

Weather Radar Research

Douglas Forsyth
Weather Radar Research



Outline

Why

Staffing

Relevance

History

Cross-cuts

Summary

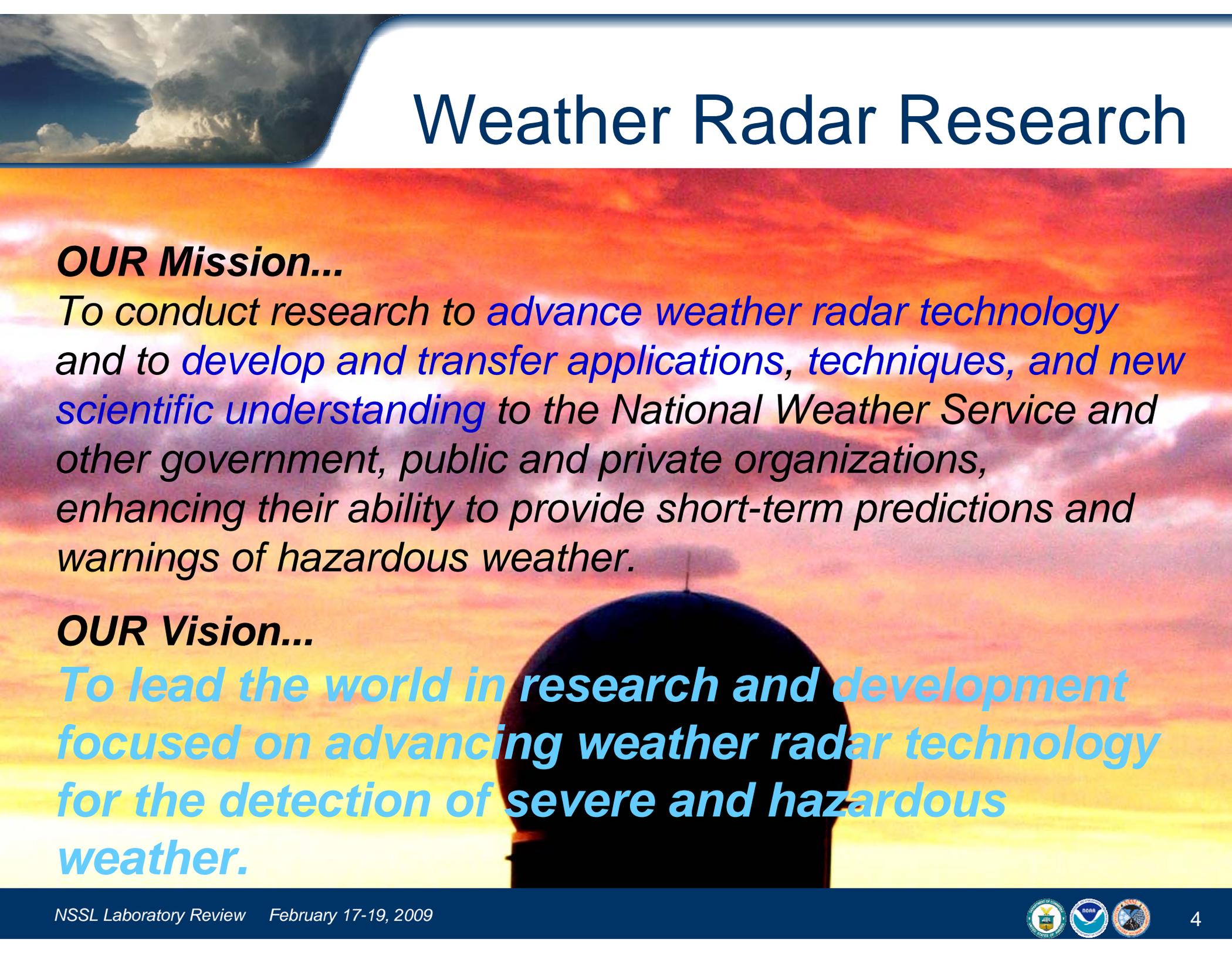
Research Topics



WHY?

Weather Radar

- Primary severe weather observational tool
- Used to issue warnings by the National Weather Service
- Used to avoid severe weather by the Federal Aviation Administration and pilots
- Used to display the location of precipitation and associated severe weather to the public



Weather Radar Research

OUR Mission...

To conduct research to *advance weather radar technology* and to *develop and transfer applications, techniques, and new scientific understanding* to the National Weather Service and other government, public and private organizations, enhancing their ability to provide short-term predictions and warnings of hazardous weather.

OUR Vision...

To lead the world in research and development focused on advancing weather radar technology for the detection of severe and hazardous weather.

Our NSSL/CIMMS Team

Weather Radar Research



Relevance

NOAA Vision: An informed society that uses a [comprehensive understanding of](#) the oceans, coasts and [atmosphere](#) in the global ecosystem to make the best social and economic decisions

NOAA Mission: [To understand and predict changes in Earth's environment](#) and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs.

NOAA VISION

An informed society that uses a comprehensive understanding of the oceans, coasts, and atmosphere in the global ecosystem to make economic decisions

NOAA'S MISSION

To understand and predict changes in Earth's environment and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs



NOAA Strategic Plan

- Reduced loss of life, injury and damage to the economy
- Better, quicker, and more valuable weather and water information to support improved decisions
- Increased customer satisfaction with weather and water information and services

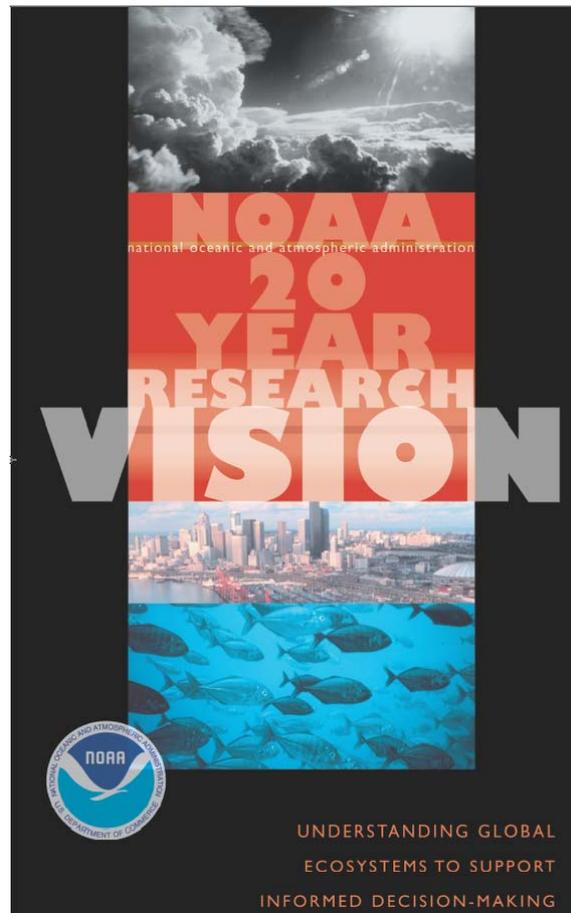
National Oceanic & Atmospheric Administration
Strategic Plan

FY 2009 – 2014



20-year NOAA Research Vision

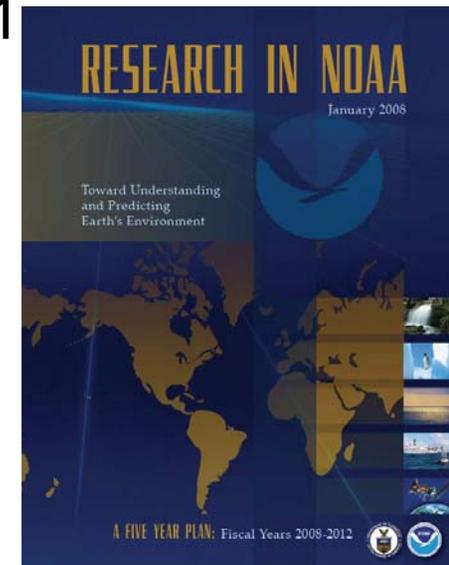
- Severe thunderstorm and tornado track forecasts at the sub-county level with one-hour or more lead time.





Research in NOAA 5-year Plan

- ✧ “committed to improving the accuracy and capabilities of its monitoring & observing systems both in situ and **remotely sensed** including timeliness, data quality....” page 38
- ✧ “**Polarized radar** has shown great potential to improve Quantitative Precipitation Estimates (QPE) and **Phased Array Radar (PAR)** technology show promise in providing higher resolution data both spatially & temporally to help improve lead times in forecasting severe storms” page 41





NOAA 2008 Weather Radar 20-Year Vision Planning (Not yet Vetted)

- ✦ Deploy Dual-Polarization and Super Resolution
- ✦ Continue R&D on MPAR
- ✦ Continue R&D on Short-wave length Radars (Gap fillers)
- ✦ R&D on adaptive radar data integration leading to Warn-On-Forecast
- ✦ Explore use of non-NOAA radar data sources
- ✦ Utilize testbeds to facilitate the evaluation of new weather radar technologies and products

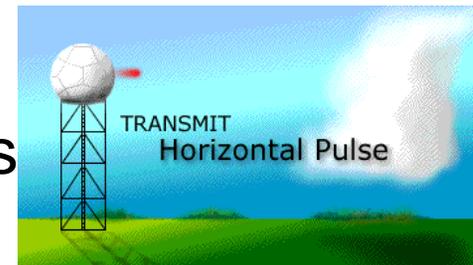
Joint Radar Plan PPBES FY10-15

Funding Profile (\$.76M bump)

✦	FY10	FY11	FY12	FY13	FY14	FY15
✦	\$1.71M	\$1.71M	\$1.71M	\$1.71M	\$1.71M	\$1.71M

Tasks

- ✦ R&D for Dual Polarization Scientific Applications
- ✦ R&D for Weather Radar Science Applications
- ✦ R&D for CASA-like Short Wavelength, Boundary Layer Radar Applications



NEXRAD Product Improvement (NPI)

Funding @ ~\$1.3M per year



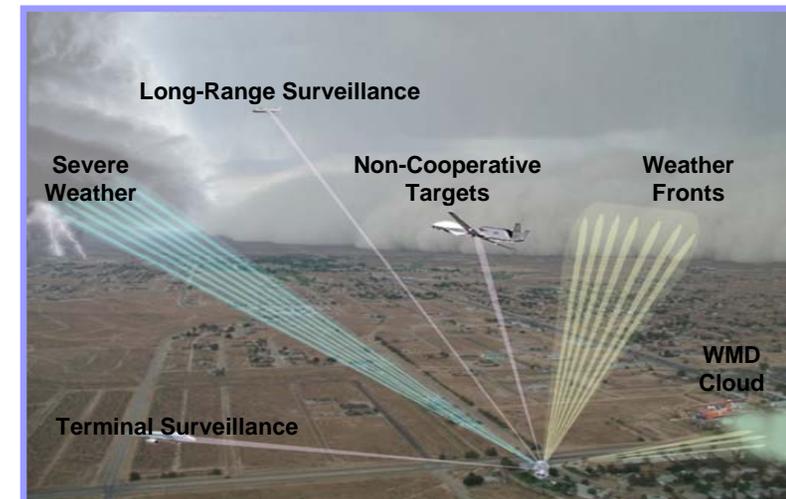
MPAR PPBES FY10-15

Funding Profile

‣	FY10	FY11	FY12	FY13	FY14	FY15
‣	\$4M	\$10M	\$10M	\$10M	\$10M	\$12M

Tasks

- Dual-Polarization Sub Array design & fabrication
- Verification of value of MPAR
- Improved Decision support systems
- Adaptive scanning
- Improved Visualization methods
- Full MPAR prototype design, fabrication and testing



NSSL RADAR HISTORY



First PPP for NOAA P-3
1980



First Dual Doppler using P3 & Cimarron
1989

Helped build First DOWs
1995



First Dual Doppler Analysis
1974
Cimarron 10cm Doppler
1973



Cimarron Upgraded Dual-Polarization
83-84

First Dual-polarization Time Series
1984

First Dual-polarization Real Time Displays
1992

First WSR-88D Research Radar
1996



First Calculations of Differential Phase & Cross Correlation Coefficient
First WSR-88D Installed
1989

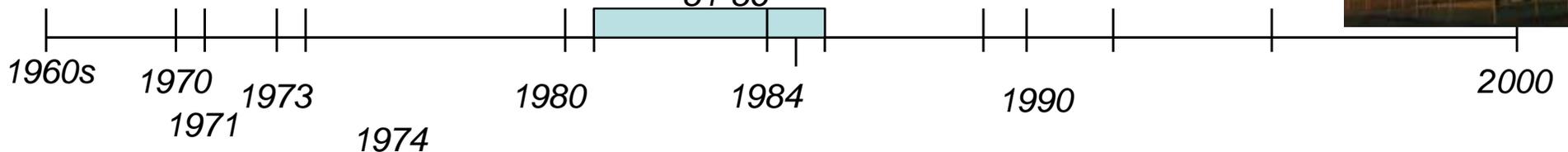
WDSS

Norman 10cm Doppler
1971

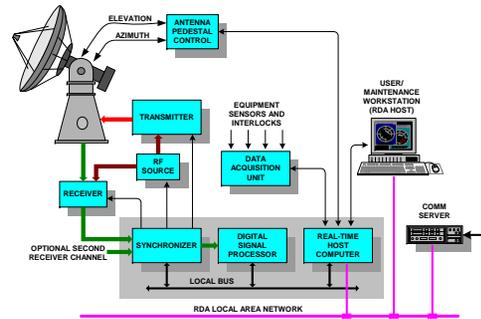
JDOP 77-79

Initial Algorithm Development Mesocyclone Wind Profiling
81-86

WSR-57 Research



NSSL RADAR HISTORY



RRDA

OPUP

1st PAR data
Initialize Model

WDSS-II

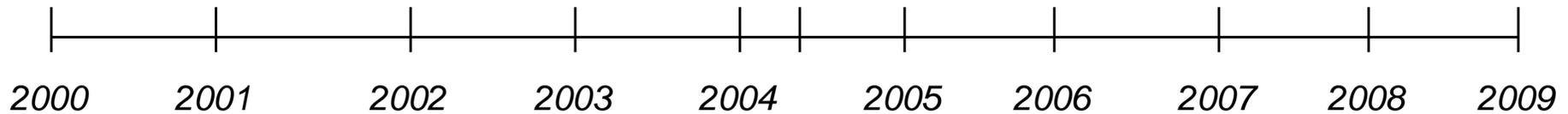
ORPG

NWRT
Operational

1st Tornado
With PAR

ORDA

Dual Polarization



Cross Cuts

- Collocation

- Collocated with NWS & OU
- Deep Collaborations vs. Superficial

- Collaborations

- Field Facilities

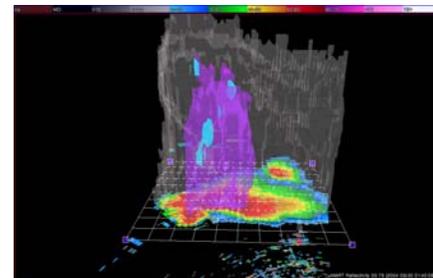
- Equipment on Kessler's Farm – Disdrometers , profilers, Micro Rain radar
- Mobile Radars

- Use of Hazardous Weather Testbed

- Visualization

- 3-D & 4-D

- Decision Support tools



Summary

- ✦ Radar is an important tool for observations and warnings of severe and hazardous weather

- ✦ **Relevance**

 - ✦ NOAA's Plans

- ✦ **Quality**

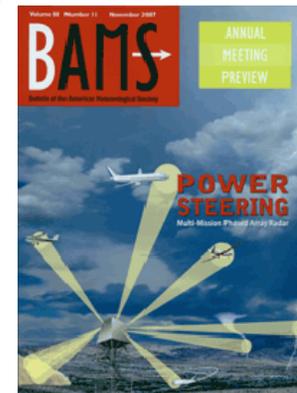
 - ✦ Awards & Publication record

 - ✦ Number of technologies transferred

 - ✦ Patents

- ✦ **Performance**

 - ✦ In FY07: Eight different technology projects undergoing transition activities



U. S. Patent # 6,081,221



Research Topics

- ✦ Today you will hear from:
 - ✦ Sebastian Torres - Innovative Techniques
 - ✦ Mike Jain - Open Systems and Development tools
 - ✦ Lak - Multi-sensor data mining
 - ✦ Dusan Zrnic - Dual Polarization and Mobile Platforms
 - ✦ Alexander Ryzkov - Meteorological applications of Dual Polarization
 - ✦ Kurt Hondl - Future Weather Surveillance Radars
 - ✦ Terry Schuur - Meteorological observations in support of Dual Polarization
 - ✦ Demonstrations
 - ✦ Chris Curtis - Phased Array Radar (PAR)
 - ✦ Pam Heinselman - PAR Weather Applications

Questions?

THANK YOU

