Spanky Kirsch (Passed away this pass December)

- Co-Chair of the OFCM MPAR Working Group and Great Supporter of the MPAR program
- Grand organizer of the air surveillance between DOD, FAA and DHS.
- Supported research into wind turbine clutter

He will be greatly Missed!
Current Work

• Modification to Real Time Controller (RTC)
  – LMCO and NSSL still working on Mv 5500 application software issues. Critical for scan strategies that require changing the PRTs frequently.
  – Continue design and porting of scanning functionality to the Digital Signal Processor (DSP) to support Adaptive Scanning

• Continued data analysis of NWRT Data & working on results from PARISE
  – Papers presented at AMS Annual Meeting
  – Continued forecaster evaluation of operational Utility of PAR technology
Current Work

• Continued work on Model Initialization with PAR data

• Continued work by OU Collaborators
  – Dual-Polarization element design
  – Eight Channel addition to the NWRT (Mono-pulse, Clutter channels) - Being Tested
  – Cylindrical Dual-Polarized PAR antenna
  – Mobile Imaging Radar

• Continued work on Wind Turbine Mitigation
  – Funded by DHS

• Dual-Polarized Fractional Sub-Array
  – Work is continuing with Basic Commerce Industries on building 12x12 panel – T/R module fabricated
Current Work

• Signal Processing
  – Adaptive range oversampling
  – Additional automatic calibration routines

• Adaptive Scanning
  – ADAPTS enhancements
    • i.e. Elevation-prioritized scanning
  – Manual schedule-based scanning
    • Modify scanning strategies and change acquisition parameters on the fly
Current Work

• Adaptive Scanning (continued)
  – Automatic schedule-based scanning
    • Remove from RTC and provided by Signal Processor

• Infrastructure:
  – Data formats – support NetCDF
  – Communication – Moving toward generic data formats
Current Work

• Infrastructure (continued)
  – User Interface
  – Added new dual-quad core machine to cluster as the 5\textsuperscript{th} node.

• Spring Data Collection & PARISE
  – Support for VORTEX-2
Current Work

• Data Collection 2010/Total
  – 2.8/11 TB of I&Q Data
  – 110.9 GB/5 TB of Moment Data
  – Archive includes:
    • 24 supercells, 11 tornadic
    • 25 MCSs, 2 tornadic, 4 with Severe Winds
    • 22 Pulse storms (microbursts, weak and strong)
    • 15 Scattered storms
22nd Vaisala Award

- “Rapid Sampling of Severe Storms by the NWRT Phased array Radar”
  – Weather & Forecasting, 2008
Technology Assessment Program (TAP)

- OFCM, FAA & NSSL – Continued work – Completed SOW
- Supported by GTRI and BCI
- Goals:
  - Determine challenges and risks for MPAR
  - Determine Path to minimize the risks
  - Implement risk reduction
- Areas of concern
  - Dual Polarization
  - Multi-frequency operations
  - Cost
  - Concept of operations
New Adaptive Scanning Capability
ADAPTS Performance

ADAPTS is OFF

ADAPTS is ON

09 AUG 2008 – Reflectivity - 8.7 deg
ADAPTS Performance
Quantitative Evaluation

Temporal Resolution (min)
0.9 1.0 1.1 1.2 1.3 1.4

Time (UTC)
0040:5 0104:3 0129:2 0154:2 0217:2

Nominal Update Time

ADAPTS Update Times

Time Savings

1 May 2009

Nominal Update Time

ADAPTS Update Times

Time Savings

200 km 100 km 200 km

0040:5 0129:2 0217:2

150 km 50 km 50 km
User Interface – Adaptive Scanning
Range Oversampling

Standard Processing

Range Oversampling Processing with 50% observation time
May 10, 2010

REFLECTIVITY

VELOCITY
1. First tornadic supercell sampled within 40 km of PAR - mesocyclones & other vortices within 20 km

2. First supercell advantageously positioned for dual-Doppler analysis using PAR and KTLX

More Firsts for NWRT PAR
Did 43 s updates improve depiction of tornado cyclone evolution?

PAR: 43 s Updates

KTLX: 4.2 min Updates
250 m AGL, 0338:00 – 0346:15 UTC

Vertical Velocity, 1 m s\(^{-1}\) contours

Storm-relative wind vectors

Vertical Vorticity, 5 \(\times 10^{-3}\) s\(^{-1}\) contours

EF0 Tornado
Conclusions

43 s updates at 0.5° provided depiction of tornado cyclone evolution superior to WSR-88D updates

The amplification of vertical vorticity assoc. w/ the tornado

- occurred during the occlusion phase, along axis of convergence
- evolution suggests vortex co-located with updraft became dominant likely in response to vortex stretching and merging with vortex center to its south
Multi-Receiver System

- Eight LNA's
- Eight downconverters
- Installed rack w/ digital receivers

1 - Az Diff
1 - El Diff

6 - Clutter Channels

Monopulse

Courtesy of Mark Yeary
Wind Turbine Clutter Studies
PLANS

• 2011 Spring Program
  – Work with Operational Meteorologists
    • Sampling procedures for severe wind and tornadoes
    • Database of Visualization techniques to aid in Warning Decision making

• Porting scan control from RTC to DSP
  – Facilitate Algorithm control of scanning strategies

• Optimization of scanning strategies based on range of storms from the radar

• Continued Risk Reduction on Dual-Polarized phased array radar systems
MPAR ROADMAP

2004

Dual-Polarized Sub-Array

2007

2 or 4 faced Prototype

2013

Dual Pol Phased Array

2018

WSR-22PDP Locations

2022

2030
Questions?

THANK YOU

R2D2 = Radar Research and Development Division