A Sampling of NOAA's *Best Research Accomplishments*

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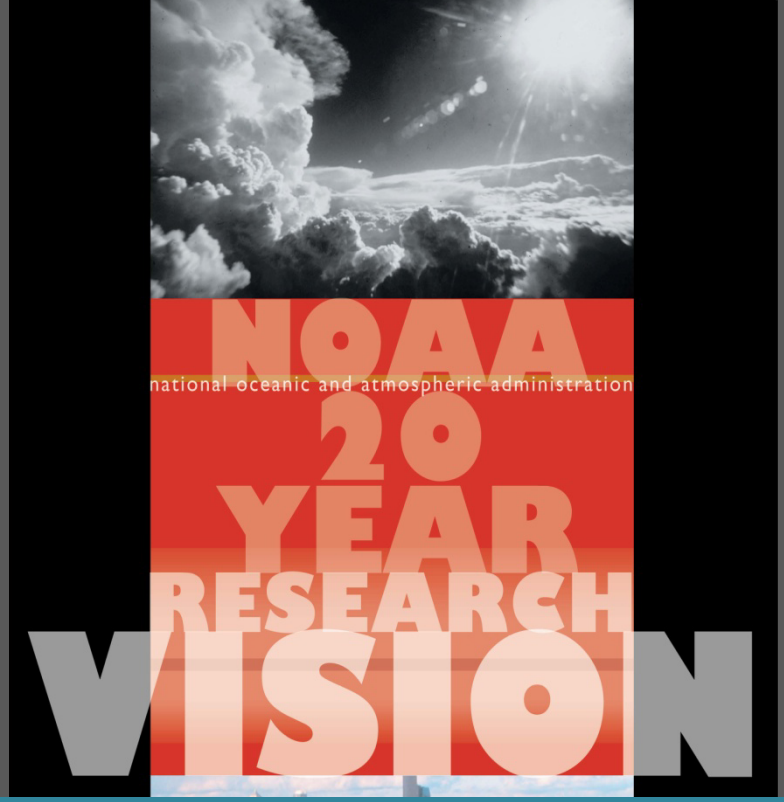
Assistant Administrator
Office of Oceanic & Atmospheric Research
National Oceanic & Atmospheric Administration



An informed society that uses
a comprehensive understanding of the role of
the oceans, coasts, and atmosphere in the global
ecosystem to make the best
social and economic decisions.

Research *Drivers*

- Population growth
- Energy security
- Resource use
- Climate change
- Pollution

5-Year Research Plan

Research *Emphases*

Integration

- Understanding, analysis, modeling, advanced technologies
- Global Earth Observing System of Systems (GEOSS)

Transition

- Strategic, streamlined transition between research and development and operations and applications communities
- Use of testbeds and other vehicles

RESEARCH IN NOAA

January 2008

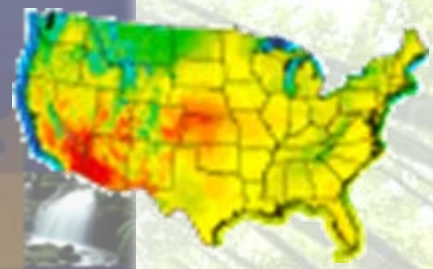
Toward Understanding and Predicting Earth's Environment

A FIVE YEAR PLAN: Fiscal Years 2008-2012

Observations

Models

Forecasts
Predictions
Projections

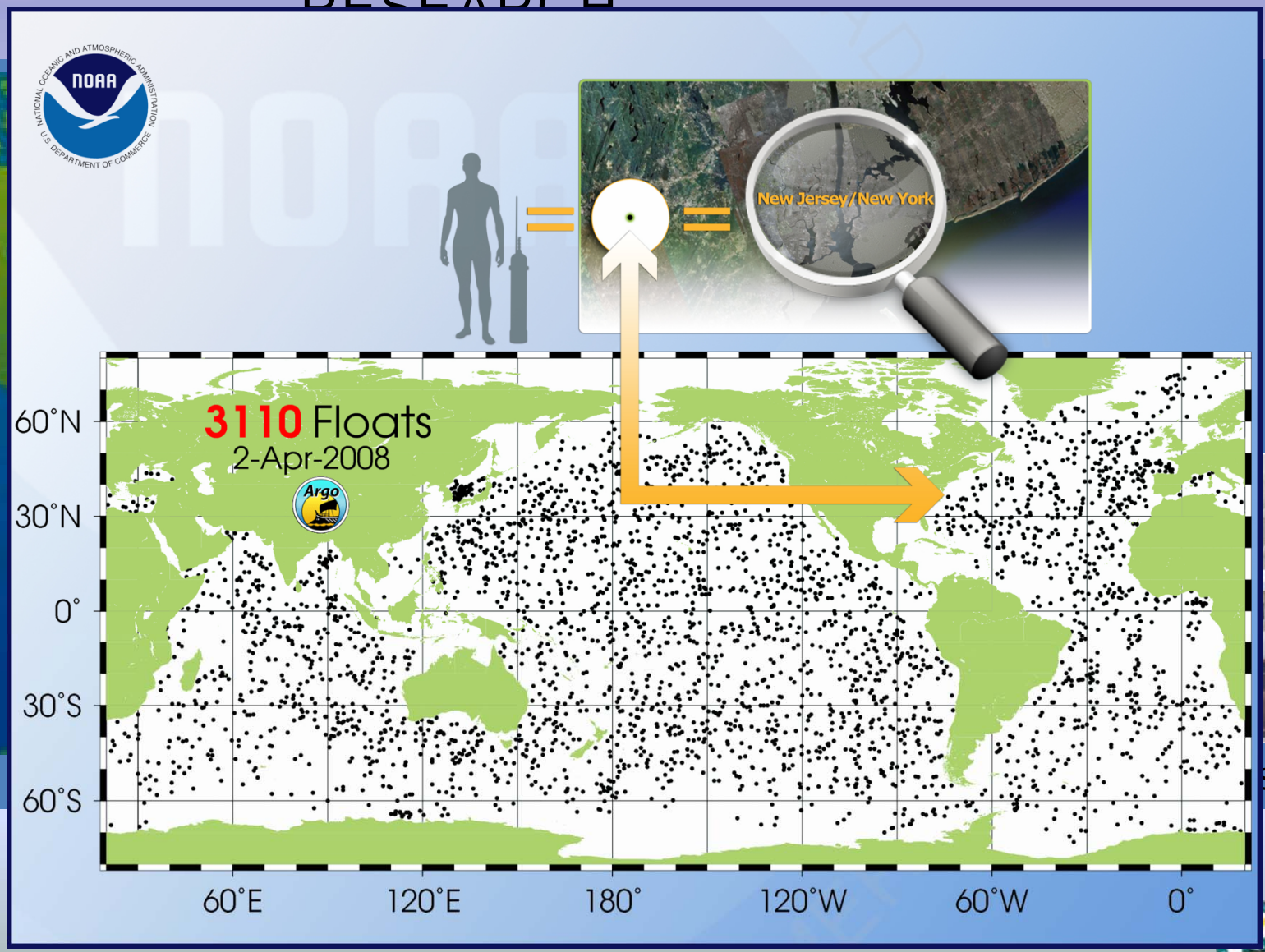


CLIMATE RESEARCH | Observations

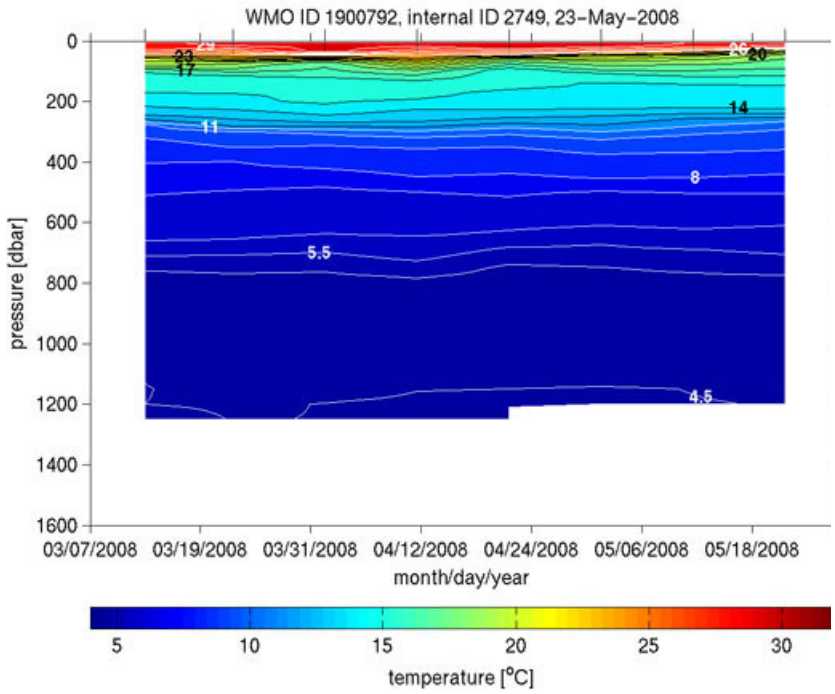
O_2 sensor

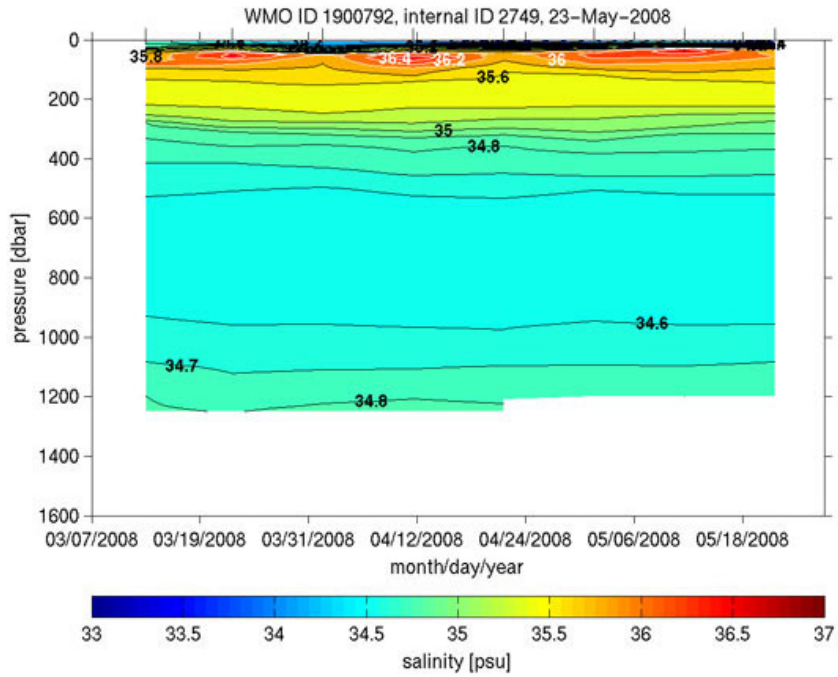
Argo Program Development

CLIMATE RESEARCH | Observations



CLIMATE RESEARCH | Observations





"Float of the Month"

Argo Data

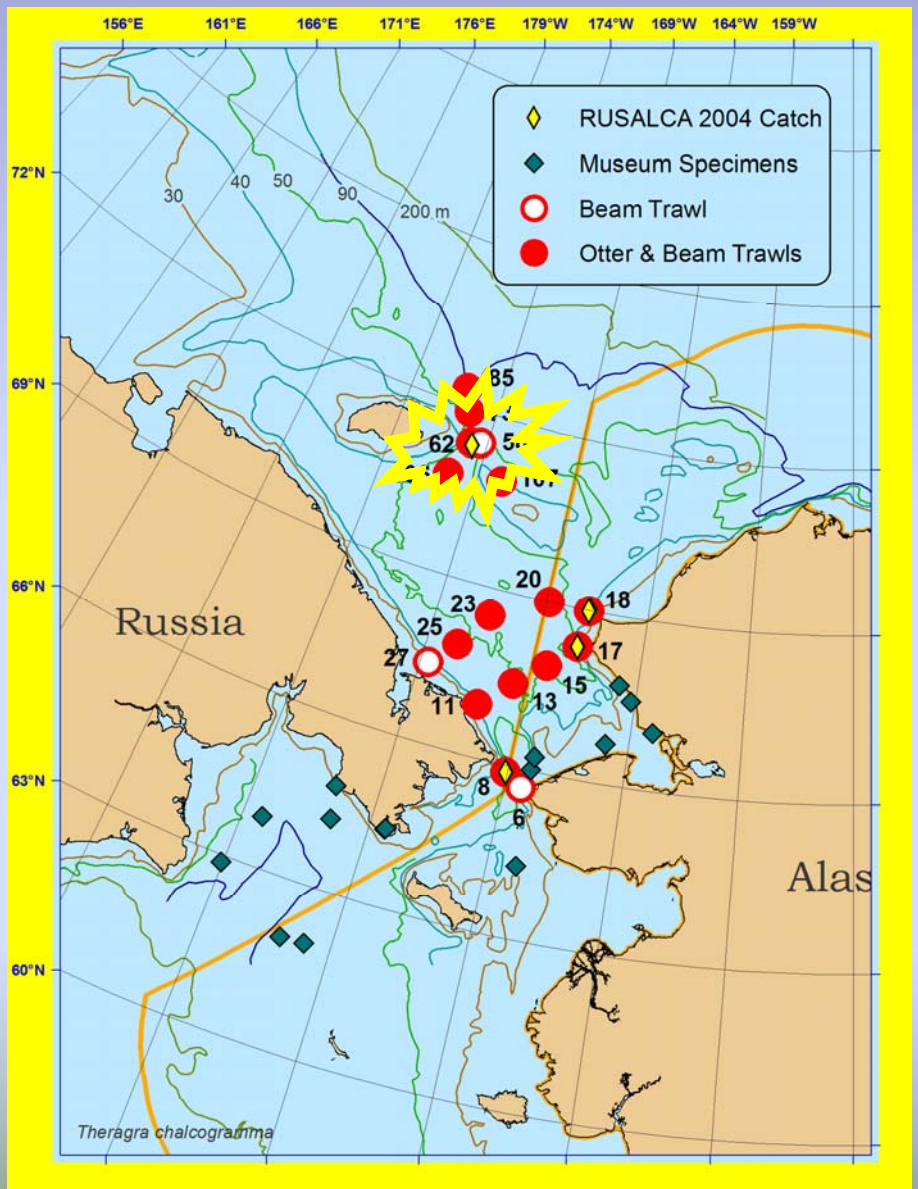
Off the coast of West Africa

0.02°S and 0.15°E

7 cycles between March 3 & May 12, 2008

CLIMATE RESEARCH | Observations

RUSALCA

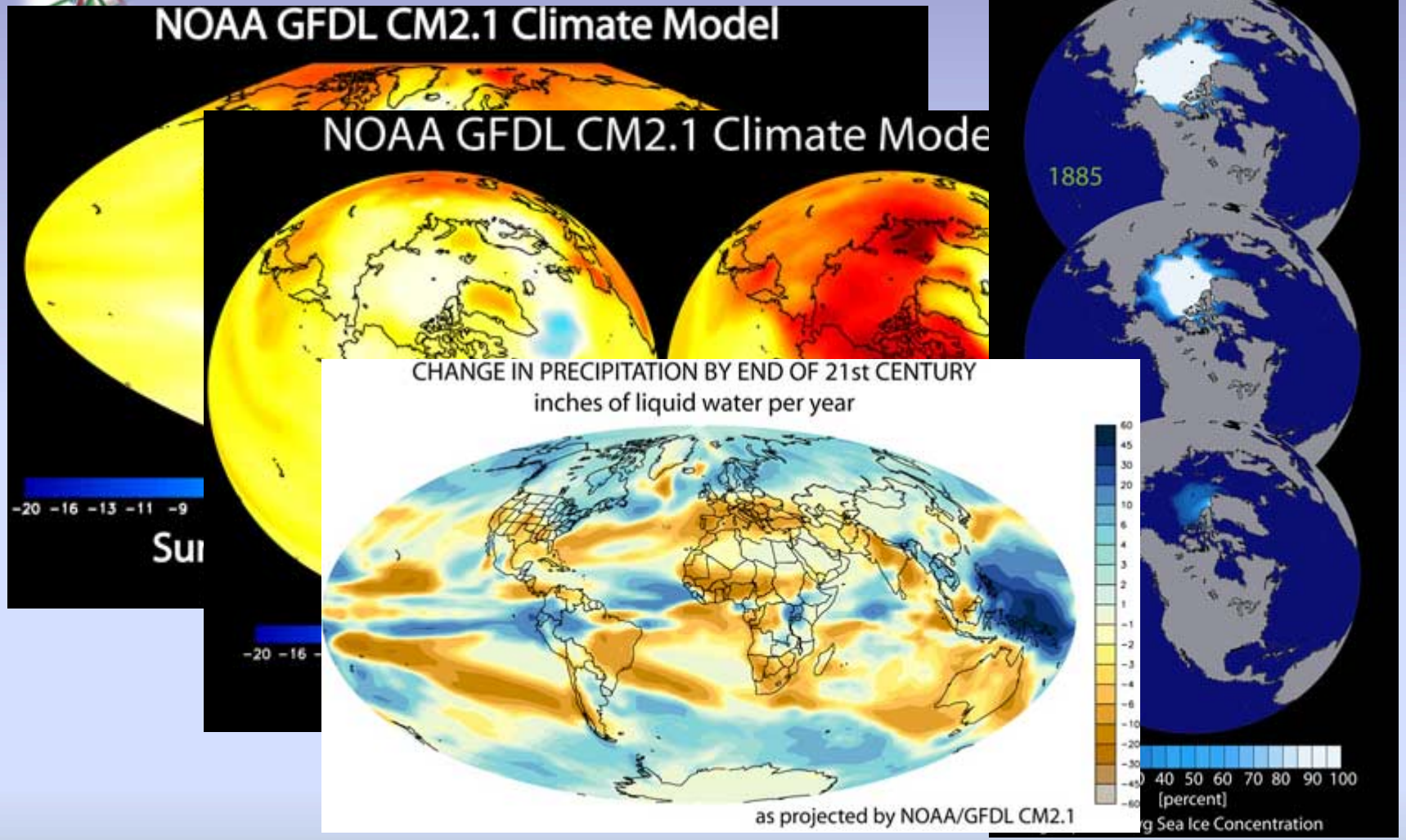


Found Further North

Walleye Pollock

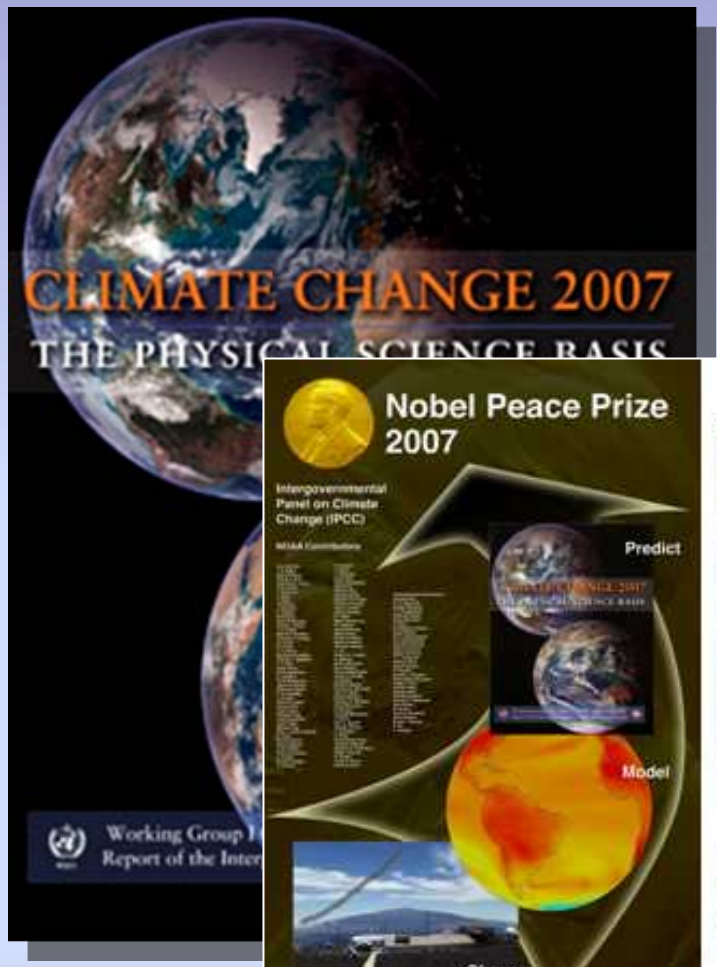
Theragra chalcogramma

CLIMATE RESEARCH | Modeling



GFDL global coupled climate model

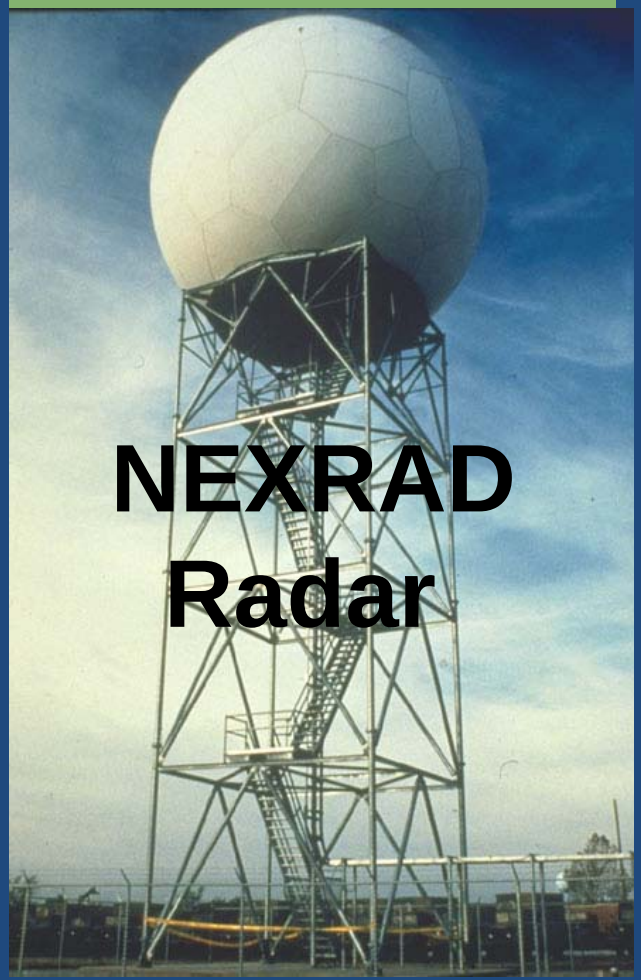
CLIMATE RESEARCH | Success



IPCC-4

WEATHER RESEARCH | Observations

Improved Observations



Improved Forecasting

Increased tornado lead time from a few minutes to 12-13 minutes

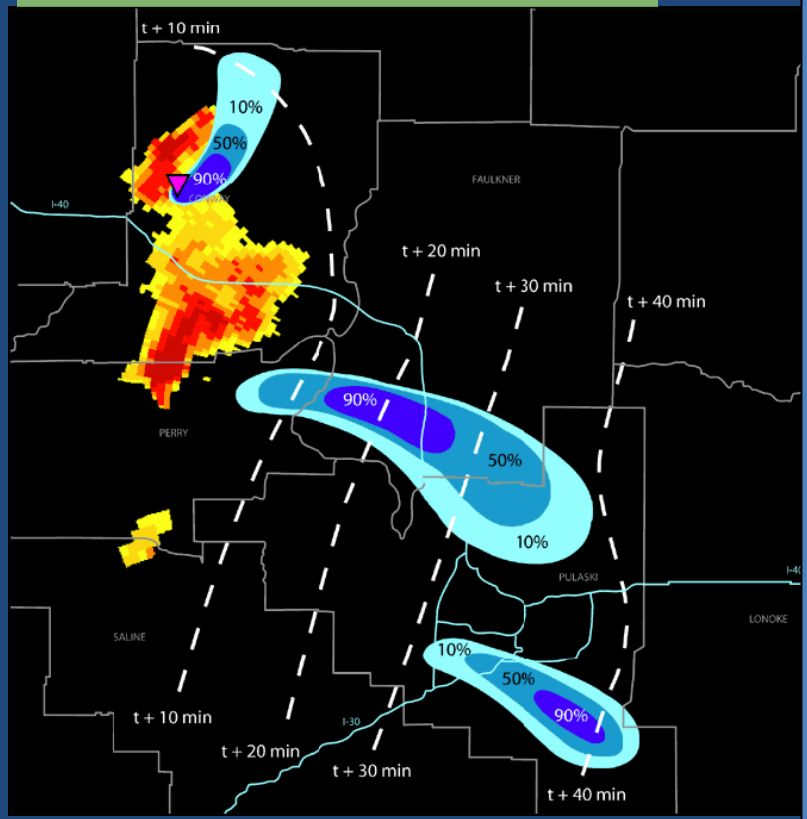
Probability of detection of tornadoes doubled to over 70%

Improved *Outcomes*

45% deaths
40% expected injuries

WEATHER RESEARCH | MPAR

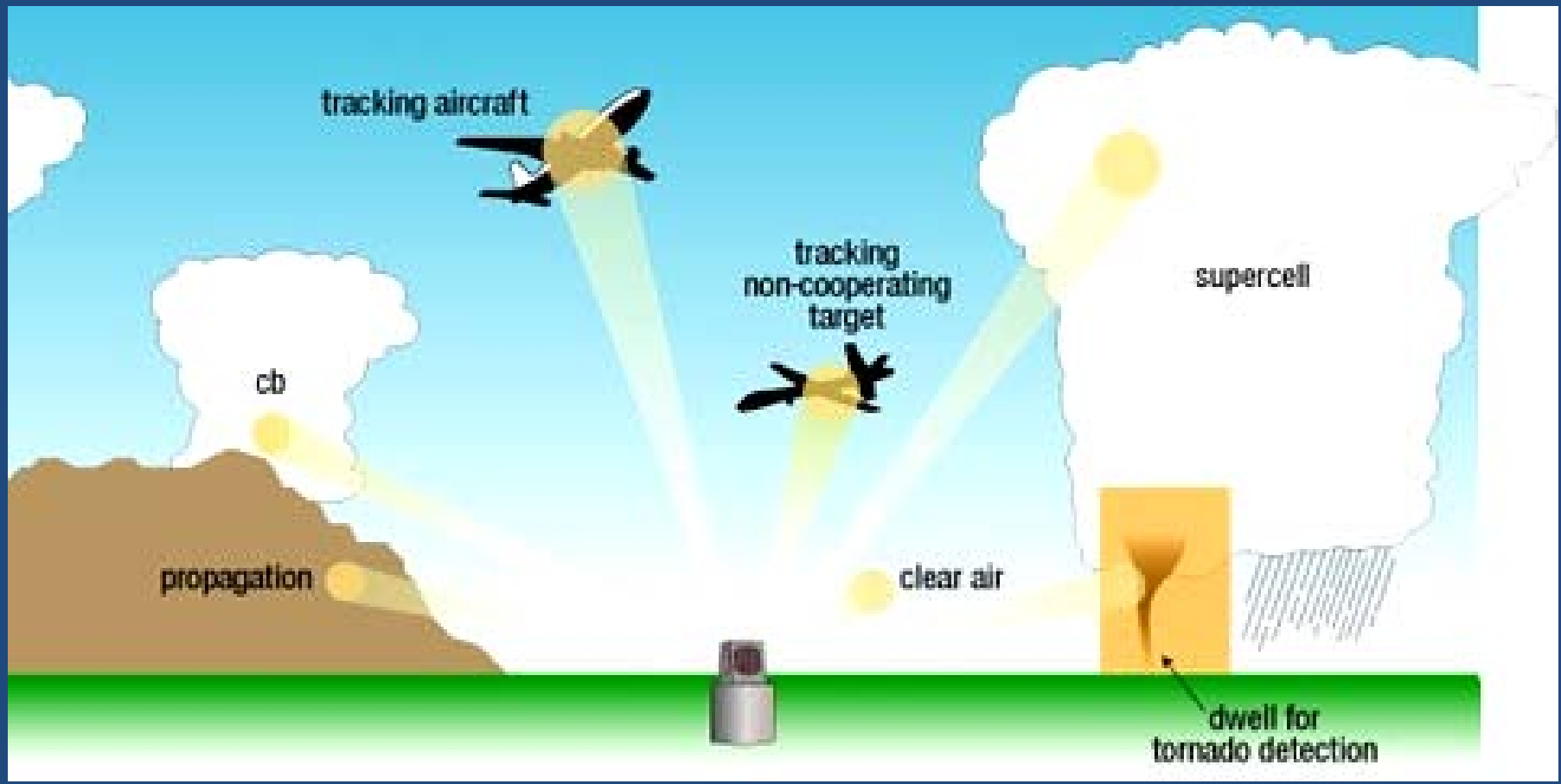
Improved Observations

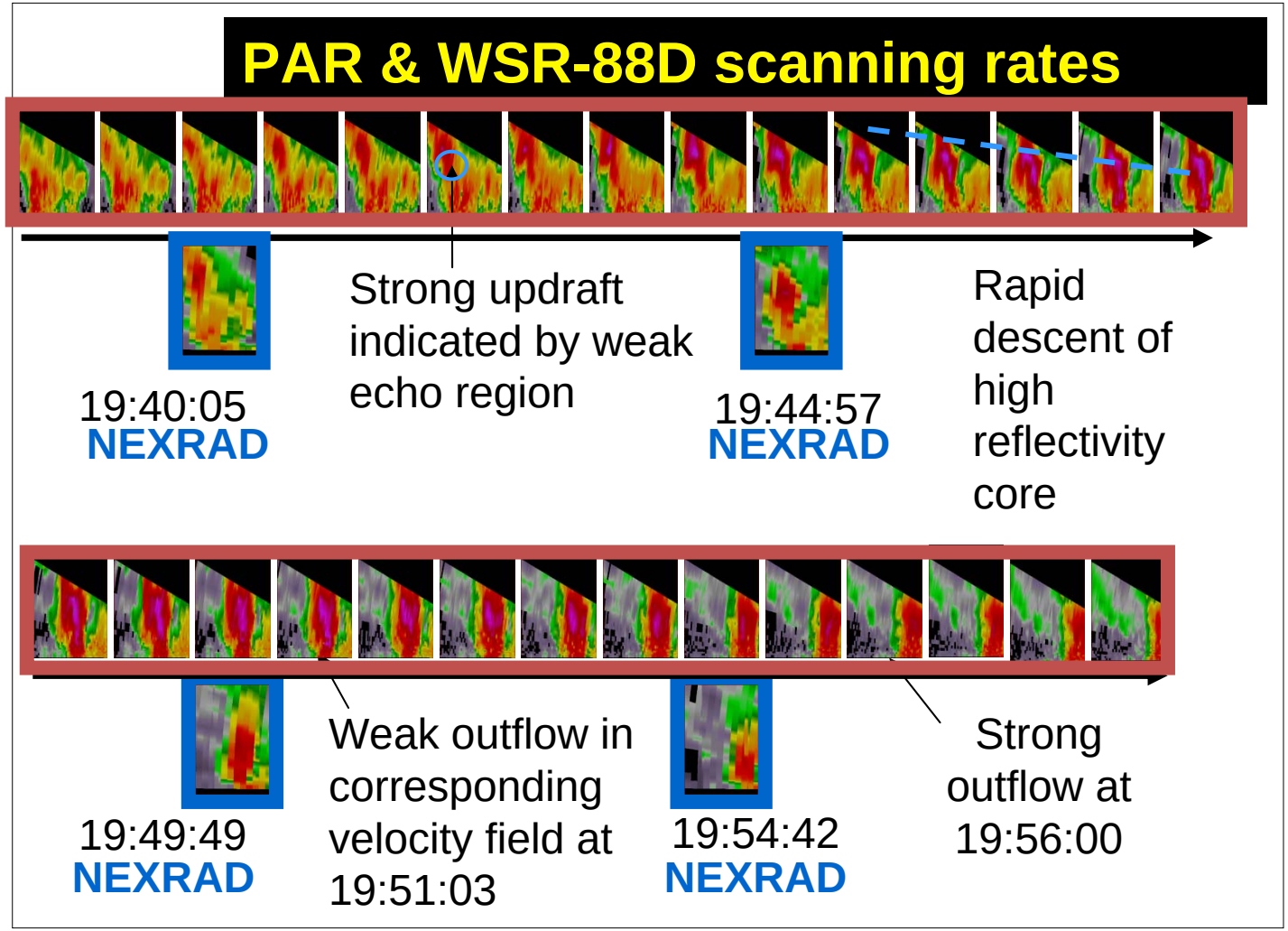


Projected Improvements

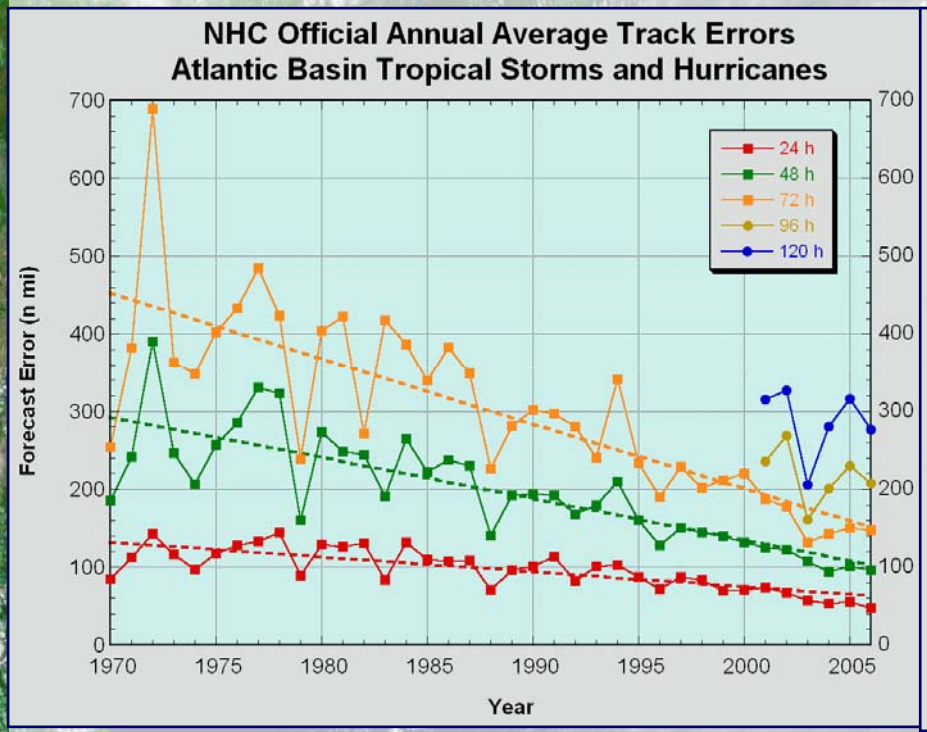
- Projected new average lead time for tornado warnings 45 minutes (current = 12-13 min)
- Improved tornado tracking, strong wind gusts, hail, and locally-heavy rains (flash floods & mudslides)

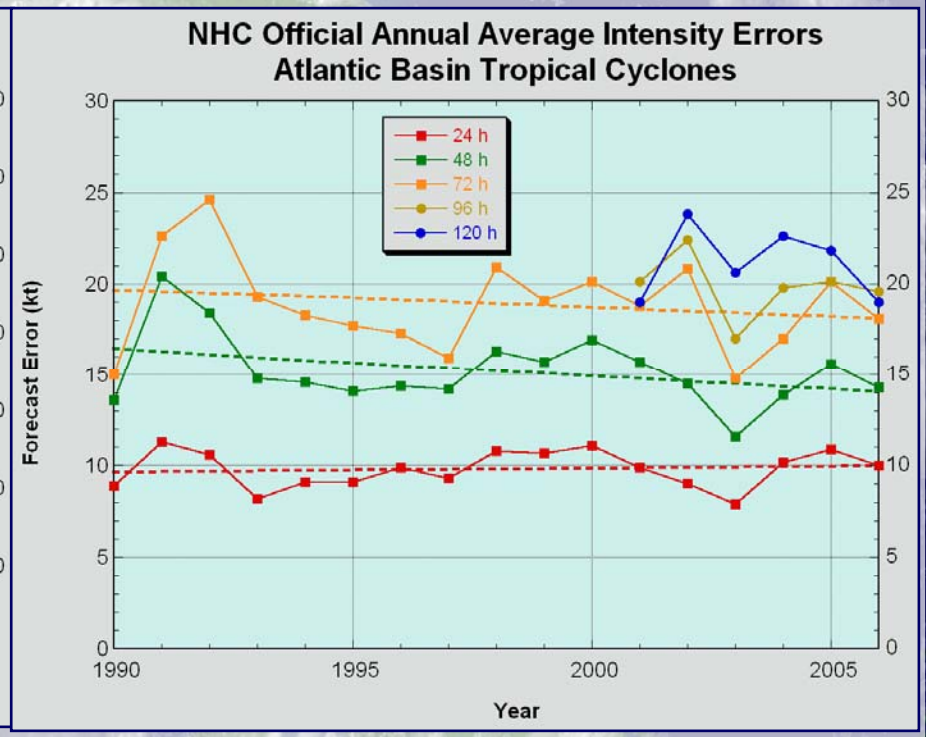
WEATHER RESEARCH | Phased-Array Radar




PAR & WSR-88D scanning rates
PAR
Strong updraft indicated by weak echo region
19:40:05
NEXRAD
19:44:57
NEXRAD
Rapid descent of high reflectivity core
PAR
Weak outflow in corresponding velocity field at 19:51:03
19:49:49
NEXRAD
19:54:42
NEXRAD
Strong outflow at 19:56:00

HURRICANE RESEARCH



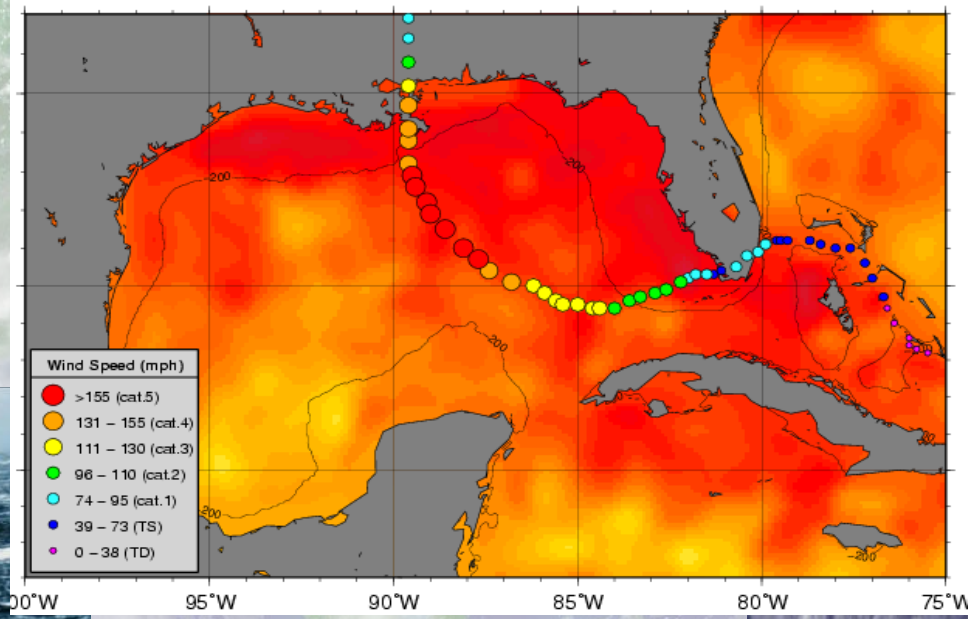


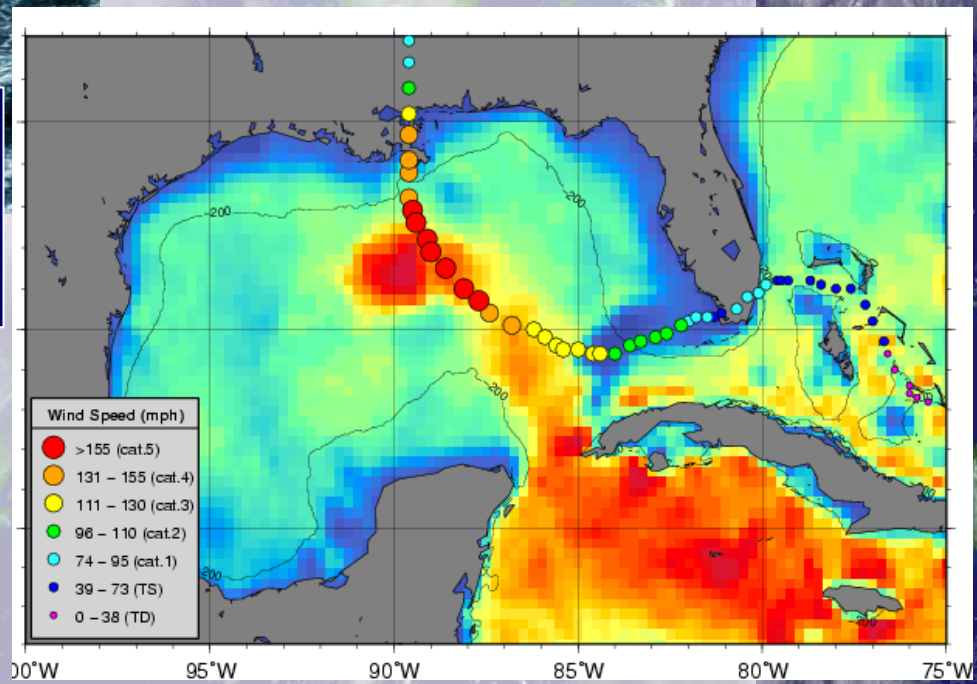
TRACK

INTENSITY

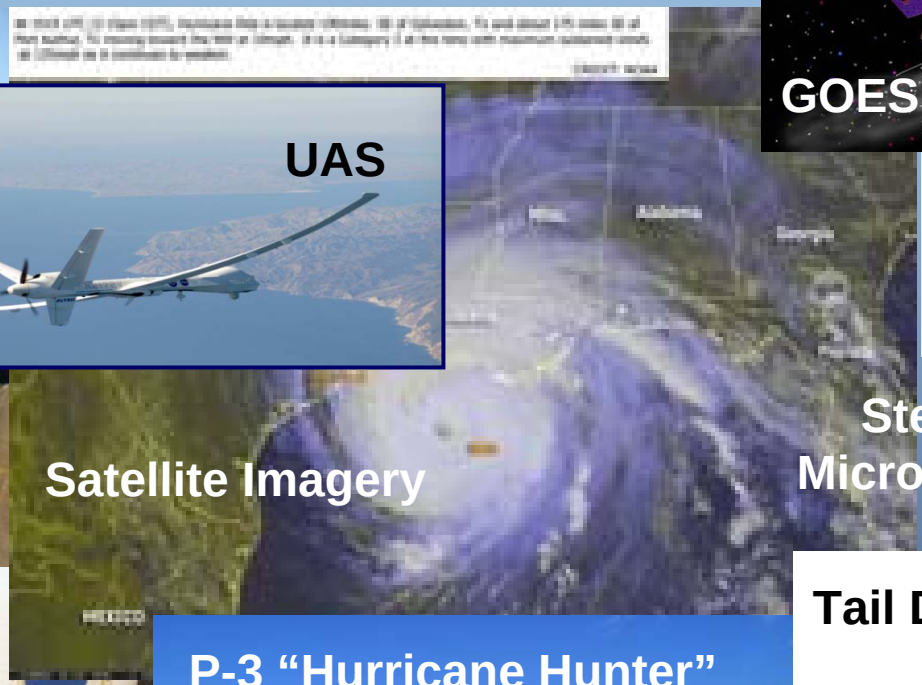
Hurricane Forecasting

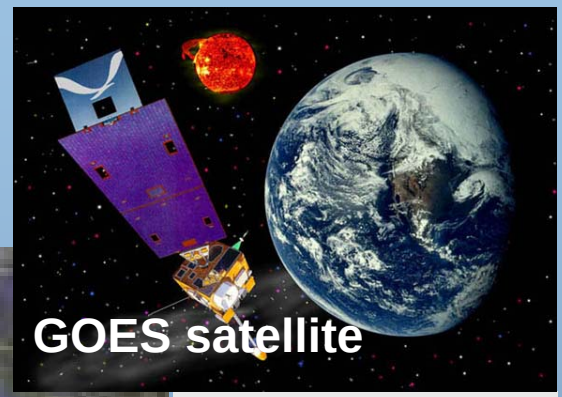
***Unmanned Aircraft System Hurricane Flight** (artist rendering)*





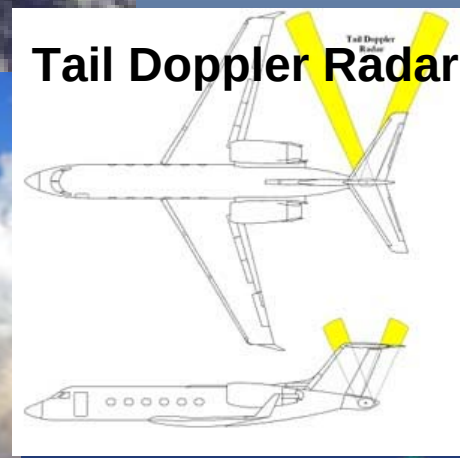
HURRICANE RESEARCH





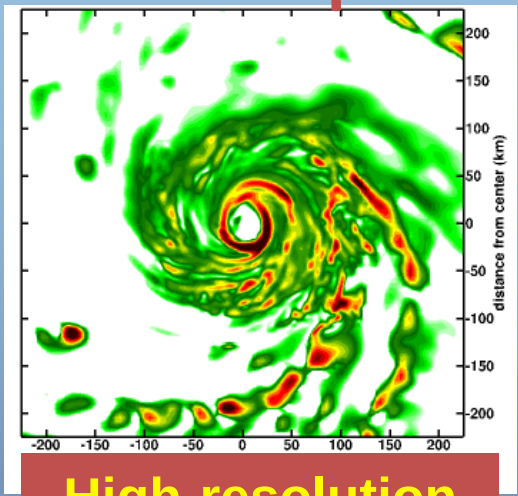
Stepped Frequency Microwave Radiometer

GPS Dropsonde Drop



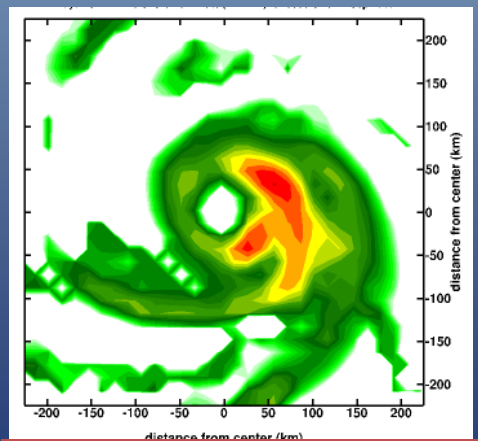
Improving the Forecast through Modeling

Hurricane-WRF (HWRF) research & support activities in NOAA/OAR



High-resolution research model

Predicted reflectivity for Hurricane Floyd (1999) obtained from a high-resolution (1.6 km) research model

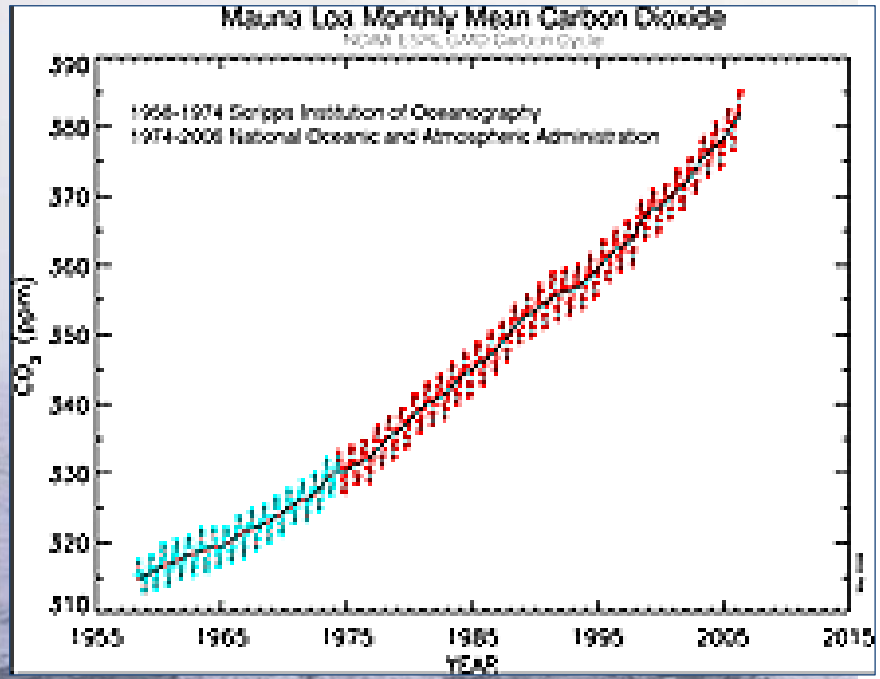


Operational model resolution

Predicted reflectivity for Hurricane Floyd (1999) from the same model using typical resolution employed by the GFDL operational hurricane model (15 km)

OCEAN SCIENCE RESEARCH

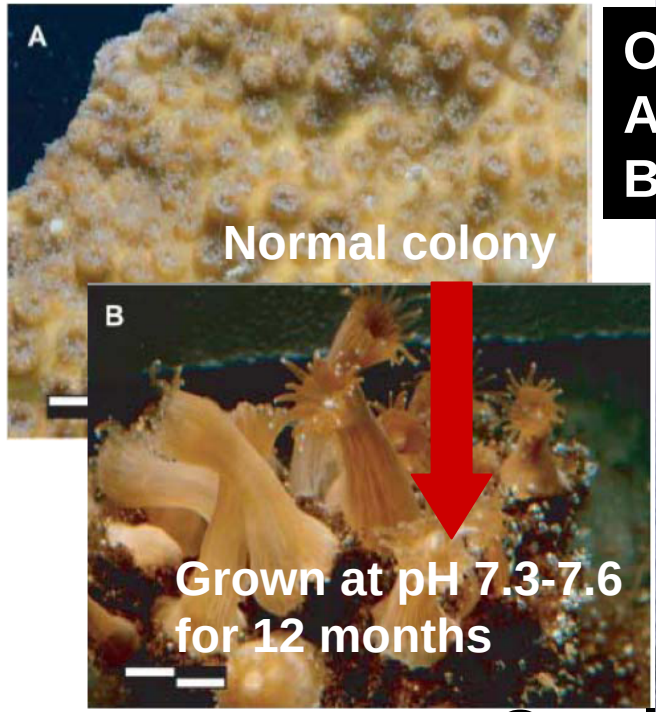
Evidence of Ocean Acidification



Coccolithophores

Gephyrocapsa oceanica

Riebesell et al., 2000; Zondervan et al., 2001

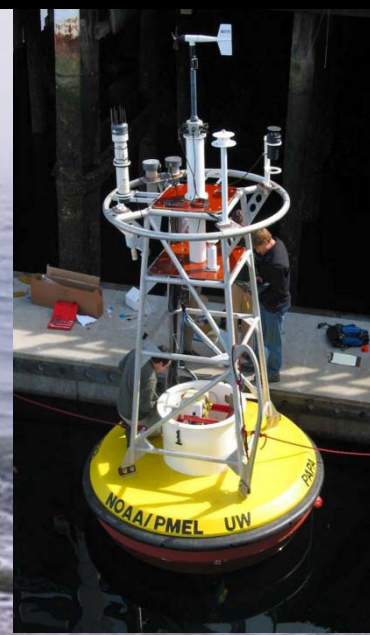


Fine & Tchernov, 2007

Coral

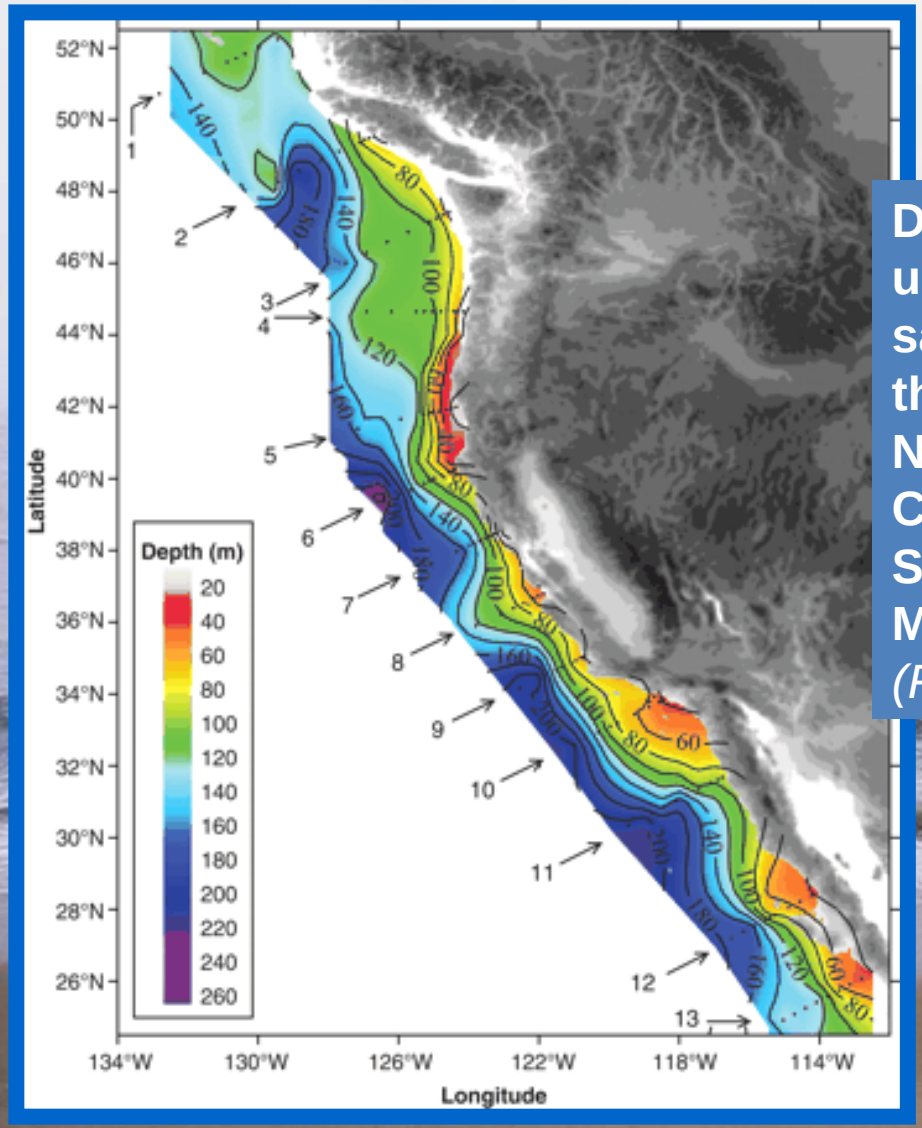
Oculina patagonica

Ocean Acidification Buoy



OCEAN SCIENCE RESEARCH

Evidence of Ocean Acidification



Distribution of the depths of the undersaturated water (aragonite saturation < 1.0; pH < 7.75) on the continental shelf of western North American from Queen Charlotte Sound, Canada to San Georgia Baja California Sur, Mexico.

(Feely et al. 2008. Science 320:1490-92.)

OCEAN SCIENCE RESEARCH

Evidence of Ocean Acidification

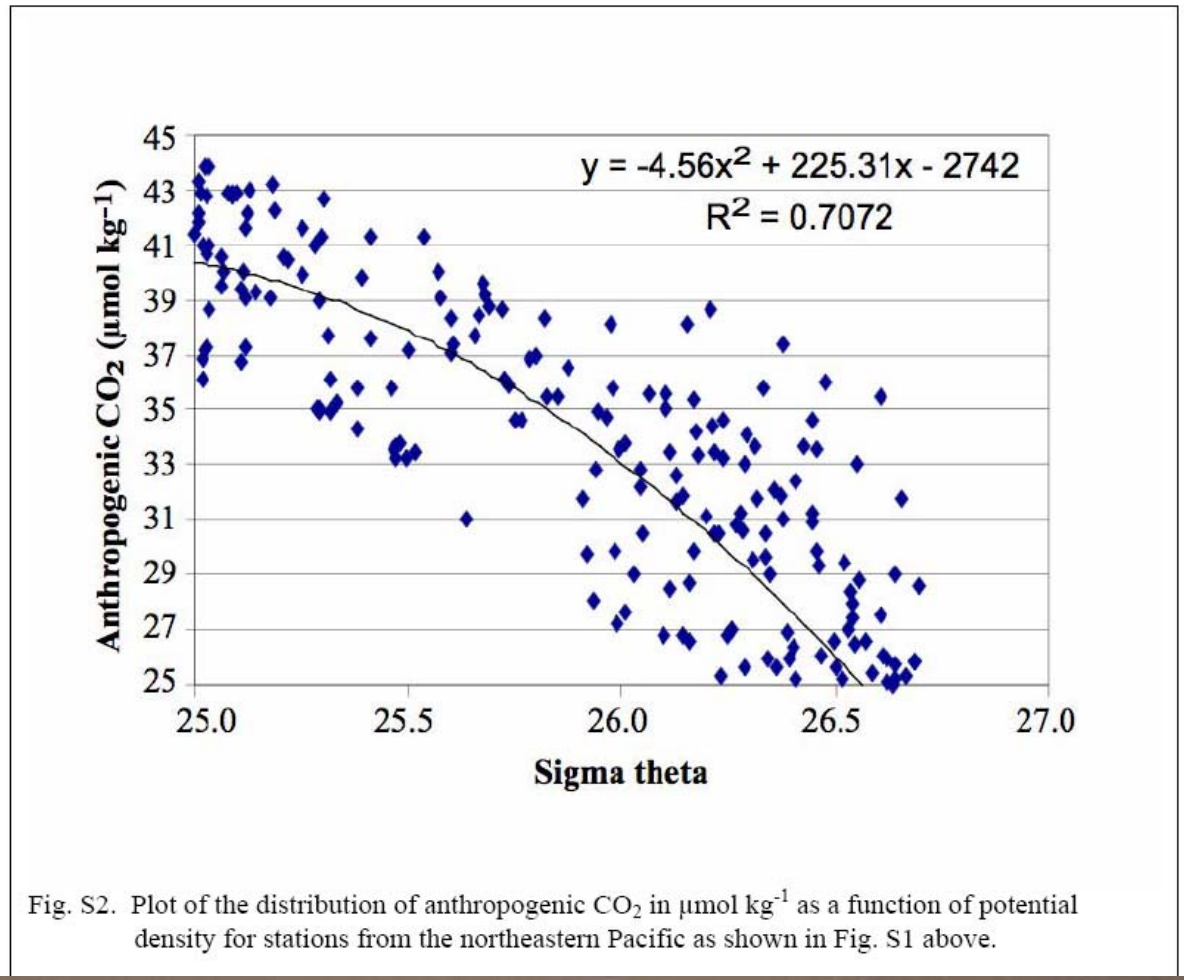
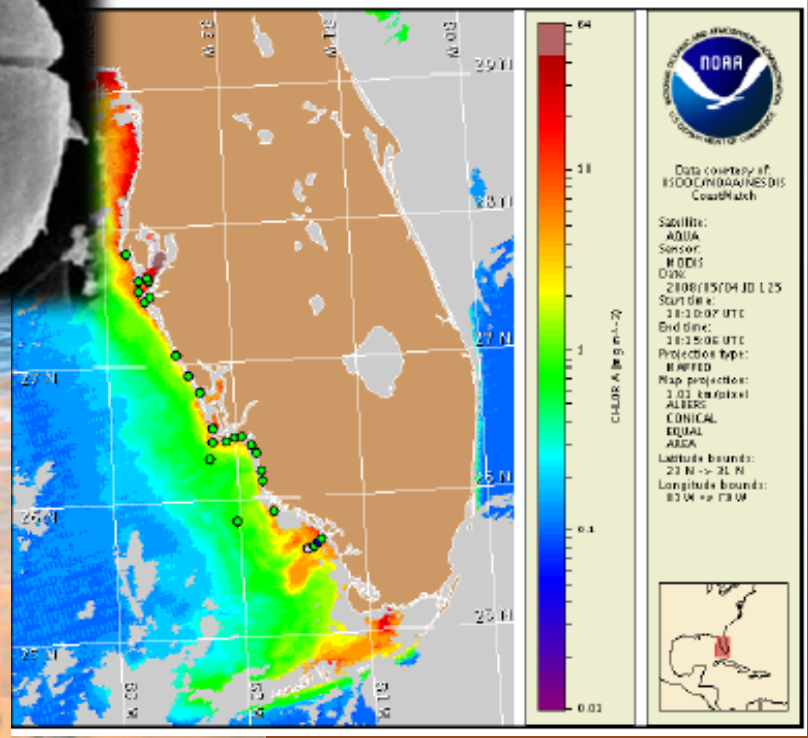


Fig. S2. Plot of the distribution of anthropogenic CO_2 in µmol kg^{-1} as a function of potential density for stations from the northeastern Pacific as shown in Fig. S1 above.

(Feely et al. 2008. Science 320:1490-92. – Online supplement)

Harmful Algal Blooms | Forecasting



AOML DNA sensor

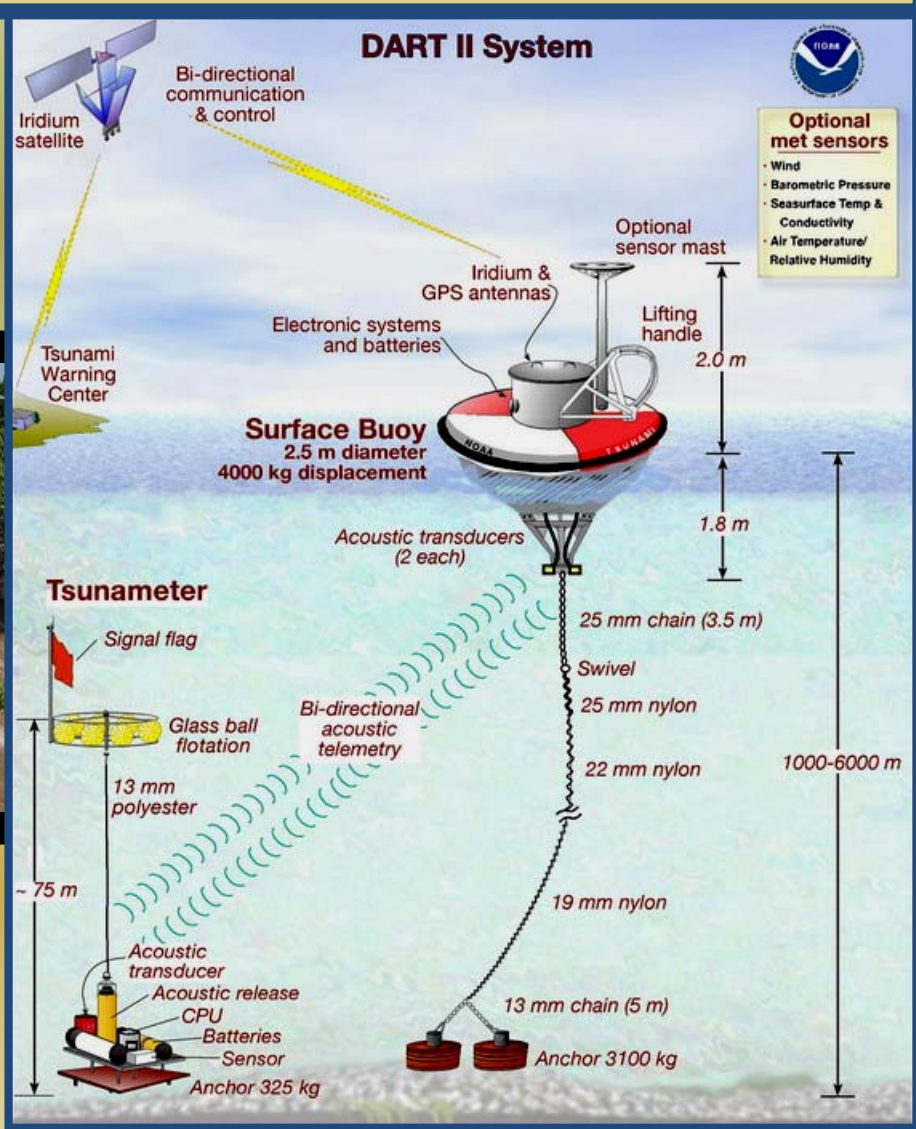
Red Tide

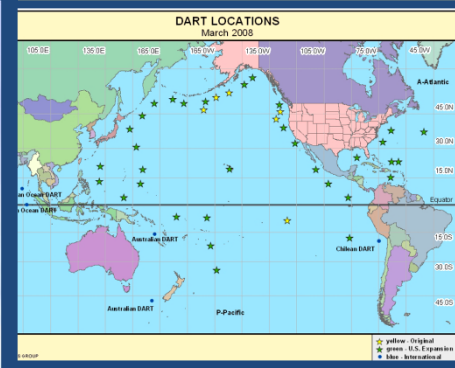
Tsunami

Early, accurate detection
Real time reporting

DART™-II Buoys

Over 295,000 lives were lost in 11 nations in the 2004 Boxing Day tsunami in the Indian Ocean.





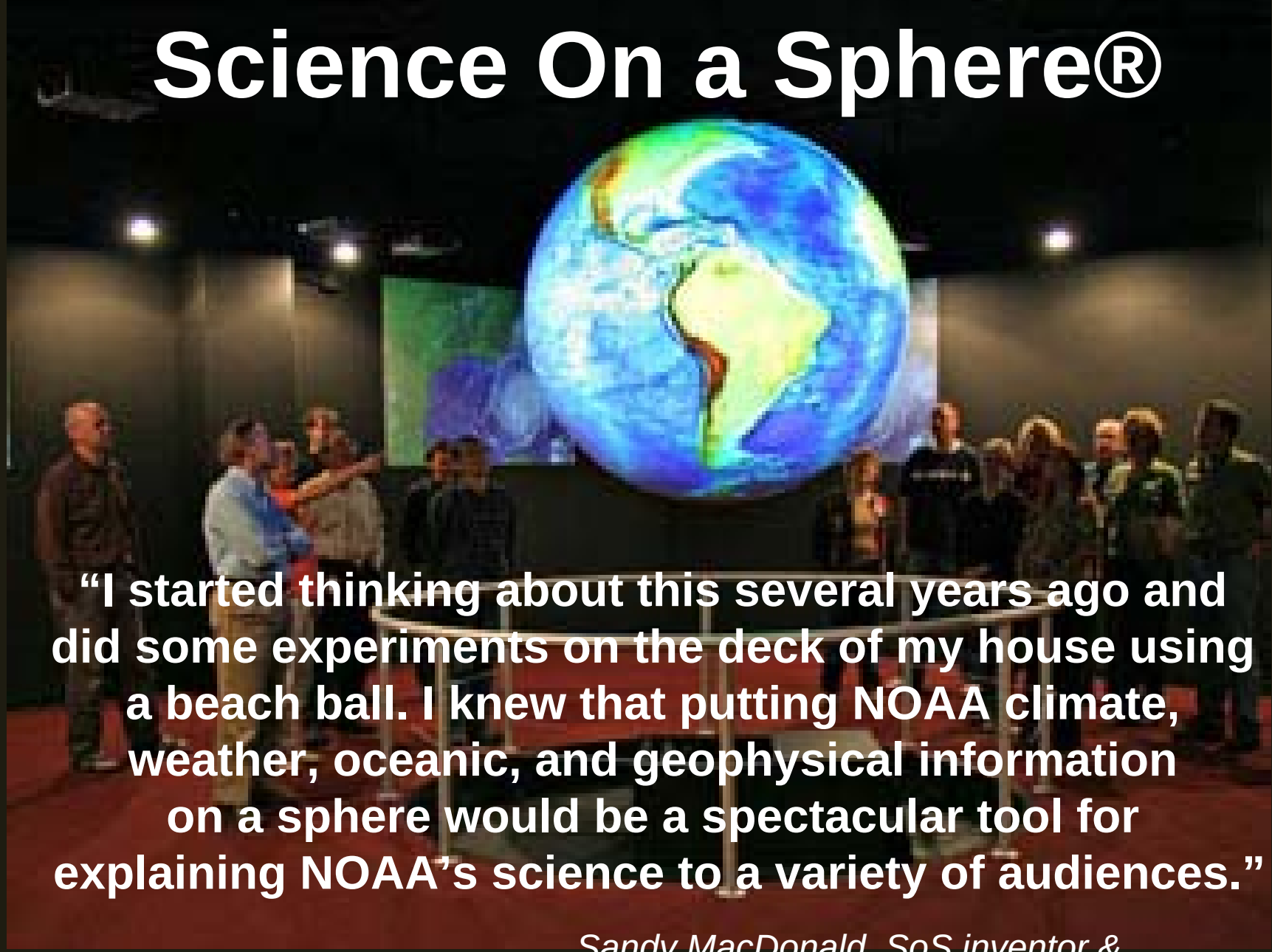
39 deployed

False alarm cost $40M *without* DART (Hawaii 1995)

R&D

$68M saved *with* DART (false alarm prevented Hawaii 2003)

Science On a Sphere®

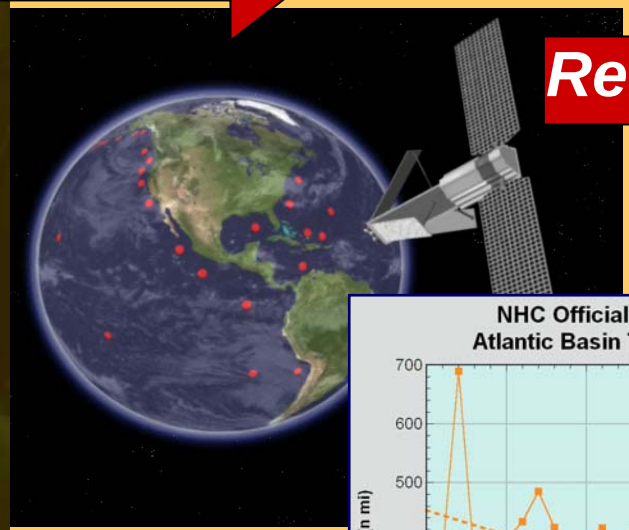


“I started thinking about this several years ago and did some experiments on the deck of my house using a beach ball. I knew that putting NOAA climate, weather, oceanic, and geophysical information on a sphere would be a spectacular tool for explaining NOAA’s science to a variety of audiences.”

Sandy MacDonald, SoS inventor &
Deputy Assistant Adminstrator
of Labs & Cooperative Institutes

NOAA Measures of Success

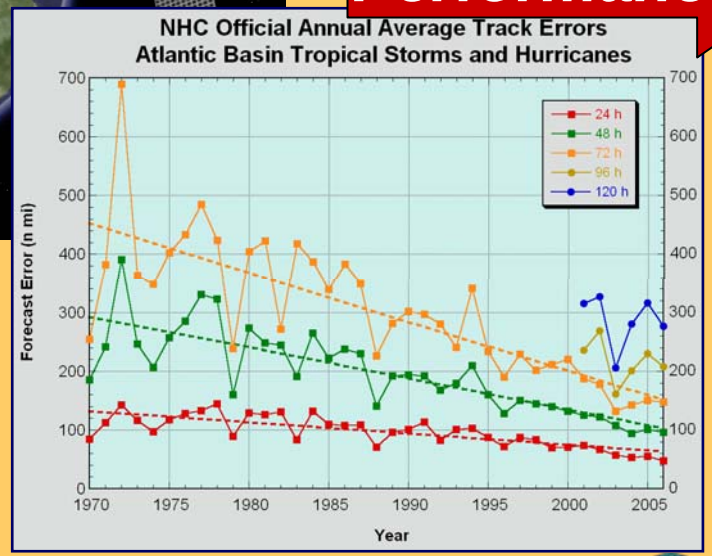
Quality



DART

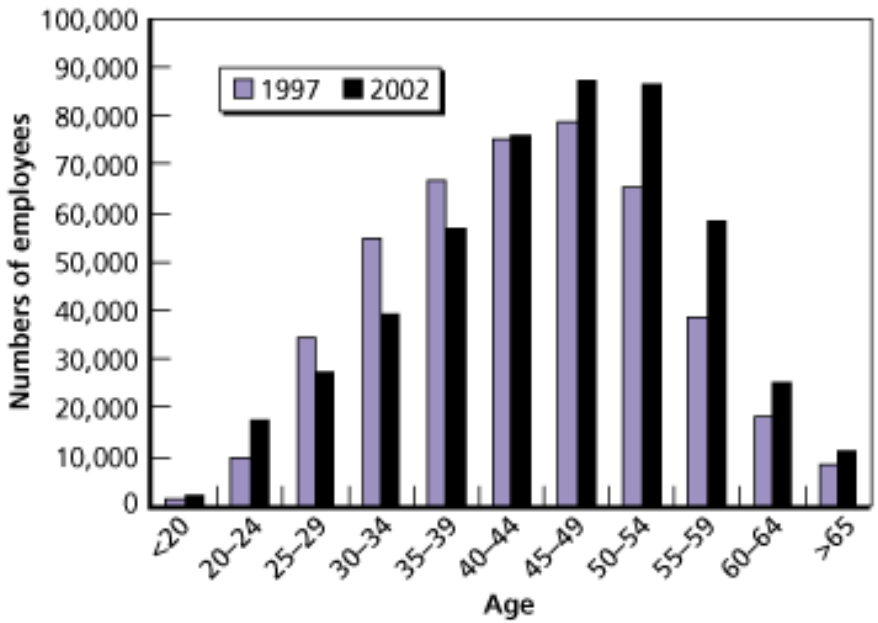
Relevance

Performance



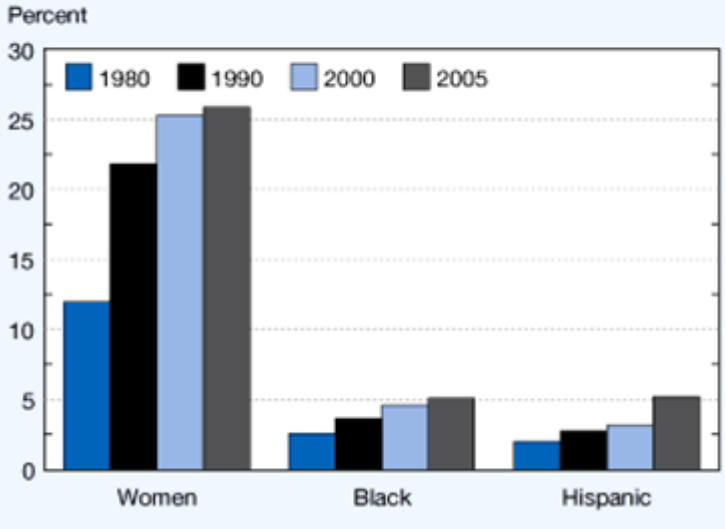
Hurricane Tracking

WORKFORCE



RAND Federal Workforce Study

College-educated women and ethnic minorities in nonacademic S&E occupations: 1980, 1990, 2000, and 2005



NSF S&I Indicators

Research
has been, is,
and always will be
at the heart of NOAA.