Atlantic Oceanographic and Meteorological Laboratory

AOML Research Review: Organization Overview

Robert Atlas

Director, AOML

AOML Research Review
March 18-20, 2008, Miami, Florida

Atlantic Oceanographic and Meteorological Laboratory

Our Vision

We envision an Atlantic Oceanographic and Meteorological Laboratory (AOML) whose research provides the backbone of information required to improve ocean and weather services for the nation through improved prediction of severe tropical storms, better utilization and management of marine resources, and better understanding of the factors affecting both climate and environmental quality.

Atlantic Oceanographic and Meteorological Laboratory

Our Mission

The Atlantic Oceanographic and Meteorological Laboratory conducts a basic and applied research program that seeks to understand the physical, chemical, and biological characteristics and processes of the ocean and atmosphere, both separately and as a coupled system.

The principle focus of these investigations is to provide knowledge that will ultimately lead to:

- Improved understanding and forecasting of severe storms
- Better utilization and management of marine resources
- Better understanding of the factors affecting both climate and environmental quality, and
- Improved ocean and weather services for the Nation

Atlantic Oceanographic and Meteorological Laboratory
Our Role in NOAA

NOAA's Mission Line Offices

- **Oceanic & Atmospheric Research**
- National Weather Service
- National Environmental Satellite, Data & Information Service
- National Ocean Service
- National Marine Fisheries Service

Oceanic & Atmospheric Research

Assistant Administrator for Oceanic & Atmospheric Research
Richard W. Spinrad

Deputy Assistant Administrator
Laboratories & Coop. Institutes
Director, Earth Systems Research Laboratory
Alexander E. MacDonald

- Air Resources Laboratory
- Earth System Research Laboratory
- **Atlantic Oceanographic & Meteorological Laboratory**
- Great Lakes Environmental Research Laboratory
- Pacific Marine Environmental Laboratory
- National Severe Storms Laboratory
- Geophysical Fluid Dynamics Laboratory

Atlantic Oceanographic and Meteorological Laboratory
Organizational History

- 1966 - An Institute of Oceanography was created as one of four new environmental research institutes of the Environmental Science Services Administration (forerunner of NOAA). Dr. Harris B. Stewart was selected to be its Director.

- 1967 - The Institute of Oceanography is relocated to Miami, Florida.

- 1968 - Two meteorological groups are incorporated into the Institute and the name is changed to the Atlantic Oceanographic and Meteorological Laboratories (AOML).

- 1973 – AOML is relocated to a new facility on Virginia Key, co-located with the University of Miami's Rosenstiel School of Marine and Atmospheric Science and NOAA's Southeast Fisheries Science Center.

- 1971 - Experimental Meteorology Laboratory moved out of AOML.

- 1972 - National Hurricane Research Laboratory moved out; 1979 moved back.

- 1981 - "Atlantic Oceanographic and Meteorological Laboratories" are changed to Divisions of the "Atlantic Oceanographic and Meteorological Laboratory."

- Currently - Part of a ~$150M Virginia Key marine research and education community including AOML, NMFS/SEFSC, University of Miami. Miami Seaquarium, and the Maritime and Science Technology High School (MAST Academy).

Atlantic Oceanographic and Meteorological Laboratory
Facilities overview

- AOML is located on 12.88 acres on Virginia Key, Miami, Florida, in an urban setting.

- 1968 - Property deeded to Federal Government by Miami-Dade County for $22M.

- 1973 - Built 5-story plus ground-level concrete building with 74,000 gross ft^2; 40,078 ft^2 usable for office, research labs, and storage, plus 6,160 ft^2 on ground level for facilities shops and storage.

- Warehouse built in 1989 with 10,000 ft^2 storage space, no A/C.

- Building owned by NOAA/OAR/AOML, no rent, no GSA.

- U.S. Department of Energy Federal Energy and Water Management Award Winner, 2003, for new A/C and lighting replacement.

- Recently completed asbestos abatement.

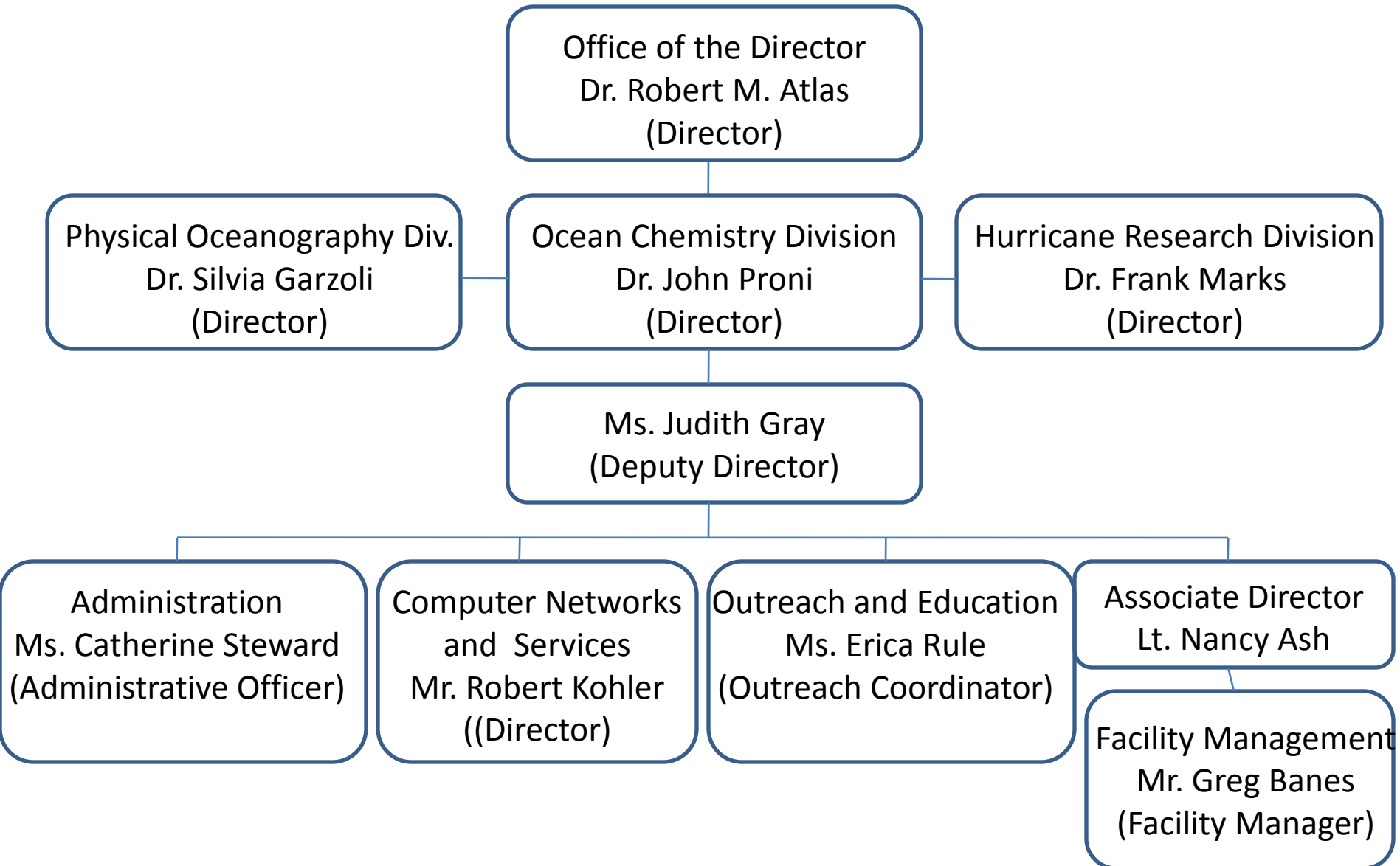- Currently undergoing facilities upgrades to windows and plumbing.

Atlantic Oceanographic and Meteorological Laboratory
Virginia Key Science Community

Maritime and Science Technology (MAST) High School

Miami Seaquarium

AOML

University of Miami's

Rosenstiel School of Marine and Atmospheric Science

Southeast Fisheries Science Center

Atlantic Oceanographic and Meteorological Laboratory
Internal Organization

Office of the Director
Dr. Robert M. Atlas
(Director)

Physical Oceanography Div.
Dr. Silvia Garzoli
(Director)

Ocean Chemistry Division
Dr. John Proni
(Director)

Hurricane Research Division
Dr. Frank Marks
(Director)

Ms. Judith Gray
(Deputy Director)

Administration
Ms. Catherine Steward
(Administrative Officer)

Computer Networks
and Services
Mr. Robert Kohler
((Director)

Outreach and Education
Ms. Erica Rule
(Outreach Coordinator)

Associate Director
Lt. Nancy Ash

Facility Management
Mr. Greg Banes
(Facility Manager)

Atlantic Oceanographic and Meteorological Laboratory
Cooperative Institute Partnerships

The Cooperative Institute for Marine and Atmospheric Studies (CIMAS)

- Dr. Joseph Prospero, Director

- Research institute of the University of Miami located in the Rosenstiel School of Marine and Atmospheric Science (RSMAS).

- Serves as a mechanism to bring together the research resources of the University with those of NOAA within the context of the NOAA's mission.

CIMAS Research Themes reflect NOAA's Strategic Plan:

- Climate Variability
- Fisheries Dynamics
- Regional Coastal Ecosystem Processes
- Human Interactions with the Coastal Environment
- Air-Sea Interactions and Exchanges
- Integrated Ocean Observations

Currently one-third or 47 AOML staff are CIMAS Research Associates or University students.

Atlantic Oceanographic and Meteorological Laboratory
AOML Research – Guiding Documents

Major Drivers:
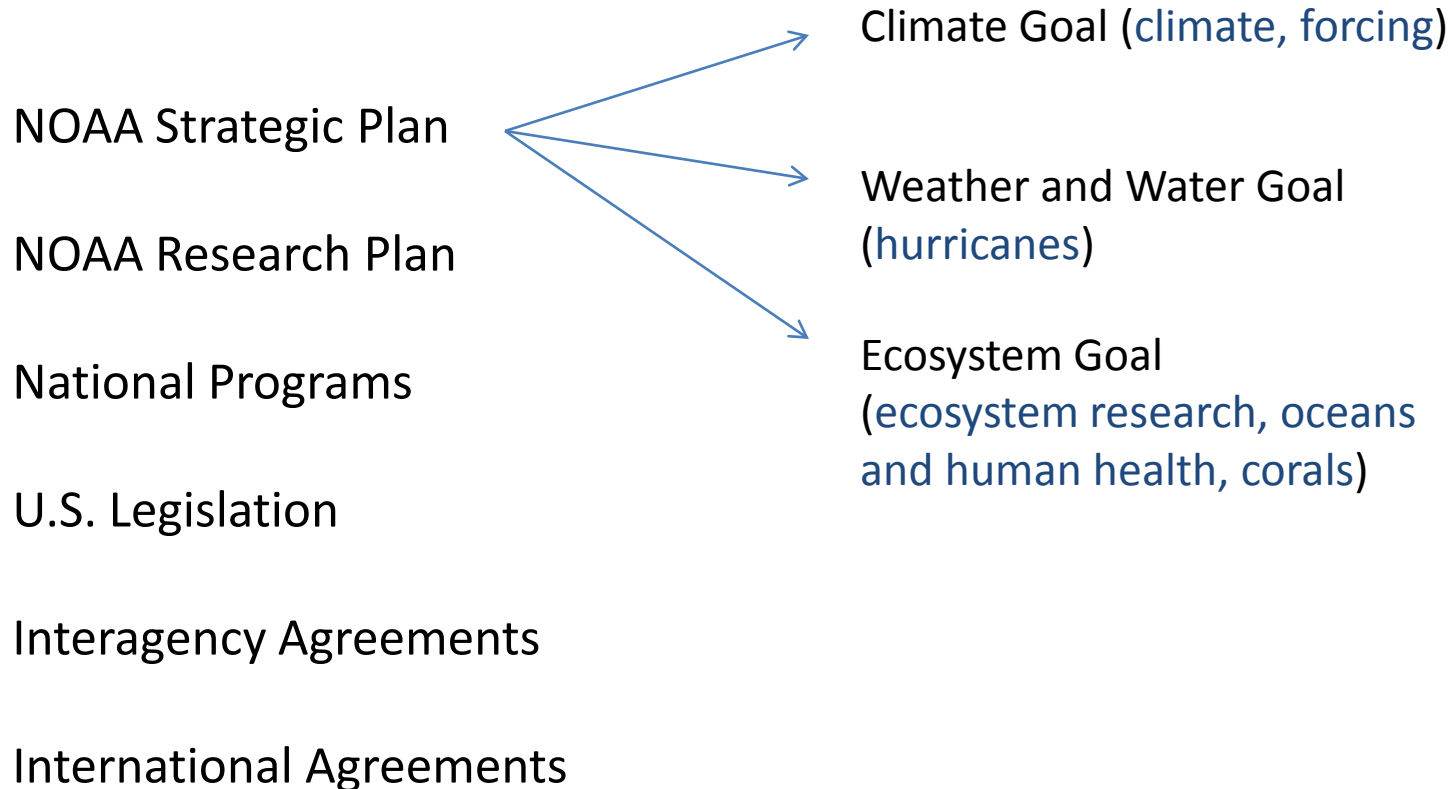
NOAA Strategic Plan

NOAA Research Plan

National Programs

U.S. Legislation

Interagency Agreements

International Agreements

Climate Goal (climate, forcing)

Weather and Water Goal
(hurricanes)

Ecosystem Goal
(ecosystem research, oceans
and human health, corals)

Atlantic Oceanographic and Meteorological Laboratory
Key Questions Driving Research

Major Foci:

Oceans and Climate

Coastal Ecosystems

Hurricanes

Key Questions:

• How do oceans control and modify climate?

• How is the Meridional Overturning Circulation changing?

• To what extent does interior mixing alter the overturning circulation?

• How do variations in the Atlantic Warm Pool influence US rainfall?

• What is the relationship between climate change and hurricane formation, track and intensity?

• What are the effects of global warming on CO_2 uptake?

• How can models best extract information about climate from observations?

Atlantic Oceanographic and Meteorological Laboratory
Key Questions Driving Research

Major Foci:

Oceans and Climate

Coastal Ecosystems

Hurricanes

Key Questions:

- What is the impact of ocean acidification on marine ecosystems?

- What are the long-term trends of meteorological and oceanographic parameters at key U.S. coral reef areas?

- Can data from various sources be integrated in real time to provide for ecological forecasts at coral reef and coastal ecosystems areas?

- Can molecular analysis be used to quickly and reliably identify human pathogens and indicators of human fecal contamination in coastal waters?

- How are ecosystems connected regionally and what is the effect of this connection on the individual ecosystems, e.g., fisheries.

- What are the impacts of hurricanes on coastal ecosystems?

- How can we measure low nutrient concentrations with high precision and accuracy?

- What are the sources of nutrients, pathogens, and fecal indicators in coastal waters?

Atlantic Oceanographic and Meteorological Laboratory
Key Questions Driving Research

Major Foci:

Oceans and Climate

Coastal Ecosystems

Hurricanes

Key Questions:

- How do the multi-scale interactions affect the predictability of hurricane formation, track, and intensity?

- What is the best mix of model ensembles to bound the uncertainty and test predictability of intensity and structure?

- What is the optimal observing strategy for initializing models for track, intensity and structure forecasts?

- How can we take advantage of information gleaned from field experiments (IFEX, RAINEX, CAMEX, TCSP, CBLAST) to improve analytical and numerical models of tropical cyclones?

- What emerging observing technologies will provide the key observations to improve track, intensity, and structure forecasts?

Observing System Simulation/Strategy Experiments (OSSEs)

As stated in section 3.1 of NOAA's 5-year plan, OSSEs will be used to help optimize the design of the global observing system, as well as to evaluate the potential impact of proposed observing systems, and to prepare for and accelerate the transition of new observing systems from research to operations.

OSSEs are well developed for large scale weather prediction and will be developed and expanded for ocean, climate, ecosystem, and regional weather applications.

AOML is working to advance OSSE capabilities for these applications.

Modeling

AOML is developing and expanding its modeling activities in the following areas:

• Model improvement through the use of observations

• Development of NOAA's Hurricane Forecasting System

• Multi-model validation of seasonal predictions in the Atlantic
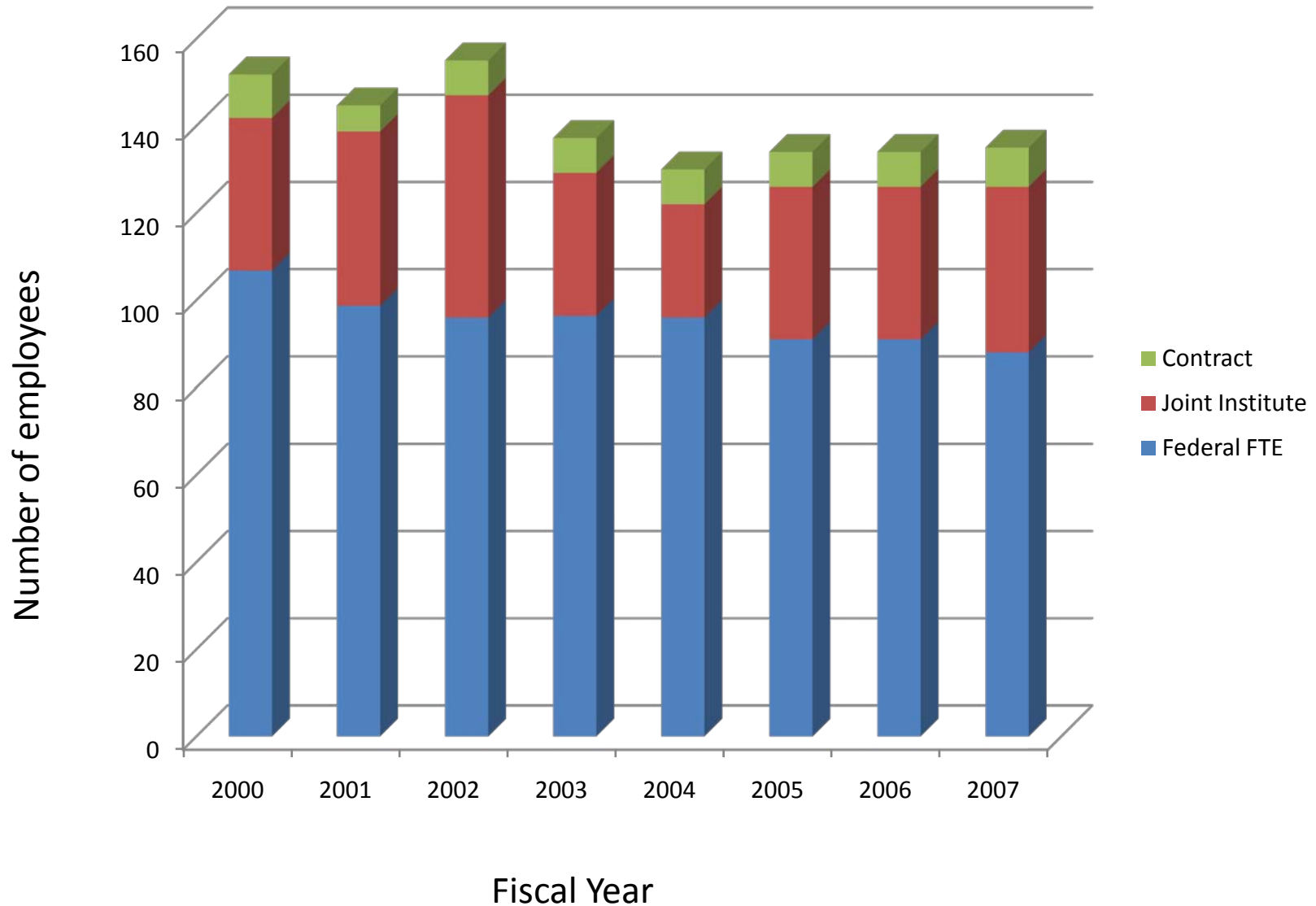
• Multi-model numerical hypothesis testing with the CCSM and CFS

Atlantic Oceanographic and Meteorological Laboratory
AOML Partnerships & Customers

	Local	Regional	National	International
Academic	•Dade/Broward County schools •MAST Academy •Florida Atlantic University •Florida International University •University of Miami (RSMAS/CIMAS, Oceans and human Health Center) •University of South Florida	•Florida Institute of Technology •Florida State University •University of Florida •NOVA Southeastern Univ. •Florida International Univ. • Florida Gulf Coast University	•Cal Tech (JPL) •CORE •Penn State University •University of Puerto Rico •University of Wisconsin-Madison •OHH Center of University of Hawaii •Univ. of South Florida •Texas Tech University •OHH Center of Woods Hole Oceanographic Institute and MBL •University of Alabama, Hunstvile •Univ. of Oklahoma •University of Washington •Louisiana State University •UNC Charlotte •Naval Postgraduate School •Howard University •Colorado State Univ. • UMASS • Center for Atmospheric Research	•Ocean University of Qingdao (China) •University of Cape Town (South Africa) •National Taiwan University •University of Munich (Germany) •University of Ghana •Universidade Eduardo Mondlane, (Mozambique) •Goteborgs University (Sweden) •University of the Virgin Islands •Centre for Australian Weather and Climate Research, Australian Bureau of Meteorology •Bermuda Met Service

Atlantic Oceanographic and Meteorological Laboratory
AOML Partnerships & Customers

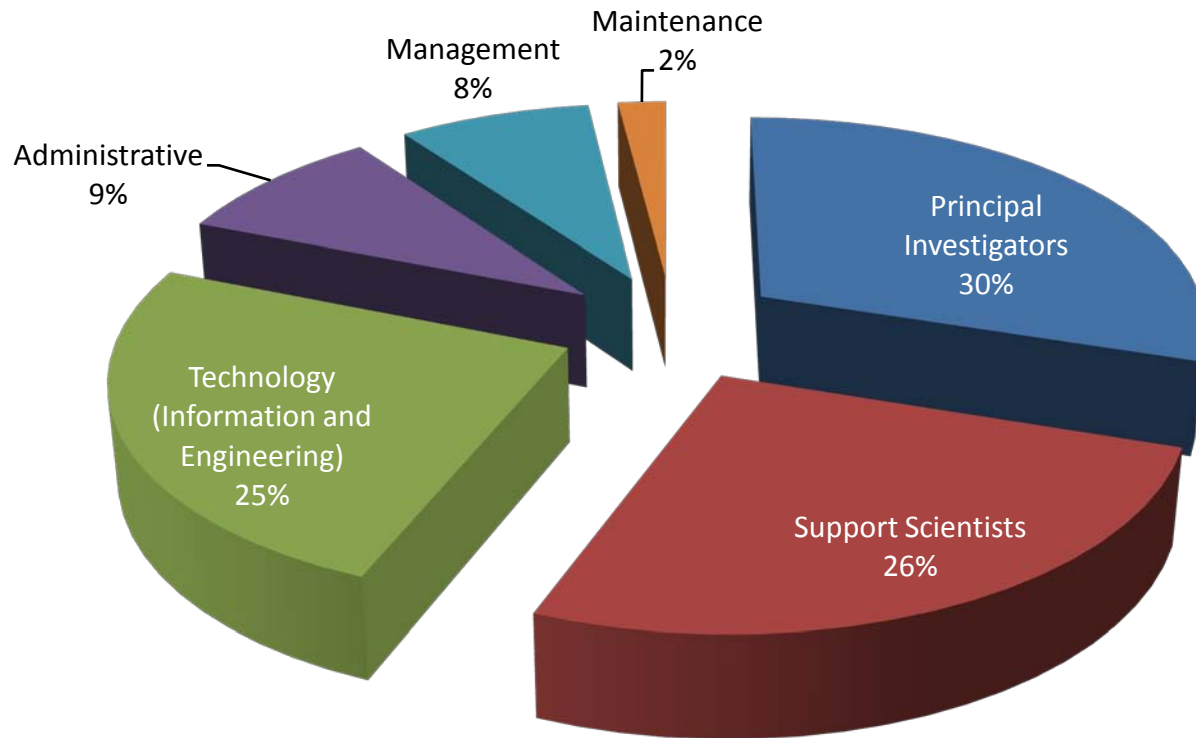|	Local	Regional	National	International
Inter-governmental	•City governments •Environmental Protection Agency •Port Everglades •Port of Miami •Virginia Key Beach Park Trust	•Everglades National Park •Dept. of Community Affairs •Dept. of Environ. Protection •Dept. of Environ. Resources Mgmt. •Florida regional planning councils •Water management districts •Florida Fish and Wildlife Conservation Commission •FL Department of Health	•EPA * FEMA •NASA *NCAR •NSF *ONR •USGS *MMS •National Park Service, Everglades Natioanal Park, Biscayne National Park •U.S. Army Corps of Engineers •U.S. Coast Guard •U.S. Navy – Naval Research Laboratory •U.S. Weather Res. Program •Office of the Federal Coordinator for Meteorological Services (OFCM) •Center for Disease Control	Organizations: •ECMWF •GODAE •IOC •WMO •Central Caribbean Marin e Inst. •Australian Institute of Marine Science •Great Barrier Reef Marine Park Authority •Discovery Bay Marine Laboratory •Perry Institute for Marine Science China: Chinese Academy of Sciences First Institute of Oceanography French: •CETP •IFREMER •MeteoFrance •ORSTOM
NOAA	•National Hurricane Center •NMFS – Southeast Fisheries Science Center •NWS Miami Forecast Office •NOS – FL Keys National Marine Sanctuary •CIMAS	•Aircraft Operations Center •Sea Grant	•Joint Institutes (CICOR, CIRA, JIMO, JISAO, CIMMS) •NCEP •NESDIS •NMFS •NOS (NCDC, NDBC) •NWS (CPC, NCEP, HPC) •OAR Labs (ESRL, GFDL,COP, OGP) •OHHatory center of Hollings Marine Labor	
Private	•NOPP proposals •BSC Laboratories, Inc.	• Florida Institute of Oceanography •Florida Power and Light •Pilot Association • Audubon • The Nature Conservancy •Shoreline Beach Preservation Association	•WeatherFlow •Applied Research Associates •OceanWeather • Eco-Hydrology Inc	•AAI, Corp.

Atlantic Oceanographic and Meteorological Laboratory
Resources - People

Chart: Number of employees vs. Fiscal Year (2000–2007), stacked bar chart with categories Contract, Joint Institute, and Federal FTE.
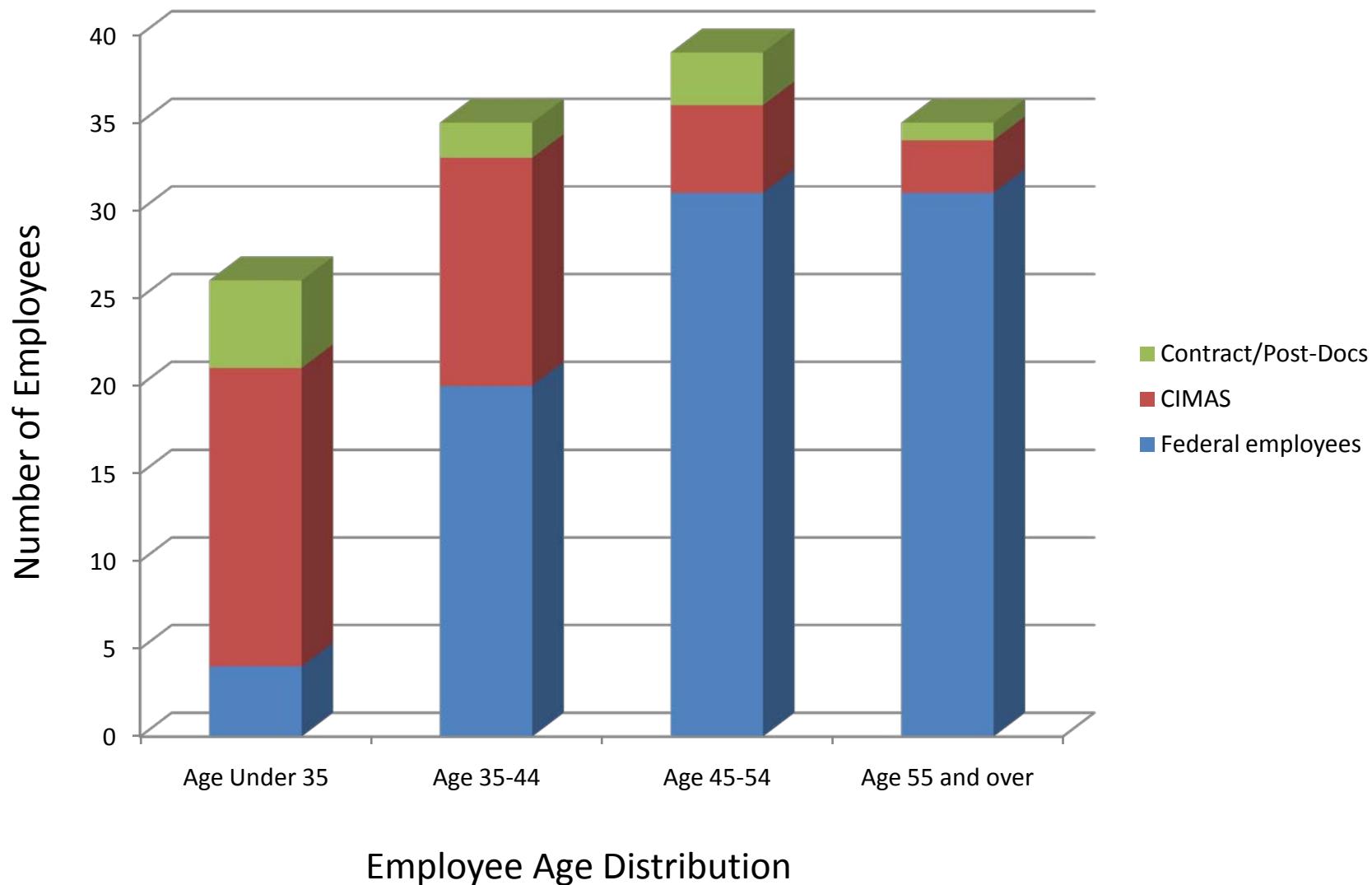
Atlantic Oceanographic and Meteorological Laboratory
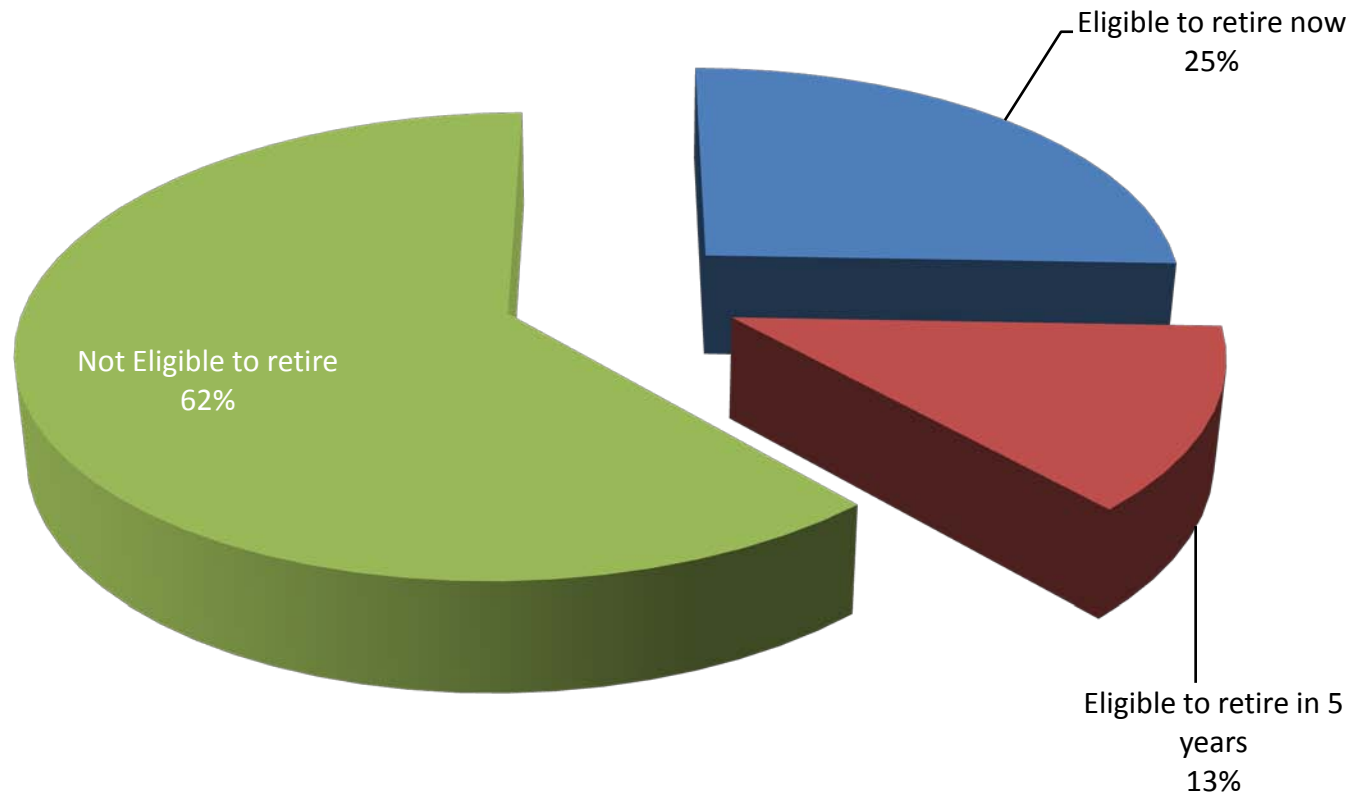## *Resources - Workforce Distribution*

Atlantic Oceanographic and Meteorological Laboratory
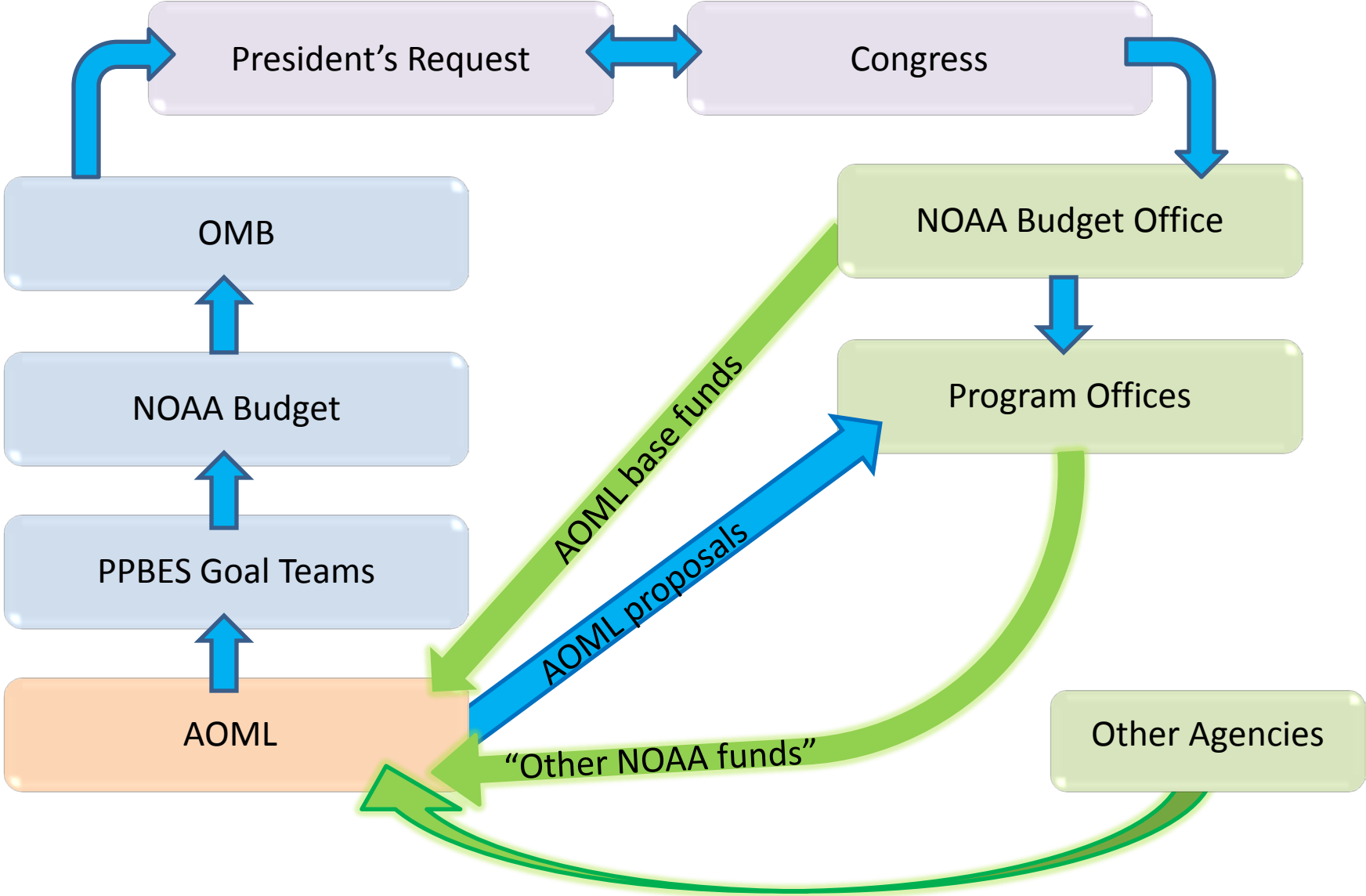## *Resources – Federal Employee Age Distribution*

Atlantic Oceanographic and Meteorological Laboratory
Resources – Federal Retirement Eligibility

Eligible to retire now
25%

Not Eligible to retire
62%

Eligible to retire in 5
years
13%

Atlantic Oceanographic and Meteorological Laboratory
Funding Process

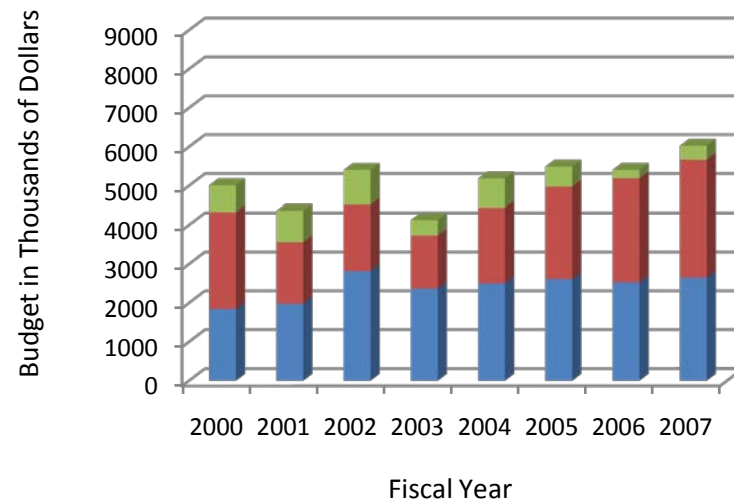# Atlantic Oceanographic and Meteorological Laboratory
Funding History
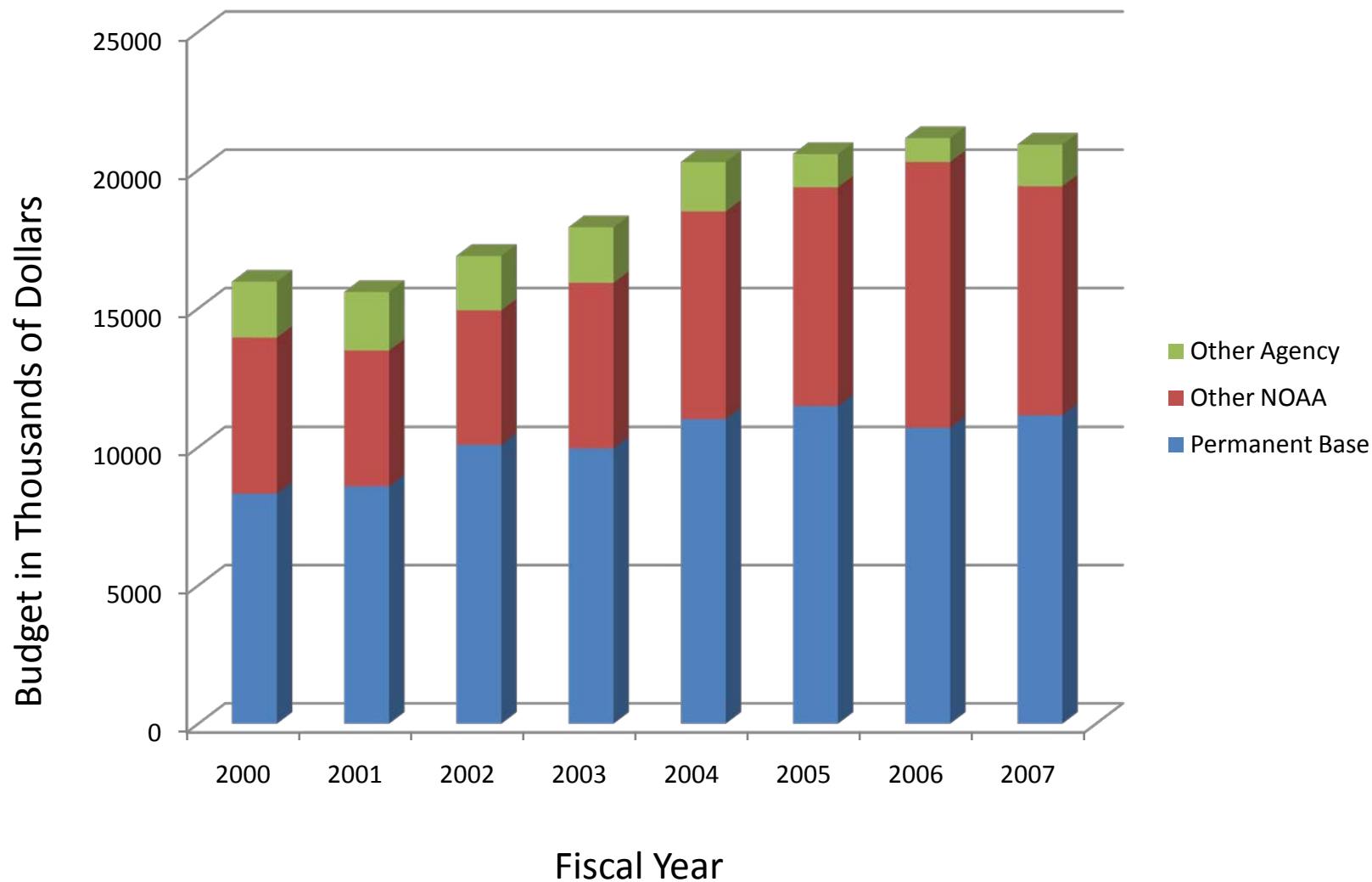
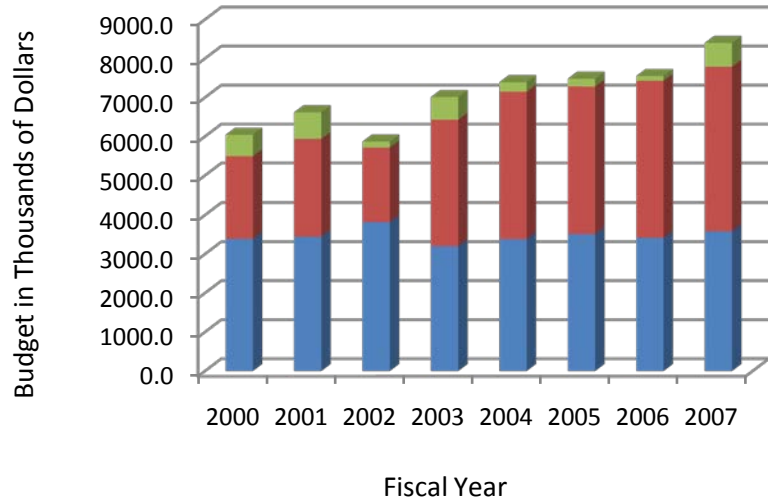Atlantic Oceanographic and Meteorological Laboratory
Funding History – per Division
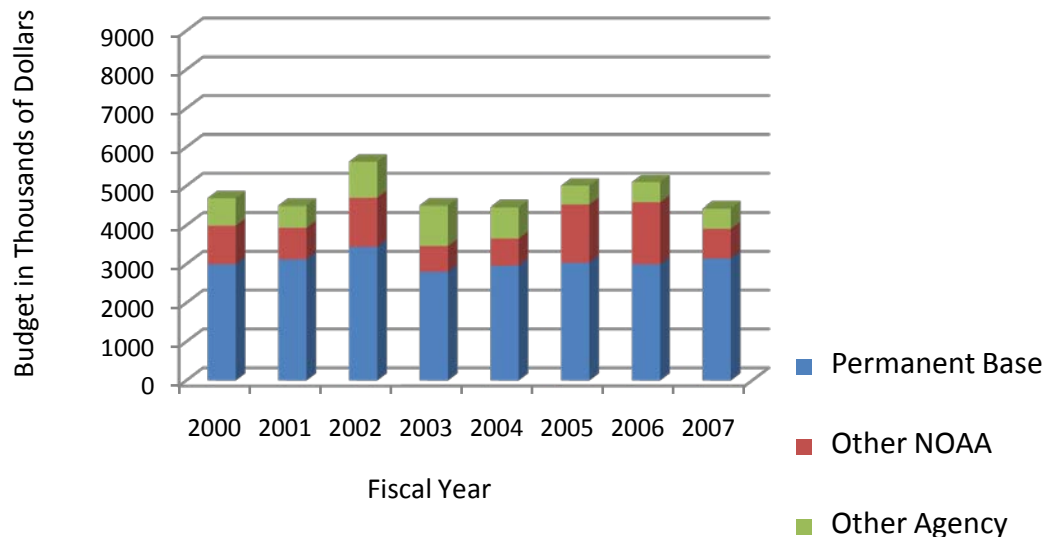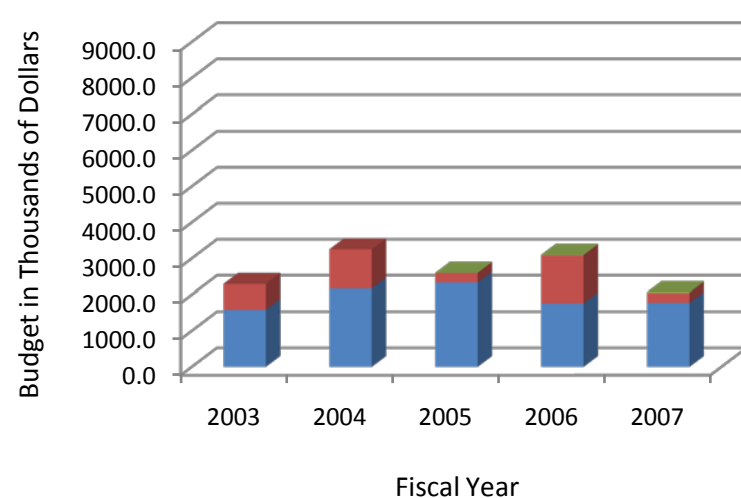
Atlantic Oceanographic and Meteorological Laboratory
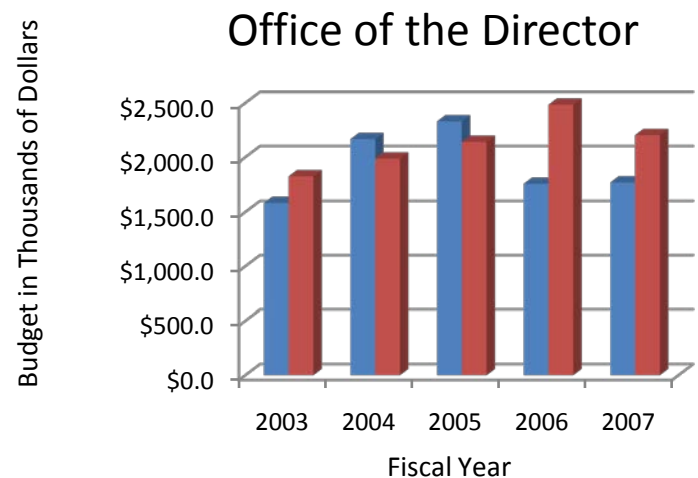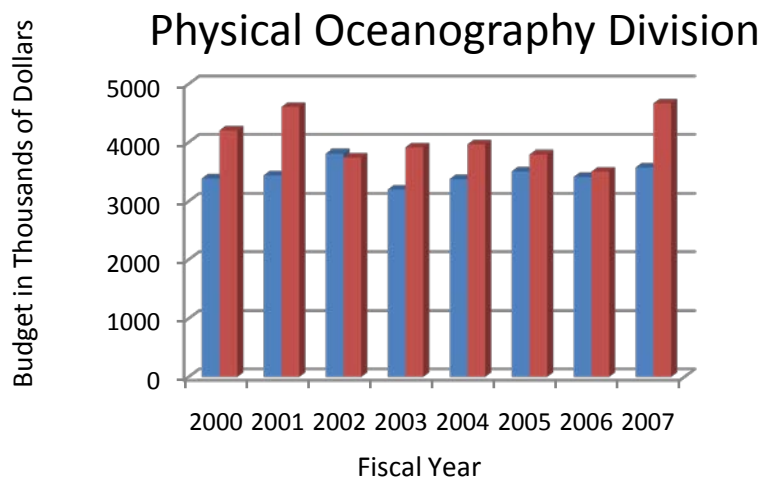## *Funding History – Base vs. Salaries*
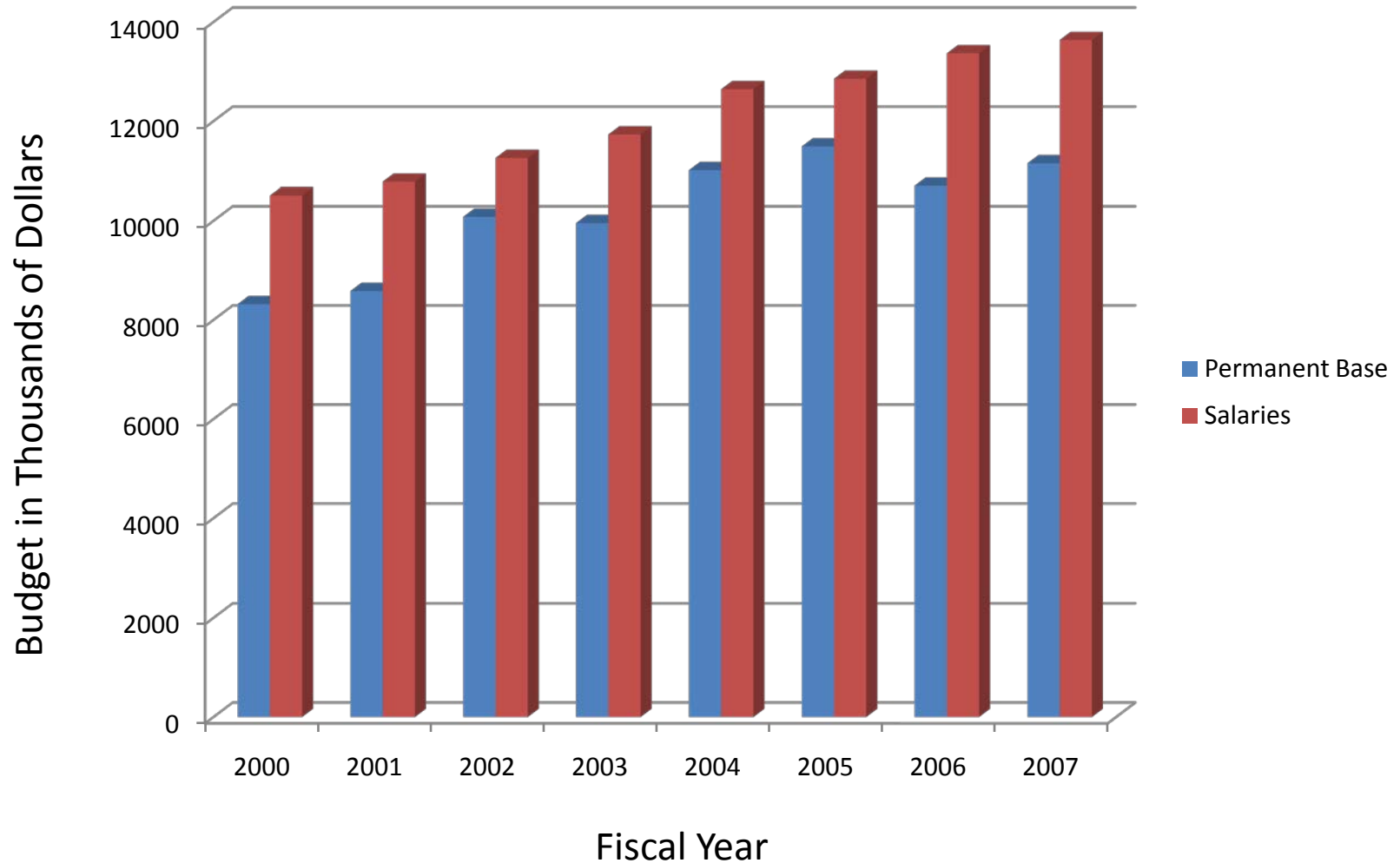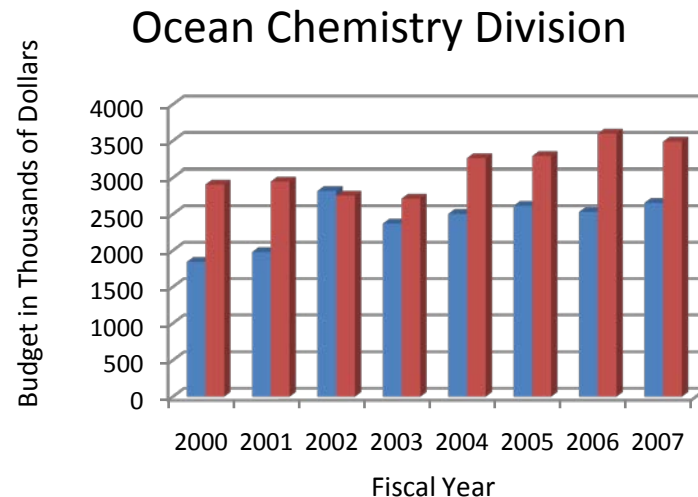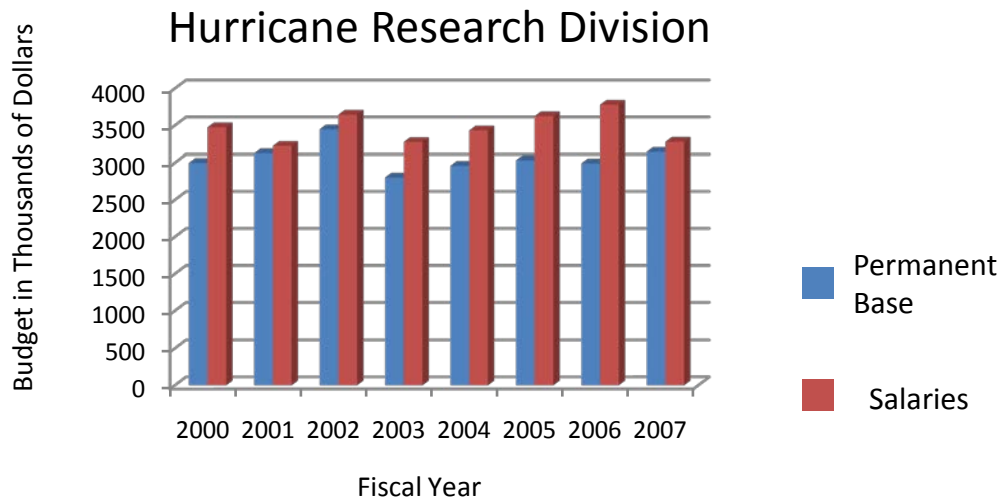
Atlantic Oceanographic and Meteorological Laboratory
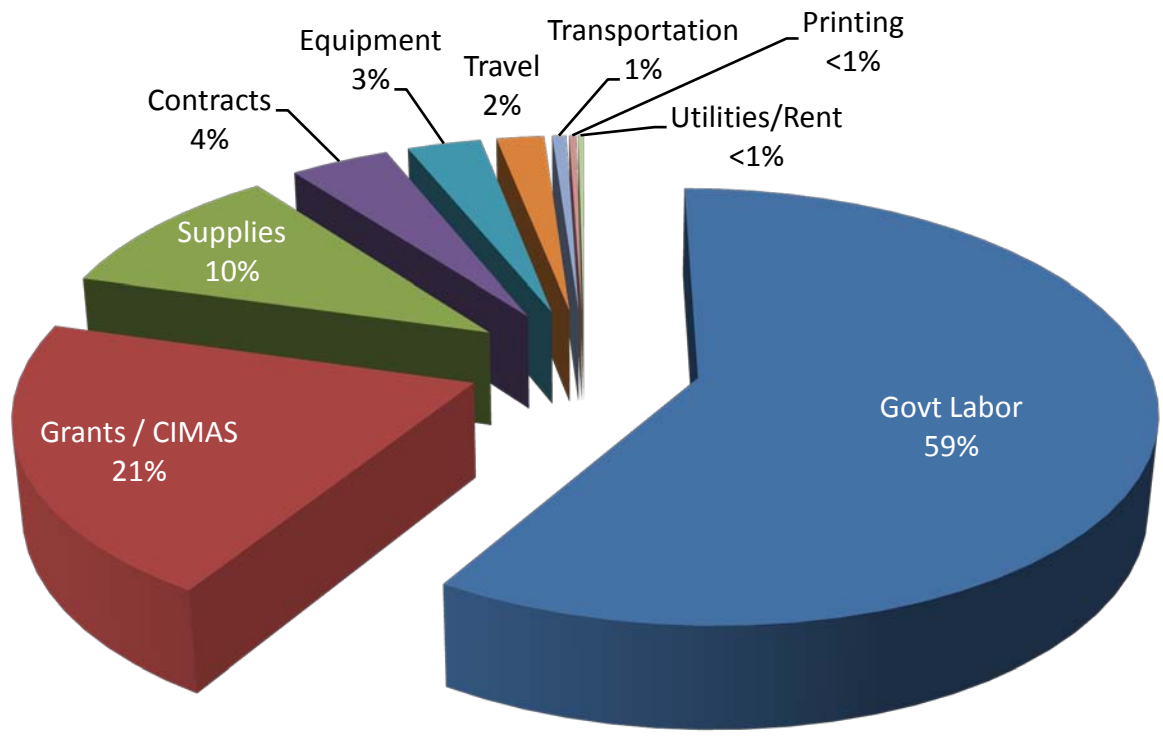## *Funding History – Base vs. Salaries by division*

Atlantic Oceanographic and Meteorological Laboratory
Resources - Expenses

Pie chart with the following segments:

- Govt Labor: 59%
- Grants / CIMAS: 21%
- Supplies: 10%
- Contracts: 4%
- Equipment: 3%
- Travel: 2%
- Transportation: 1%
- Printing: <1%
- Utilities/Rent: <1%

Atlantic Oceanographic and Meteorological Laboratory
Transition to Operations & Transformational Research

Step Frequency Microwave Radiometer (SFMR)
Statistical Hurricane Intensity Prediction Scheme (SHIPS)
Rapid Intensification Index (RI)
The HRD Hurricane Wind Analysis System (H*Wind)
Drag Coefficient in Extreme Winds
Synoptic Flow/Surveillance
Targeted Observations
Five-day CLIPER (CLImatology & PERsistence) Model (CLP5)
Dropwindsondes
EDITSONDE
Observing System Experiments (OSEs)
Assimilation of Humidity from Dropwindsondes
Observing System Simulation Experiments (OSSE)
Tail Doppler Radar
Utilization of NEXRAD Radar Data in Landfalling Hurricanes
Improved Rainfall Parametric Models
Storm Surge
Hurricane Heat Potential
Reanalysis of Hurricane History
Seasonal to Multi-decadal Hurricane Forecasting
Unmanned Aircraft Systems (UAS)
ASPEN-2: ASPEN/EDITSONDE Unification
G-IV Doppler Radar
Transmission of tail Doppler Radar
Assimilation of Tail Doppler Radar
Rainfall Validation in Operational Models
New Rainfall Parametric Models
Empirical Decay Model
State of Florida Public Hurricane Loss Model
New scales for Hurricane Destructive Potential
Boundary Layer Parameterizations
New Verification Technique for Intensity Forecasts
Addition of "Off-Time" Land-Based Data
Saharan Air Layer
AXBT - Aircraft Expendable Bathythermograph Data (water temperature with depth)
Mean Atmospheric Soundings for the Tropical North Atlantic and Caribbean Sea
Advanced Weather Research Forecasting Model (WRF)
Adaptive Hurricane Landfall Observing System

Organization of Peak Winds
Inner-Core Structure and Dynamics Related to Rapid Intensification and Genesis
Statistical Model for Genesis
Improved rapid intensity index
Optimal Observing System for Hurricane Prediction
Development of an Optimal Ensemble Forecasting System for Hurricanes
The Hurricane Imaging Radiometer (HIRad)
Doppler Wind Lidar (DWL)
SANBAR and VICBAR/LBAR
Electrochemical Sensors to Detect DNA Associated with Human Pathogens
Assays for Fecal Contaminants in Coastal Waters for Multiple Source Tracking
DNA Hybridization Assay in Microplate Format
Continuous Underway Measuring of Amonium at Extremely Low Levels in Seawater
Methodology for Low-level Nutrient Analysis (NO2, NO3, SiO4, PhO4)
Technical Guidance for Characterization of Waste-water Plumes in Coastal Waters
Continuous Underway Fish Egg Sampler Incorporating Synced-frame Video Recorder
Adaptation of 4-sensor MOCNESS to 8-sensors
Towed Underwater Silhouette Video System
Autonomous CO2 Measurements in Surface Sea Water
Low-level Nutrient Measurement Process Using Liquid Waveguide System
Salinity Estimates from Temperature Data
Probability Index of Future Atlantic Multidecadal Climate Regime Shifts
Climate Indices for the Atlantic Multidecadal Oscillation, the Western Hemisphere Warm Pool and the Tropical Atlantic
Heat Budget Computation Routine using HYCOM
Oceanic CO2 Data Bases
Florida Current Daily Transport Estimates
Quarterly State of the Ocean Reports on Meridional Oceanic Heat Transport in the Atlantic Ocean, Global Heat Storage, and Global Surface Currents
Near-real-time Quality-controlled Drifter Measurements Available on the Web
Real-time Upper Ocean Surface Currents Derived from Satellite Altimetry on the Web
Argo 'Operational' Products for US Argo Floats
Real-time Quality Control of XBT and Argo Float Data Before Submission to the GTS
Real-time Surface Salinity Technology, Data Transmission, and Quality Control Tools
"Mini-drifter" to Track Currents in Very Shallow (1-3 m) Waters
Real time Spar Buoys for Measurements in Shallow Waters (CREWS, Looe Key)
Shipboard Environmental Data Acquisition Software (SEAS)
Expert System for Data Integration and Forecasting

Atlantic Oceanographic and Meteorological Laboratory
Publications Fiscal Years 2004 – March 2008
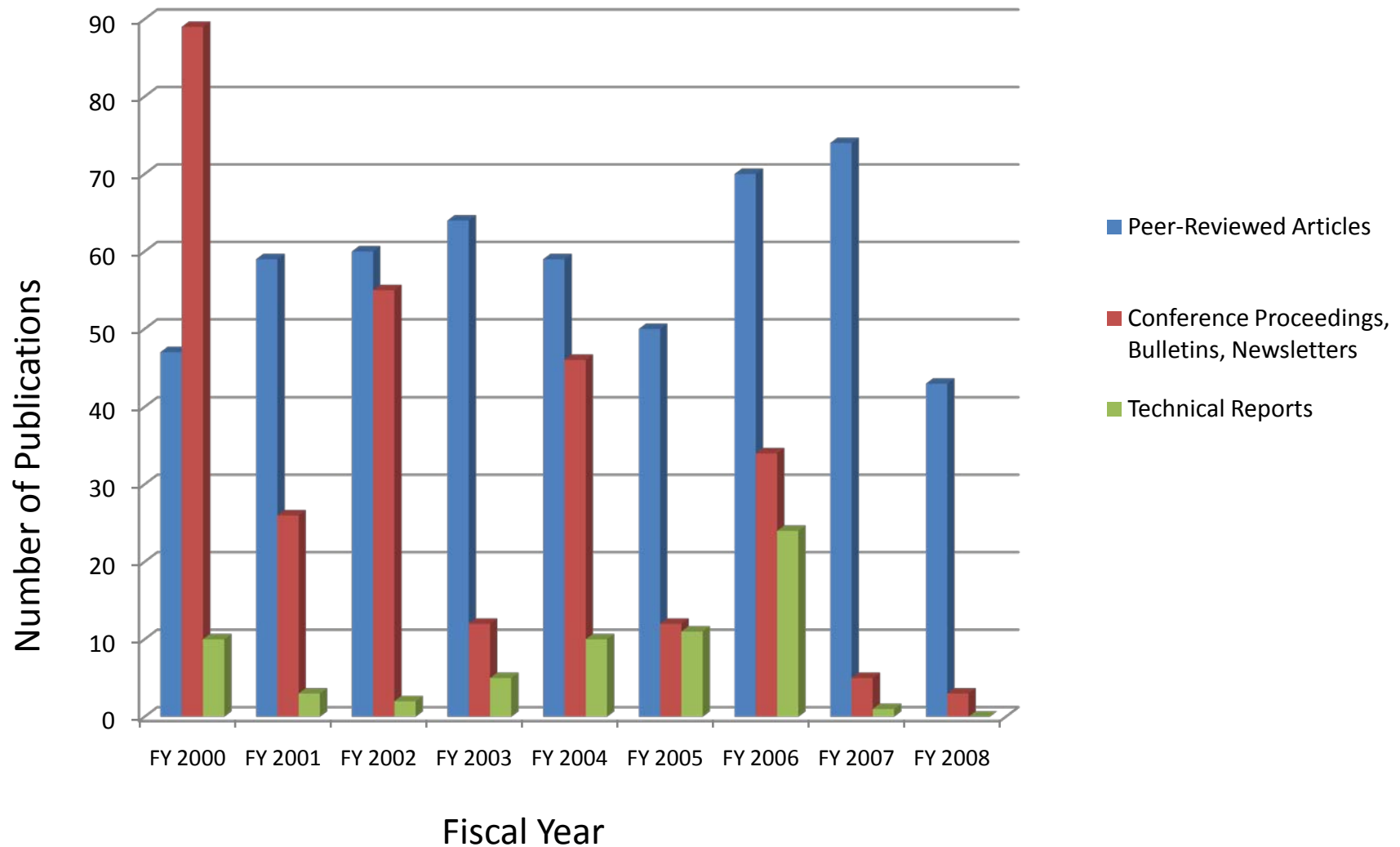
Atlantic Oceanographic and Meteorological Laboratory
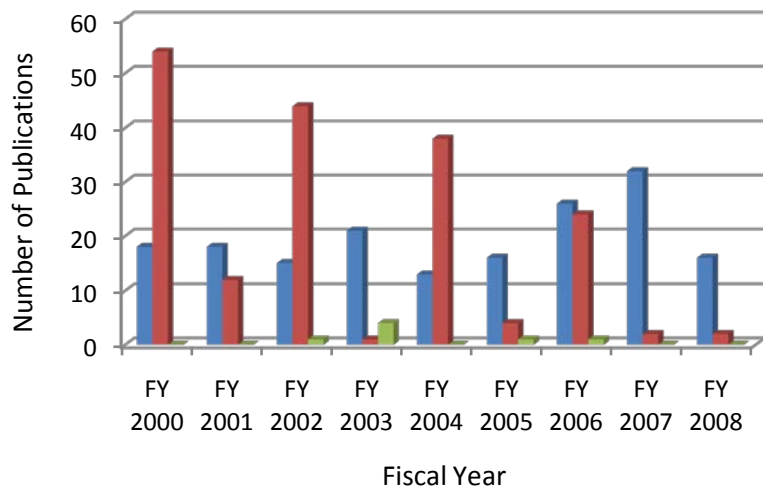## *Publications Fiscal Years 2004 – March 2008*

Year	Total	Publication
2000	47	Peer-Reviewed Articles
	89	Conference Proceedings, Bulletins, Newsletters
	10	Technical Reports
2001	59	Peer-Reviewed Articles
	26	Conference Proceedings, Bulletins, Newsletters
	3	Technical Reports
2002	60	Peer-Reviewed Articles
	55	Conference Proceedings, Bulletins, Newsletters
	2	Technical Reports
2003	64	Peer-Reviewed Articles
	12	Conference Proceedings, Bulletins, Newsletters
	5	Technical Reports
2004	59	Peer-Reviewed Articles
	46	Conference Proceedings, Bulletins, Newsletters
	10	Technical Reports
2005	50	Peer-Reviewed Articles
	12	Conference Proceedings, Bulletins, Newsletters
	11	Technical Reports
2006	70	Peer-Reviewed Articles
	34	Conference Proceedings, Bulletins, Newsletters
	24	Technical Reports
2007	74	Peer-Reviewed Articles
	5	Conference Proceedings, Bulletins, Newsletters
	1	Technical Reports
2008	43	Peer-Reviewed Articles (includes in press articles)
	3	Conference Proceedings, Bulletins, Newsletters
	0	Technical Reports

Atlantic Oceanographic and Meteorological Laboratory
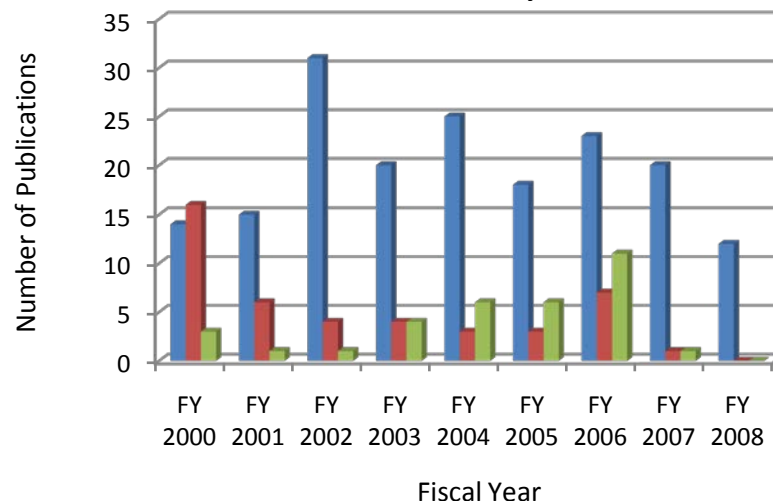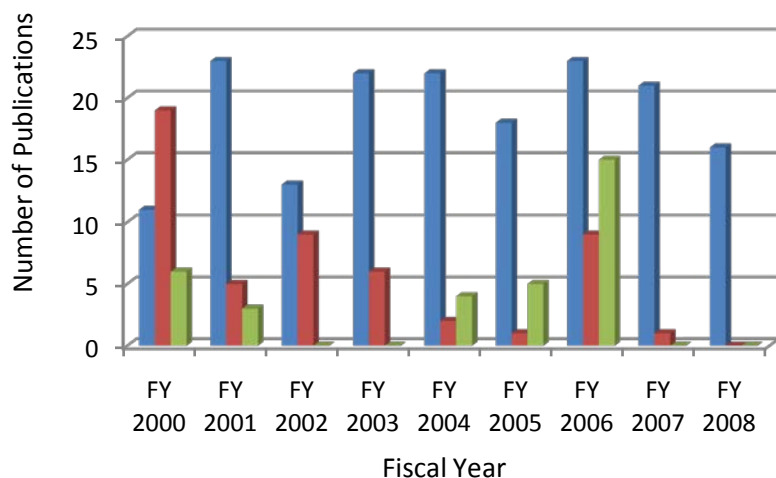## *Publications Fiscal Years 2004 – March 2008 (By Division)*

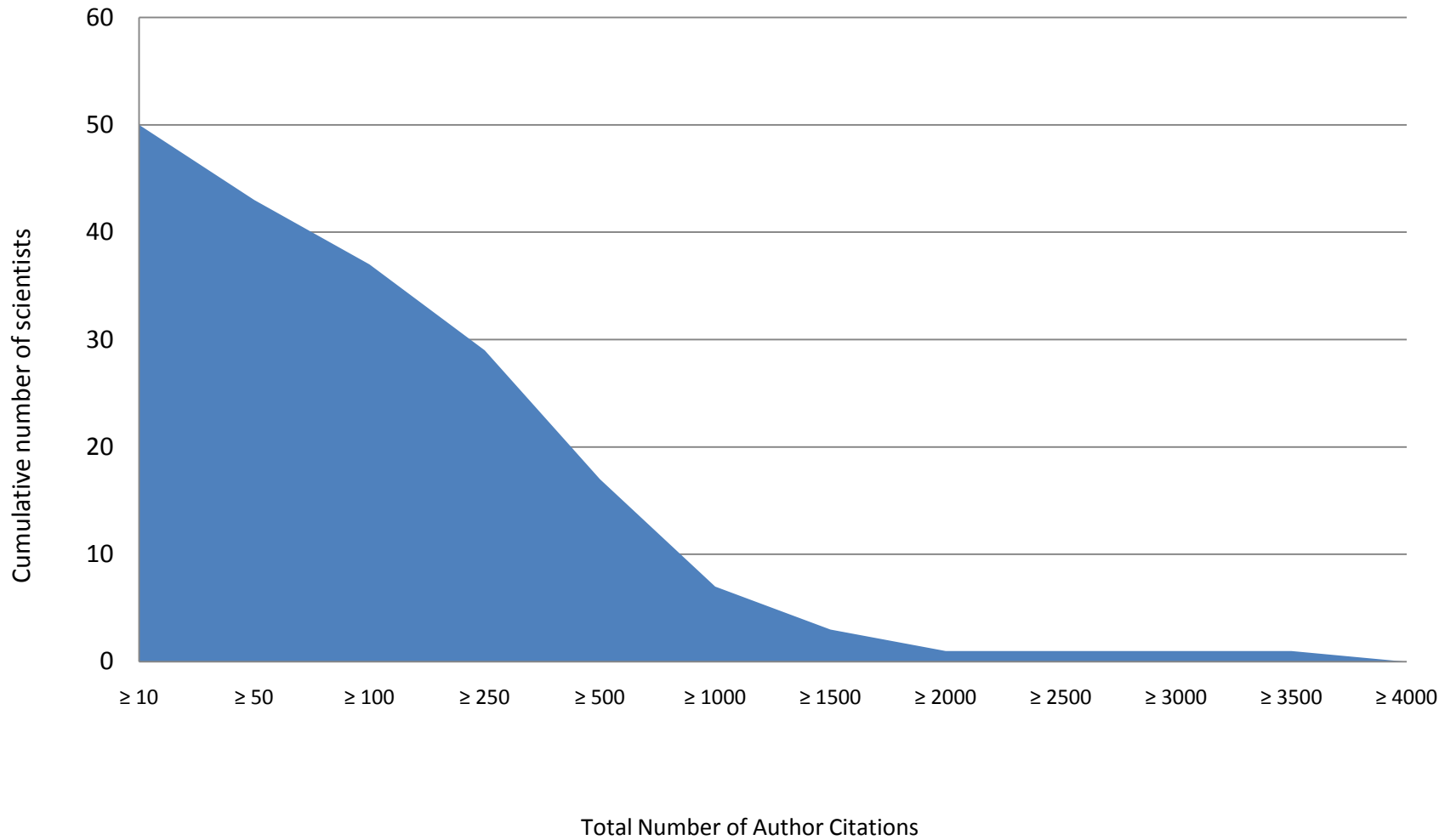# Atlantic Oceanographic and Meteorological Laboratory
Publications Fiscal Years 2004 – March 2008 (By Division)

Year	Publication	Hurricane Research Division	Ocean Chemistry Division	Physical Oceanography Division
2000	Peer-Reviewed Articles	19	14	11
	Conference Proceedings, Bulletins, Newsletters	54	16	19
	Technical Reports	0	3	6
2001	Peer-Reviewed Articles	18	15	23
	Conference Proceedings, Bulletins, Newsletters	12	6	5
	Technical Reports	0	1	3
2002	Peer-Reviewed Articles	15	31	13
	Conference Proceedings, Bulletins, Newsletters	44	4	9
	Technical Reports	1	1	0
2003	Peer-Reviewed Articles	21	20	22
	Conference Proceedings, Bulletins, Newsletters	1	4	6
	Technical Reports	4	4	0
2004	Peer-Reviewed Articles	13	25	22
	Conference Proceedings, Bulletins, Newsletters	38	3	2
	Technical Reports	0	6	4
2005	Peer-Reviewed Articles	16	18	18
	Conference Proceedings, Bulletins, Newsletters	4	3	1
	Technical Reports	1	6	5
2006	Peer-Reviewed Articles	26	23	23
	Conference Proceedings, Bulletins, Newsletters	24	7	9
	Technical Reports	1	11	15
2007	Peer-Reviewed Articles	32	20	21
	Conference Proceedings, Bulletins, Newsletters	2	1	1
	Technical Reports	0	1	0
2008	Peer-Reviewed Articles (includes in press articles)	16	12	16
	Conference Proceedings, Bulletins, Newsletters	2	0	0
	Technical Reports	0	0	0

Atlantic Oceanographic and Meteorological Laboratory Publication *Citation Records*

AOML Scientist Citations

Total Number of Author Citations

Atlantic Oceanographic and Meteorological Laboratory
New Metrics for Publications

The Following research articles by AOML authors were listed on the AMS web site as some of the most popular articles for their respective journal during January 2008:

• ABERSON, S.D., 2003: Targeted observations to improve operational tropical cyclone track forecast guidance. Monthly Weather Review, 131(8):1613-1628.

• ABERSON, S.D., 1997: The prediction of the performance of a nested barotropic hurricane track forecast model. Weather and Forecasting, 12(1):24-30.

• ATLAS, R., R.N. Hoffman, S.C. Bloom, J.C. Jusem, and J. Ardizzone, 1996: A multiyear global surface wind velocity dataset using SSM/I wind observations. Bulletin of the American Meteorological Society, 77(5):869-882.

• DUNION, J.P., and C.S. Velden, 2004: The impact of the Saharan Air Layer on Atlantic cyclone activity. Bulletin of the American Meteorological Society, 85(3):353-365.

• SCHMID, C., G. Siedler, and W. Zenk, 2000: Dynamics of intermediate water circulation in the subtropical South Atlantic. Journal of Physical Oceanography, 30(12):3191-3211.