Dual Polarization and Mobile Platforms for Weather Observation

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Weather Radar Research

Outline

Dual Polarization

Motivation, Development, What it is, Cost benefit, Joint POLarization Experiment (JPOLE)

Mobile Platforms (dual Polarization)

5 cm wavelength and 3 cm wavelength radars, Attenuation and Differential Attenuation, Correcting effects of attenuation

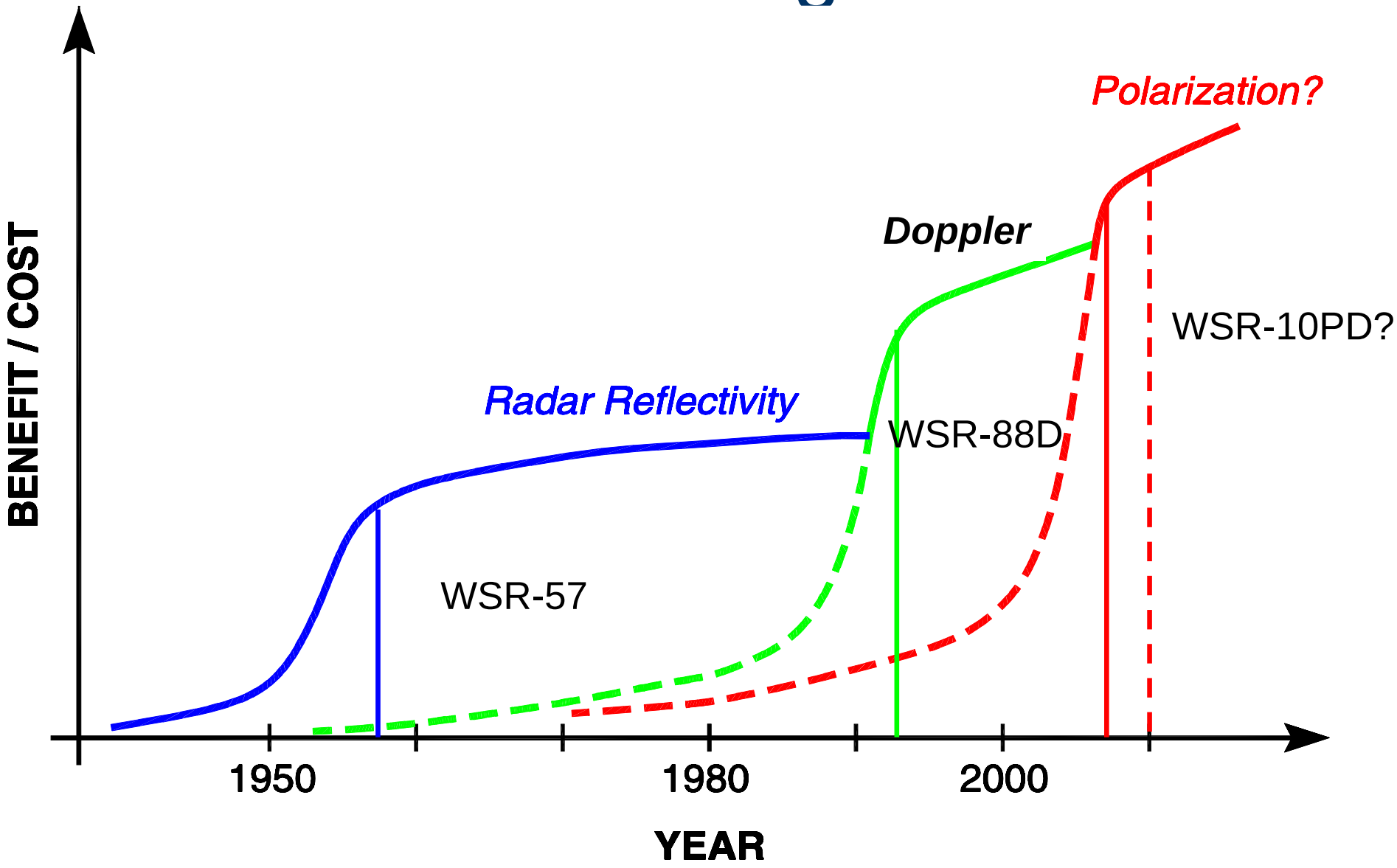
Assessing Current Precipitation on the Ground

Fundamental questions:

- What is where (rain, hail, snow, sleet..)?
- How much of it is there?

These depend on the type and quantity of precipitation in the cloud aloft.

Weather Radar Technologies Benefit/Cost



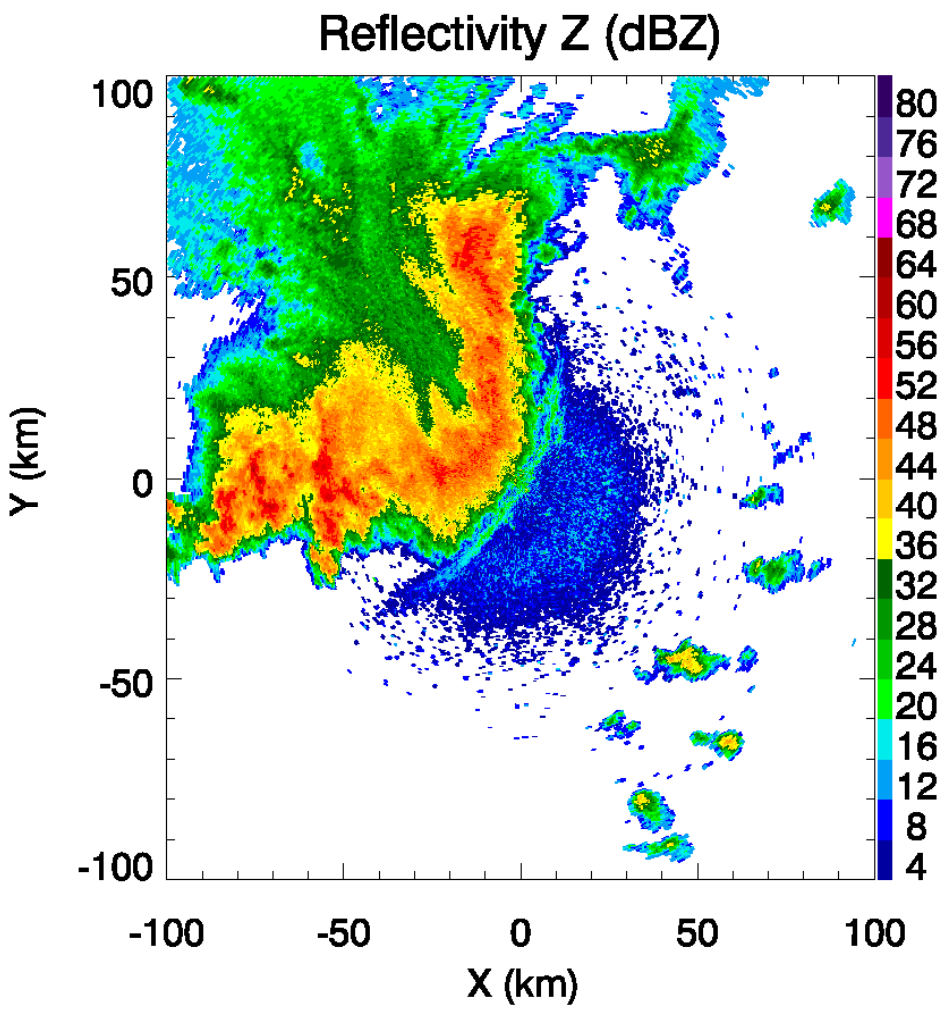
Sample Reports on NSSL WEB focused on Polarization

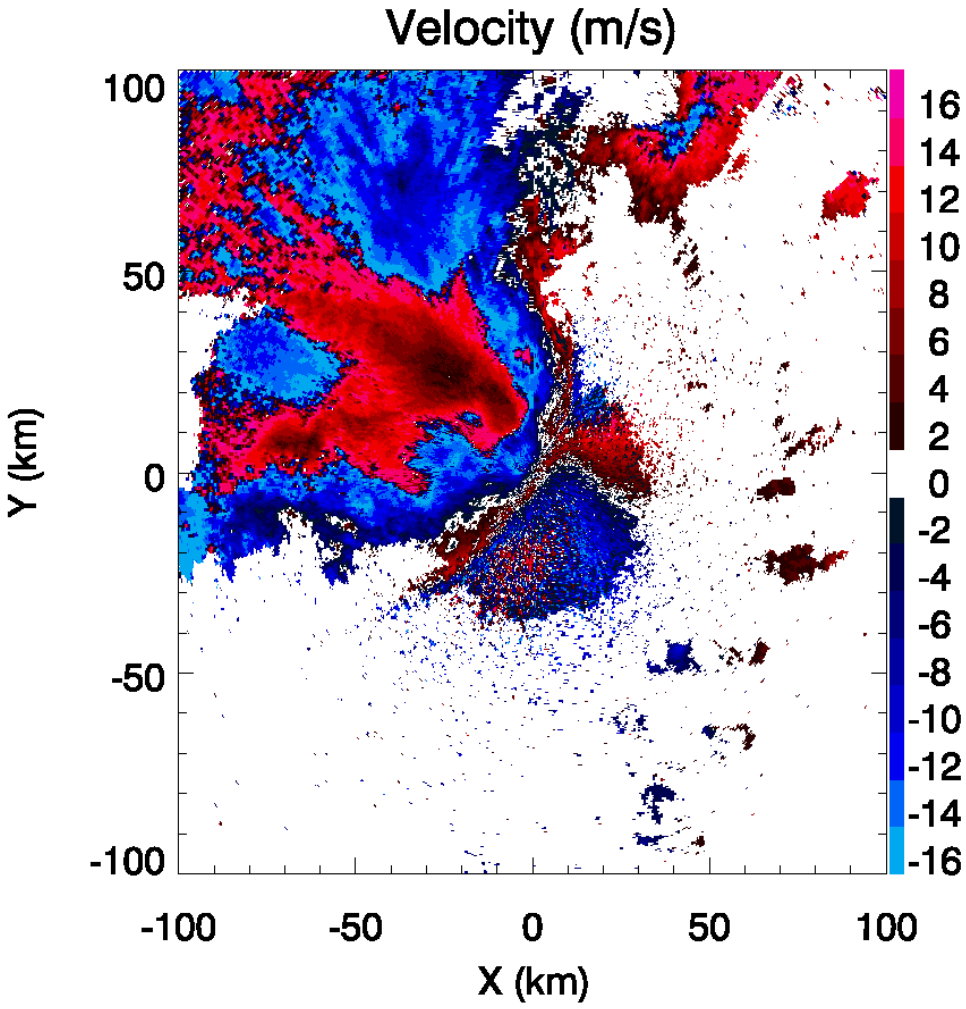
Ivic, I., D. S. Zrnic, and S. M. Torres, 2008: NSSL's Dual-polarization Censoring Algorithm (.pdf, 56 kB, and coefficient table, .xls, 28 kB), NOAA/NSSL report, 3 pp.

Zrnic, D., S. V. M. Melnikov, and I. Ivic, 2008: Processing to Obtain Polarimetric Variables on the ORDA (Final Version) (.doc, 1.48 MB), NOAA/NSSL Report, 60 pp.

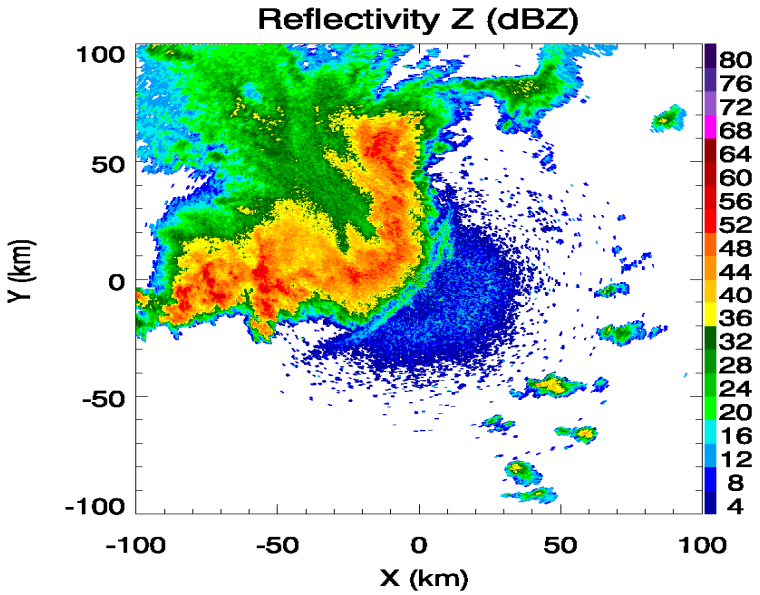
Doviak, R. J., and D. S. Zrnic, 1998: WSR-88D Radar for Research and Enhancement of Operations: Polarimetric Upgrades to Improve Rainfall Measurements (.pdf, 7.01 MB), NOAA/NSSL Report, 110 pp.

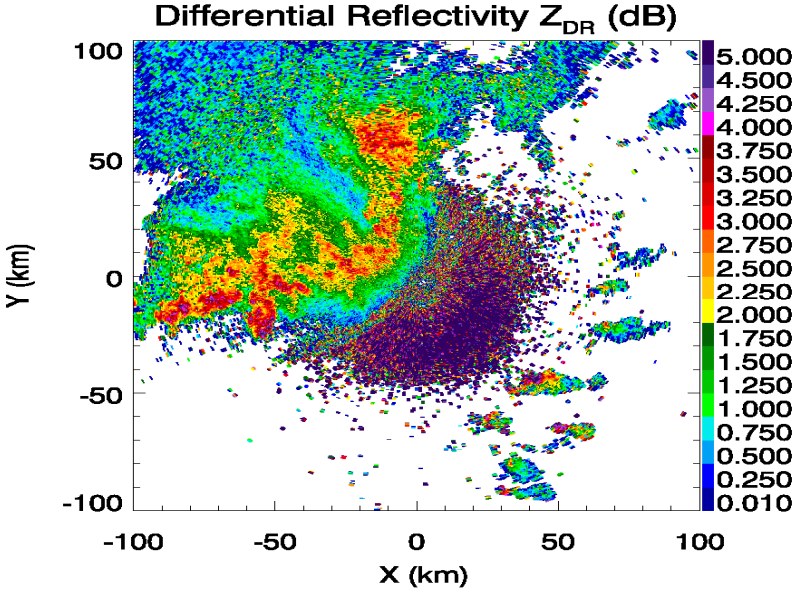
Doppler Radar: Reflectivity and radial velocity fields

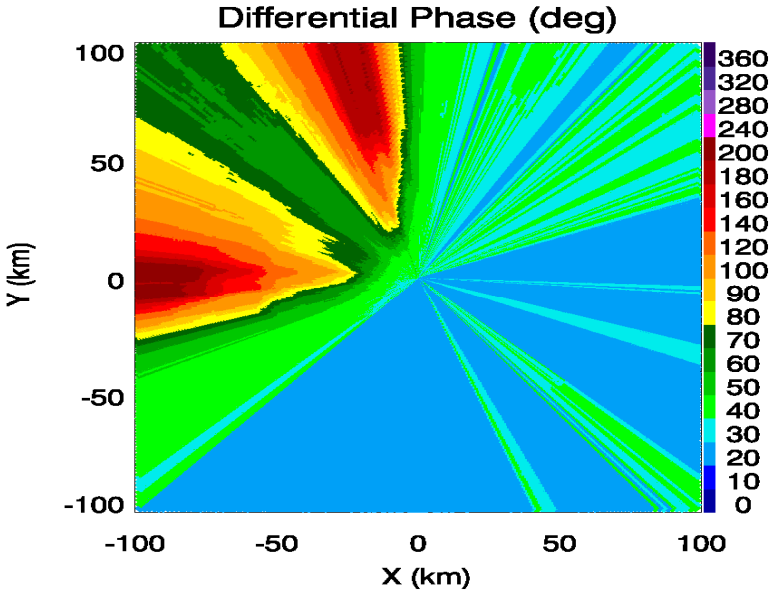


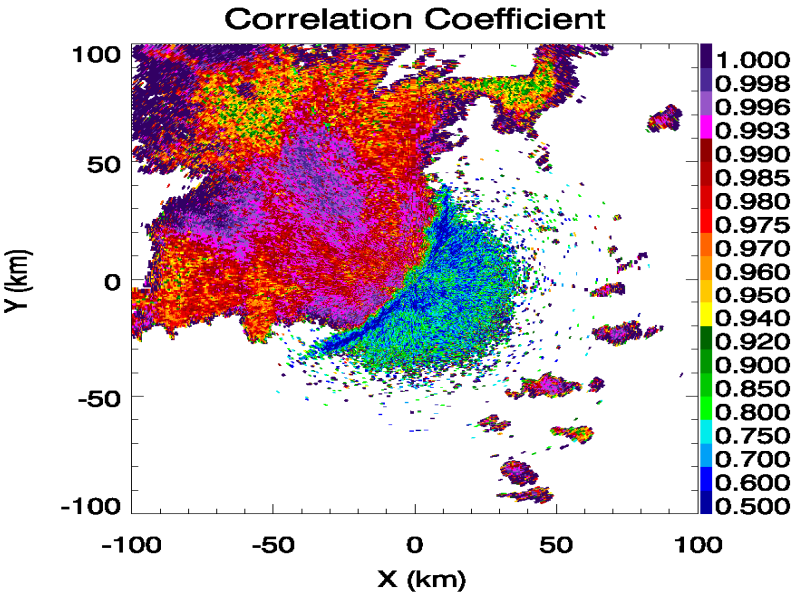


Polarimetric Radar: Three additional fields

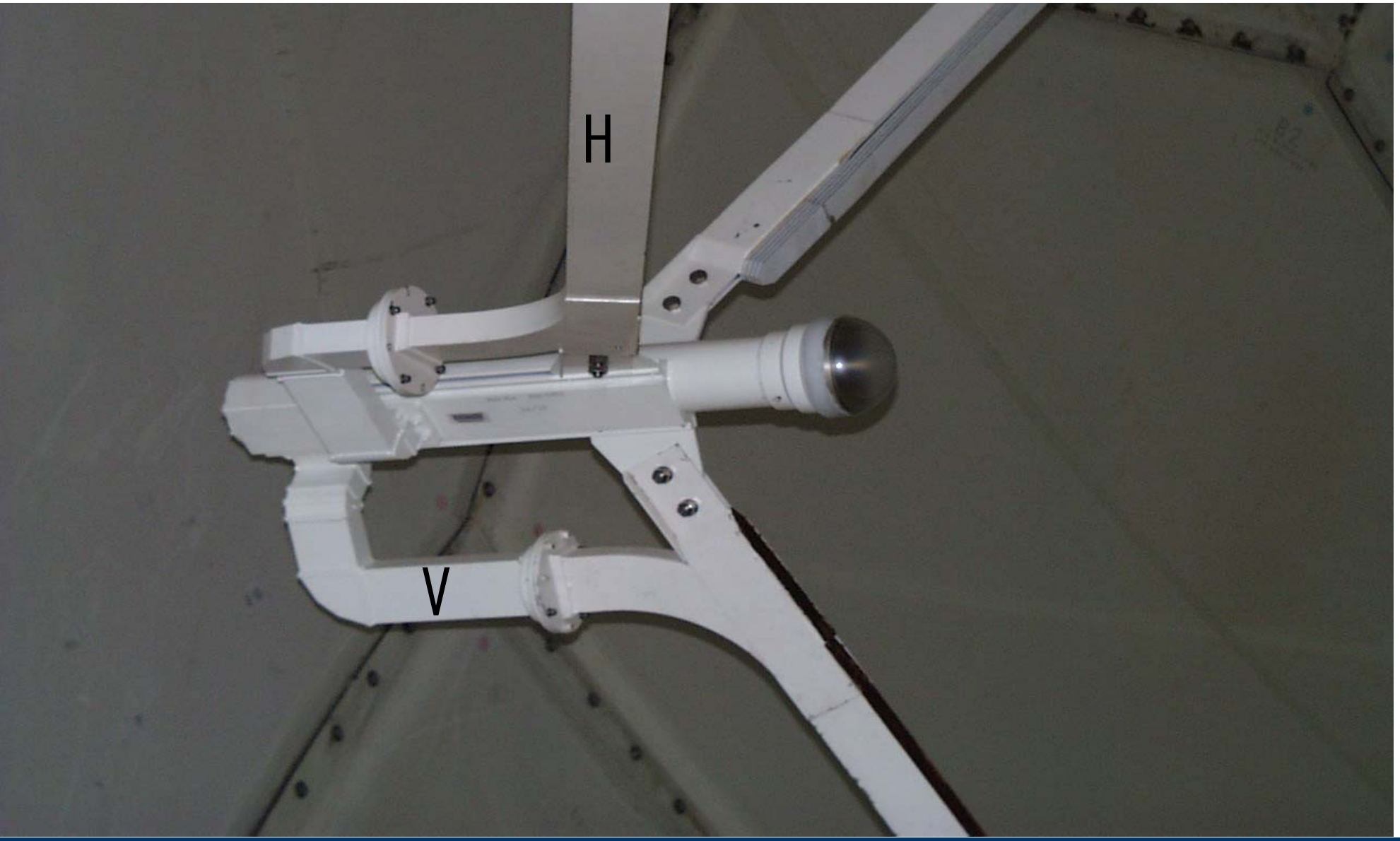




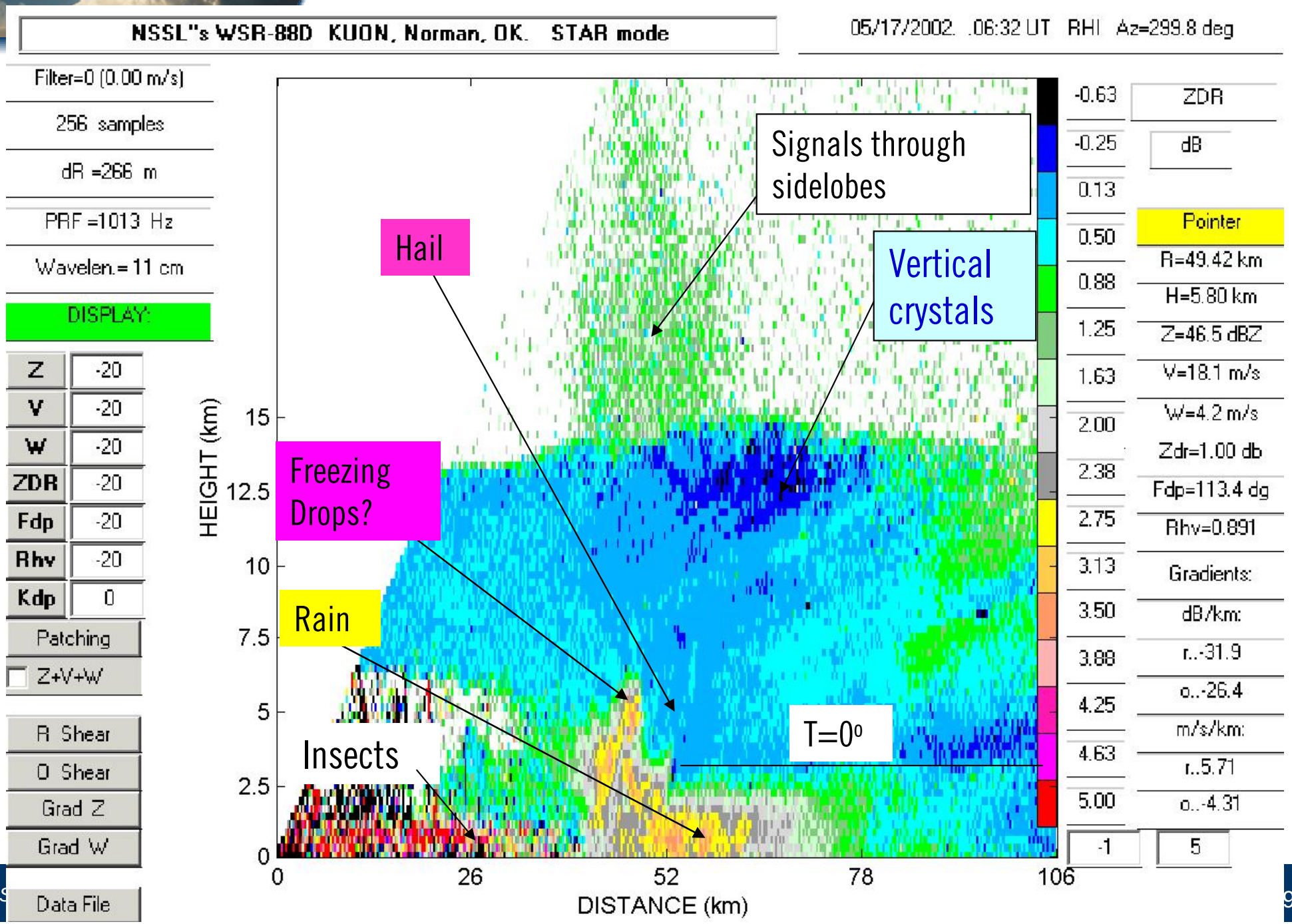




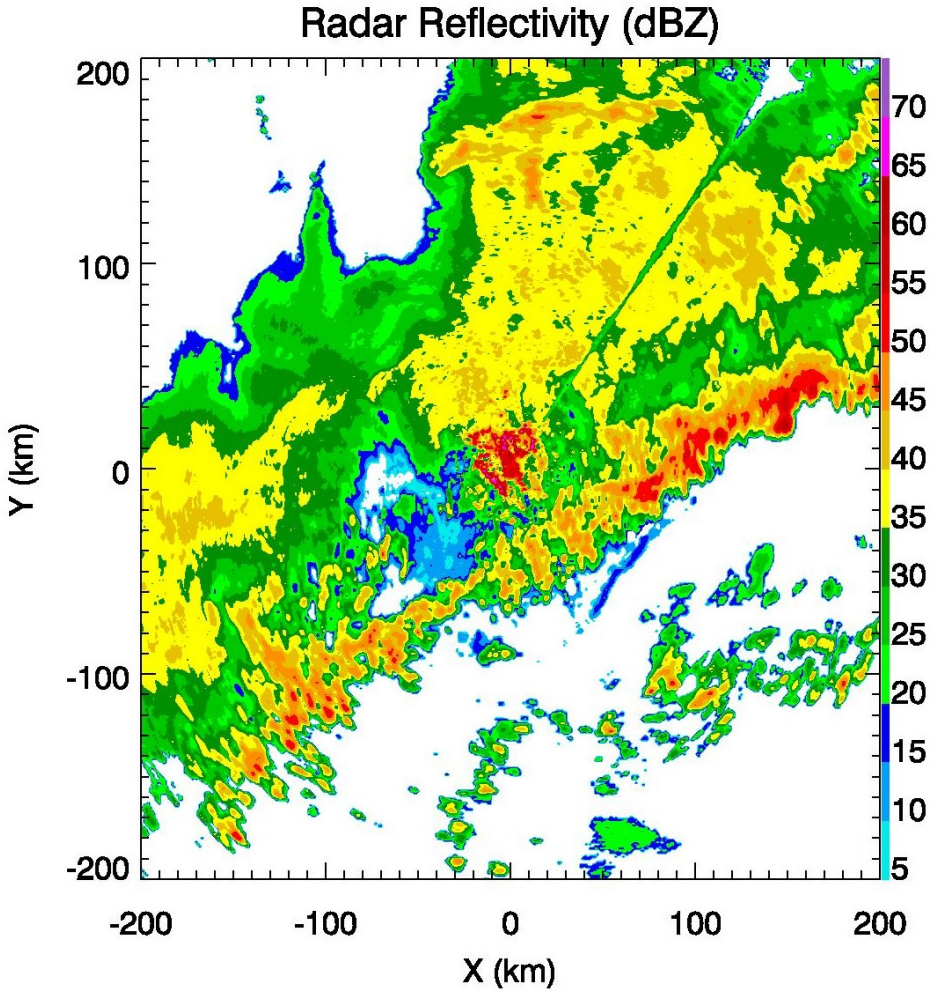
Dual Polarization Feed Horn

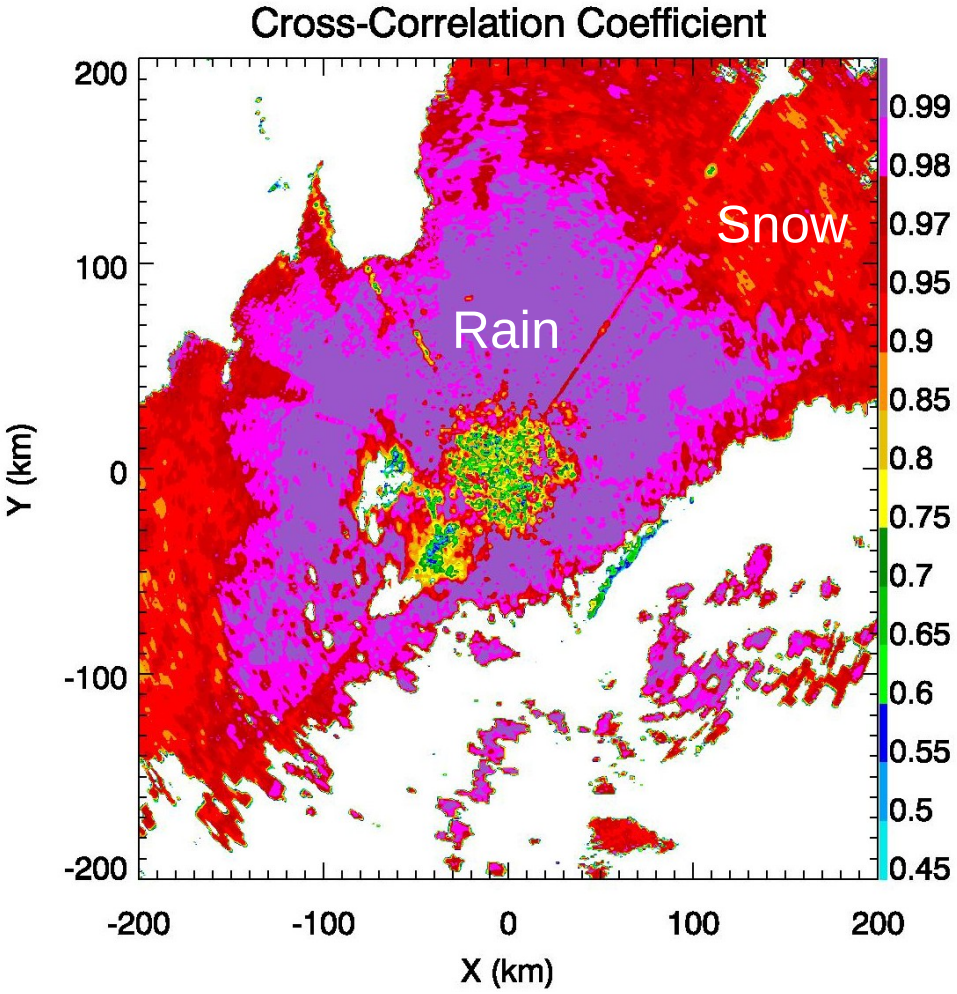


Vertical Cross Section – Z_{DR} (dB)

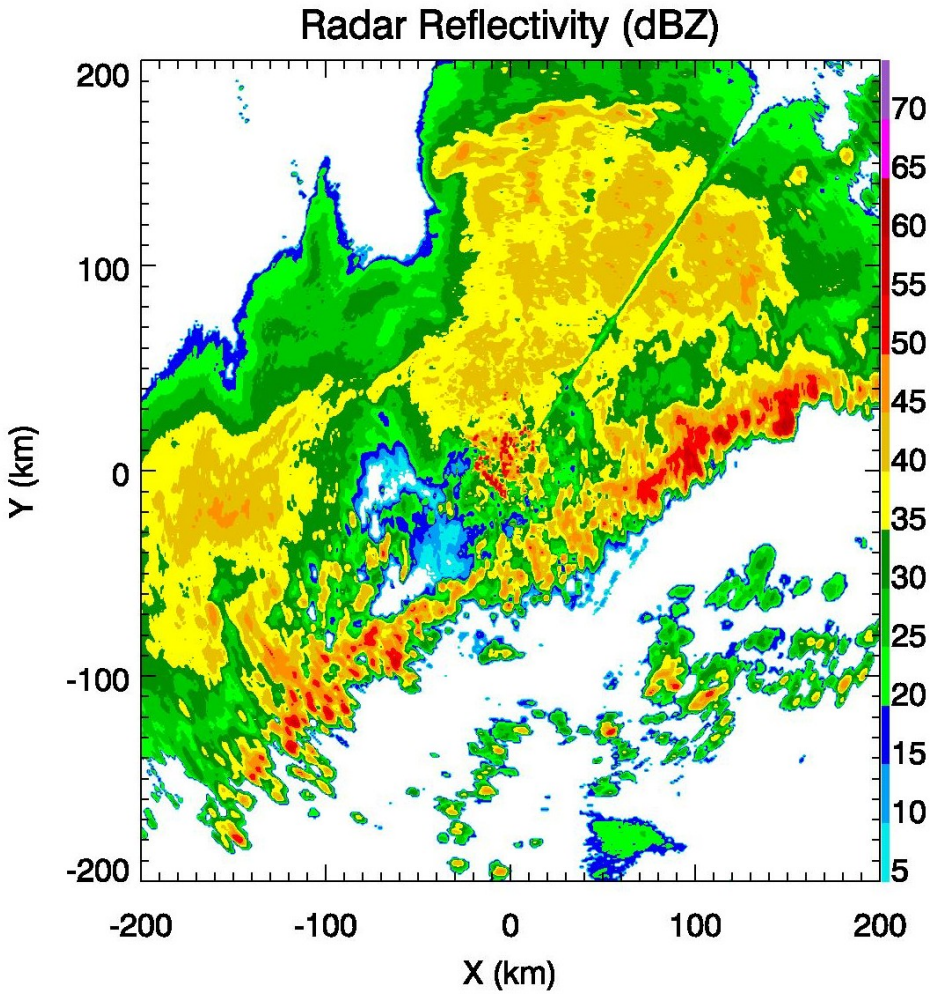


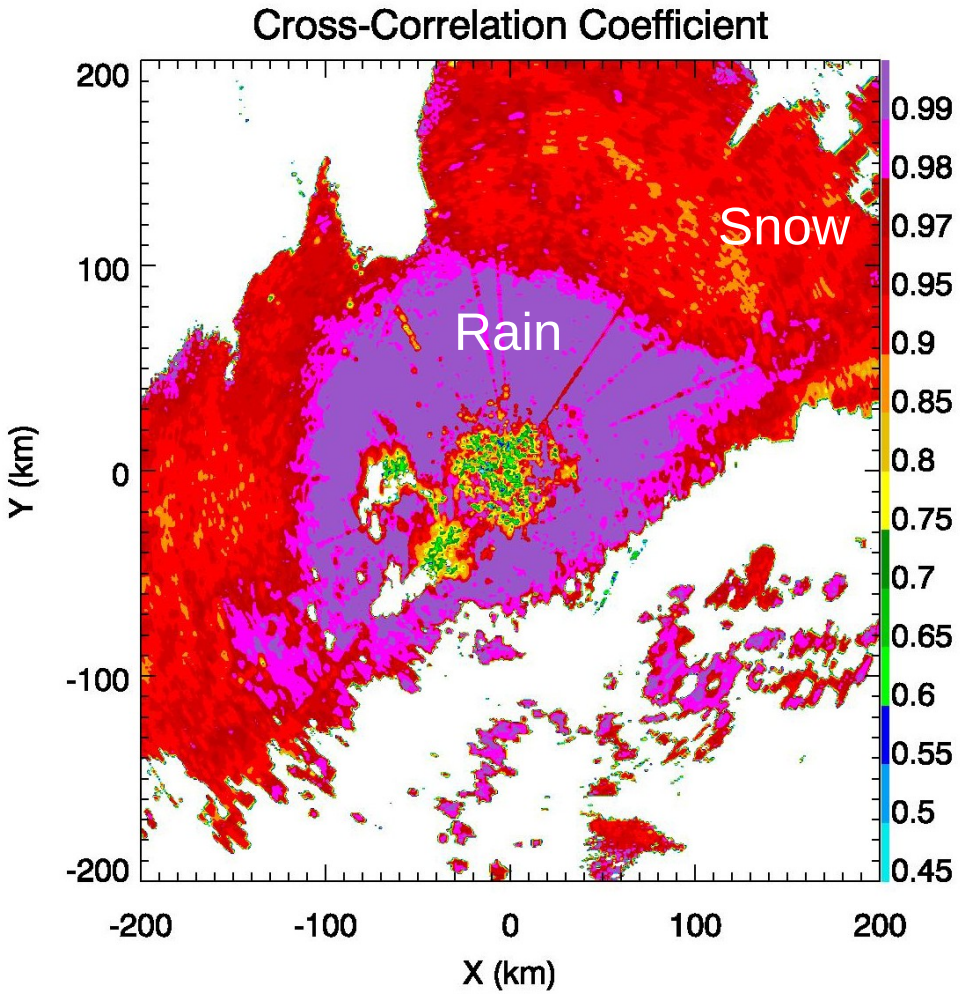
Rain Snow boundary aloft: Reflectivity and Correlation El = 0.5 deg



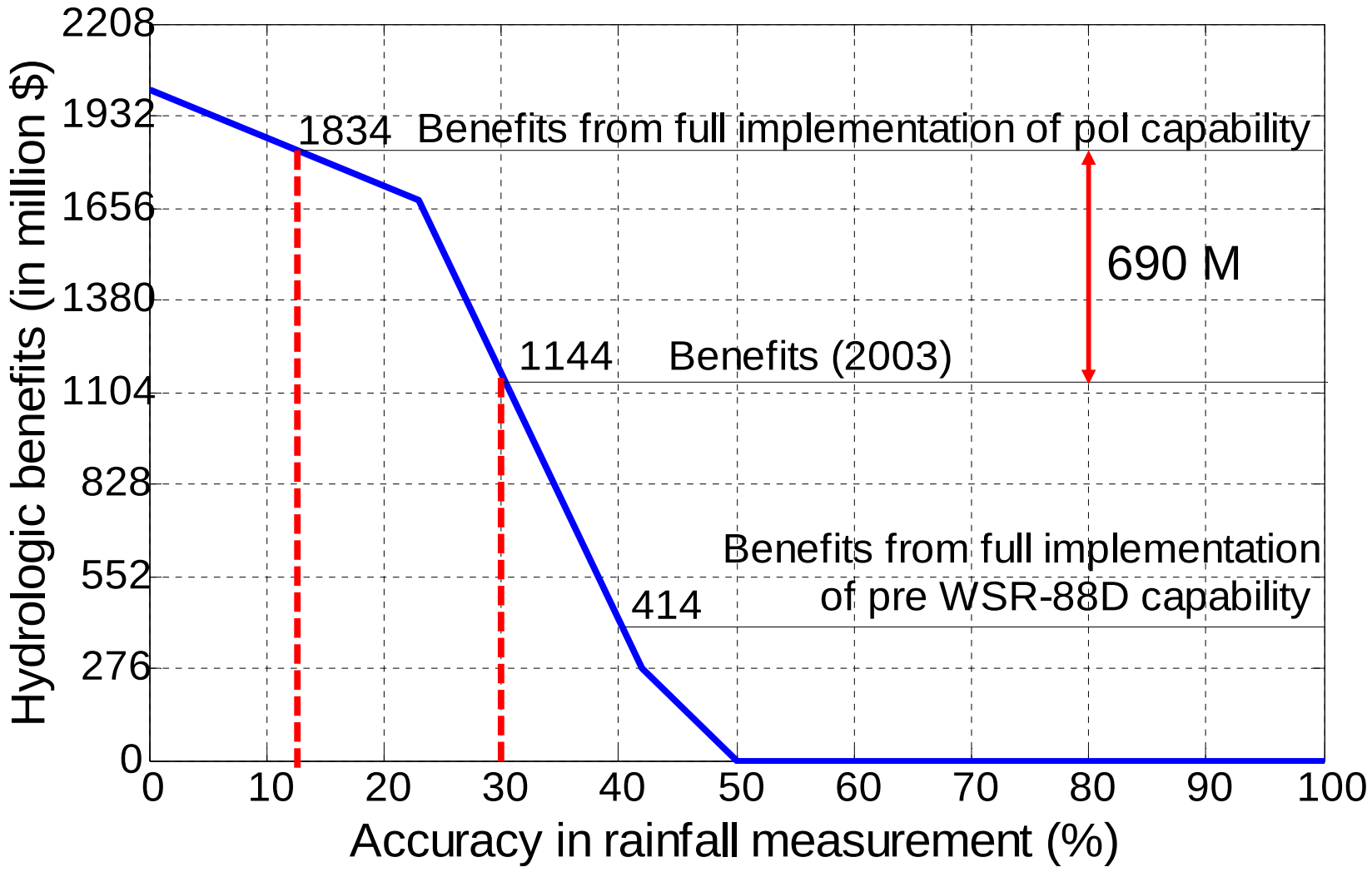


Rain Snow boundary aloft: Reflectivity and Correlation El = 1 deg



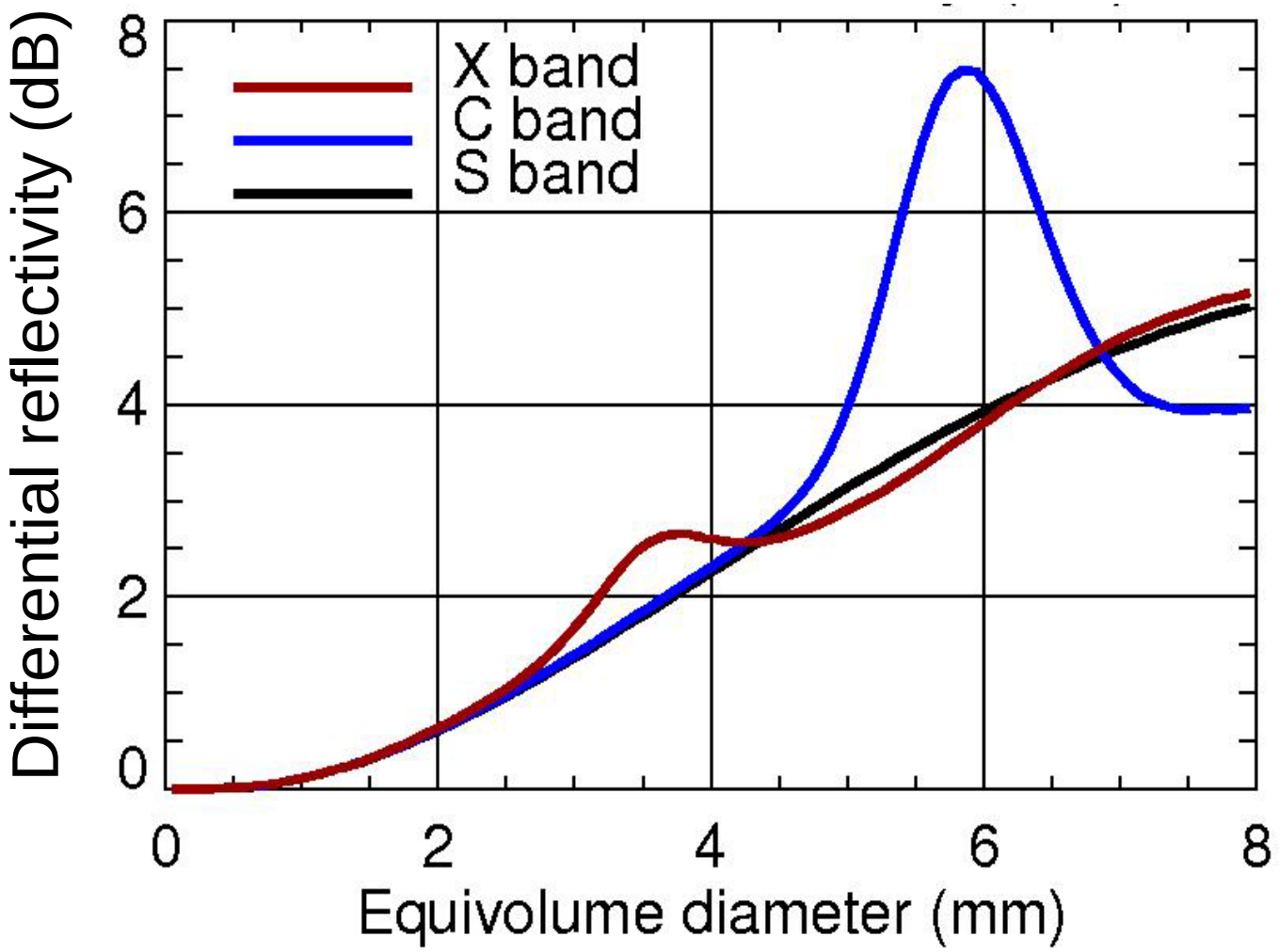


Cost Benefit of Dual Polarization (in 2003 $):

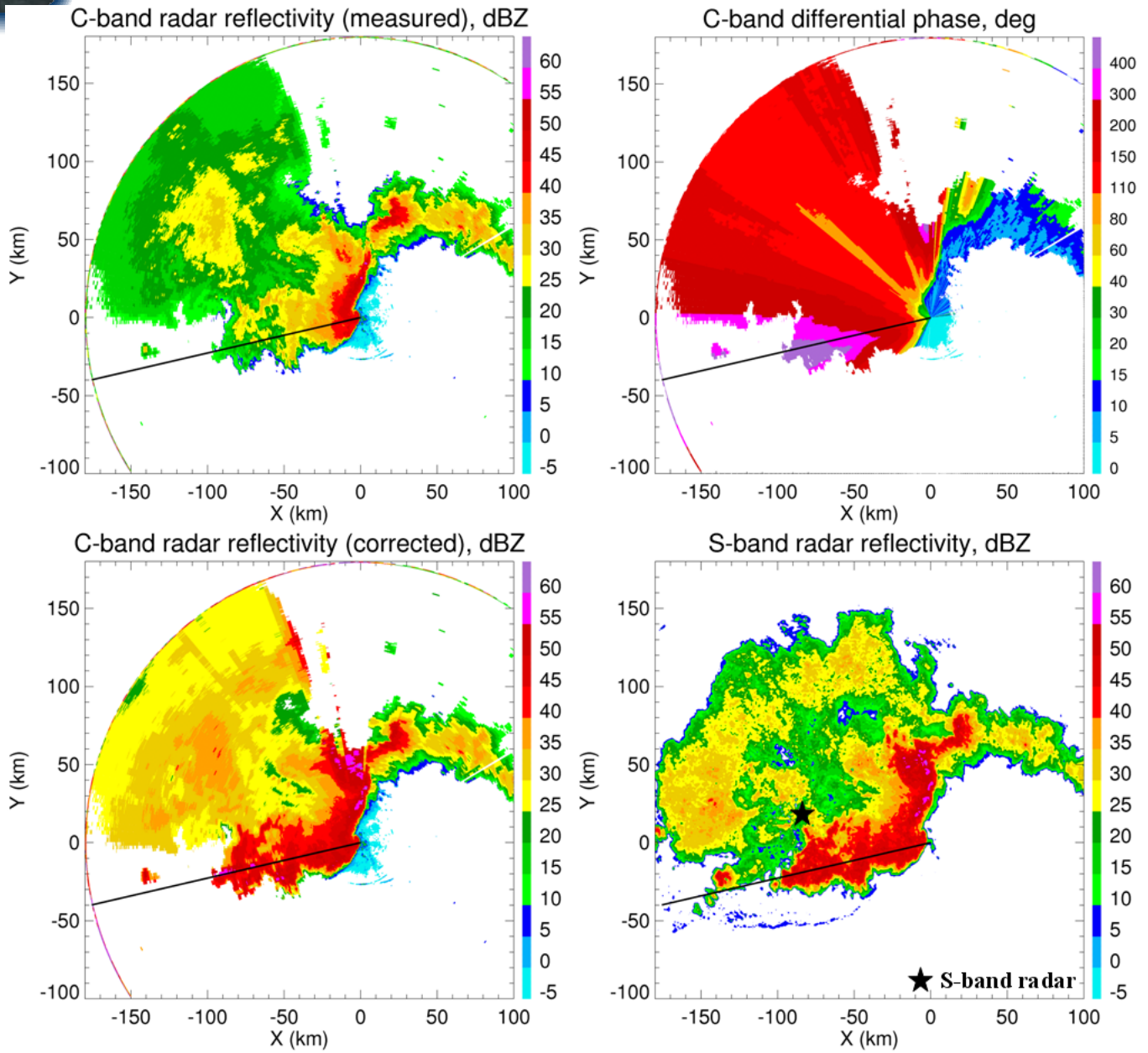


Mobile Dual Polarization Radar 3 cm wavelength (XERES)

Differential Reflectivity at three wavelengths vs Drop Diameter



Reflectivities: not attenuated (S band) and C band with and without correction



Summary

✓Dual Polarization technology for operational application has been developed, tested, and transferred to the NWS

✓Polarimetric variables from precipitation at shorter than 10 cm wavelengths offer challenges to interpreters as well as opportunities by revealing size dependent characteristics

✓In collaboration with OU NSSL has developed a 3 cm mobile polarimetric radar and is developing a similar 5 cm polarimetric radar

Questions: