

**50th Anniversary
of Operational Numerical
Weather Prediction**

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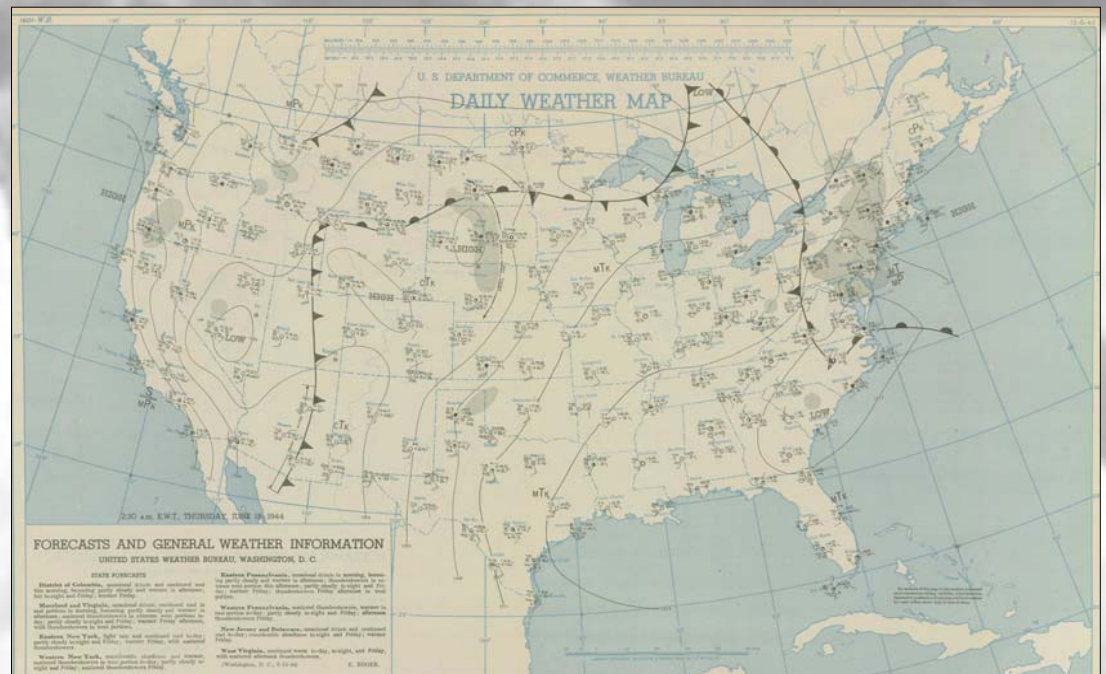
June 15, 2004
University of Maryland
College Park

Overview

- ✓ Forecasting 60 years ago: before Numerical Weather Prediction
- ✓ Forecasting today: Model-based
- ✓ Remaining challenges for the future
- ✓ Debt to the Joint Numerical Weather Prediction Unit

Weather Prediction – 60 Years Ago

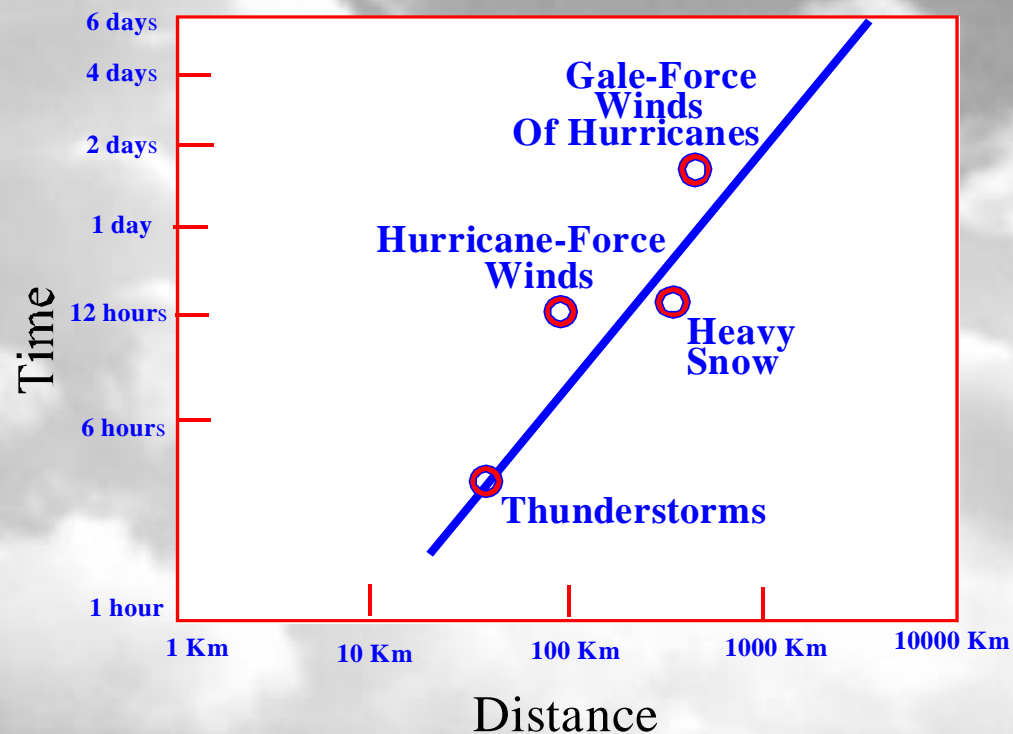
- Forecasting was a subjective art
 - Based on surface observations
- Forecasts of extreme events were poor beyond 12 hours



June 15, 1944

Limits of Predictability of Public Weather Forecasts (from Cressman 1970)

Even as late as the early 70's, forecast skill for snowstorms and hurricane force winds was only 12 hours



Revolution in Forecasting after World War II

- ✓ Expanding Raob network
- ✓ Improved theoretical basis
- ✓ Development of computers

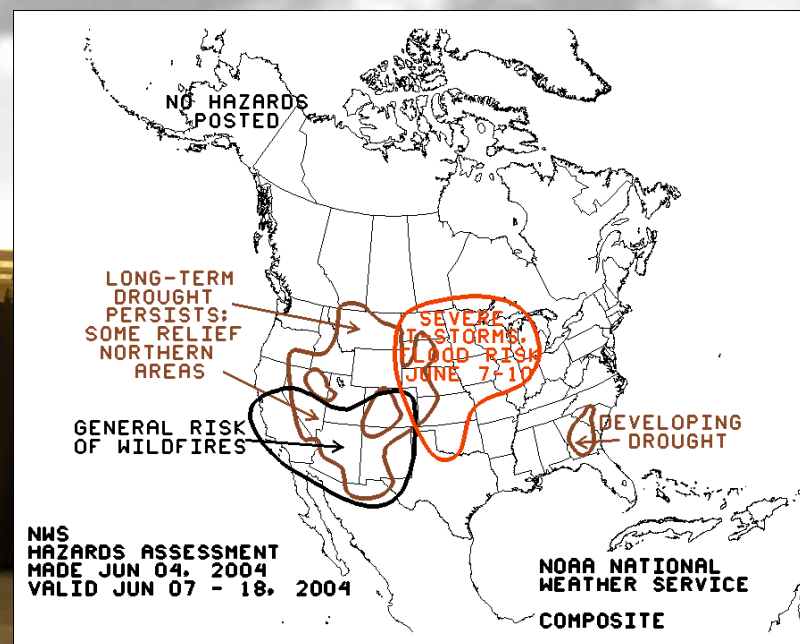
All came together for:

- ✓ Development of Numerical Weather Prediction models
- ✓ Creation of the Joint Numerical Weather Prediction Unit in 1954



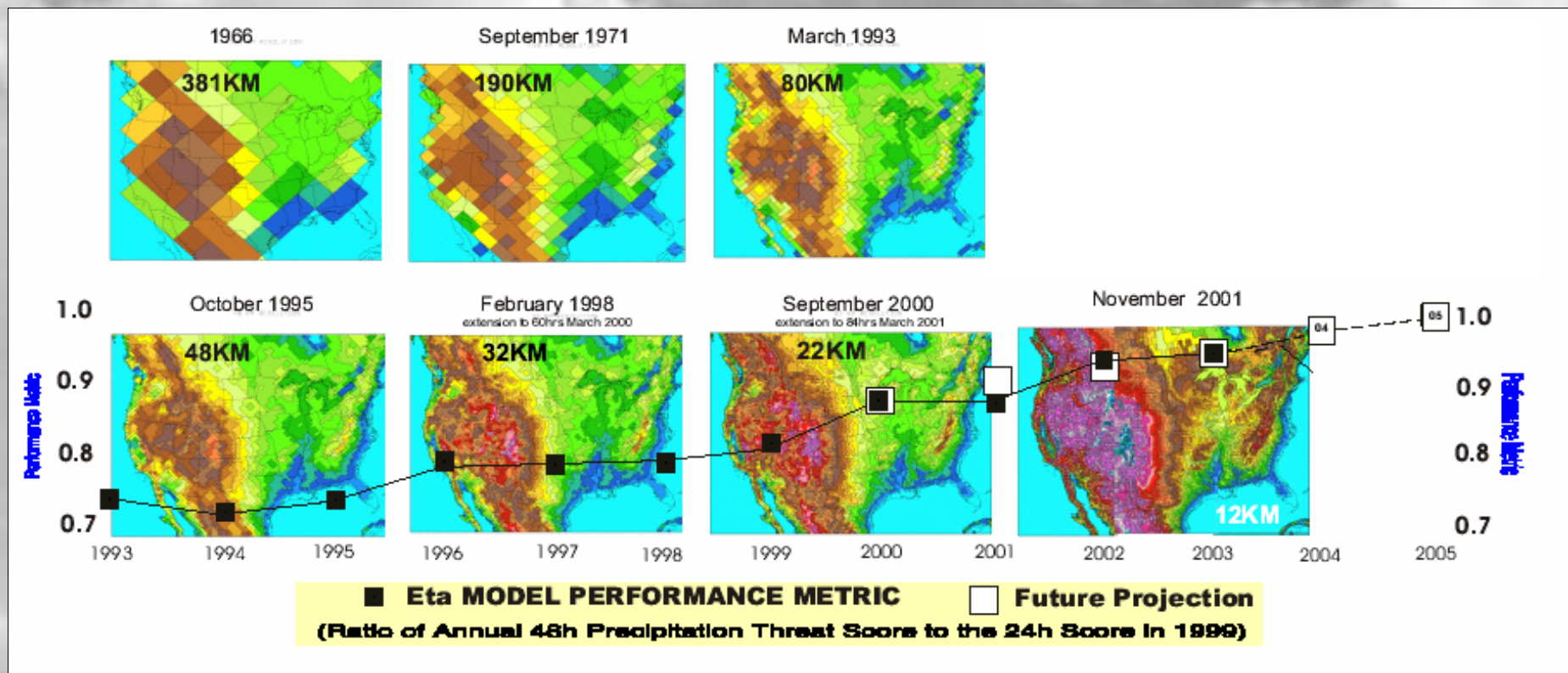
Forecasting Today

- Based on sophisticated global and regional numerical models
 - Initialized with global observations, satellites, raobs, aircraft, ships, buoys, radar
 - Which produce accurate forecasts of extreme events 5-7 days in advance
 - Including “hazards assessment” product to day 14



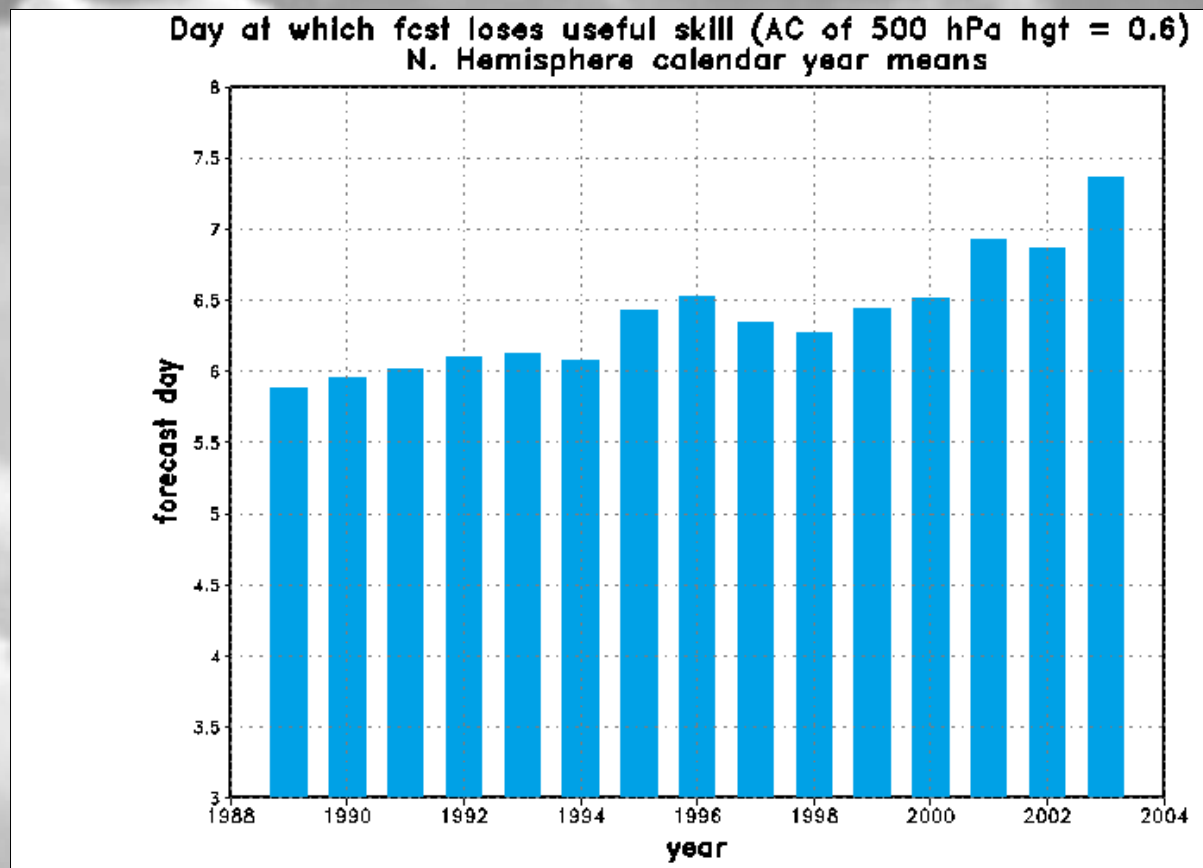
Measuring Progress

- Improved short range QPF
 - Fine scale is being improved



Measuring Progress

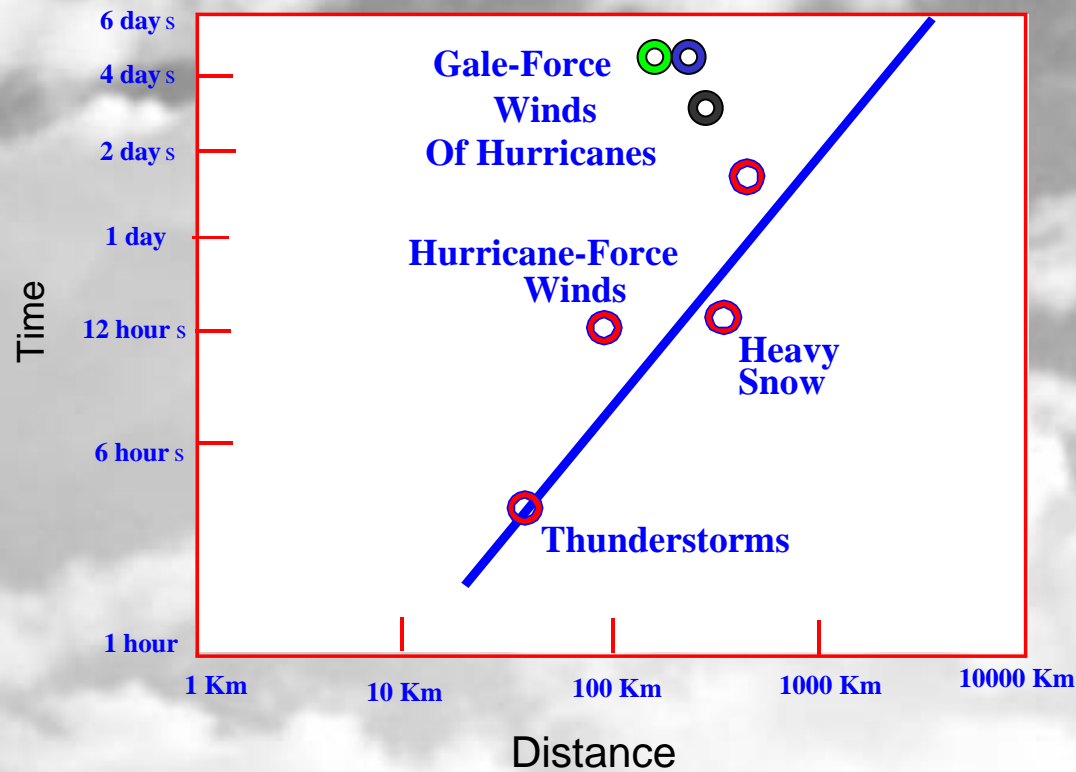
- Increasing skill through day 7
 - Predictions extended with improved skill



Major Advancement in Prediction: Extreme Events Captured 4-7 Days Ahead

- ✓ Severe Weather – May 3-5, 2003 Outbreaks predicted 3+ days in advance
- ✓ Snowstorms – Feb 17-19, 2003 predicted 5 days in advance
- ✓ Hurricanes – Isabel, September 6-19, 2003, landfall predicted with record skill 5 days in advance

Cressman Chart for 2000



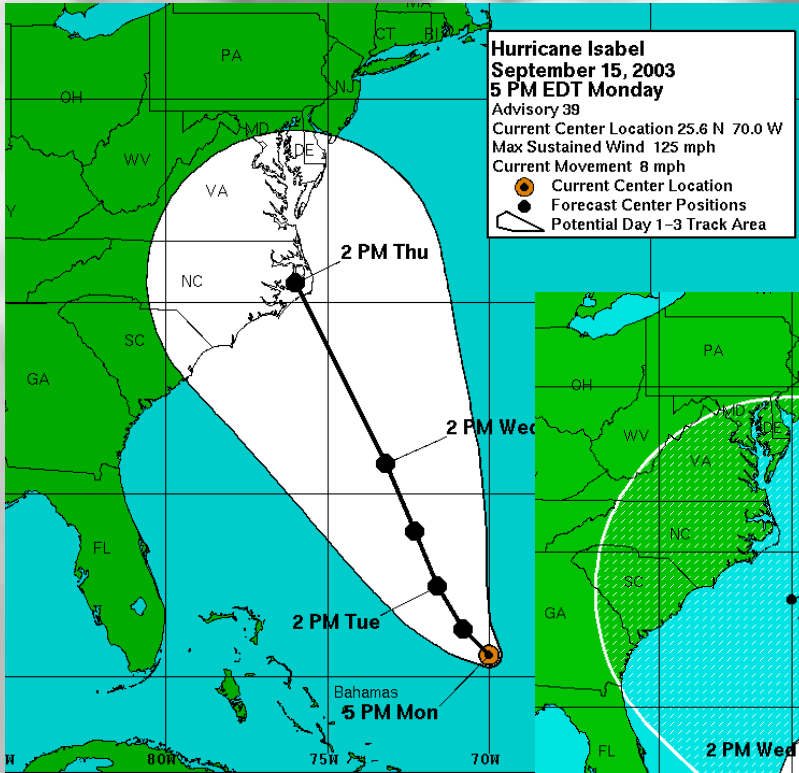
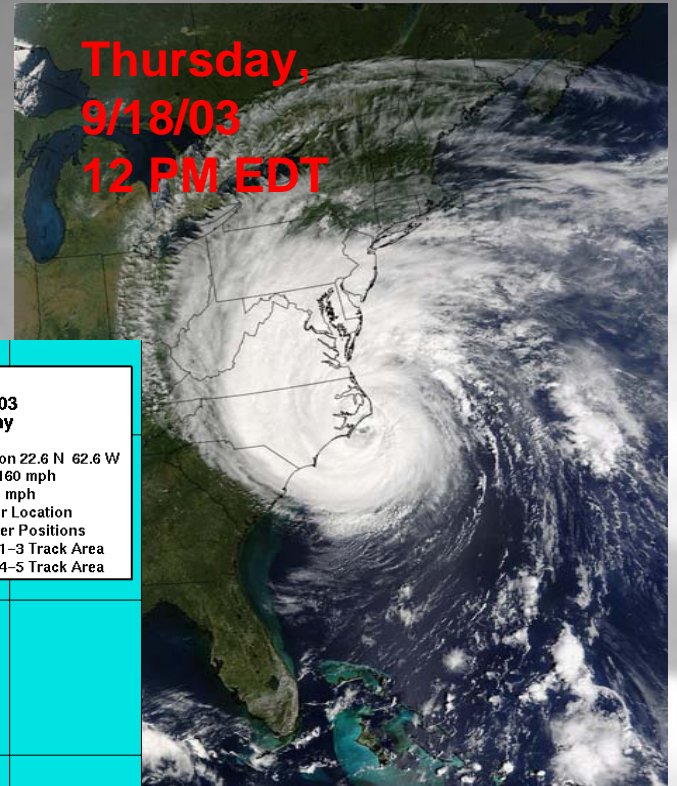
Today's Weather

● Severe Weather Outbreaks

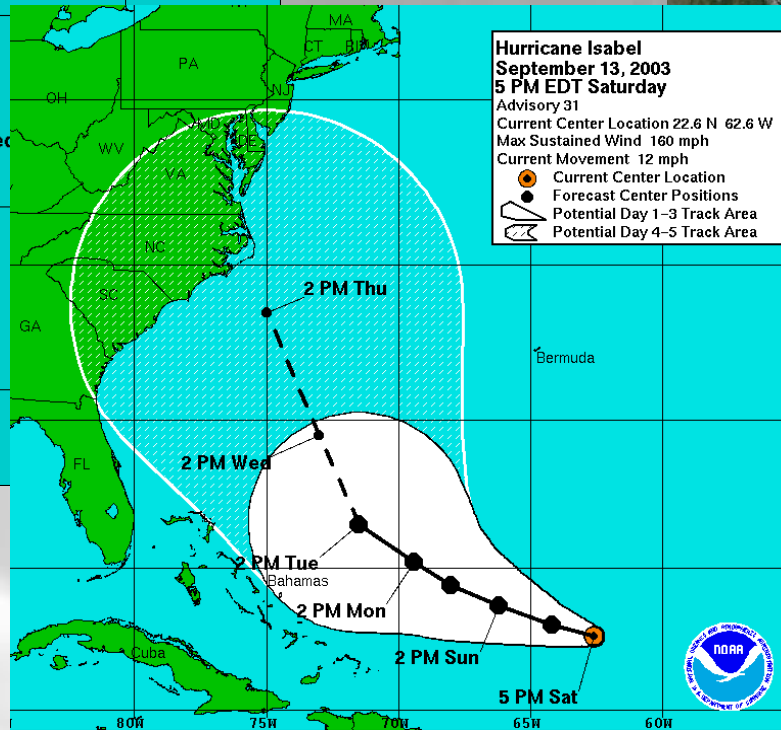
● Hurricanes

● Heavy Snow

Hurricane Isabel

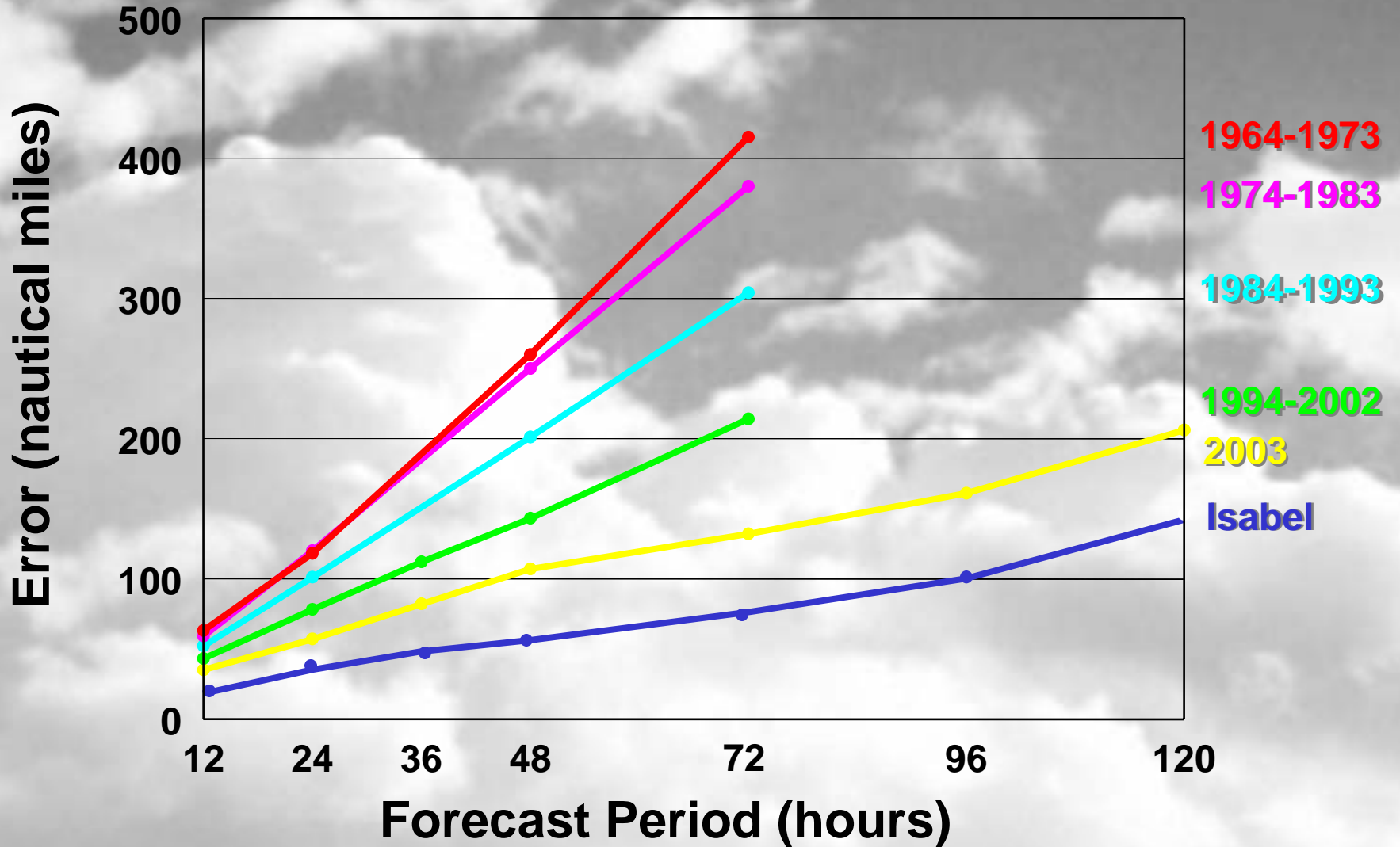


3-day forecast



5-day forecast

National Hurricane Center Atlantic Track Forecast Errors



Remaining Challenges for the Future

- As we approach the NPOESS era (2012), apply global satellite data to weather, climate, ocean and ecosystem prediction
- Extend forecasts to Day 14
- Apply ensemble-based approach to quantify forecast uncertainties
 - We look forward to working with the international community to develop and implement “super ensemble” systems

Our Debt to the JNWPU

- All these achievements were made possible by the creation of the JNWPU
- The meteorological community owes much to the original members of the Air Force, Weather Bureau and the Navy who pushed for the creation of the JNWPU
- They had the guts and foresight to get the best minds working on a challenging problem
- Transformed weather prediction from a subjective “art” to a mathematically-based applied science
 - This transformation represents one of the great intellectual achievements of the 20th Century