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***Lessons Learned from the USWRP:
from Onset to Reset***

***John Gaynor
NOAA***

For

***Bob Gall
NCAR***



Reset?

- **Reset incomplete**
 - Interagency Project Office, as an official entity, ended in October 2004
 - Office of the Lead Scientist activities ended February 2005
 - IWG teleconference July 7, 2005 after a year's hiatus to continue reset
- **The program struggled to define itself as reset activities began January 2004**
 - Result of lack of agreement on which projects should be included under USWRP
 - Also, resulted from lack of agreement on the addition of agencies to the program and the philosophy of the USWRP:
 - What mix of research, transition of research to operations, applications?
 - Loose cooperation or close coordination?



Outline

- **History of USWRP**
- **Recent USWRP activities and goals**
- **USWRP successes**
- **Lessons learned and recommendations**

History



- **National Mesoscale Program (1970s)**

- Several NSF sponsored workshops that led to an NRC/NAS meeting in 1981-1982
 - Reports
 - “Framework of a plan”-- 1982
 - “Call to Action”-- 1983
 - “The National Storm Program”-- 1983
 - An interagency Steering Subcommittee was formed under the old Federal ICAS

- **STORM (1983-1991)**

- Storm-Central document-1984
- Field programs
 - Pre-STORM--May-June 1985
 - GALE—15 January-15 March 1986
 - STORM-FEST 1 February-15 March 1992

- **The name USWRP replaced STORM in 1991**
- **Authorized in NOAA’s budget in 1992**

Recent History

- **USWRP**

- Program leads:
 - Lead Scientist: Rit Carbone 1994-1999
 - Program Office: Bill Hooke 1994-2000
 - Lead Scientist: Bob Gall 1999-2005
 - Program Office John Gaynor 2000-2005
- Authorized in NOAA's budget in FY1992
- USWRP Strategic Plan "Predicting our Weather" July 1992
- Science and Implementation Plan in March 1993

- **USWRP Reset**

- At an IWG meeting at the AMS Annual Meeting In Seattle 2004 Agencies noted the need to redefine or "reset" the USWRP
- There were significant reset activities from January 2004-Summer 2004.
- Reset plan submitted by USWRP Reset Committee for IWG consideration December 2004
- Final activity related to the reset of the USWRP was the meeting at the AMS Annual meeting last January—Organized by the Weather Coalition
 - Led to the Organization of this meeting



U.S. Weather Research Program (USWRP)

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Public expectations for weather forecasting are rising faster than the current rate of improvement in weather forecasting technology.

- **Purpose: Accelerate the rate which weather forecasts are improved**
- **Interagency Initiative (NOAA, NSF, NASA, DOD)**
- **Focus narrowed to two initial programs:**
 - Improving Precipitation Forecasts**
 - Forecasting Hurricanes at Landfall**

USWRP Organization

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Interagency Working Group
Uccellini, Chair

Interagency Program Office
Gaynor, Director

Office of the Lead Scientist
Gall, Lead Scientist
Kerschner, Admin. Asst.
Fredrick, Webmaster

Science Steering Committee
(Gall)

Impacts and Use Assessment Committee
(Harriss)

Prospectus Development Teams
(as needed)

Workshops
(as needed)

Field Projects
(as needed)



USWRP Planning Process

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1. Conduct a series of Prospectus Development Teams

- ➔ Identify research opportunities for improving forecasting

2. Use Scientific Steering Committee (SSC) to identify initial focus of the program

- ➔ Areas where rapid progress is possible, and
- ➔ Where the impact of improved forecasts is expected to be large

3. Conduct workshops to refine Science Objectives of each Focused Component

4. Develop Implementation Plans

5. Implement

- ➔ Calls for proposals
- ➔ Field programs
- ➔ Periodically assess project and adjust program as needed
- ➔ Develop test bed centers

US Weather Research Program Prospectus Development Teams (Co-Chairs)



Team 1	Overarching Issues & Opportunities in Weather Prediction <i>K. Emanuel, MIT.; D. Raymond, New Mexico Mines</i>	Oct '94	Team 2	Observations In the Forecast System <i>W. Dabberdt, NCAR; T. Schlatter, NOAA</i>	May '95
Team 3	Coastal Issues & Opportunities <i>L. Pietrafesa, NCSU; R. Rotunno, NCAR</i>	Sept. '95	Team 4	Mountain Issues & Opportunities <i>J. Paegle, U of Utah; R. Smith, Yale</i>	March '96
Team 5	Landfalling Hurricanes <i>F. Marks, NOAA; L. Shay, U of Miami</i>	April '96	Team 6	Societal Aspects <i>J. Kimpel, NOAA; R. Pielke, Jr., NCAR</i>	May '96
Team 7	Observing & Assimilation Strategies for Data-Sparse Regions <i>K. Emanuel, MIT; E. Kalnay, U of Oklahoma</i>	July '96	Team 8	Quantitative Precipitation Forecasts <i>J.M. Fritsch, PSU; R. Houze, U of Washington</i>	Sept. '96
Team 9	Hydrological Aspects & Flood Prediction <i>K. Droegemeier, U of Oklahoma; J.D. Smith, USGS</i>	Jan. '98	Team 10	Urban Forecast Issues & Opportunities <i>S. Changnon, Illinois State Water Survey; W. Dabberdt, NCAR</i>	July '98
Team 11	Meteorological Research Needs for Improved Air Quality Forecasting <i>W. Dabberdt, Vaisala, M.K. Carroll, UMich</i>	Nov '01			



USWRP Workshops

- Workshop on the Social and Economic Impacts of Weather
2-4 April, 1997—Boulder, Colorado
- Hurricane Workshop
17-20 November, 1997—Miami, Florida
- Workshop on Data Assimilation
9-12 December, 1997—Monterey, California
- Weather Research Needs of the Private Sector
28 November-3 December, 2000—Palm Springs, California
- Warm Season Workshop
5-7 March, 2002—Boulder, Colorado
- First International THORpex Workshop
18-20 March, 2002—Potomac, Maryland
- Mesoscale workshops on regional observations and numerical prediction December 2003, Boulder Colorado



Specific USWRP Goals for Quantitative Precipitation Forecasting

- Increase the skill by one full day for current Day-5, Day-6, and Day-7 forecasts.
- Improve numerical model guidance over the Pacific and West Coast so it is as accurate as the rest of the country
- Extend precipitation forecasts to 3 days and attain current Day 2 accuracy at Day 3
- Provide weather and water forecasts in probabilistic terms
- Increase the skill of the Day 1 operational NWP model QPFs by 50%. Examine the accuracy in six-hour increments.

Specific USWRP Goals for Hurricane Landfall



- Reduce landfall/track/intensity forecast errors by 20%
- Increase warning leadtime to and beyond 24 h with 95% confidence without increasing the present 3 to 1 overwarning
- Make skillful (vs. persistence) forecasts of gale-and hurricane-force radii out to 48 h with 95% confidence
- Extend QPF to 3 days and improve skill of day-3 forecasts to improve inland flooding forecasts



THE USWRP Grants Programs

- **1996 Joint Agency Grants**
- **1997 Joint Agency Grants**
- **1997 NSF/NCAR USWRP Projects**
- **1997 Severe Weather Initiative Proposals**
- **1998 Joint Agency Grants**
- **1998 Severe Weather Initiative Proposals**
- **1999 NSF/NCAR USWRP Projects**
- **1999 USN awards**
- **1999 NSF/NOAA Joint Grants Programs**
- **2001 NSF/NCAR USWRP Projects**
- **2001 NAVY CBLAST (hurricane) for USWRP**



Programs Within USWRP

- WRF
- JHT
- DTC
- SPoRT
- THORPEX
- Pacjet
- IHOP
- IMPROVE
- CRAFT
- CONDUIT
- Hurricane Landfall (HL)



USWRP Basic and Applied Research Program

Two Major Foci

- Quantitative Precipitation Program
 - Three Components:
 - Extended range: QPF 2-14 Days, global (**THORPEX**)
 - Short-term Summer QPF 0-48 hours, mesoscale
 - Short-term Winter QPF 0-48 hours, mesoscale
- Hurricane Landfall
- We never completed the planning for the short term QPF components



USWRP Technology Transfer Program

- **Transfer primarily accomplished through four components**
 - **Community Models**
 - WRF
 - **Operational Transition Test Beds**
 - Joint hurricane test bed
 - Numerical weather prediction test bed (DTC)
 - Joint satellite data assimilation center
 - WRF
 - **Expert Systems**
 - Several examples including Auto-Nowcasting

Achievements of the USWRP



- **The USWRP engaged a large segment of the Weather Community in a planning and priority setting process**
 - Proved that the community can work together
 - Developed clear priorities
 - Hurricane Landfall
 - Quantitative Precipitation Forecasting
- **In some instances there was substantial cross agency coordination**
 - Hurricane Landfall (HL)
 - THORPEX
 - Weather Research and Forecasting Model (WRF)
 - Testbeds (Joint Hurricane Testbed (JHT), Developmental Testbed Center (DTC)...))
- **The USWRP developed a Societal Impacts Program**

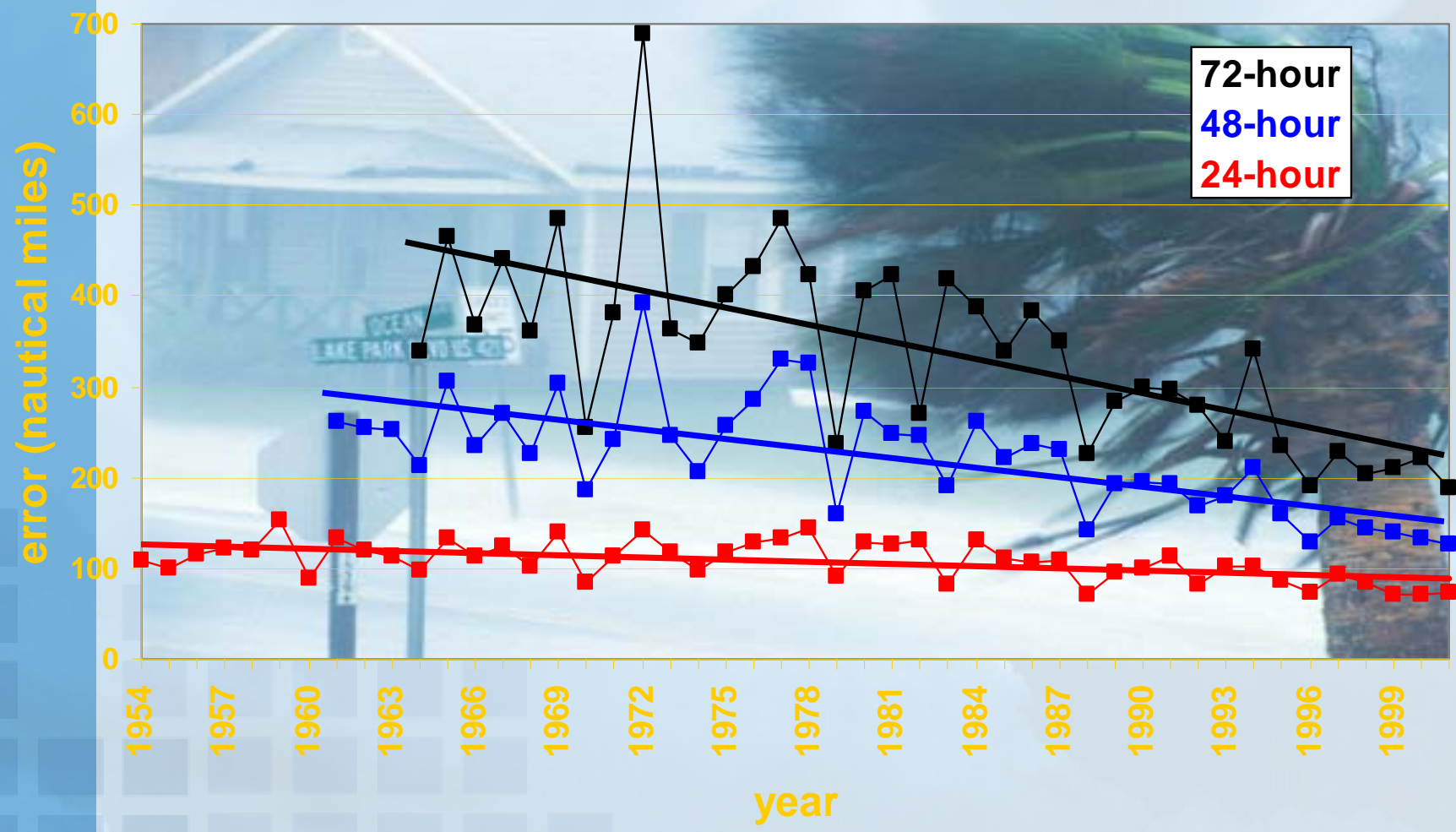
Achievements of the USWRP



- **Research Announcements of Opportunity:**
 - Noted earlier
- **Community Model—WRF**
- **Field Programs—CAMEX, CBLAST, IHOP, BAMEX, THORPEX...**
- **Testbeds—DTC, JHT, focus for JCSDA**
- **Major Accomplishment** (from research-proof of concept—operations—results)
 - Greatly improved hurricane track forecasts

Improved Operational Warnings and Forecasts

Hurricane Track Forecast Errors in Atlantic basin: 24-72 Hrs

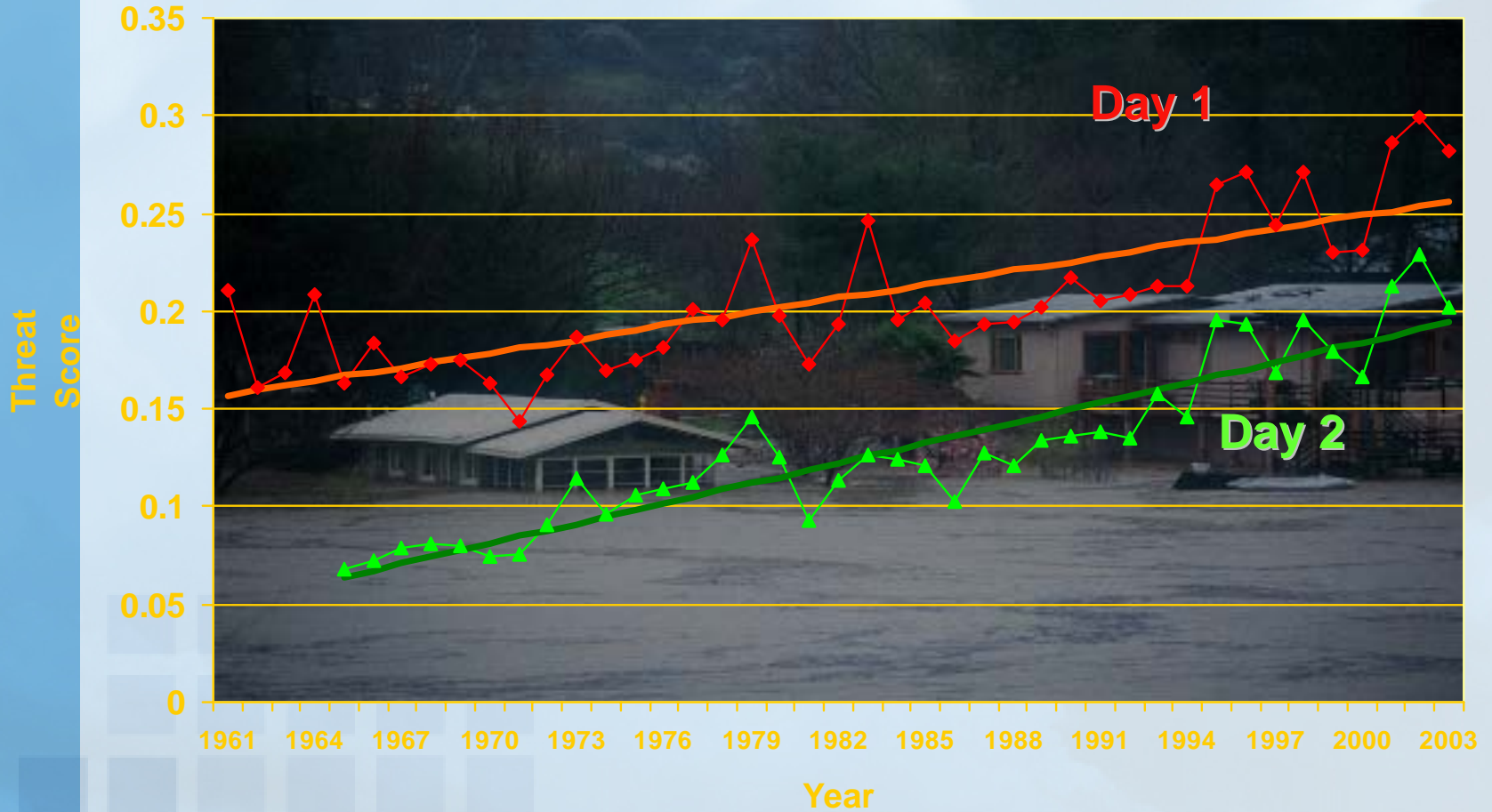


Improved Operational Warnings and Forecasts



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QPF 1" Threat Score: Days 1 and 2



Lessons Learned



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- **USWRP never had buy in from the very top of the agencies**
 - Top leadership of the program was fairly low down for all agencies.
 - This isn't necessarily bad if there is a strong commitment to the program from the very top.
 - USWRP never had that
- **A grass roots or bottom up effort doesn't really work**
 - Unless it is widespread, focused and united
 - This never happened with the USWRP
 - At times there were only a few actively working on the program
 - Which clearly is sub-critical
- **The program initially was too focused on research**
 - The mission agencies were not interested unless there was a clear path to operations within a few years
 - The program needed to be more end-to-end
 - We tried to steer it in that direction in later years
- **The program was probably too focused on mission agency needs towards the end.**
 - Research agencies weren't interested
 - The broad community became less interested
- **Expected funding increases never materialized**
 - There was little help from the broad community in lobbying for funding increases

Recommendations



- **Any revised program that may replace the USWRP will fail unless the weather community is highly organized, broad based and strong.**
 - High level agency leadership will ignore the program unless they feel *strong* pressure from a broad based community
- **A broad based community must include representation from the private sector, academic community and agencies.**
 - Strong pressure from this community will probably have to be in the form of political pressure
 - *Lobbying?*
 - *Be aware the distinction between a planning/lobbying/organizing group and an implementation group*
- **Basic Question for this meeting:**

“How should we organize ourselves?”



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END