NOAA's National Weather Service:

Weather, Water, Climate, and Beyond

Board on Atmospheric Sciences and Climate

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Deputy NOAA Assistant Administrator for Weather Services

April 20, 2004

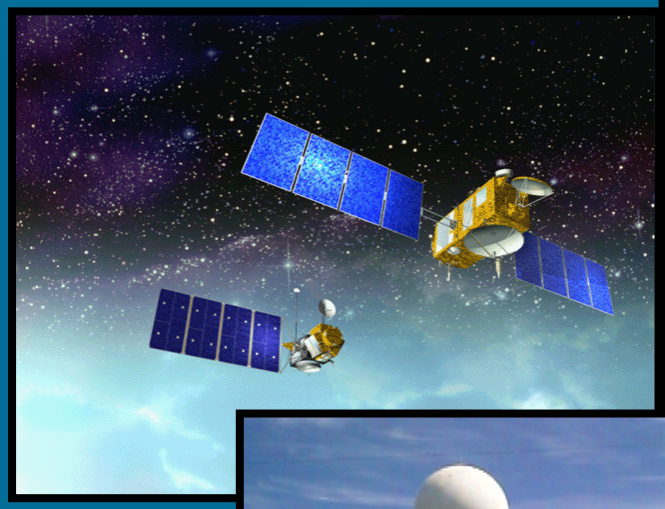
NOAA's National Weather Service:

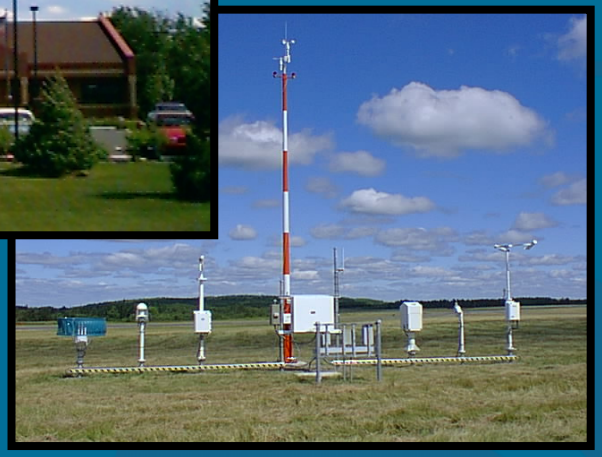
contents

Modernization

Leveraging Taxpayers' $4.5 Billion Investment

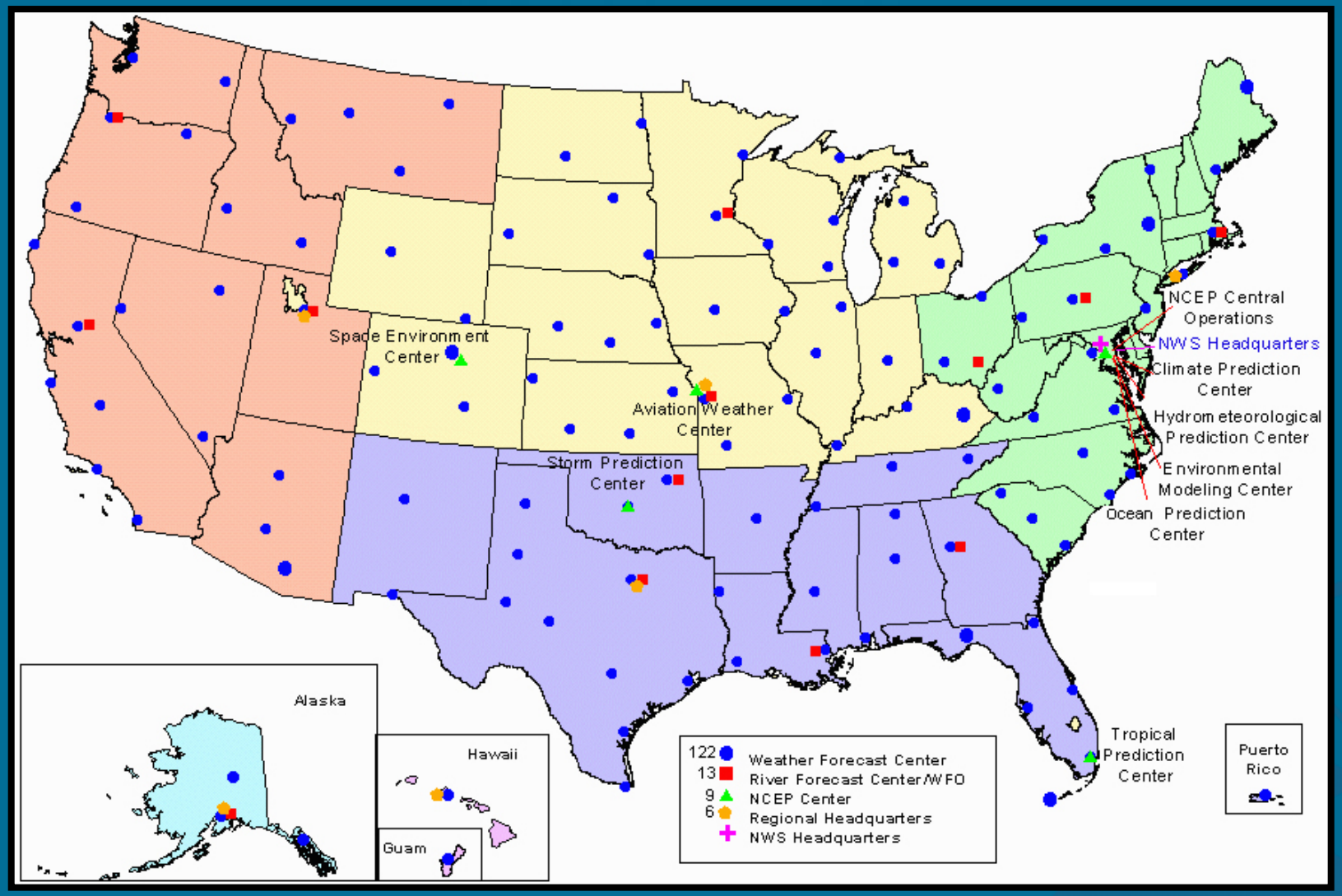
- NEXRAD (125)
- AWIPS (154)
- ASOS (313)
- Supercomputer
- Workforce Restructuring
- Office Construction
- Satellites





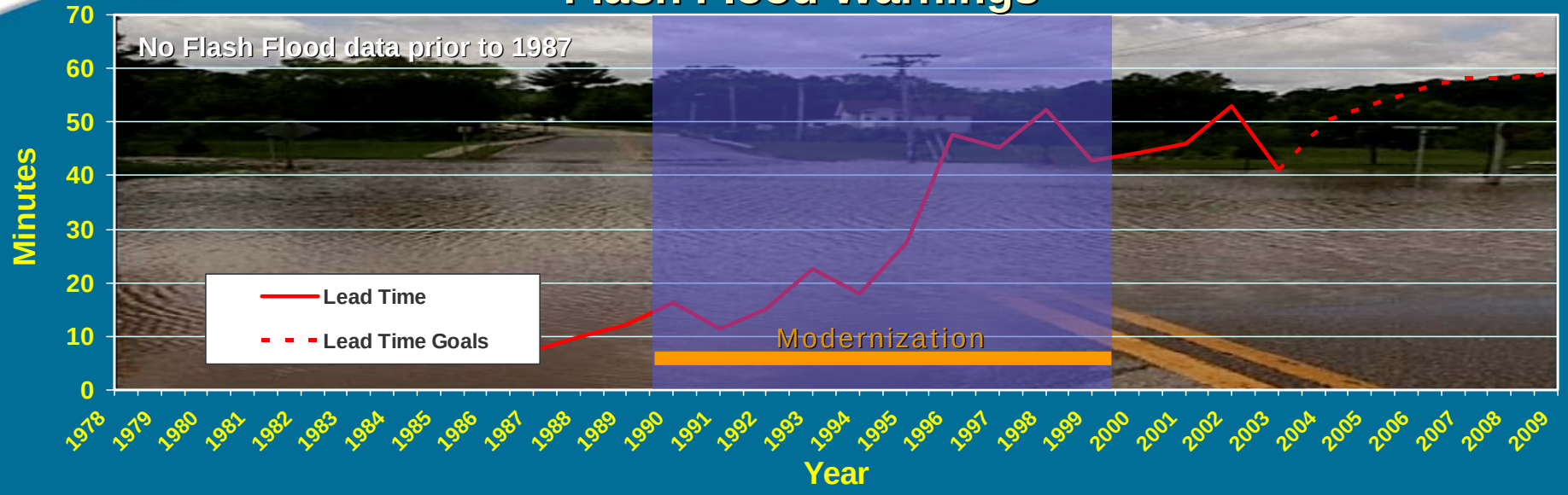
Modernization

NWS Service Delivery Facilities

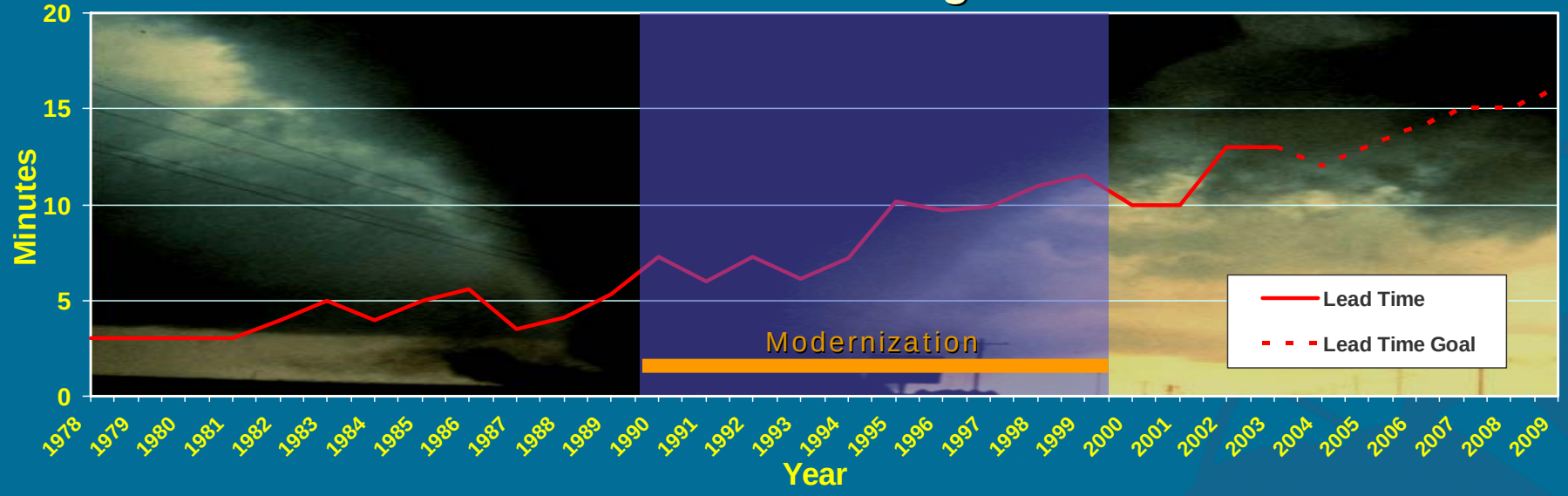


NWS Modernization Made a Difference

Flash Flood Warnings

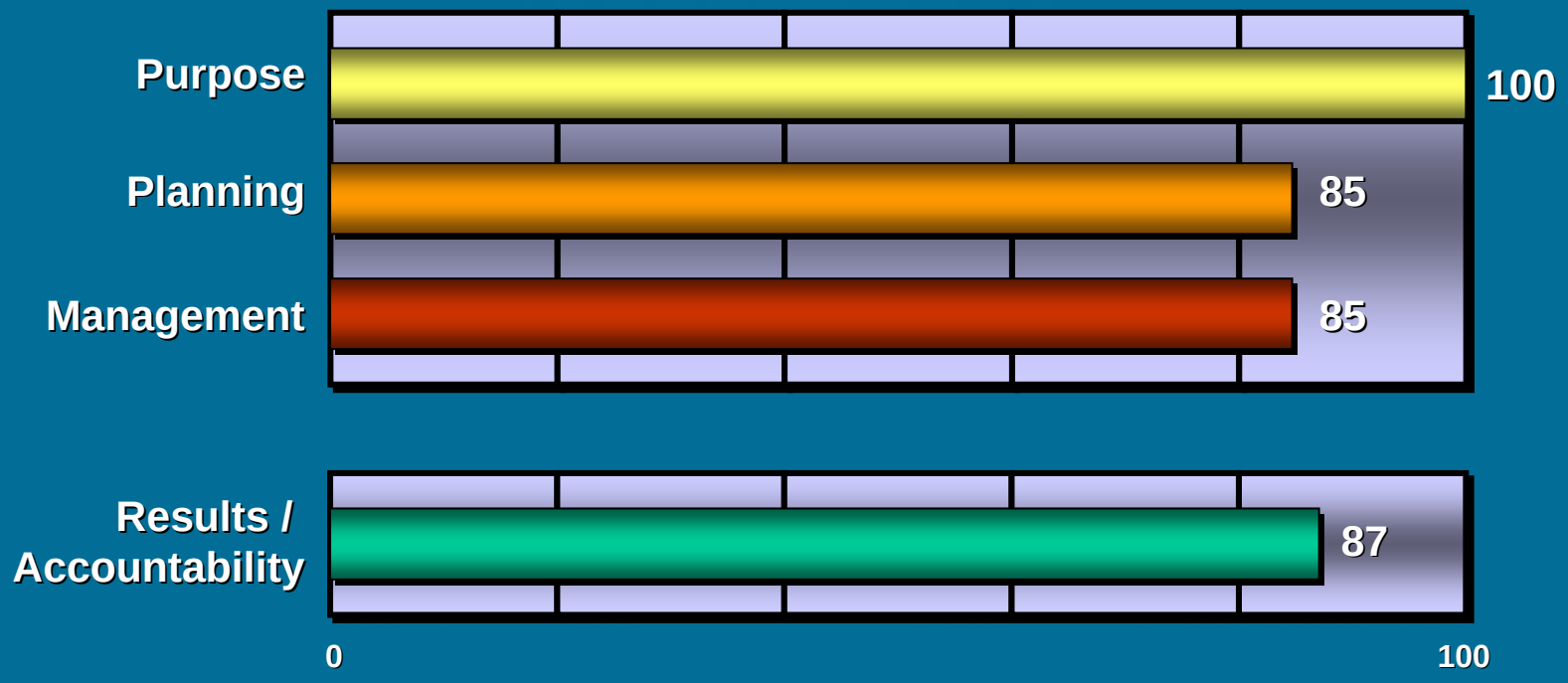


Tornado Warnings



FY 2005 Program Assessment

Rating Tool



"NWS is well-managed and results-oriented."

Office of Management and Budget

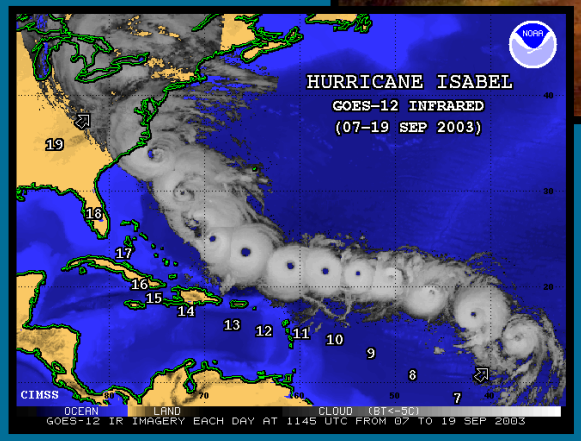
Modernization

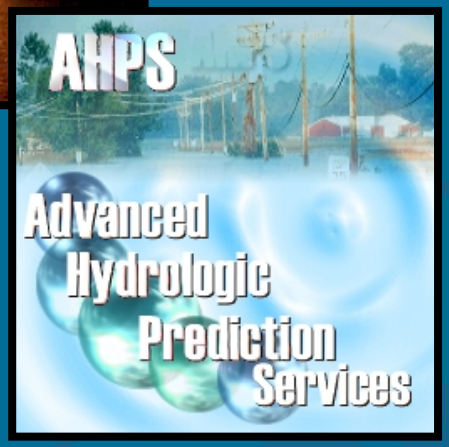
National Academies of Science/National Research Council Interaction Was and Is Critical

- **Then:**
  - ***Dec 29, 1989, NRC established the NWS Modernization Committee at NOAA's request***
- **Now:**
  - **February 2003, *Fair Weather: Effective Partnerships in Weather and Climate Services***

Cannot Stand Still…

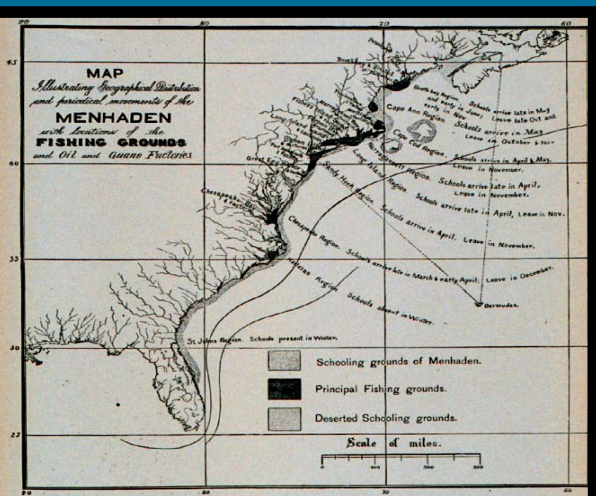
- ✓ Users Continue to Have Needs
- ✓ Science and Technology Continues to Advance

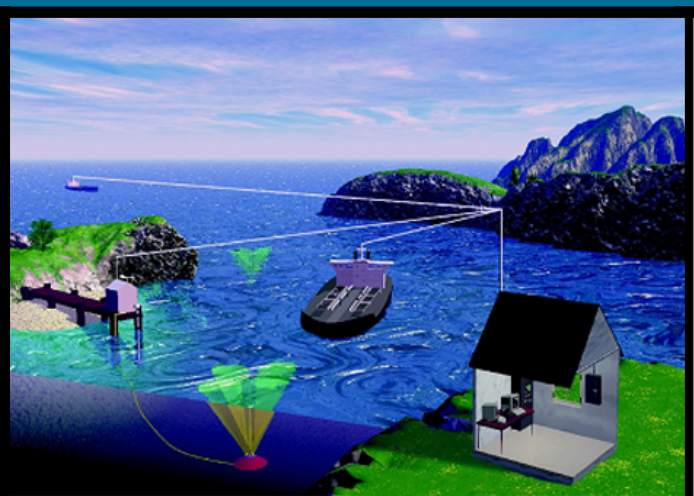




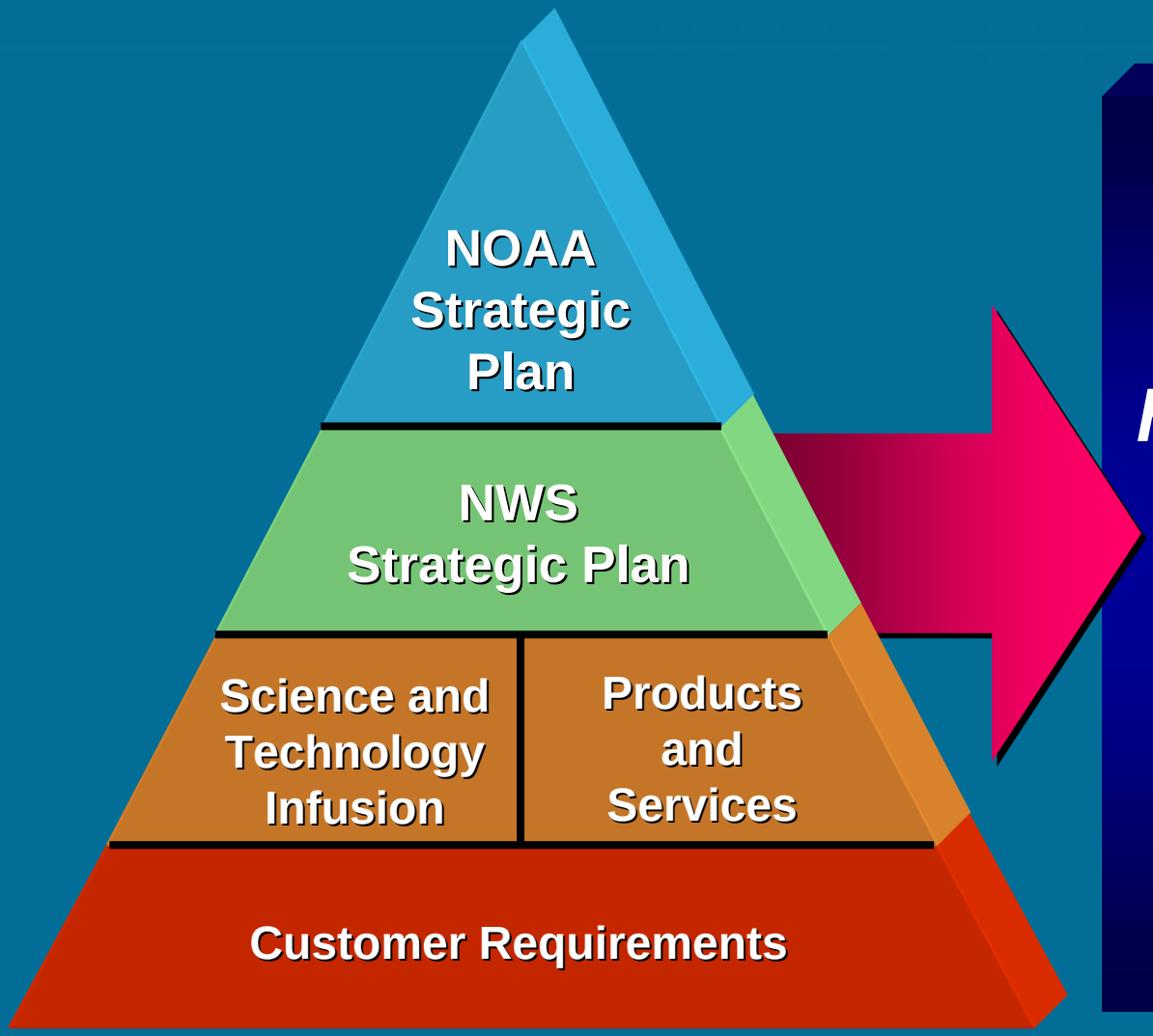
NOAA Vision

- To move NOAA into the 21st Century scientifically and operationally, in the same interrelated manner as the environment that we observe and forecast, while recognizing the link between our global economy and our planet's ecology.





Beyond Modernization

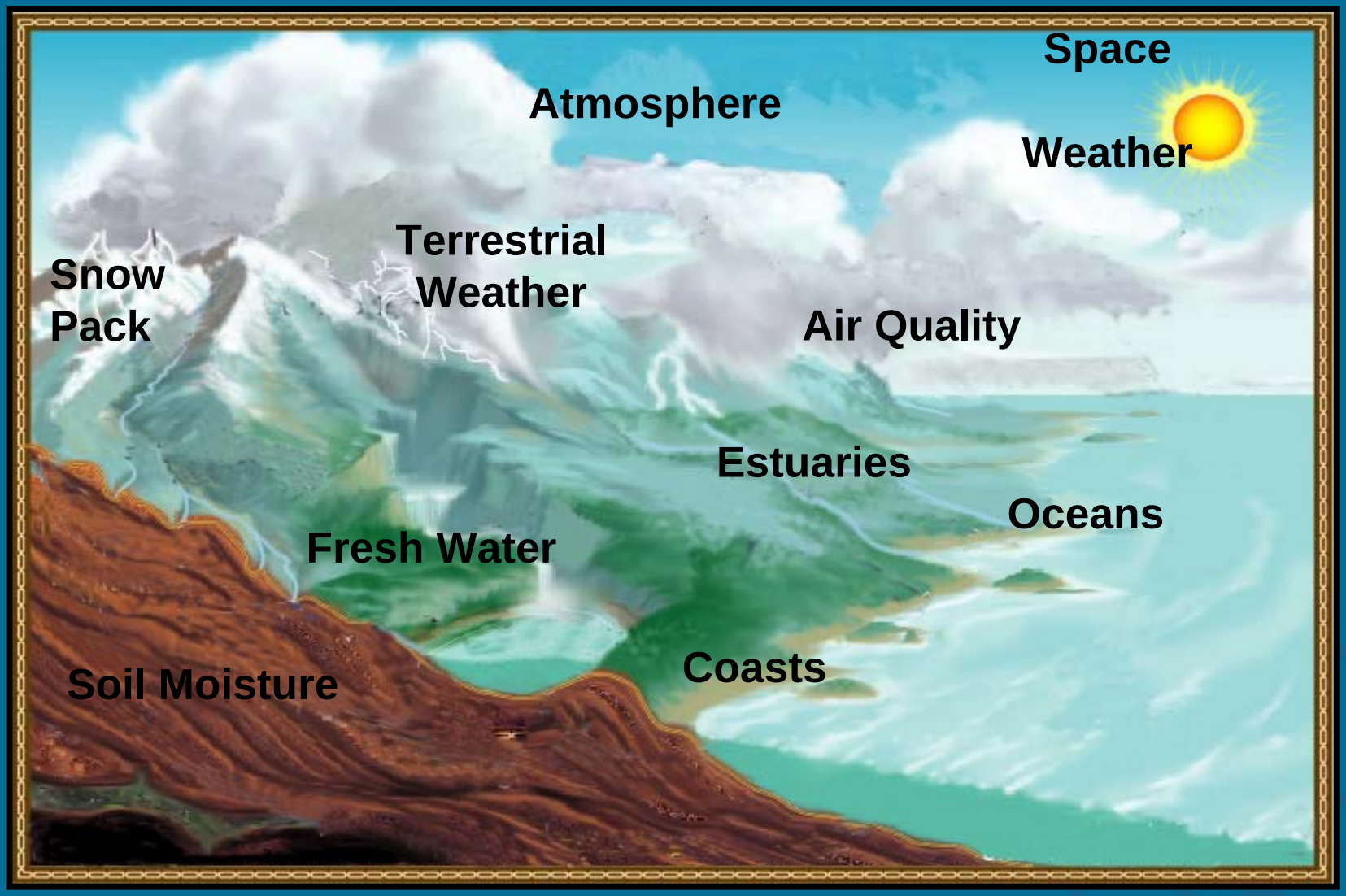


Result

Safer, stronger, healthier America through trusted, timely, and accurate environmental information

Environmental Services

"From Mud to Sun"



Strategies

Monitor and Observe
Assess and Predict
Understand and Describe
StormReady
Entering A
TsunamiReady
Community
IN CASE OF EARTHQUAKE, GO TO
HIGH GROUND OR INLAND
Engage, Advise, and Inform

Vision: Observations when and where needed–integrated, adaptable, extensible, stable, continuous, and quality-assured.

Monitor and Observe

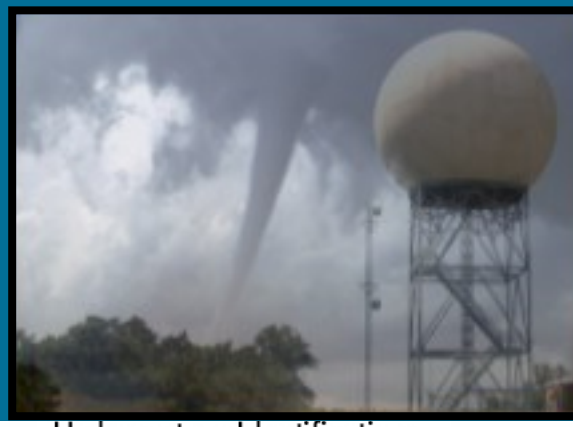
Objectives

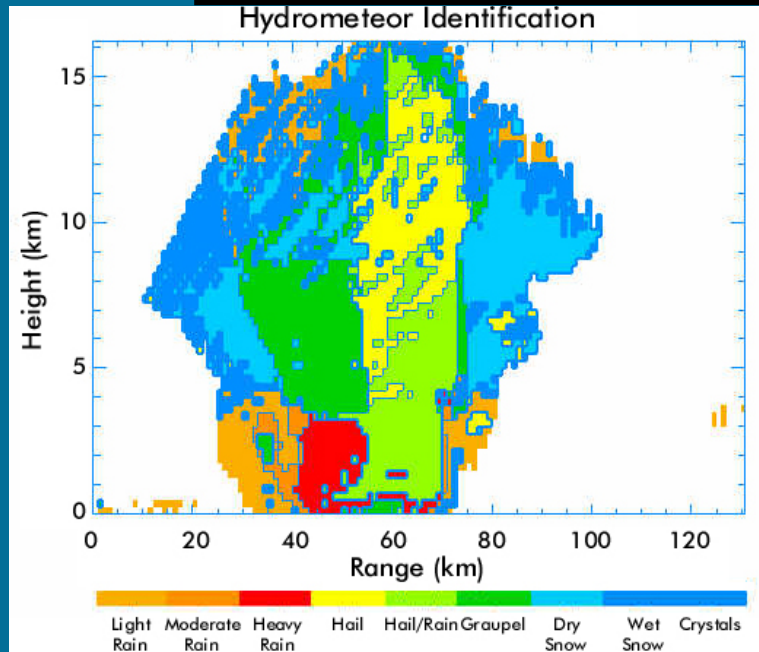
- Improve temporal, spatial, and spectral resolution at all scales
- Obtain observations of new environmental elements
- Improve data quality and timeliness
- Integrate multi-purpose observing systems and networks within an extensible enterprise architecture (EA)

Monitor and Observe

Radar

- **Open Systems Radar Data Acquisition**
  - ***1st deployment scheduled late FY04***
  - ***About 80 systems upgraded prior to 2005 storm season***
- **Complete Development and Deployment of Dual Polarization Capability**

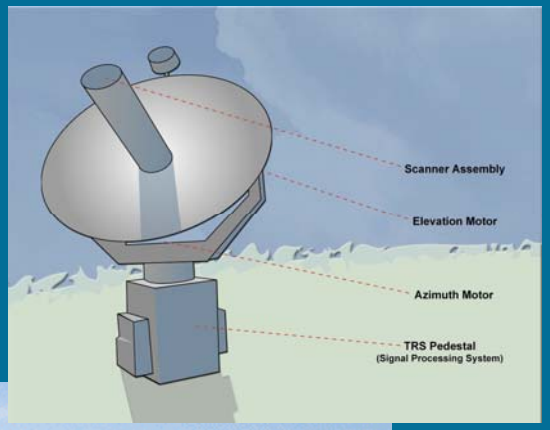




Monitor and Observe:

Upper Air

- Complete Radiosonde Replacement Program
- Sustain and Grow Meteorological Data Reporting and Dissemination System
- Integrate Profilers into Operational Observing Network



Monitor and Observe

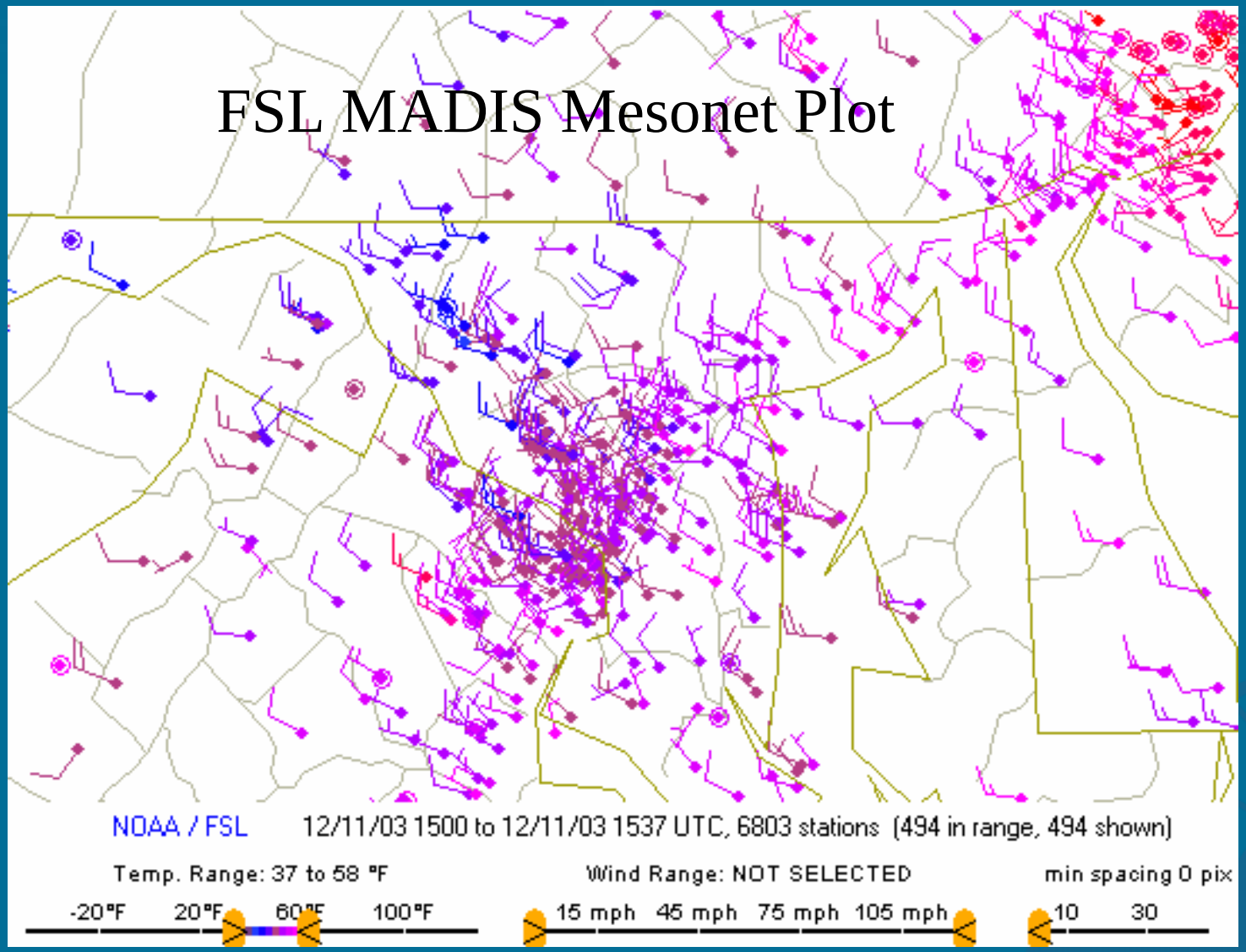
COOP Modernization Program

- **COOP Modernization will provide U.S. with network of accurate, near real-time surface data**

- **Program change of $1.4M funds operation & maintenance of 460 modernized COOP sites installed during FY03/04 in New England and New York State**

Monitor and Observe

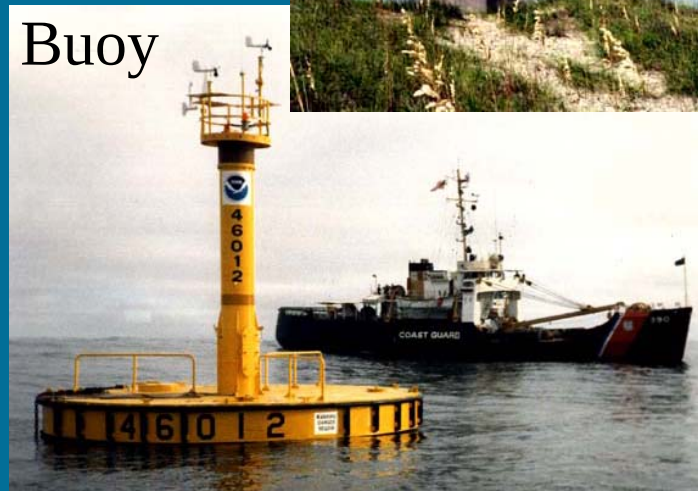
Mesonets



Monitor and Observe

Coastal Global Ocean Observing System (CGOOS)

- **Add sensors to 14 existing buoys and 6 Coastal Marine (C-MAN) stations**
- **Fill Marine Buoy Coverage Gaps**
- **Address Recommendations in National Research Council Report**
- **Provide NOAA with a 3D view of the oceans**



Monitor and Observe

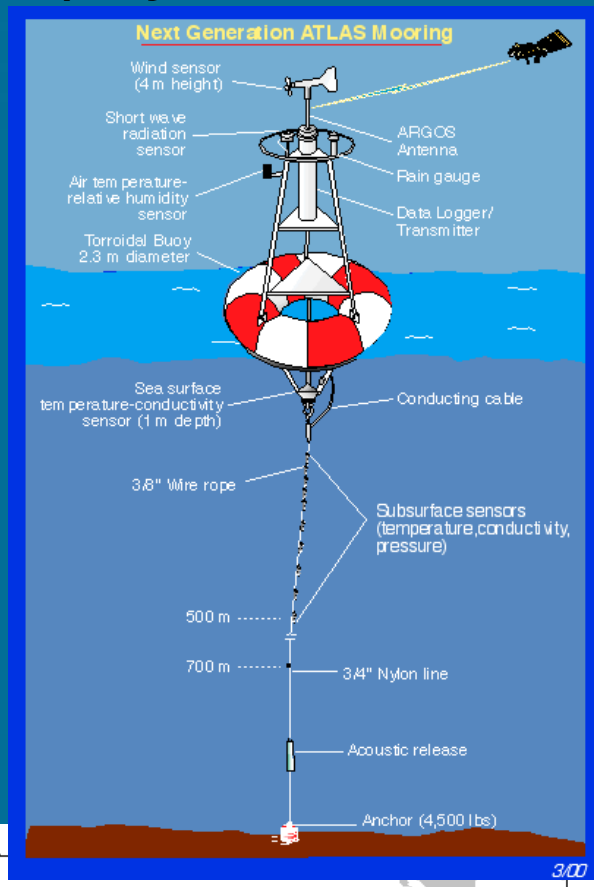
Tropical Atmosphere and Ocean (TAO) System

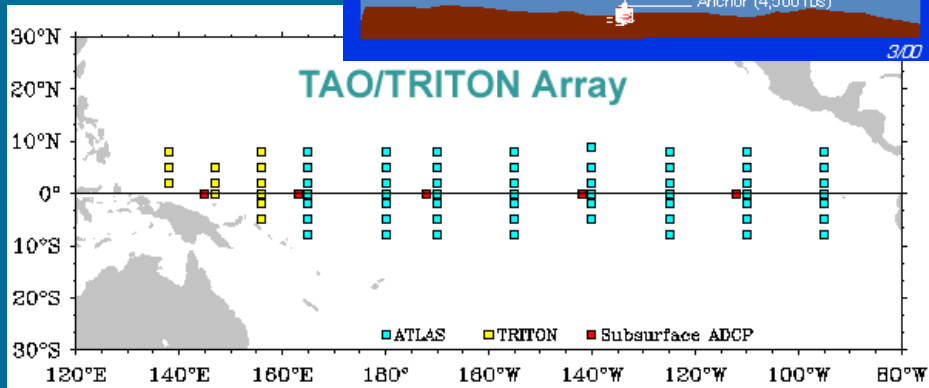
Current Status

- **Completed in 1994**
- **Managed by OAR Pacific Marine Environmental Laboratory (PMEL)**
- **70 moored buoys with real-time collection of high quality oceanographic and surface meteorological data**
- **Used for predicting La Nina/El Nino and validating satellite remotely sensed atmospheric and marine observations**

Where are we going?

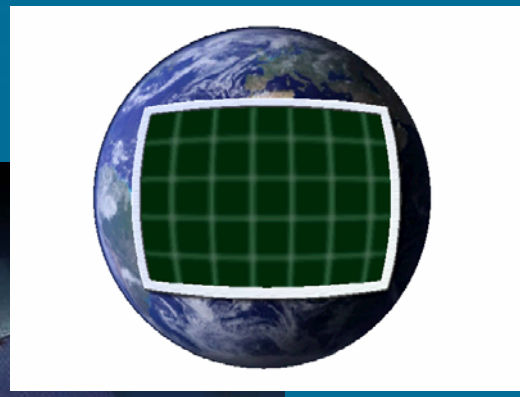
- **Transferred to NWS National Data Buoy Center (NDBC) in FY05**
- **Will be maintained as a component of the Global Climate Observing System**





Monitor and Observe

Integrated Observations

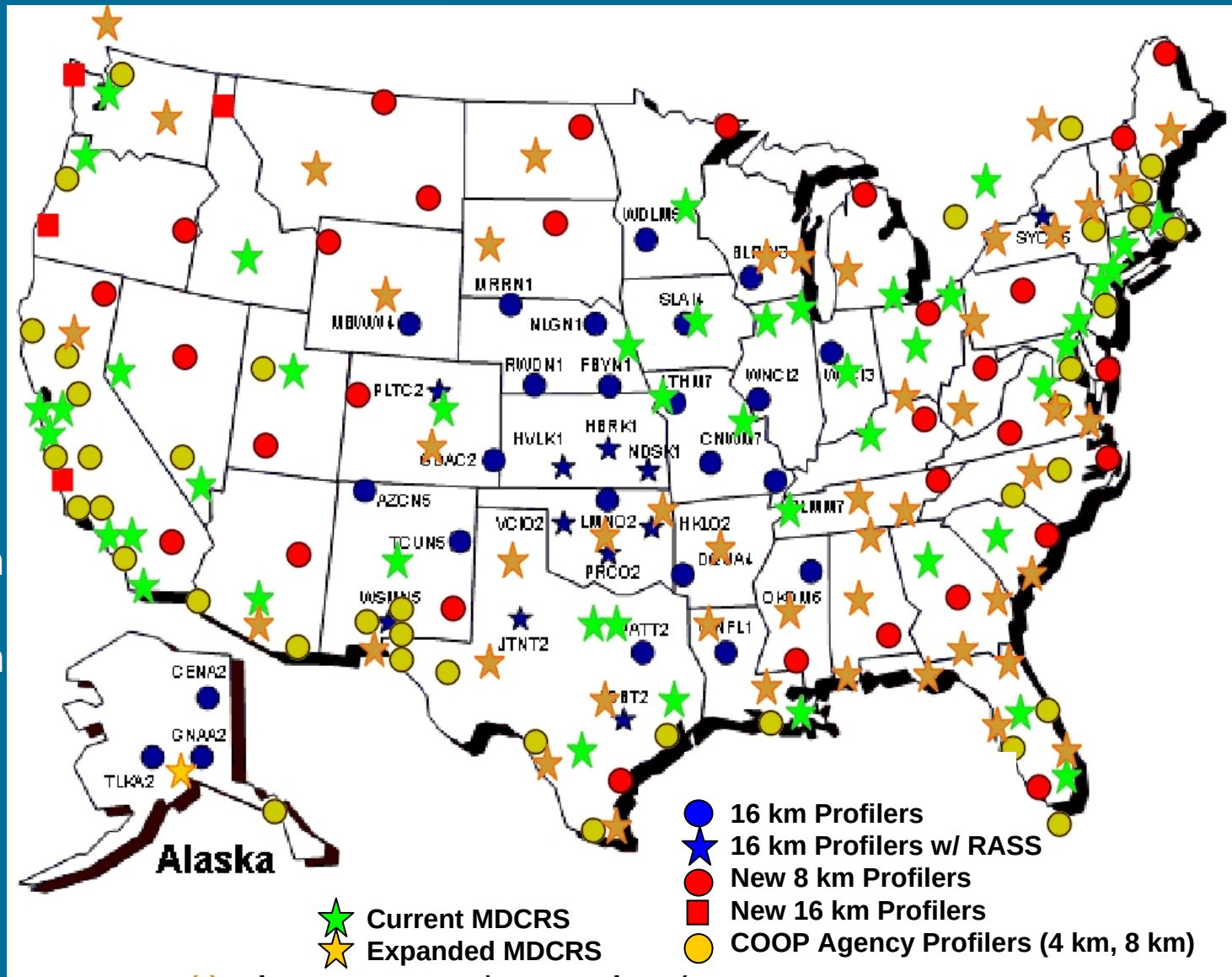


Monitor and Observe

Integrated Tropospheric Observing System (ITOS)

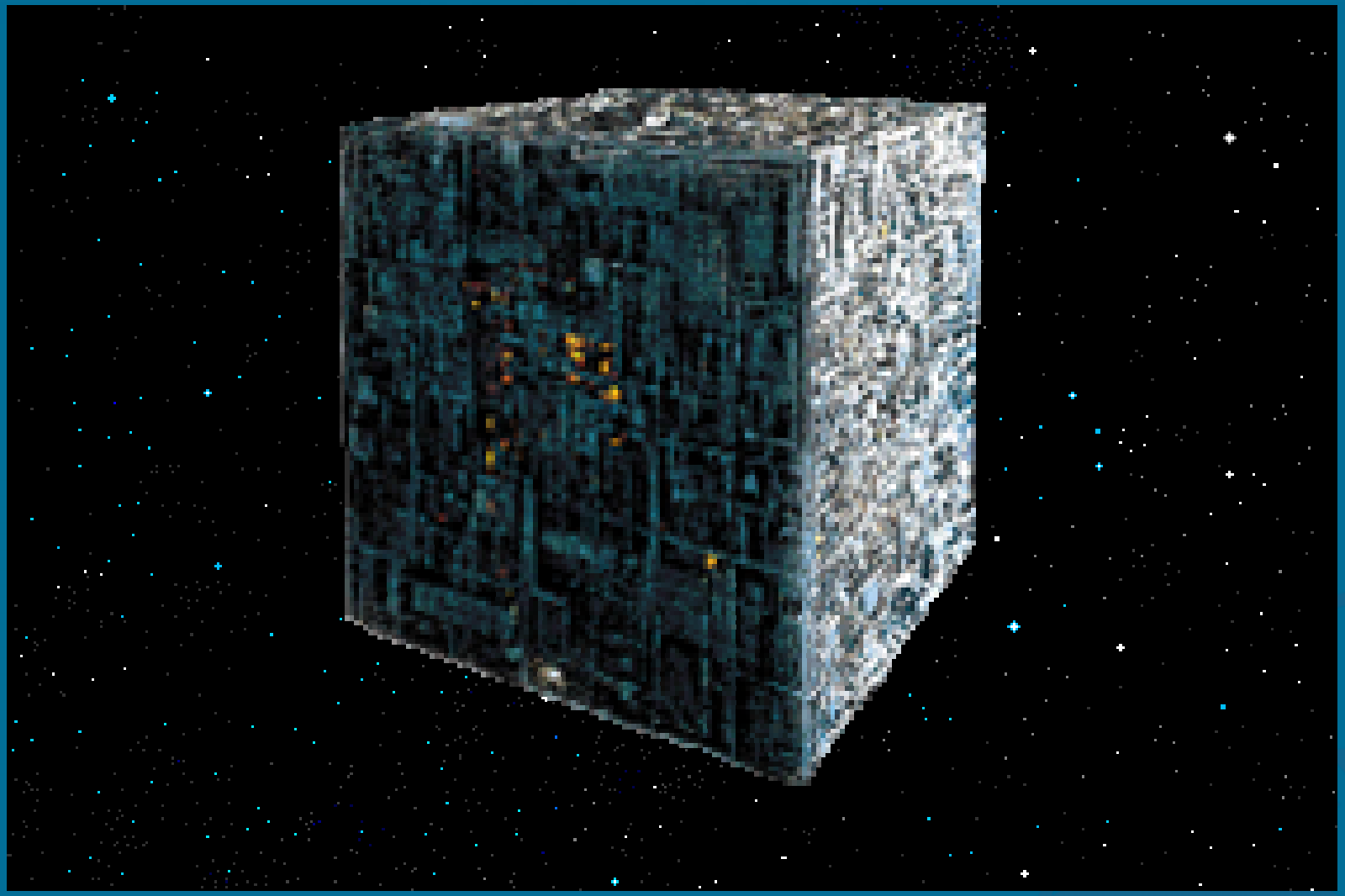
A Component of NOAA's Integrated Global Observing System

- **Leveraging: 50% NOAA, rest private and non-NOAA**
- **Time: 1 sounding / 3 hrs, min parameter: winds**
- **Height: Sfc-6 km**
- **Spacing: 160 km horizontal 0.3 km vertical**



Vision: Integrated probabilistic environmental forecasts and information.

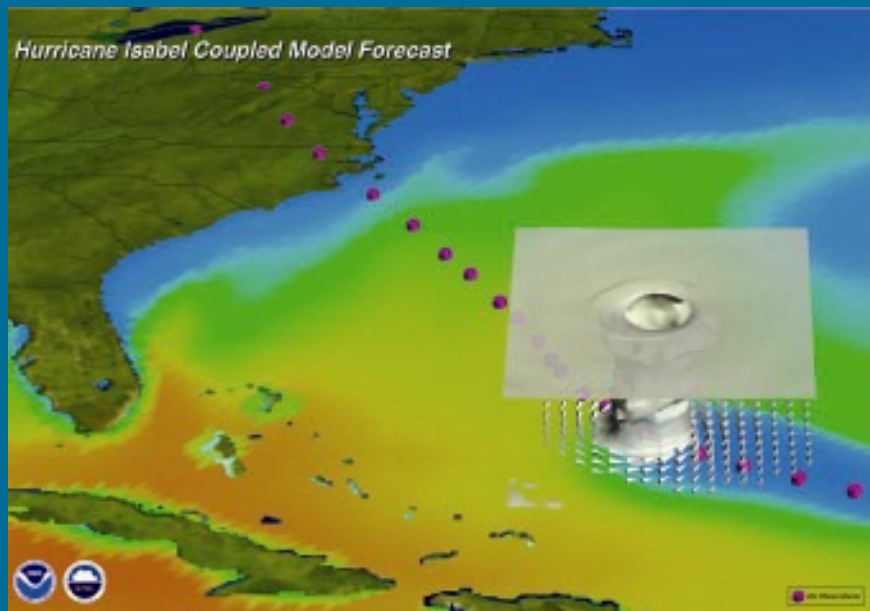
We Will Assimilate



Assess and Predict

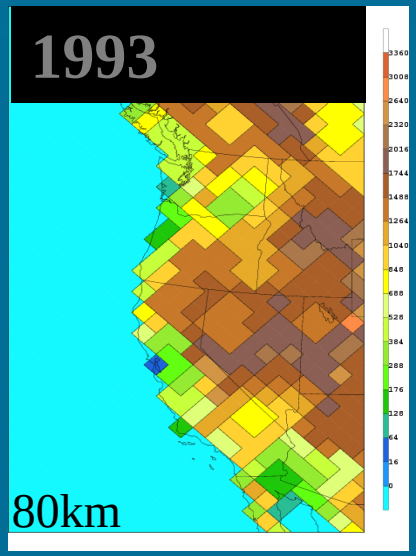
Objectives

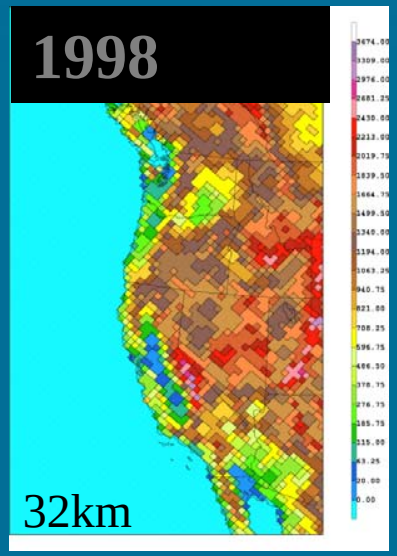
- Develop Advanced and High Resolution Data Assimilation Techniques
- Improve Models and Linkages Among Weather, Water, and Climate Processes
- Improve Probabilistic Environmental Information by Fully Establishing and Applying Ensemble Prediction Systems
- Improved Forecast Applications

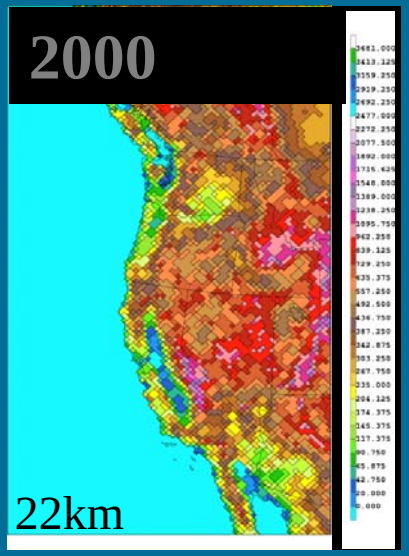


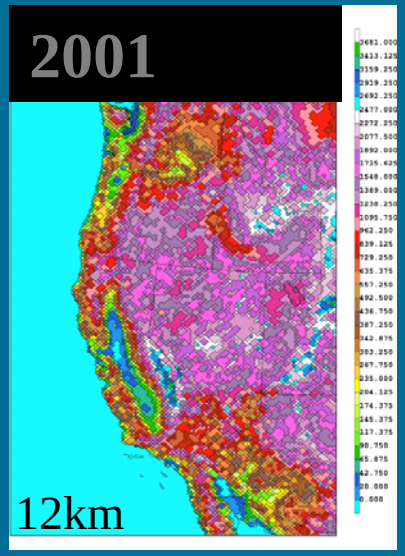
Assess and Predict

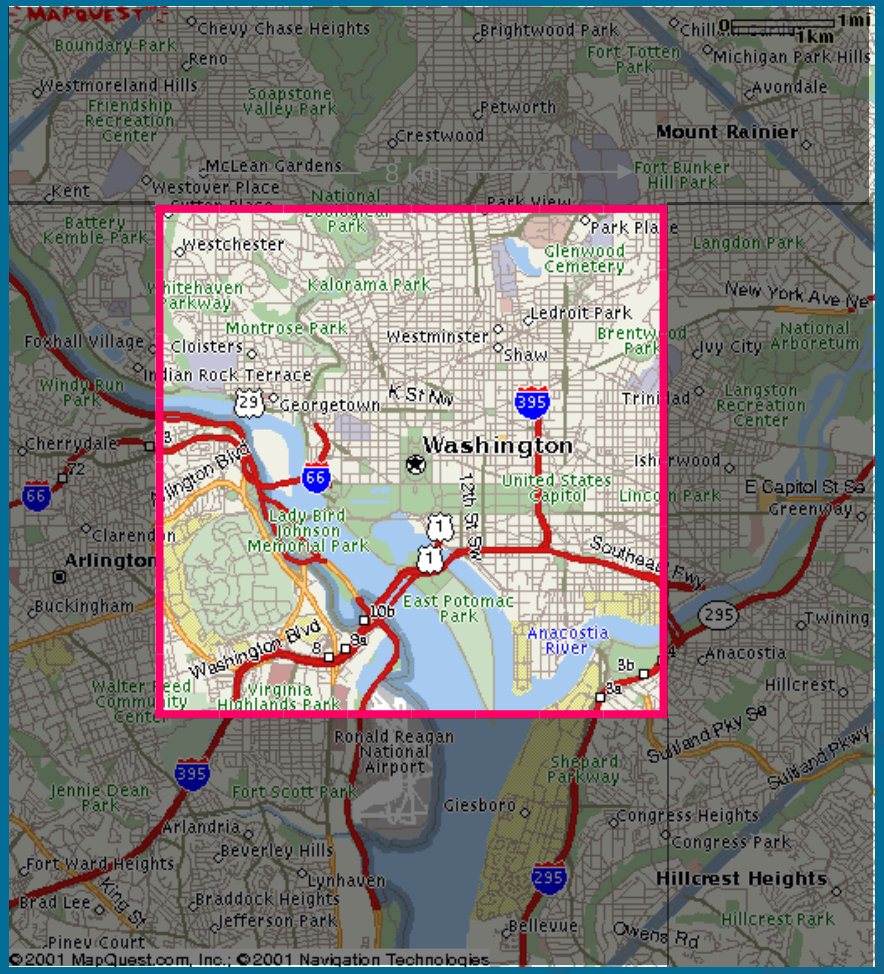
Data Assimilation and Modeling











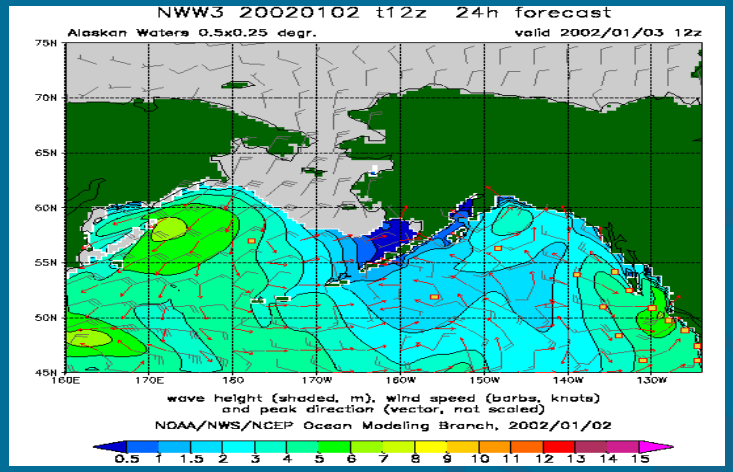
Sample coverage of an 8 km grid point

Assess and Predict

Ocean Prediction

Ocean Prediction Center Analysis & Forecast Products:

- winds, sea state, restrictions to visibility
- vessel superstructure icing, coastal flooding, surf conditions, rip currents, sea ice
- Gulf Stream location, sea surface temperature,
- tropical cyclones, ocean storm surge, tsunamis
- radiological dispersion
- aviation-related fields

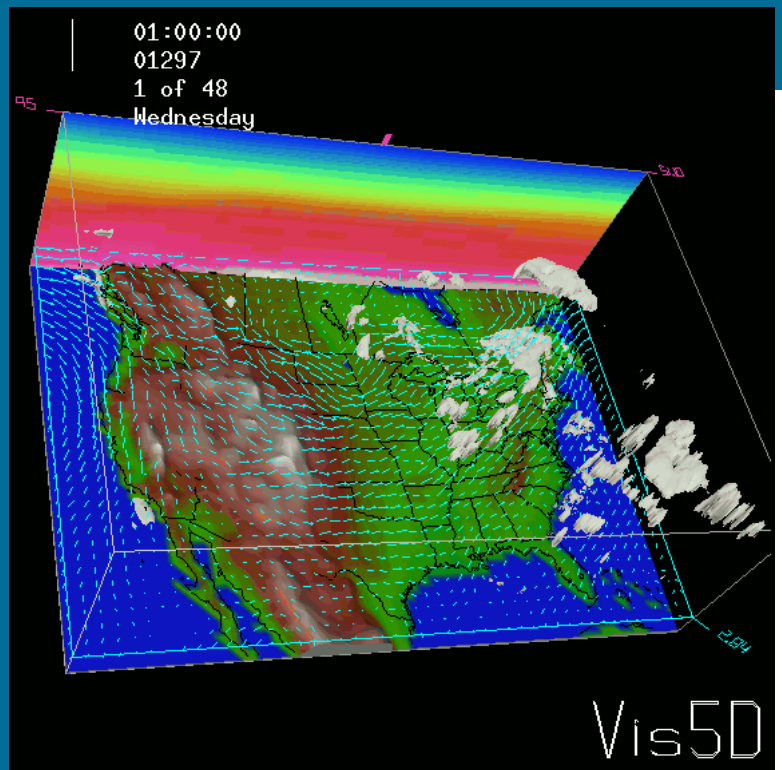


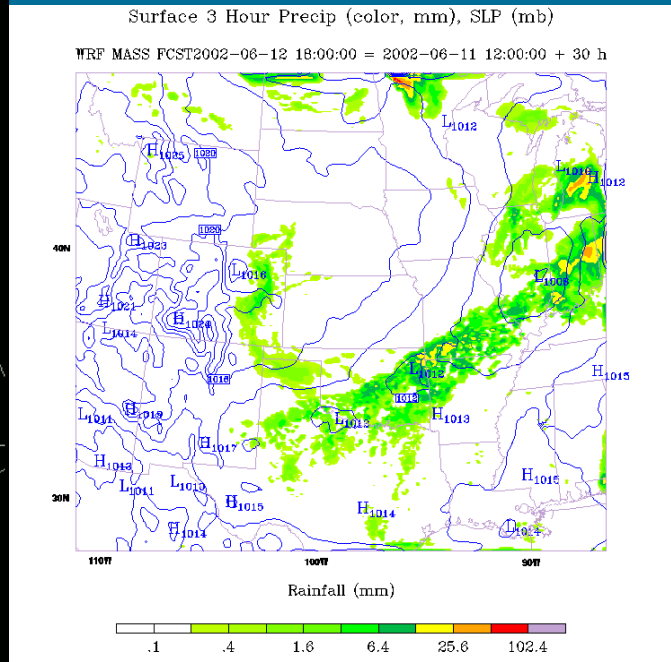
Wavewatch III

Assess and Predict

Weather Research Forecast Model

- ***Initial Operating Capability in Fall 2004***
- ***NOAA participation in Earth System Modeling Framework***





Assess and Predict

Advanced Hydrologic Prediction Service

Insert GIS flood inundation animation here

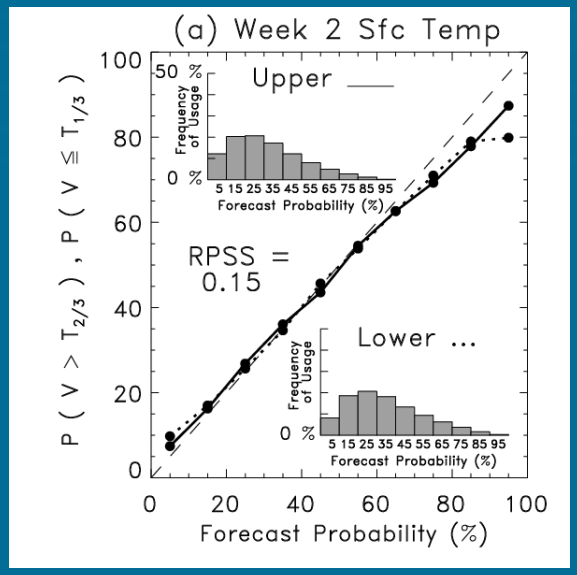
Assess and Predict

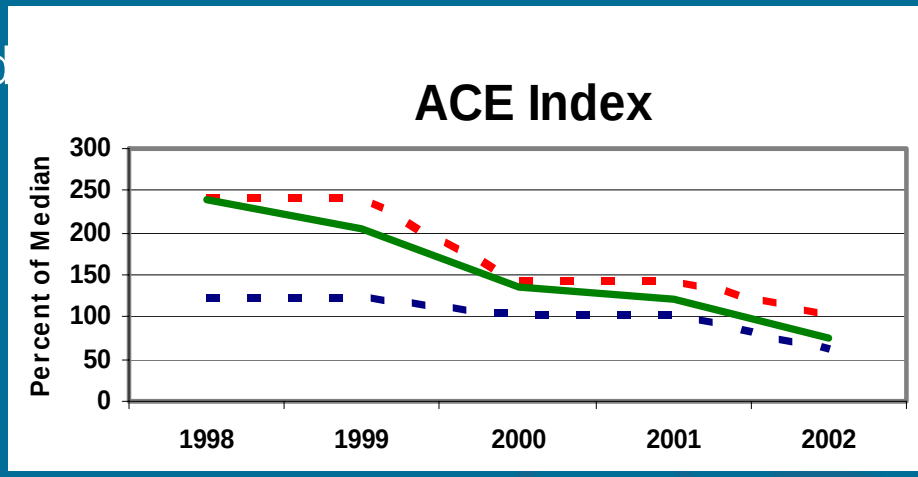
NWS Climate Services Improvements

- **Vision: Provide resources and direction to ensure NWS climate services are easily accessible, understood, optimally used, and satisfy customer needs.**

- **Week Two Predictions**
  - Big gains made in forecast skill by
  - statistically correcting forecasts
  - Validations show “corrected” 8-14 d
  - forecasts superior to “official” 6-10
  - forecasts

- **Hurricane Season Outlooks**
  - Sixth straight year of accurate predictions of hurricane activity (above, normal, below)

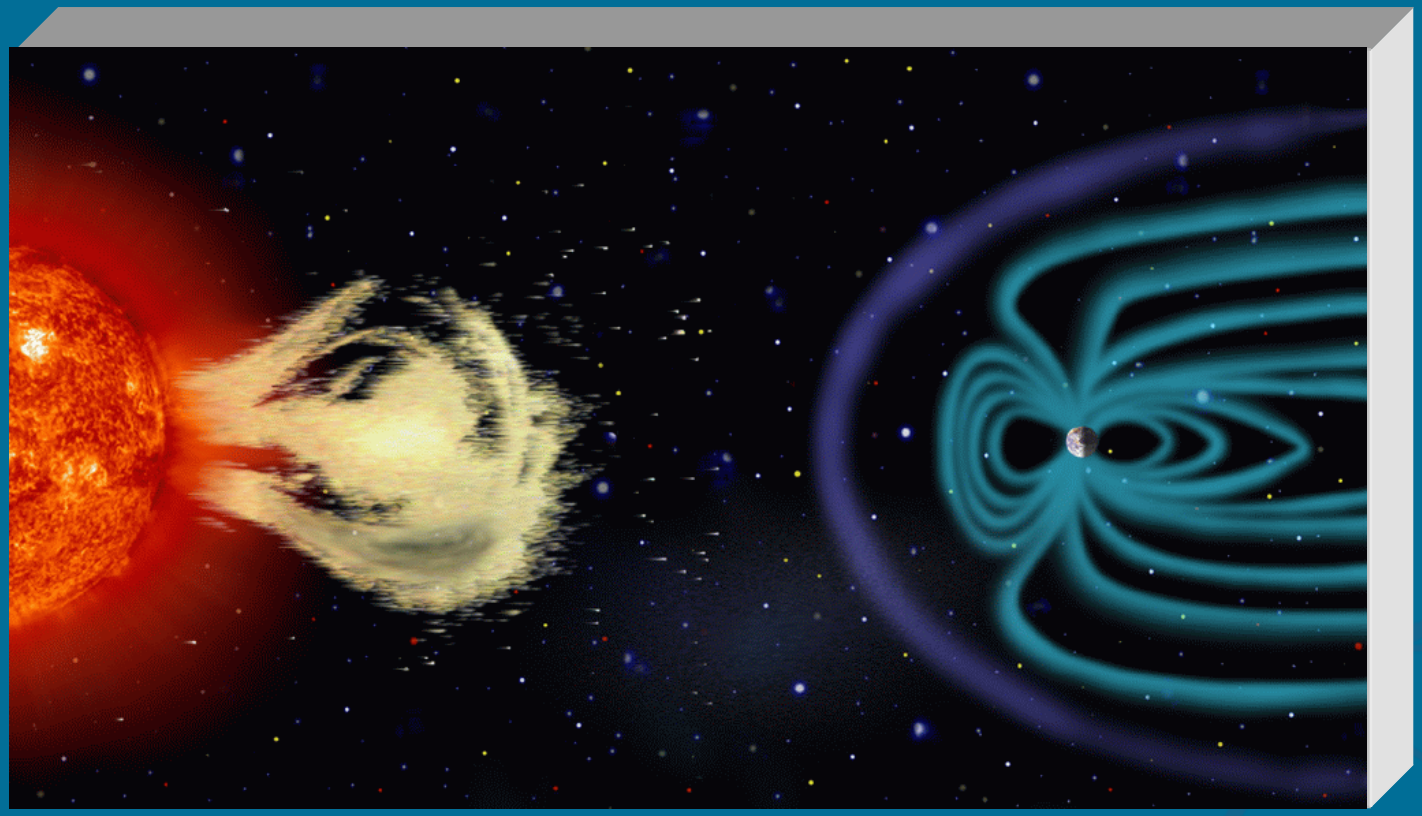




Assess and Predict

Space Weather

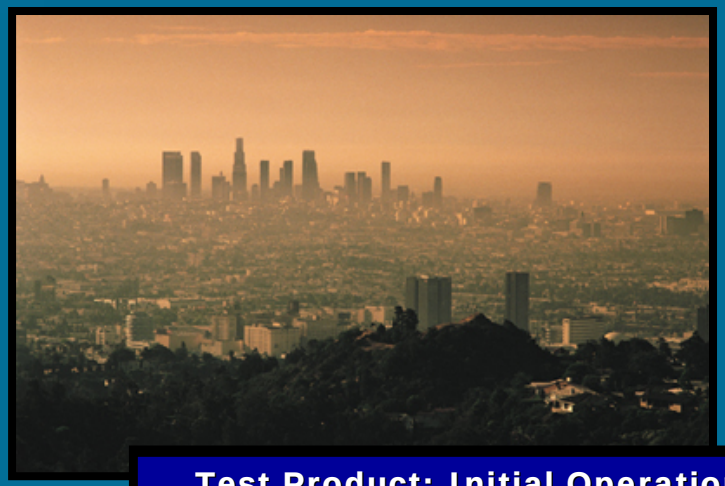
Research to Operations to Action

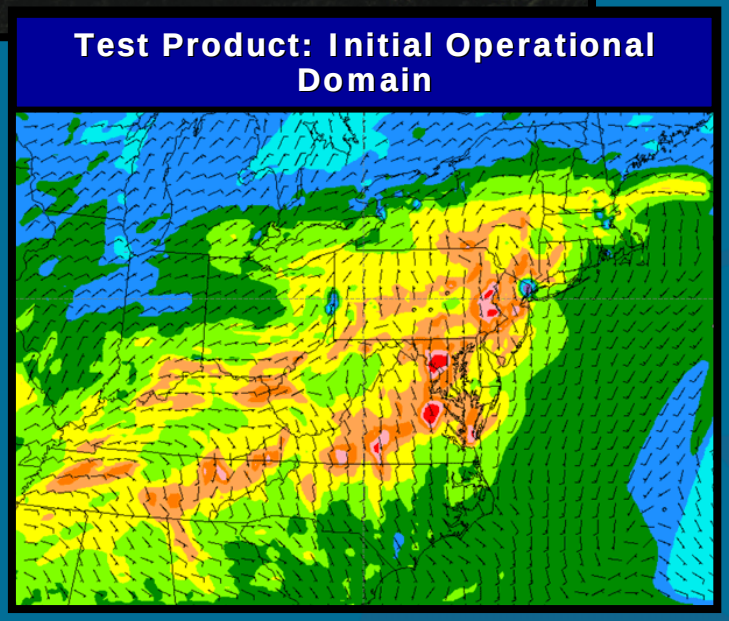


Assess and Predict

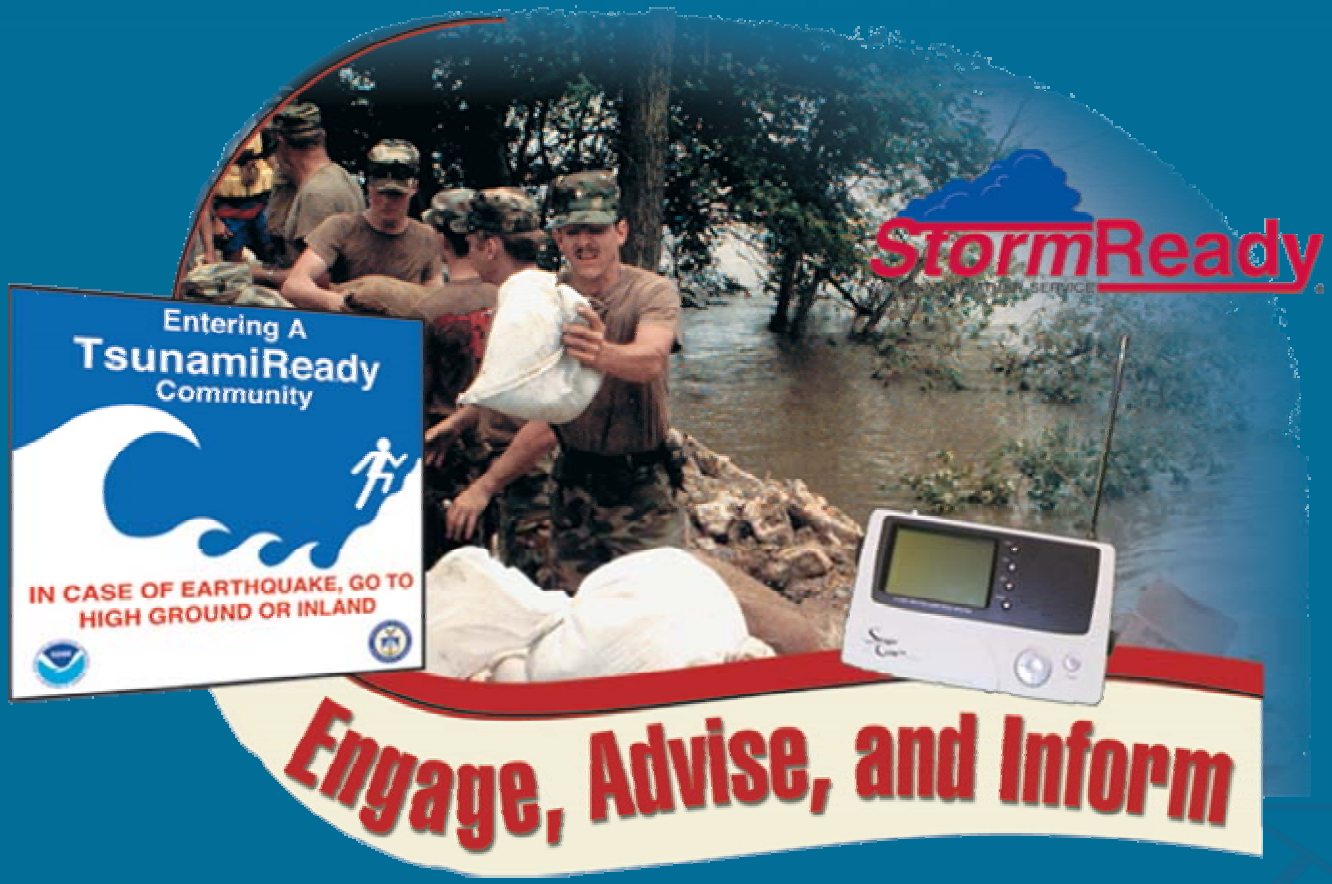
National Air Quality (AQ) Forecasting

- **Lives and property at risk from poor AQ**
- **AQ Forecast guidance produced 2 times daily**
- **Phased Deployment**
  - *Beginning FY 2005: Northeastern US, next-day, ozone*
  - *Five years: Nationwide coverage;*
  - *Later on…particulates forecasts*





Vision: Reach each person in the Nation.



Engage, Advise, and Inform

Objectives

- Keep pace with need for more data and information
- Provide appropriate information when and where needed
- Meet customer information and timeliness needs

Engage, Advise, and Inform

Weather, Water, and Climate Team

Engage, Advise, and Inform:
Dissemination

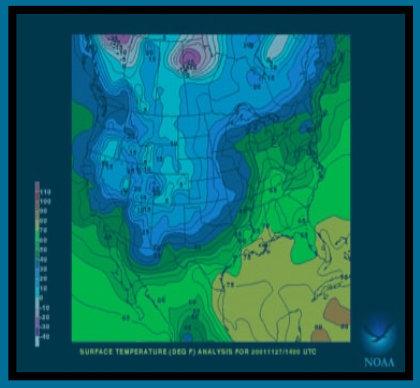
- All-Hazards NOAA Weather Radio
- Media
- Commercial Weather Services
- Emergency Management Community
- Internet II

Engage, Advise, and Inform:

National Digital Forecast Database (NDFD) Gives Customers What They Want

Different Products for Different Customers

Commercial weather companies & emergency managers use grids to generate tailored products



The public, emergency managers and city planners use WWW. graphic products for detailed forecasts

TODAY...RAIN LIKELY. SNOW LIKELY ABOVE 2500 FEET. SNOW ACCUMULATION BY LATE AFTERNOON 1 TO 2 INCHES ABOVE 2500 FEET. COLDER WITH HIGHS 35 TO 40. SOUTHEAST WIND 5 TO 10 MPH SHIFTING TO THE SOUTHWESTEARLY THIS AFTERNOON. CHANCE OF PRECIPITATION 70%.

Radio stations & public read text forecasts

- ✓ *More weather data*
- ✓ *Higher resolution forecasts*
- ✓ *Visual displays of probability*
- ✓ *User-defined products create business opportunities*

Vision: Advanced Analysis and Prediction of the Earth's Environment

Understand and Describe

Objectives

- Conduct and participate in process studies
- Develop and leverage new techniques and technologies
- Evaluate user needs and socio-economic impact of new products and services
- Integrate user needs, operations, and research results into prototypes for new products and services

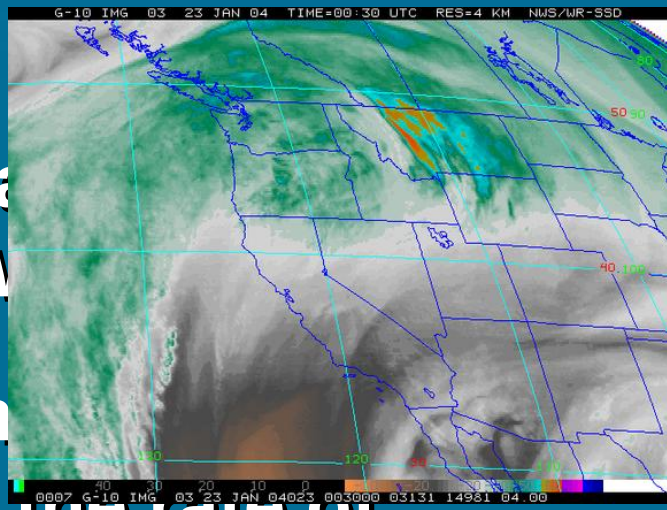
Understand and Describe

Improve hurricane forecasting

- ***Intensity***
- ***QPF***

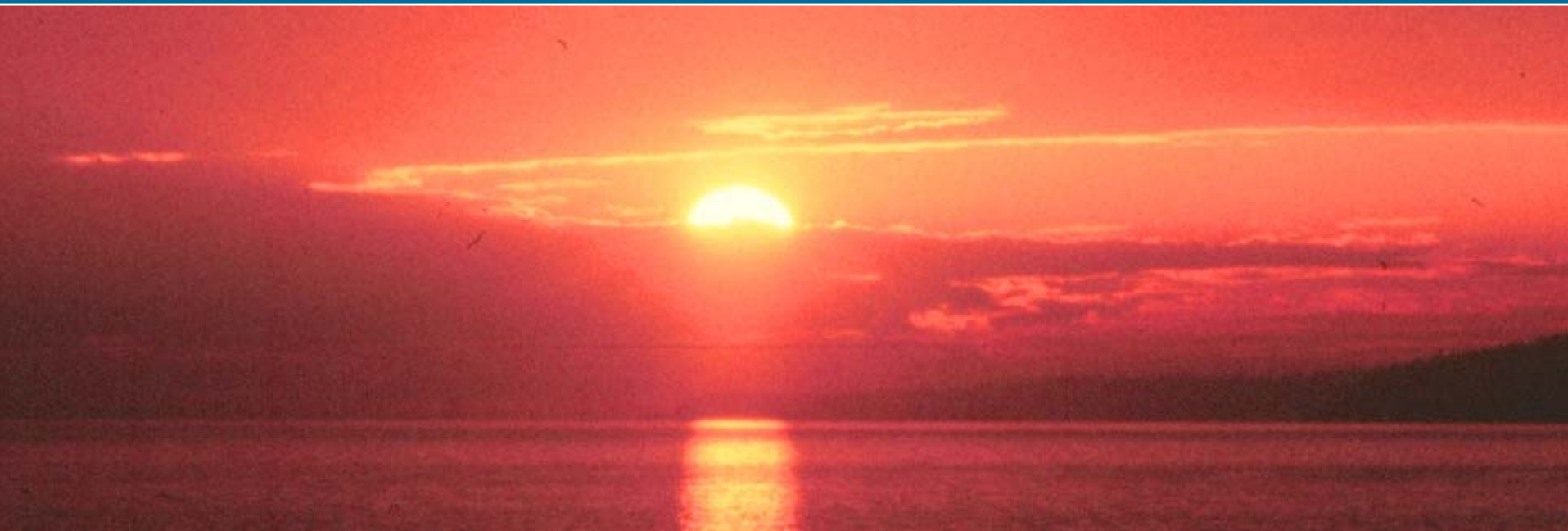
Understand and Describe

USWRP/ Hemispheric Observing System Research and Predictability Experiment (THORPEX)



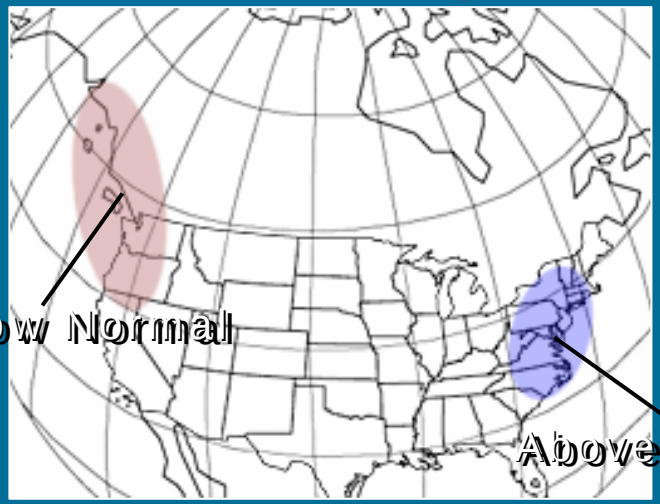
- **THORPEX is a 12-nation interna Meteorological Organization (W**
- **Goal to accelerate improvemen accuracy of 1-14 day at double the rate of improvement seen over the past 20 years; make 10-14 day forecasts as accurate as current 7-10 day forecasts**
- **Partners include WMO, U.S. Navy, NASA and National Science Foundation (NSF)**

Putting it all together…



Event Scenario

Seasonal Precipitation

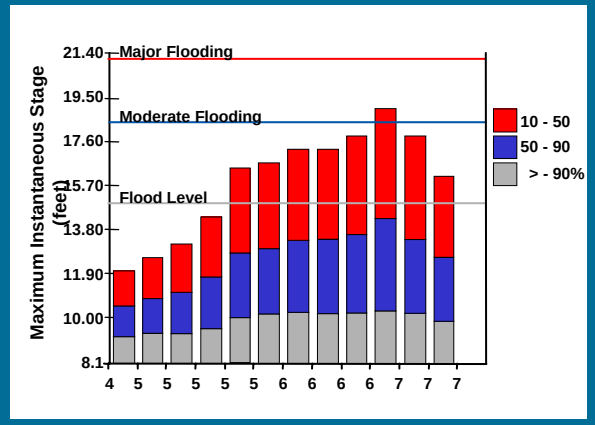


Precipitation Outlook
Made Mar 17 200x
Valid AMJ 200x

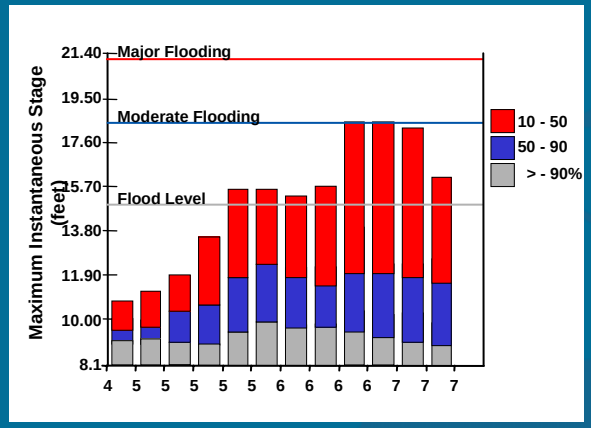
US Hazard Assessment

NWS Hazard Assesment
Made Jun 10 200x
Valid Jun 13-24 200x

Potomac Stage



Susquehanna Stage



Upper Chesapeake Bay Ecology

Nutrient Loading

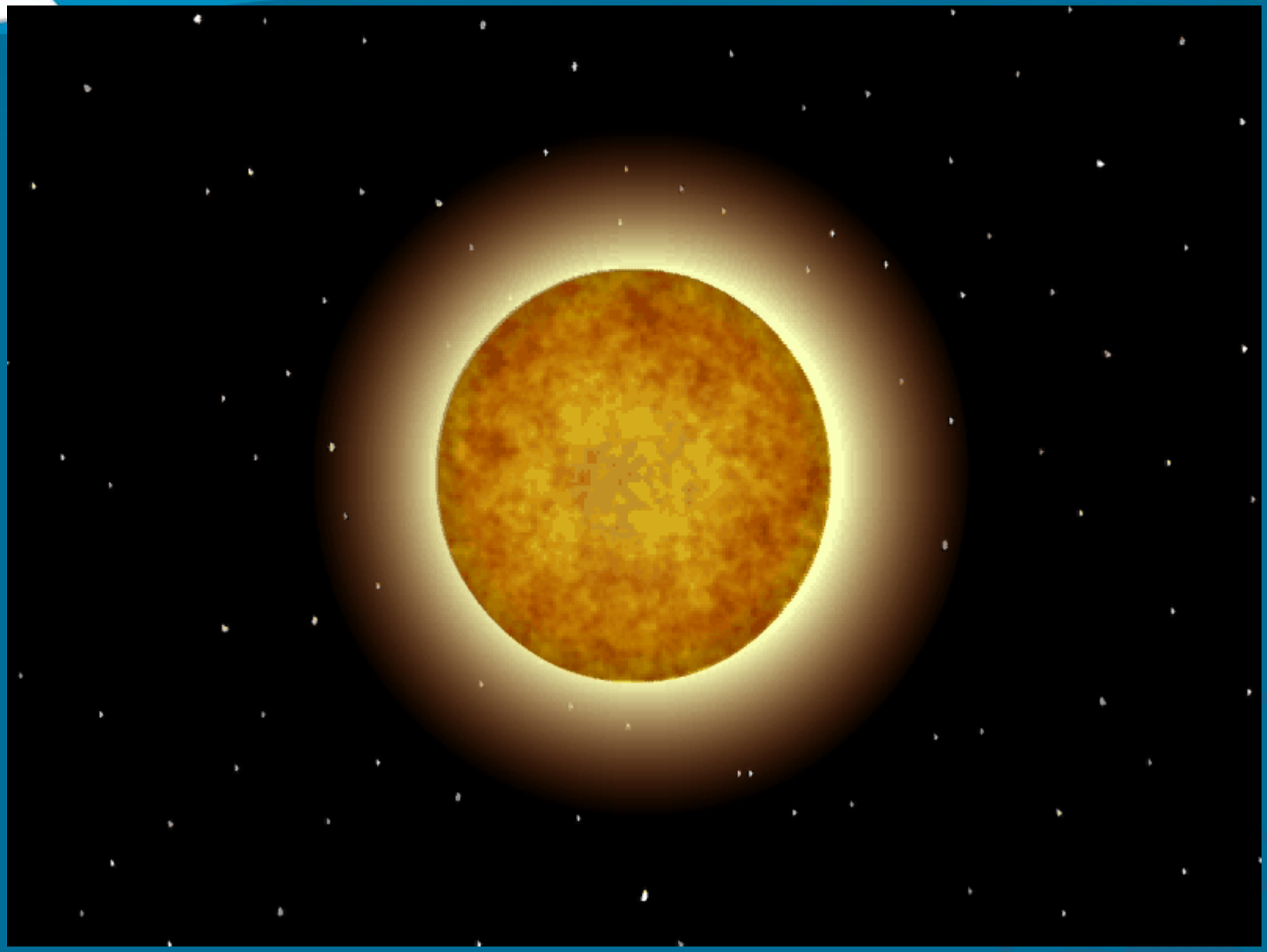
Turbidity

Salinity

Oyster Mortality

Challenges

- Technology Infusion
- Aviation Weather
- Water Resource Information
- Climate Services
- Homeland Security

Result

Safer, stronger, healthier America through trusted, timely, and accurate environmental information