



Dual-Polarization Research: Winter Microphysics

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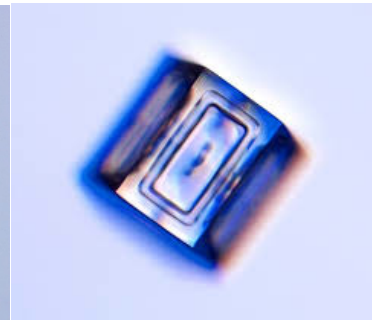
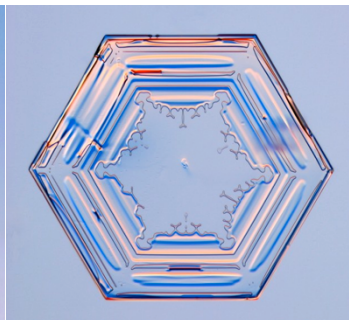
Types of crystals in winter storms



Highly anisotropic: high Z_{DR}



Intermediate forms: Z_{DR} depends on canting angle



Nearly isotropic: Z_{DR} near 0 dB



Polarimetric “fingerprints” can be used to

- Improve the warning/decision-making process
- Improve microphysical parameterization schemes and assimilation of radar data

See K. Elmore talk

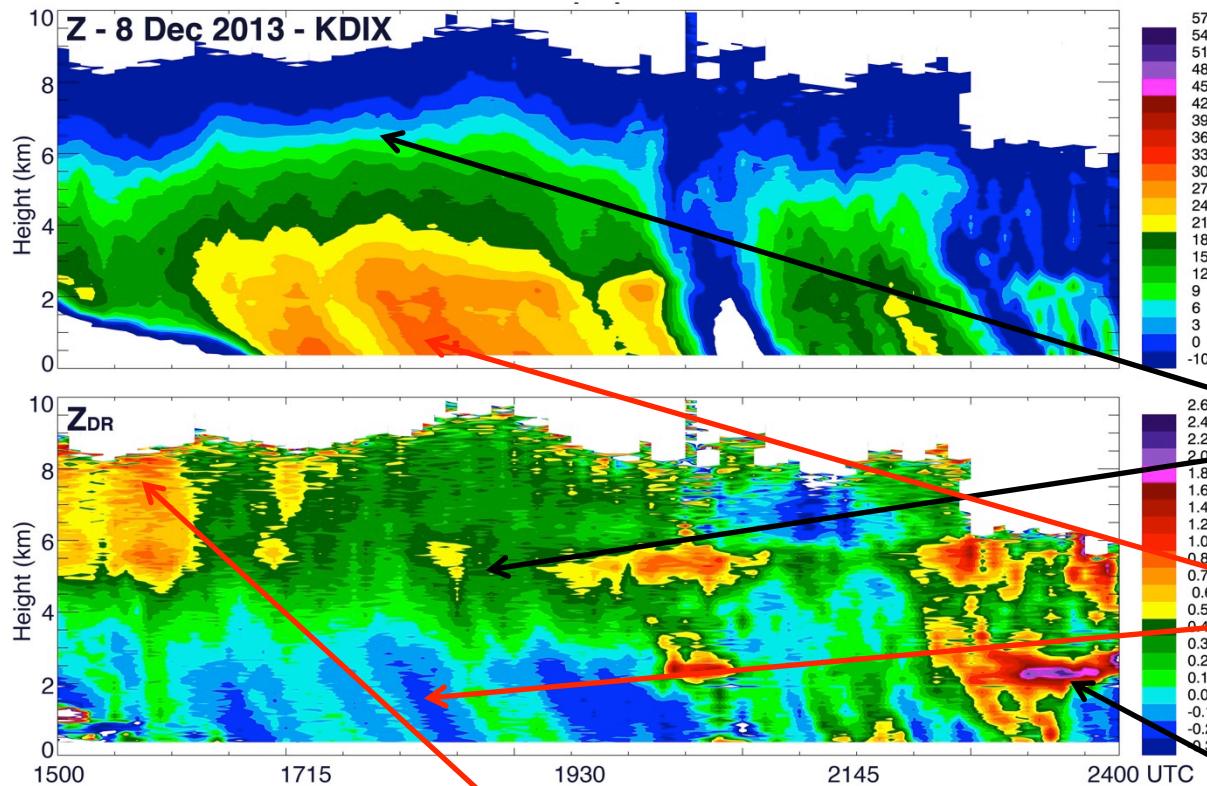
The PING Project

Precipitation Identification Near the Ground





Polarimetric fingerprints: Operational utility



Dendrites –
Enhanced Z_{DR} /
gradient in Z

Aggregation –
Low Z_{DR} /High Z :

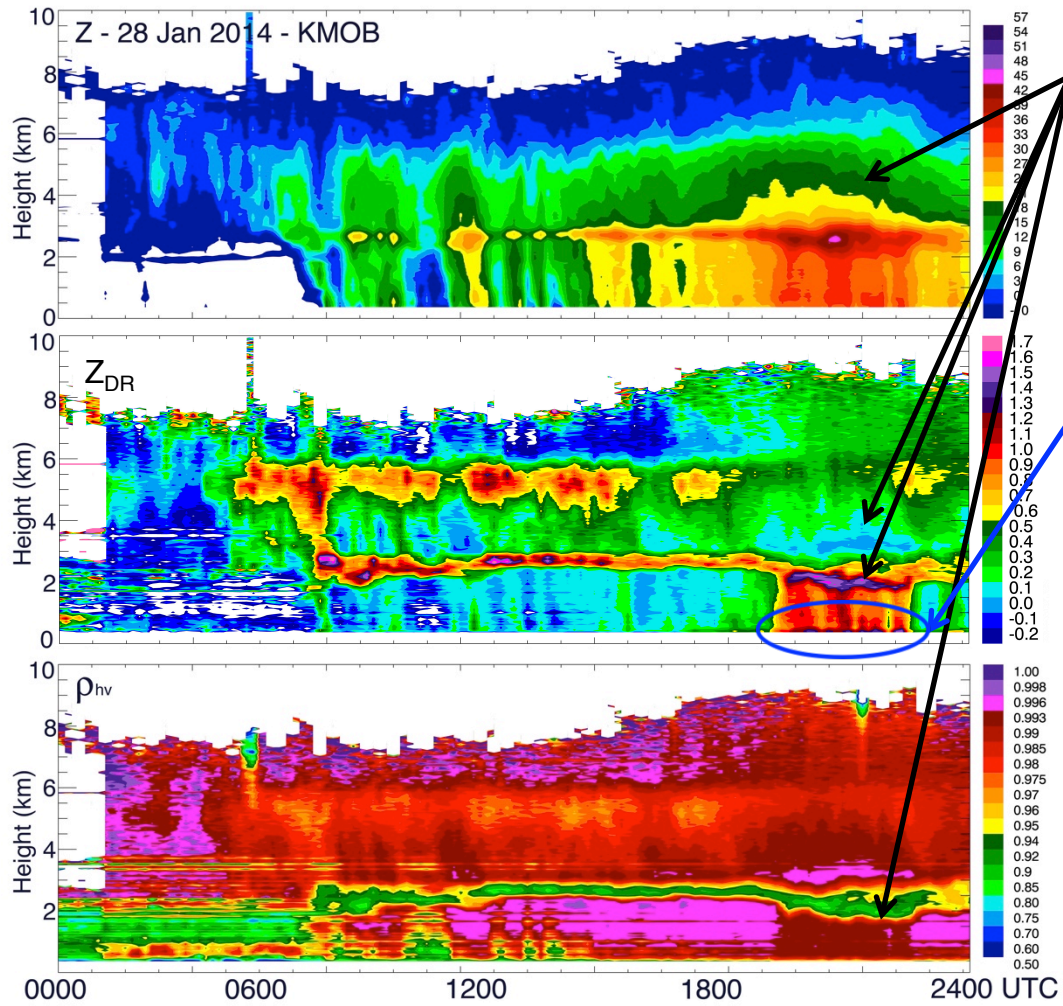
Melting aloft
(freezing rain at sfc)
– enhanced Z_{DR}

Highly anisotropic - High Z_{DR}





Polarimetric fingerprints: research value



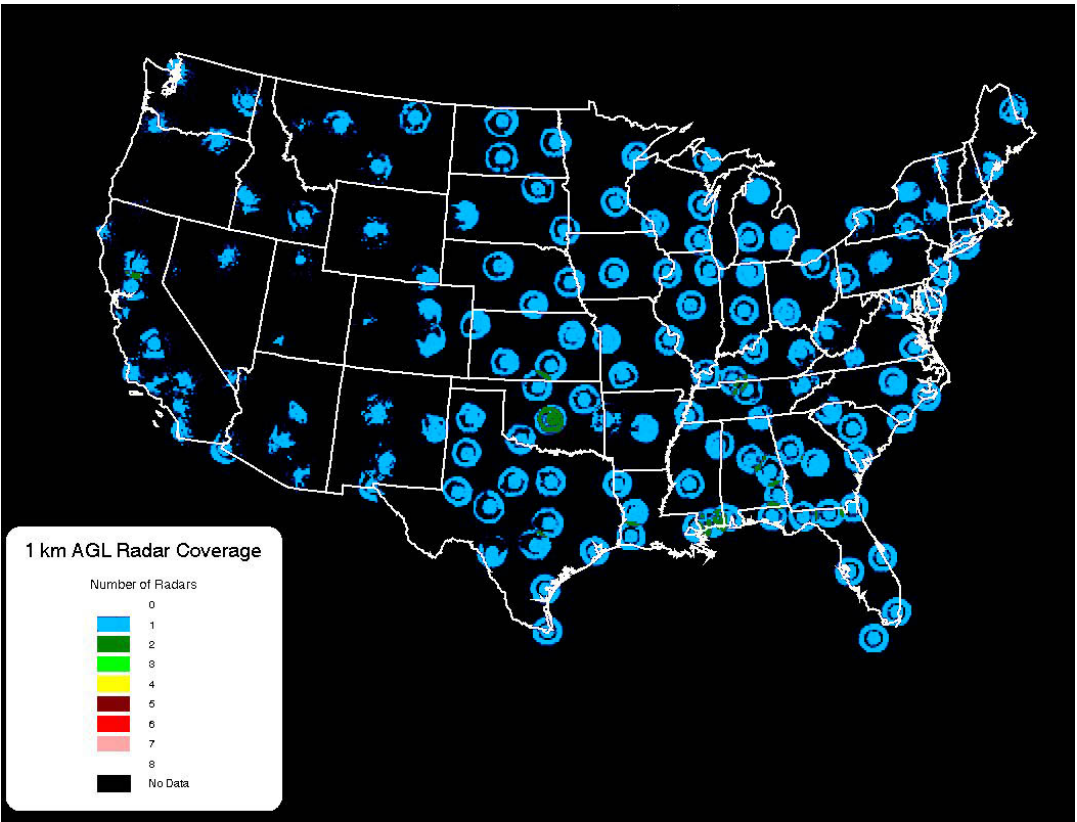
Riming

Refreezing





Next Frontier: Combined data approaches



Radar coverage in lowest 1 km: very limited

Radar observations
+
Profiles of temperature &
humidity from numerical
models
↓
Spectral Bin Classifier (SBC):
3D depiction of cloud habit
viewable in MRMS
(see K. Howard talk)



Next Frontier: Combined data approaches

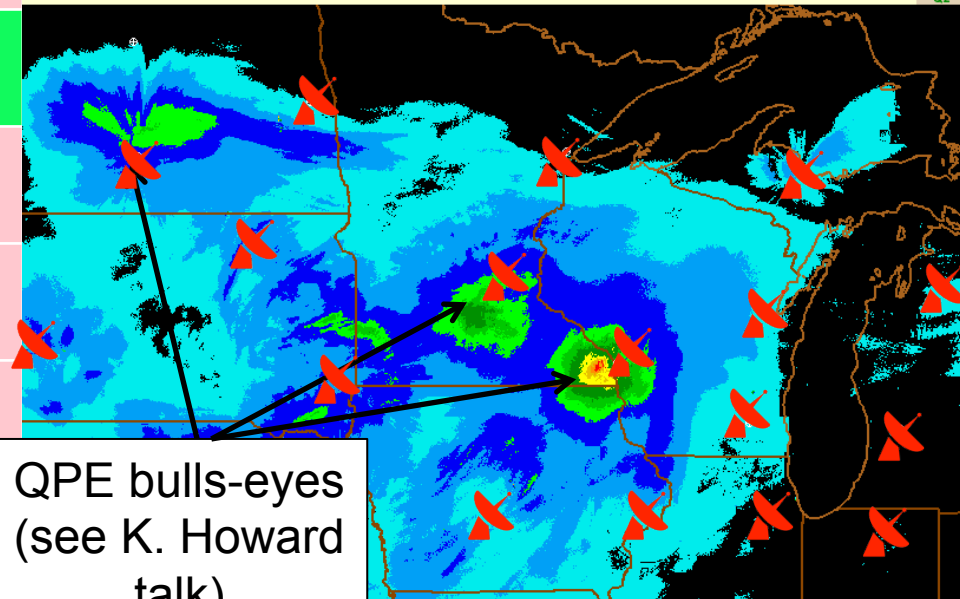
POD of surface precipitation type for different types of precipitation and different classifiers

	SNOW	RAIN	SLEET	FRZ. RAIN
SBC	95.2	98.3	73.6	71.0
NCEP1	86.7	96.1	89.6	28.4
NCEP2	97.1	96.1	56.0	28.4
NCEP3	92.6	96.1	50.4	48.8
NCEP4	94.9	99.6	25.6	65.4

Other beneficiaries of this approach:
 Melting layer detection
 Hail size detection
 Quantitative precipitation estimate (QPE) for snow

Q2 [Radar Only]
 24 hr Accumulation

Valid: 12/11/2010 12:00:00 UTC



QPE bulls-eyes
 (see K. Howard talk)





Summary

1. Fingerprinting will aid in operational decision making.
2. Fingerprinting reveals new knowledge of microphysical processes.
3. New technology (QVPs: Quasi-Vertical Profiles) allows users to quickly interrogate radar data and is in the process of being transferred to operations.
4. A revolution in the way radar algorithms work is underway – the combined data approach.

NSSL is continuing our legacy of revolutionizing the way forecasters use radar observations *in all four seasons.*

Our external partners

