MPAR Engineering Research

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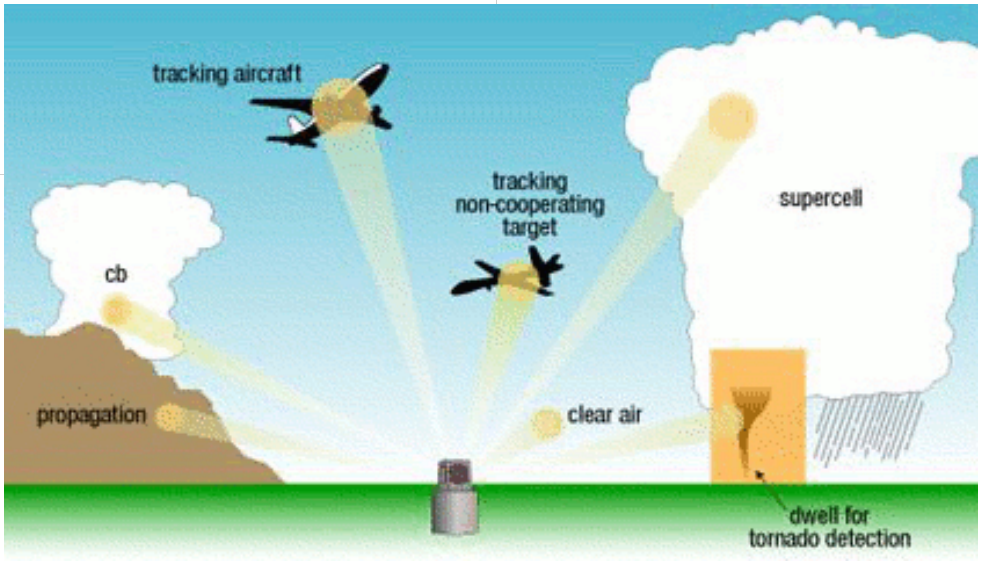
Through MPAR engineering research, NSSL is devising a practical implementation of the **MPAR concept** that addresses evolutionary **users' needs** with the available resources.

- Good quality
- Fast
- Many customers



Animation courtesy of Chris Curtis, NSSL

The next revolution in weather observation technology is here!

- Improving observations
  - technology obsolescence
  - data quality & timeliness
- PAR's unique capabilities
  - beam agility & adaptability
- MPAR challenges
  - cost, dual pol, multifunction

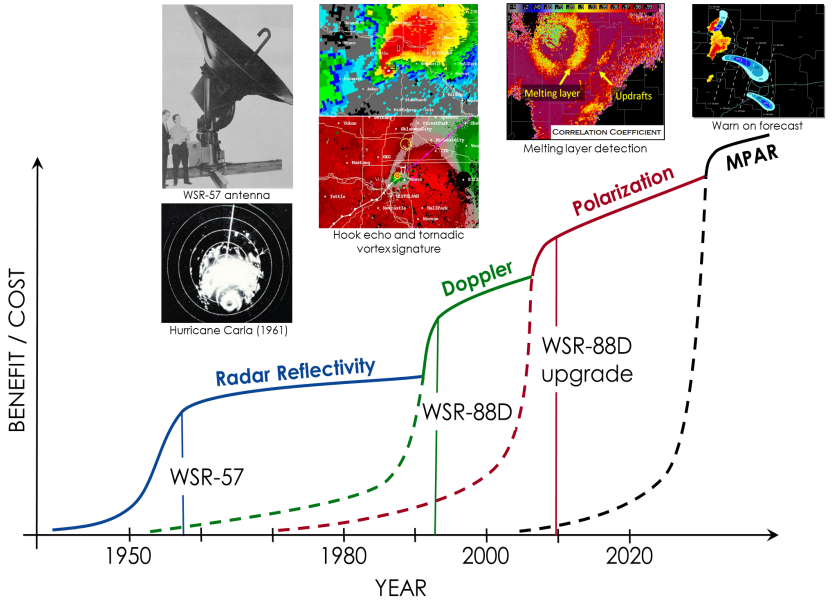


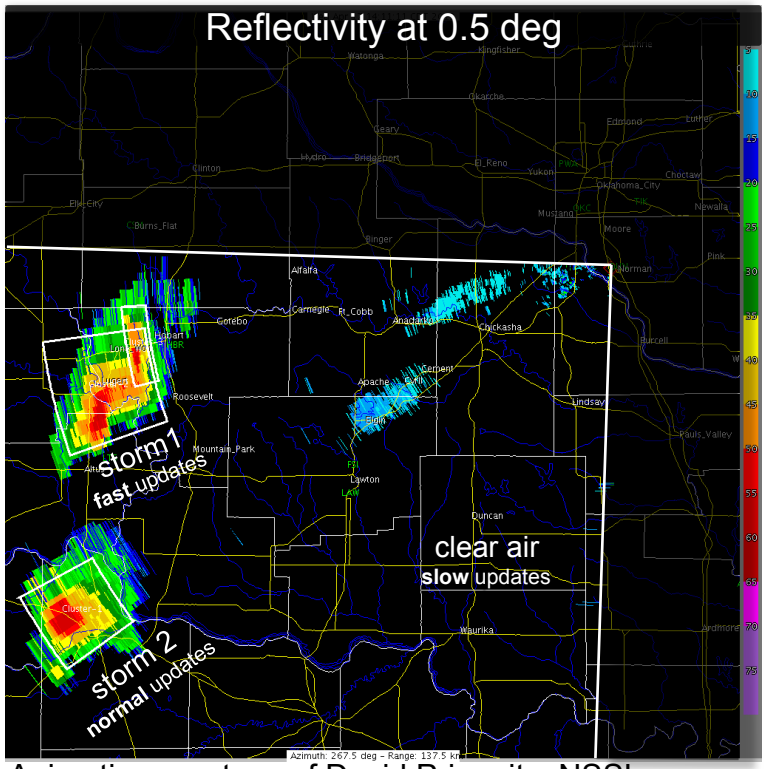
Image adapted from Dusan Zrnić, NSSL

NSSL is **pioneering** the development and demonstration of **PAR technology** for improved **weather observations** in a multifunction environment

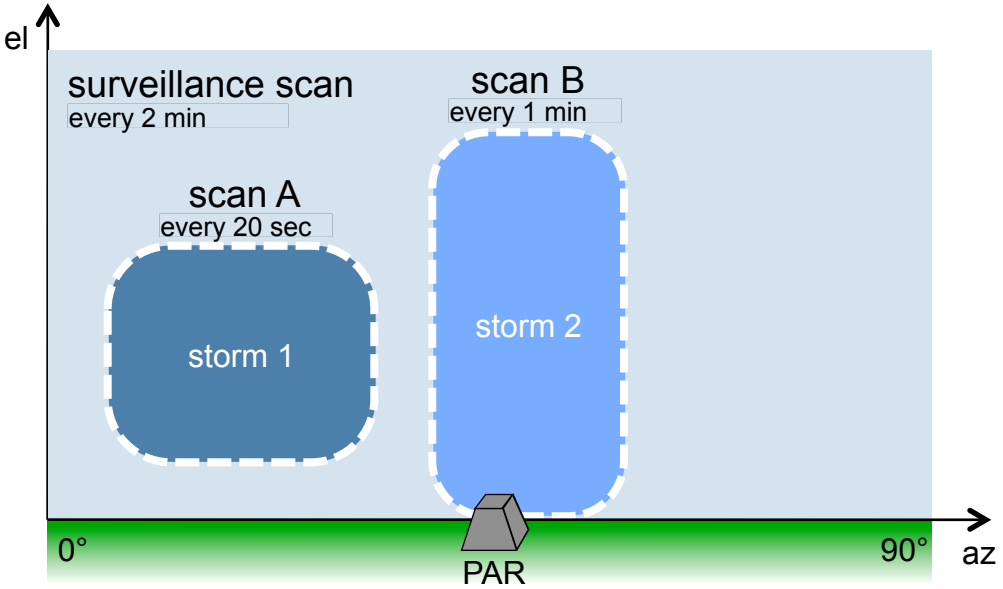
RELEVANCE

The Future: Adaptive Scanning

Giving users what they need when they need it



Animation courtesy of David Priegnitz, NSSL

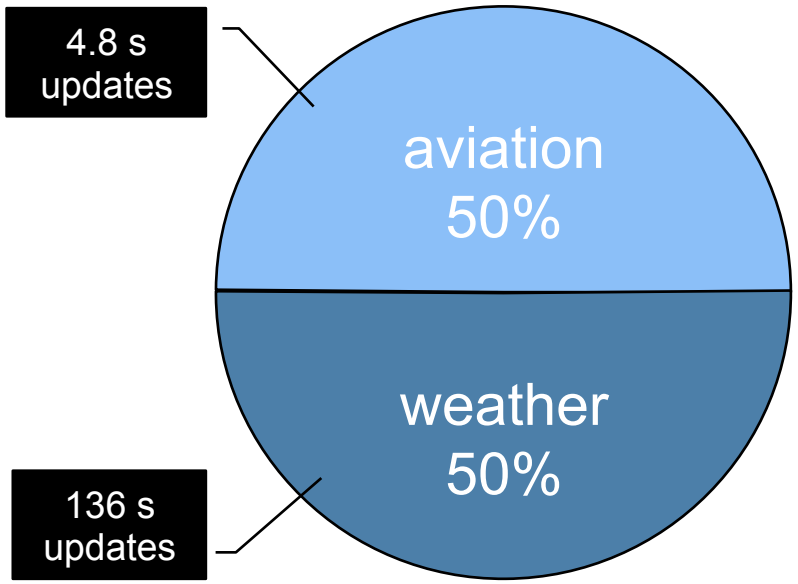


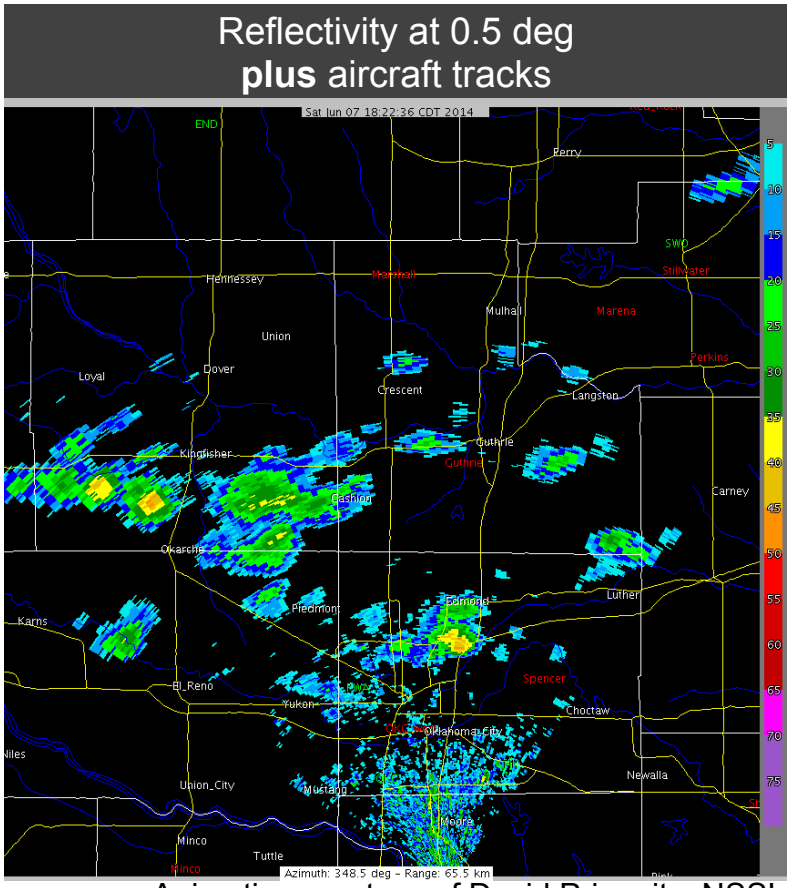
Focus is on **storm regions**
using **tailored** strategies

Adaptive scanning using PAR
is key to **improving weather warnings** and **forecasts**

Multifunction

Can one radar do it all?





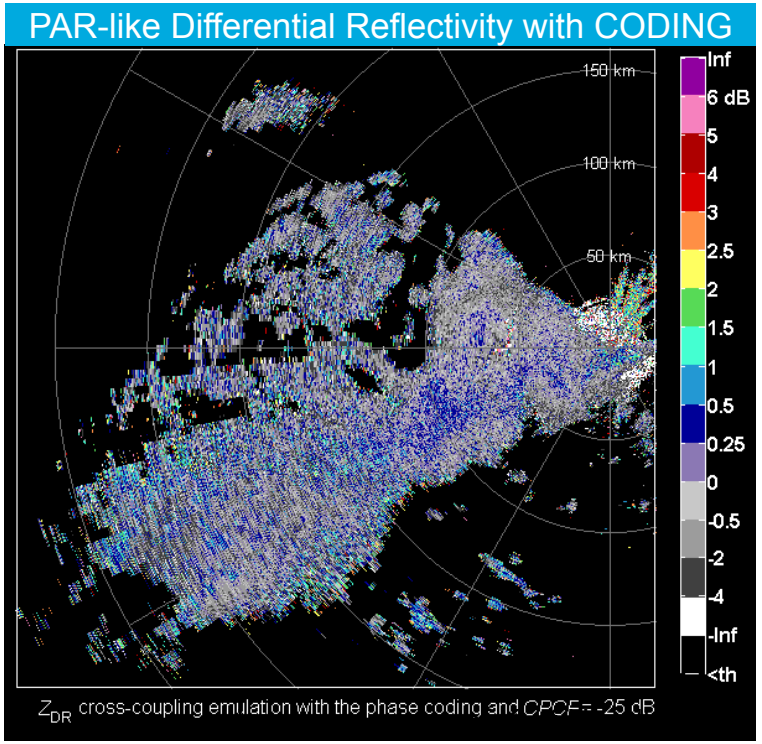
Animation courtesy of David Priegnitz, NSSL

Multifunction operation with the NWRT/PAR allows for simultaneous observation of **weather** and tracking of **aircraft**

Dual Polarization

Can MPAR match NEXRAD?

- One vs. many beams
  - alignment & orthogonality
  - co-polar matching
  - cross-polar coupling
- Reducing cross-polar coupling
  - channels are encoded
  - signal processing reduces bias of differential reflectivity

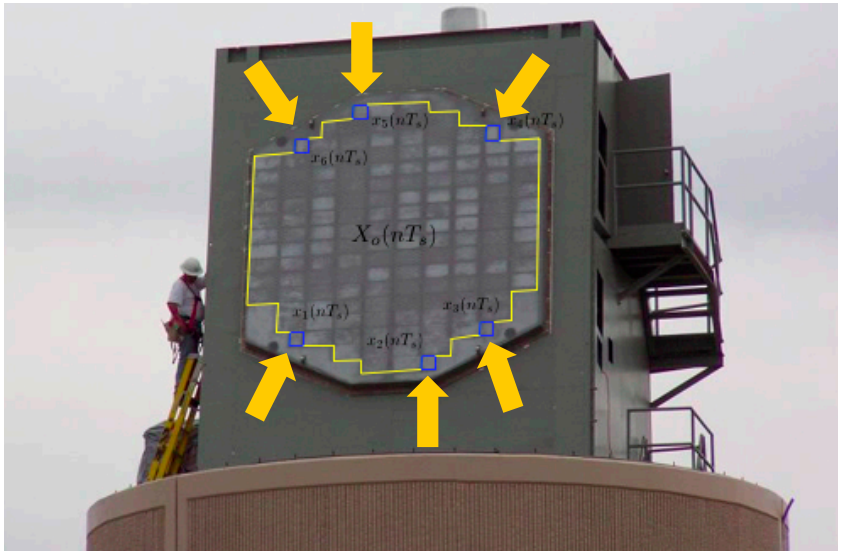


Images courtesy of Igor Ivić, NSSL

NSSL is developing and demonstrating **dual-polarization** weather-observation capabilities **for PARs**

Adaptive Beamforming

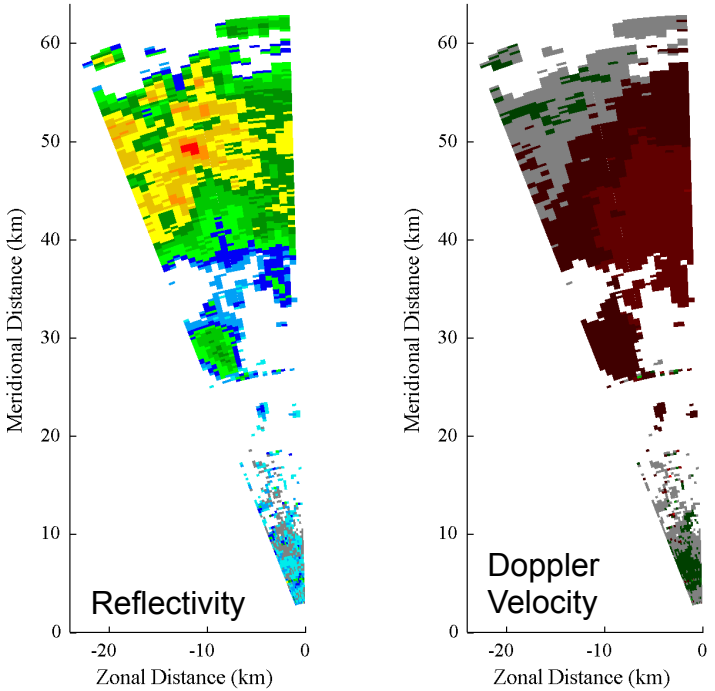
Where one beam does NOT fit all



NWRT/PAR antenna

Adaptive Beamforming can be used to mitigate clutter and interference

Adaptive Beamforming



Images courtesy of Chris Curtis, NSSL

NSSL is exploring **PAR's unique capabilities** to address evolutionary needs for weather observations

Summary

MPAR Engineering Research at NSSL

- **System Design**
  - definition of requirements
  - industry studies
  - cylindrical vs. planar
  - all-digital architecture
- **Dual Polarization**
  - 10-panel demonstrator
  - Adv. Tech. Demonstrator
  - cross-polar isolation
  - calibration
- **Adaptive Scanning**
  - focused & tailored scans
  - multifunction
- **Adaptive Beamforming**
  - clutter mitigation
  - interference mitigation

Through **partnerships** with government, industry, and academia, NSSL is **leading** the development and demonstration of **the MPAR concept**