Outline

Warn on Forecast (WoF)
- what is it?
- why do we need it?

Scientific challenges for WoF

WoF and VORTEX2
Current Warning Paradigm

Warn on detection of pre-tornadic structures

Doppler Radar

Human prediction of storm evolution
What is Warn on Forecast?

- NWP for individual convective storms using an ensemble approach
- High-resolution synthesis of mesoscale, radar-scale, and in situ observational data via 4D data assimilation
- Provides forecasters with detailed information on the type, severity, and probability of weather threat


Why do we need WoF?
Reached the limit of our current technologies?

Tornado Warnings Statistics 1978-2007

Okay...standard warning information input here...
Cool!, hmm...uh, I think....

Reached Information Overload?
Information Overload!

NWS Forecaster

HELP!

“I’ve tried to tell Stuart he’s over-loading himself with too much information but…..”
Available data synthesized into a single 3D analysis

Numerical prediction of severe weather can follow

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**FLUS74 KOUN 082202 AWUOKC**

**WARNING DECISION UPDATE**
NATIONAL WEATHER SERVICE NORMAN OK
500 PM CDT THU MAY 8 2003

**THIS WARNING DECISION UPDATE CONCERNS CENTRAL OKLAHOMA.**

...URGENT...
**STRONG COVERGENCE SIGNATURE WITH RFD AND INFLOW NOW MOVING INTO SOUTHWEST METRO WEST OF MOORE.**
RADAR TRENDS AND SPOTTER REPORTS POINT TOWARD VERY HIGH TORNADO POTENTIAL...ANDRA
Warn on Forecast:
What might it look like?

Projected low-level reflectivity at 1 hour from storm-scale NWP model

Probabilistic Tornado Warning

Most Likely Tornado Path

Developing thunderstorm

Current

60 Minute Forecast
Warn on Forecast: New Data Sources

- **Surface data**
  - surface mesonets, micronets, surface vehicle mesonets

- **Polarimetric radar**
  - precipitation type (rain, snow, hail)
  - data quality control

- **Rapid-scan (> 1 minute) radar volumes**
  - phased-array radar systems
Warn on Forecast: Benefits of Rapid Scanning

Current Scanning Rate
(~5 min volumes)

PAR Scanning Rate
(~1 min volumes)

T = 15 min

PAR data from 29 May 2004 OKC Supercell
Warn on Forecast: Benefits of Rapid Scanning

Current Scanning Rate
(~5 min volumes)

PAR Scanning Rate
(~1 min volumes)

T = 00 min

PAR data from 29 May 2004 OKC Supercell
Model Error: microphysics

- impacts retrieval of unobserved variables
  - (e.g., surface temperature, moisture, 3D winds)

Initial condition uncertainty

- how well do we need to know the mesoscale environment?

Warn on Forecast:

Completely mobile data collection throughout the southern and central plains

VORTEX 2009–2010
Combining surface data with Doppler and polarimetric radar data to understand microphysical processes

- **their role in tornadogenesis**
- **help improve model parameterizations**
Understanding environmental sensitivities and predictability through storm-scale analysis, prediction, and VALIDATION
Increasing understanding of fundamental storm processes via observations and numerical simulations lead to improved warnings.
Warn on Forecast

- to meet NOAA’s Weather and Water warning goals
- benefit to hydrology and other sig-wx events
- V2: high-resolution data sets and scientific knowledge needed to develop and test WoF

Partners
The End
Questions?