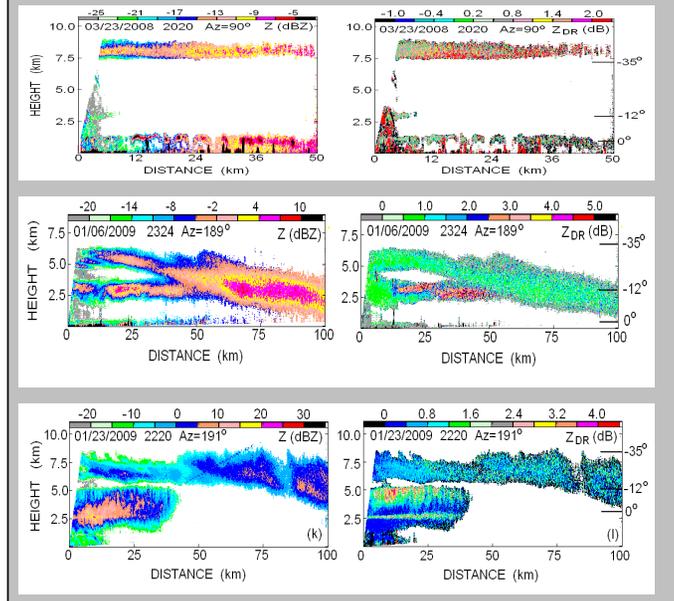
KOUN, "cloud" VCP

	ARM MCR	ARM WCR	NASA CPR	NOAA WSR-88D
Wavelength, mm	8	3	3	109
Antenna beamwidth, deg	0.2	0.24	0.12	0.96
Radial resolution, m	4590	45	500	250
Two-way transversal resolution, m	17@10km	29@10km	1400 x 2500	83@10km
Z <sub>min</sub> , dBZ	-30 (general mode)	-26	-26	-25.5 short pulse -33 long pulse
Attenuation	Strong	Severe	Severe	Negligible
Number of systems	5	3	1	157

## Reflectivity Z, Doppler velocity V, and spectrum width fields. Range >100 km



## Polarimetric fields, differential reflectivity Z<sub>DR</sub>



## CONCLUSIONS:

- Observations from WSR-88D KOUN illustrate the advantage of scanning Doppler polarimetric radars: near-instantaneous sampling of 3D cloud fields and their evolution
- Enhanced signal processing techniques applied to the WSR-88D increases sensitivity to -25.5 dBZ@10km in dual-polarization mode and -33 dBZ in single polarization mode
- Polarimetric capabilities allow for classification of hydrometeor type
- The existing NEXRAD radar network could be employed for cloud-climate studies and incorporation into NWP update cycles