



Earth System Research Laboratory

SCIENCE, SERVICE & STEWARDSHIP

Assessing The Impact Of Current And Future Observing Systems On Environmental Predictions

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NOAA Earth System Research Laboratory

ESRL Dedication and Open House

August 23-24, 2006





The need for better forecasts

Transportation



Agriculture



Construction



Recreation



Resource managers

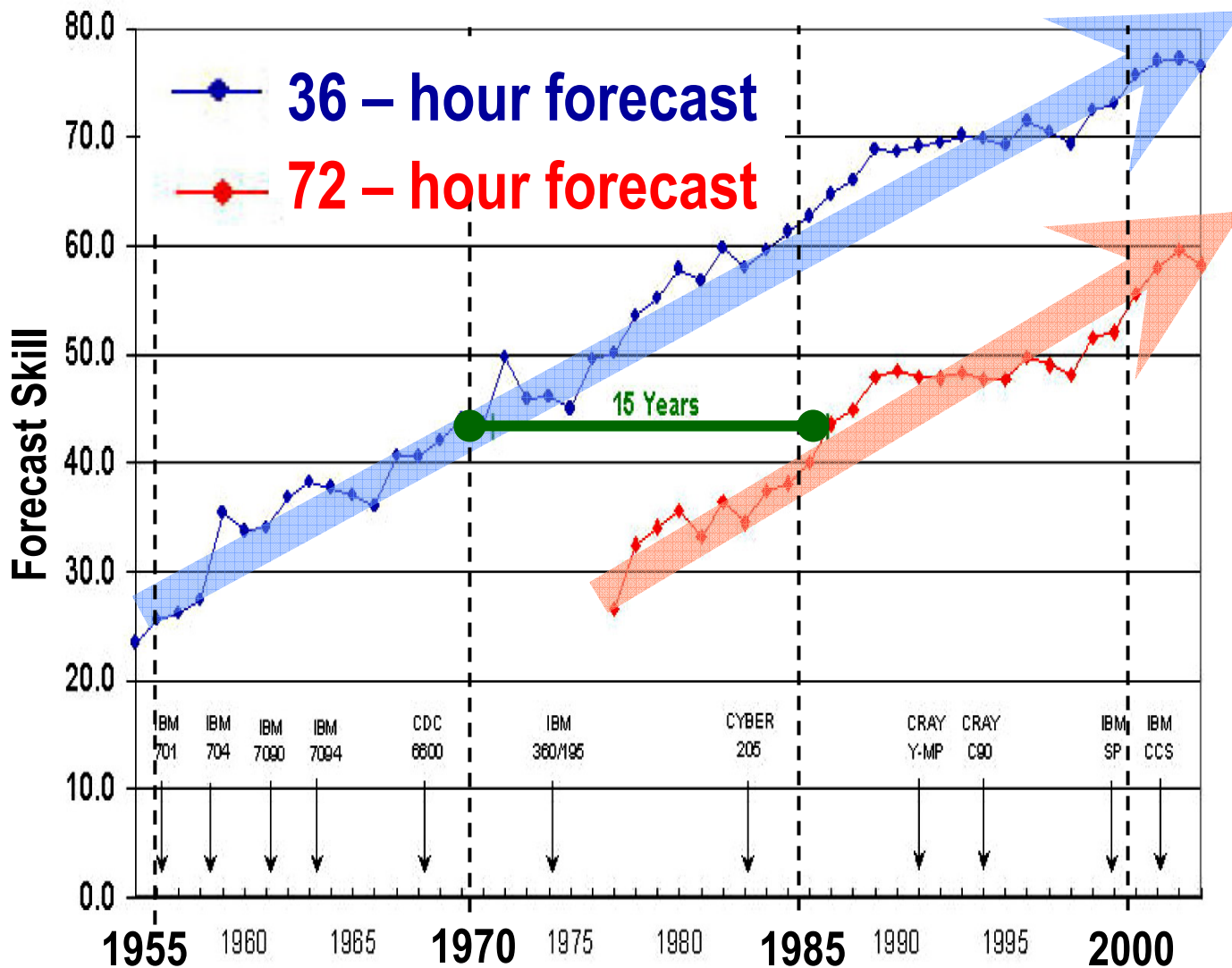


Emergency Managers



Many people need better forecasts !

Steady Progress in Prediction Skill

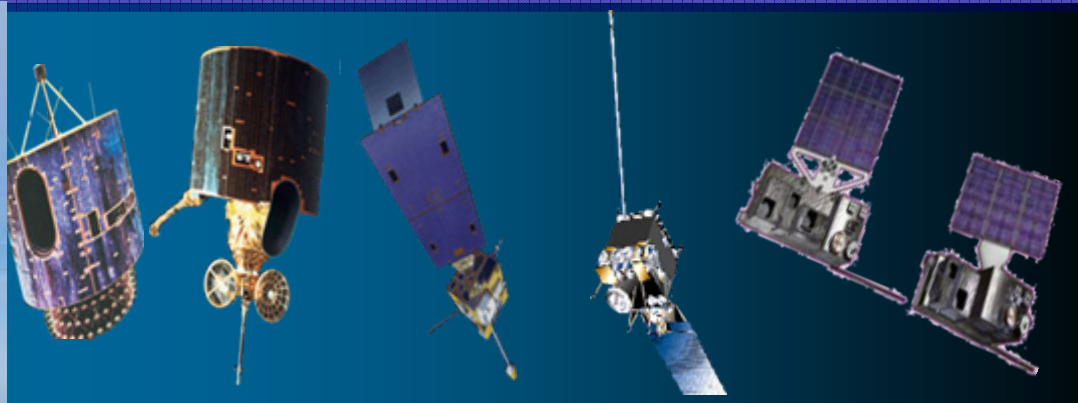


**About one day
per decade
for large-scale
weather events**

**Small-scale
features
(precipitation,
thunderstorms)
more difficult**



The Evolution of Observations



OLD

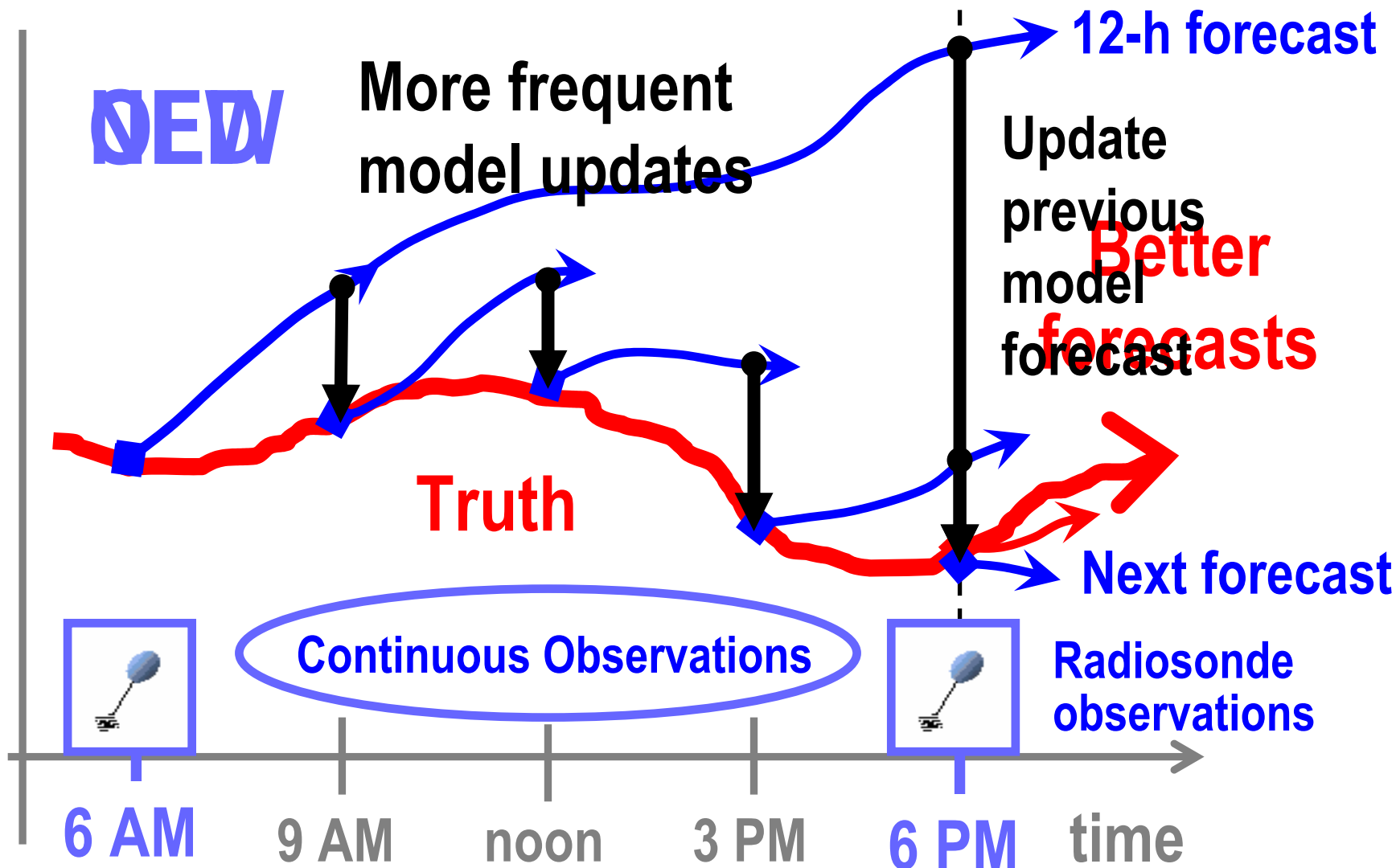


NEW

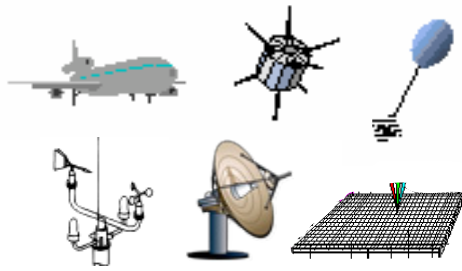




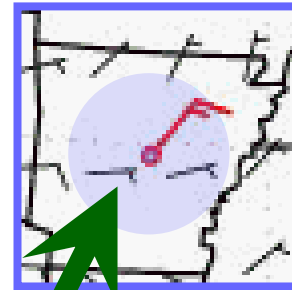
DATA ASSIMILATION: *Analysis Update Cycle*



Operational Prediction Process



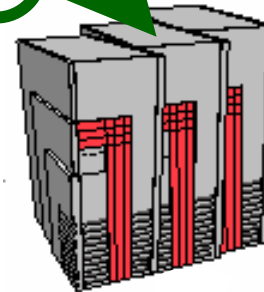
Observations



*Objective
Analysis*

**ESRL contributions to NOAA
operational predictions**

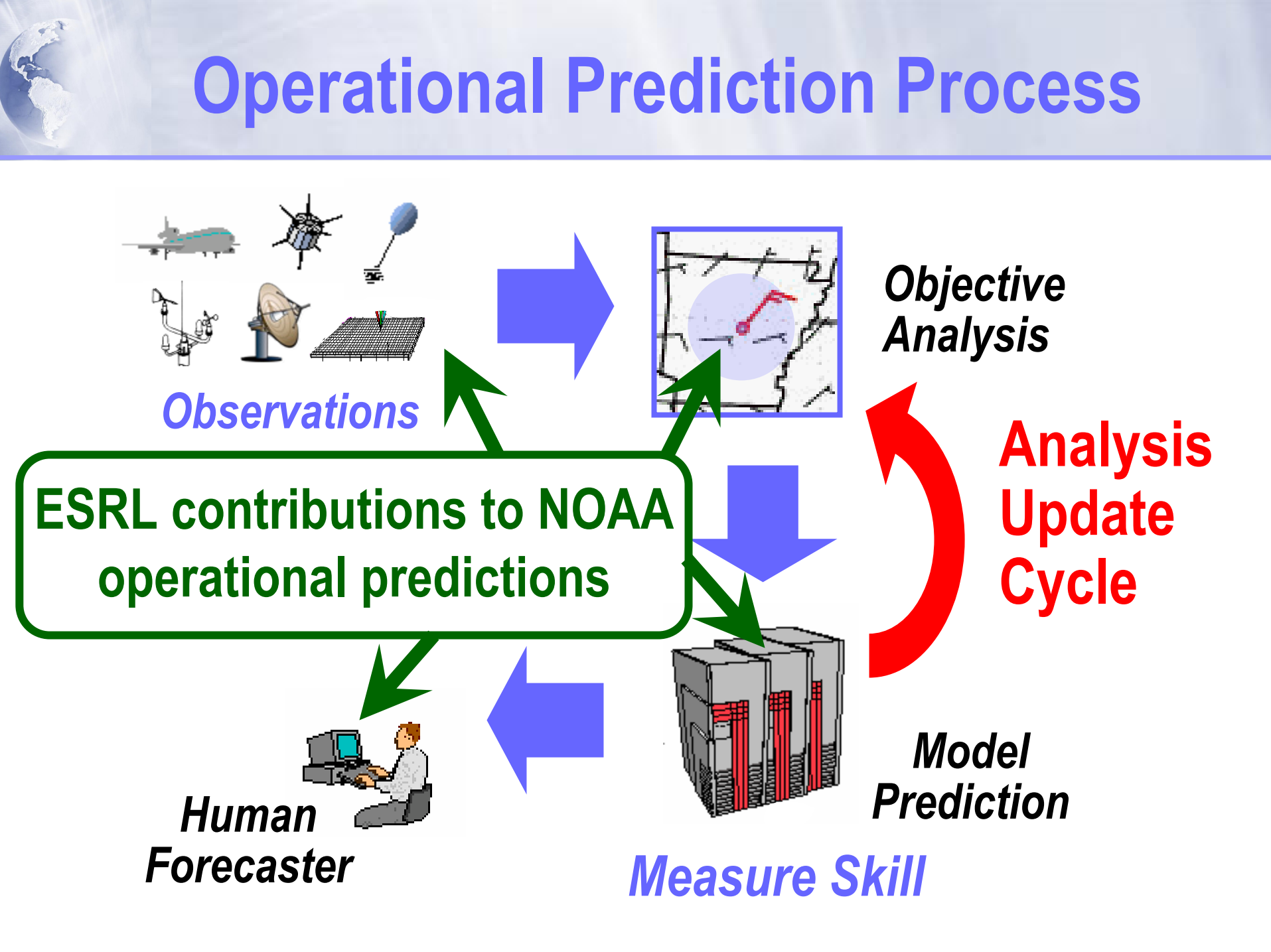
**Analysis
Update
Cycle**



*Model
Prediction*

*Human
Forecaster*

Measure Skill



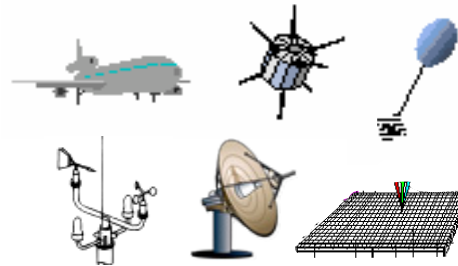
Observing System Experiments

Why?

*Assess value added
from current observing
systems*

OSE

How?



Run model cycle with all observations

Remove specific observations, repeat cycle

Can test experimental observing systems



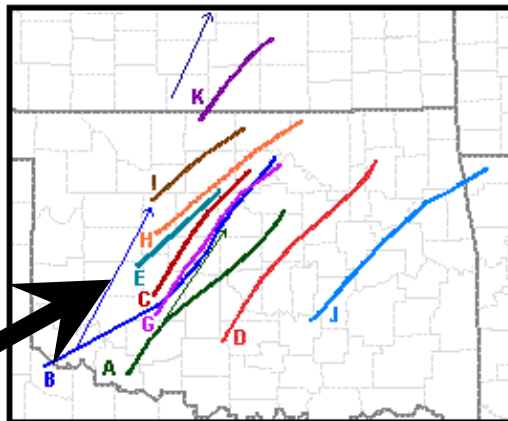
Profiler Case Study Example

May 3, 1999 Oklahoma tornadoes

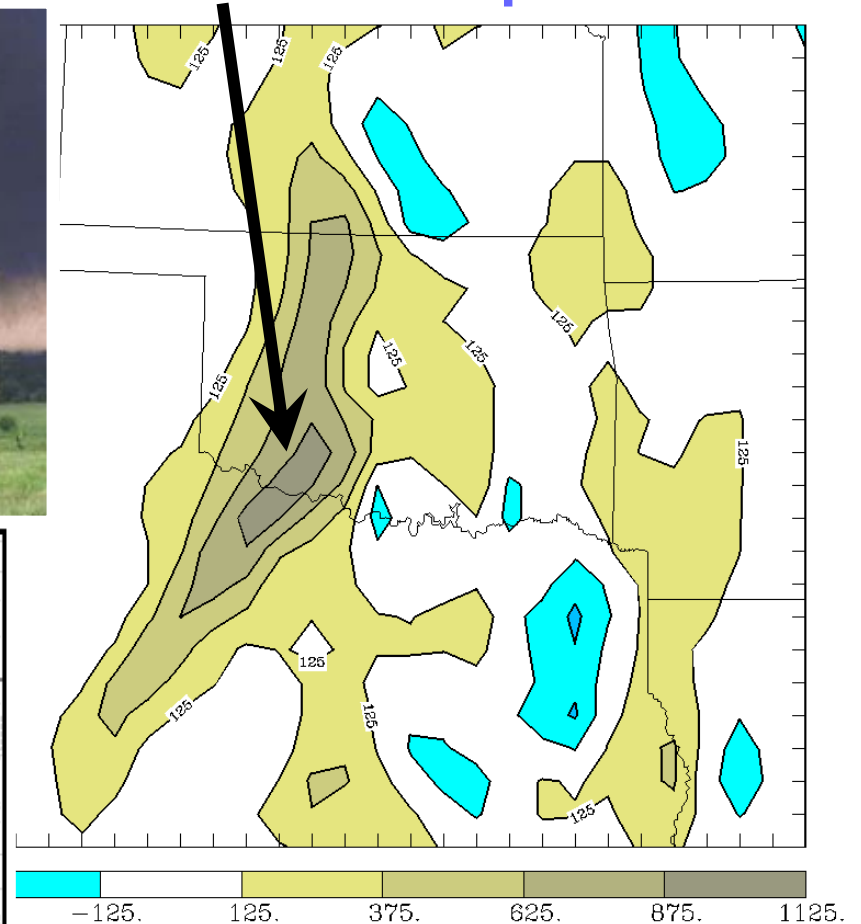


50+ tornadoes cause 42 deaths in Oklahoma

More energy for thunderstorms
6-h forecast with **profiler data**



Tornado paths





GPS-Precipitable Water example

April 20, 2004 Utica, IL tornado

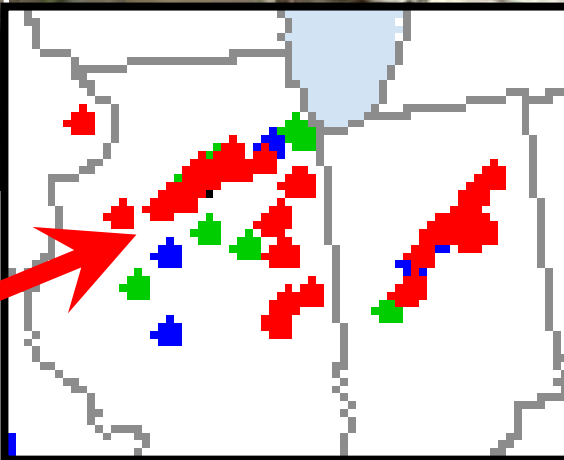


Tornado death toll rises to 8

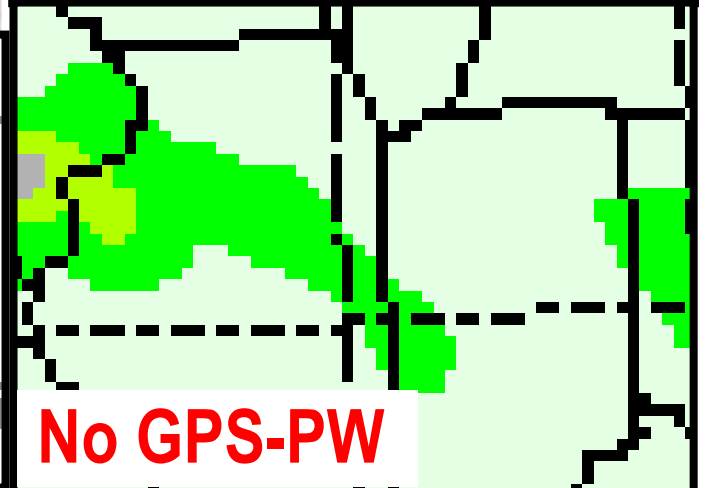
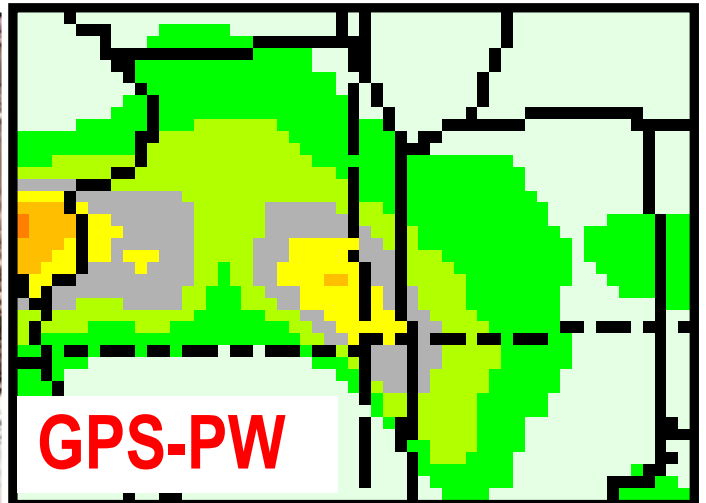
Thursday, April 22, 2004 Posted: 9:43 AM EDT (1343 GMT)

UTICA, Illinois (CNN) -- The death toll from Tuesday evening's tornadoes rose to eight Wednesday afternoon, LaSalle County Coroner Jody Bernard

More energy for thunderstorms
3-h forecast with **GPS-PW data**



Tornadoes



Observing System **Simulation** Experiments

Why?

Assess value of proposed future observing systems

OSSE

How?

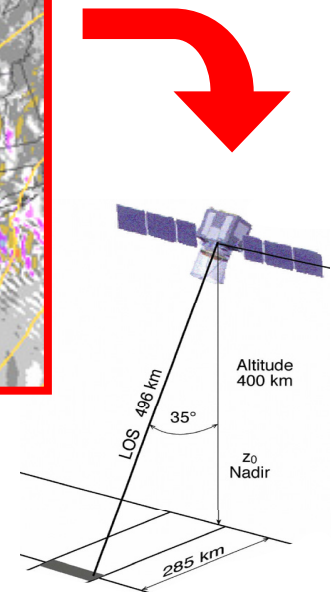
Create **simulated** atmosphere

Simulate current and proposed future observing systems

Run model cycle with current observations

Add future observing system, repeat cycle

Test different observing system strategies



*Proposed
Wind Lidar*



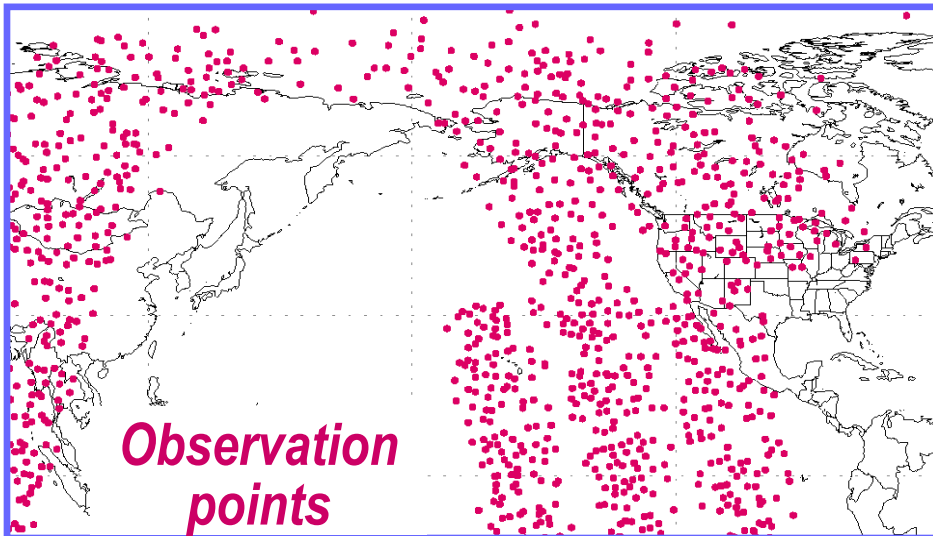
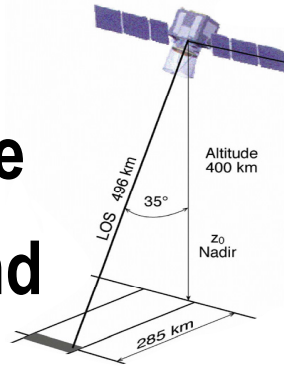
Future observing system example: *Space-based Doppler wind lidar*



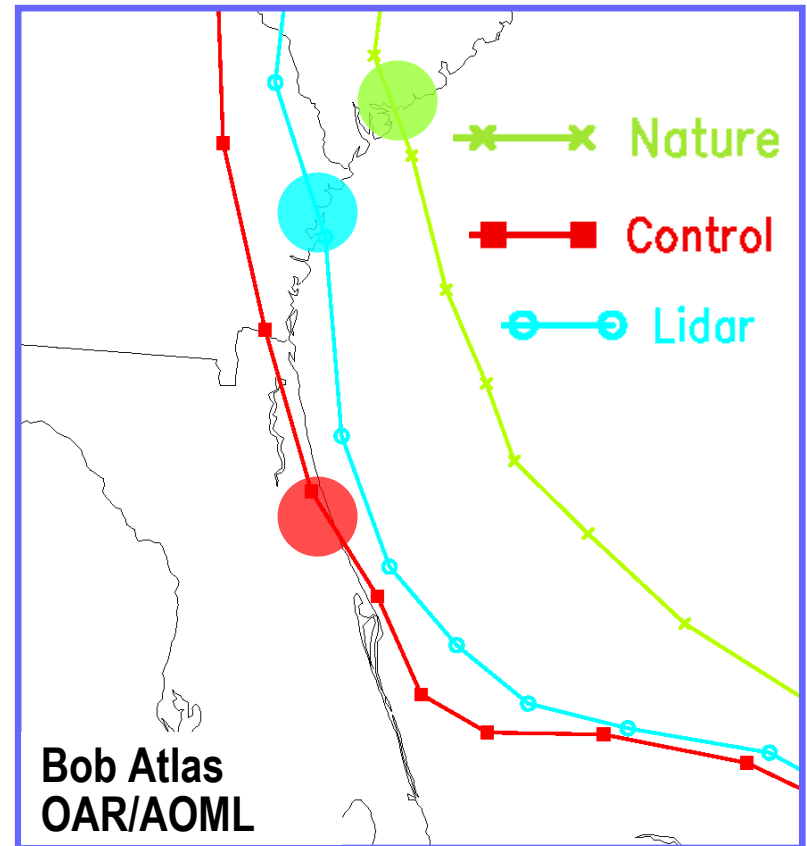
Proposed system

Doppler lidar aboard polar orbiting satellite

Vertical profile of wind at each point



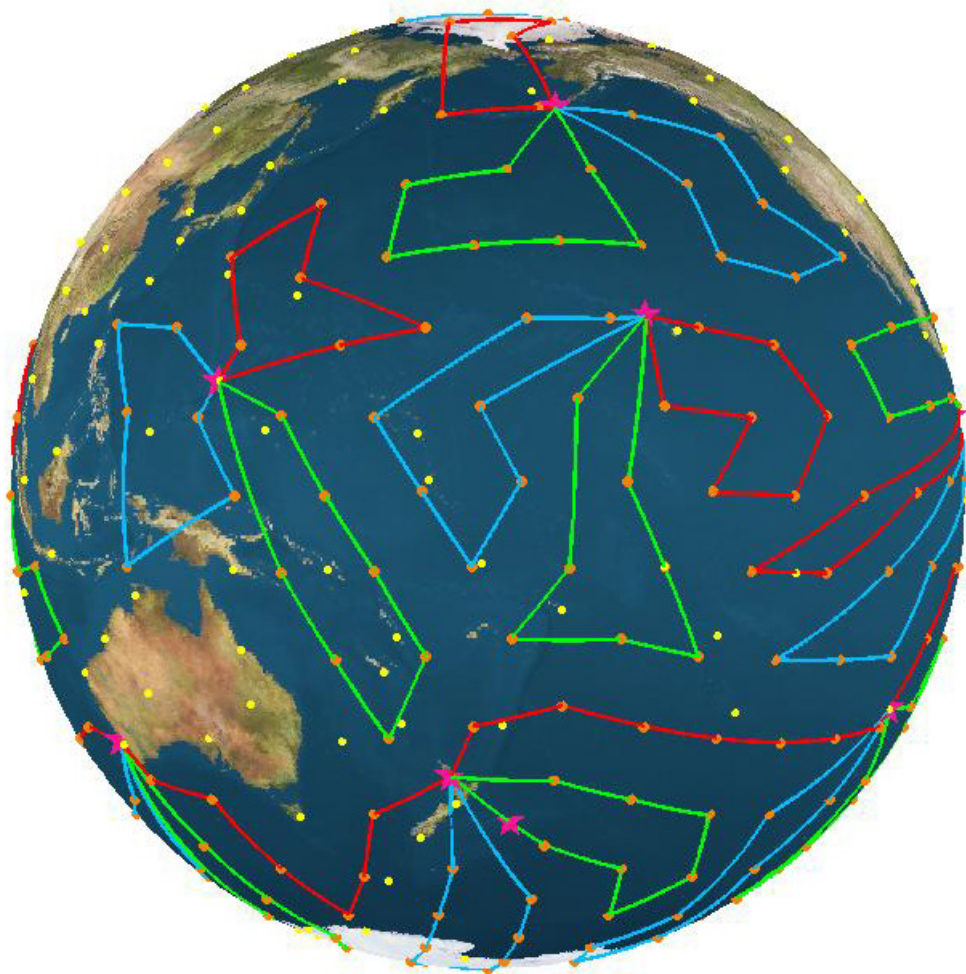
Hurricane track forecast improvement





Proposed observing system strategy: *Global Unmanned Aircraft System (UAS)*

OSSE



Goals

Monitor climate

**Improve operational
predictions**

Components

36 UASs from 12 bases

244 observation points

Dropsonde every 3 days

Sidesondes at 3 levels

Summary

**Society needs accurate
environmental predictions**

**Rapid progress by merging
models and observations**

**Current and future observing
systems are very expensive**

OSEs and OSSEs:

***Tools to invest wisely
for better environmental predictions***

