NOAA GLOBAL MONITORING LABORATORY

Overview

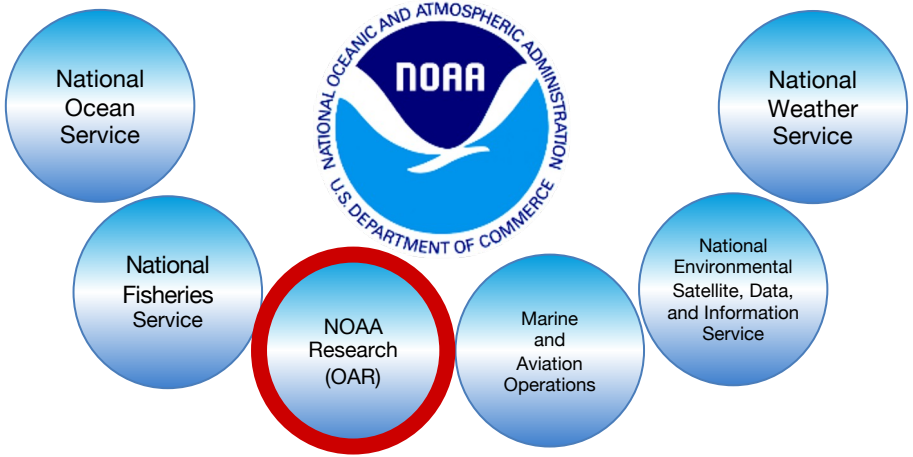
Dr. Vanda Grubišić, Director

NOAA RESEARCH

Outline

- NOAA and OAR Strategic Goals and Objectives
- GML Mission, Vision, Research Themes
- 2018 Review Report and Recommendations
- Organizational Structure, Personnel and Budget
- Diversity, Equity, Inclusion, and Accessibility
- Strategic Approach
- Measures of our Success
- Role We Play at the National and International Level
- Sustainability of Environmental Observations

NOAA and OAR: Organization, Mission, Strategic Goals



NOAA's Mission: Science, Service and Stewardship

- To understand and predict changes in climate, weather, ocean and coasts;
- To share that knowledge and information with others; and
- To conserve and manage coastal and marine ecosystems and resources.

NOAA Strategic Goals (2022-2026)

- Build a climate ready nation;
- Make equity central to NOAA mission;
- Accelerate growth in an information-based blue economy.

OAR Mission: Research, Develop, Transition

- Conduct research to understand and predict the Earth system;
- Develop technology to improve NOAA science, service, and stewardship; and
- Transition the results so they are useful to society.

NOAA Research: Goals and Objectives

OAR Strategy (2020-2026)

1 Explore the Marine Environment

Increase knowledge of the oceans, coastal areas, and Great Lakes to support resource management and public awareness.

2 Detect Changes in the Ocean and Atmosphere

Produce, analyze, and interpret observation records to understand the Earth system and inform the public.

3 Make Forecasts Better

Improve accuracy, precision, and efficiency of forecasts and predictions to save lives and property and support a vibrant economy.

4 Drive Innovative Science

Cultivate and deliver mission-relevant research to lead the environmental science community.

OAR Societal Challenges

Delivering Knowledge for a Prosperous Society

OAR Portfolios: Purpose and Focus

- Purpose of the OAR Portfolios is to enhance the communication, coordination, and collaboration across OAR
- Portfolio membership is determined by the recipient's line of OAR funding ("PPA")
- Portfolio Leadership consists of the two Stewards (Program Director + Lab Director) & Portfolio Advisor (OAR HQ)

The OAR **Climate Portfolio** focuses on long-term observations, research to advance understanding, and modeling to improve predictions of our Earth system (Climate Program Office + GML, ARL, CSL, and GFDL).

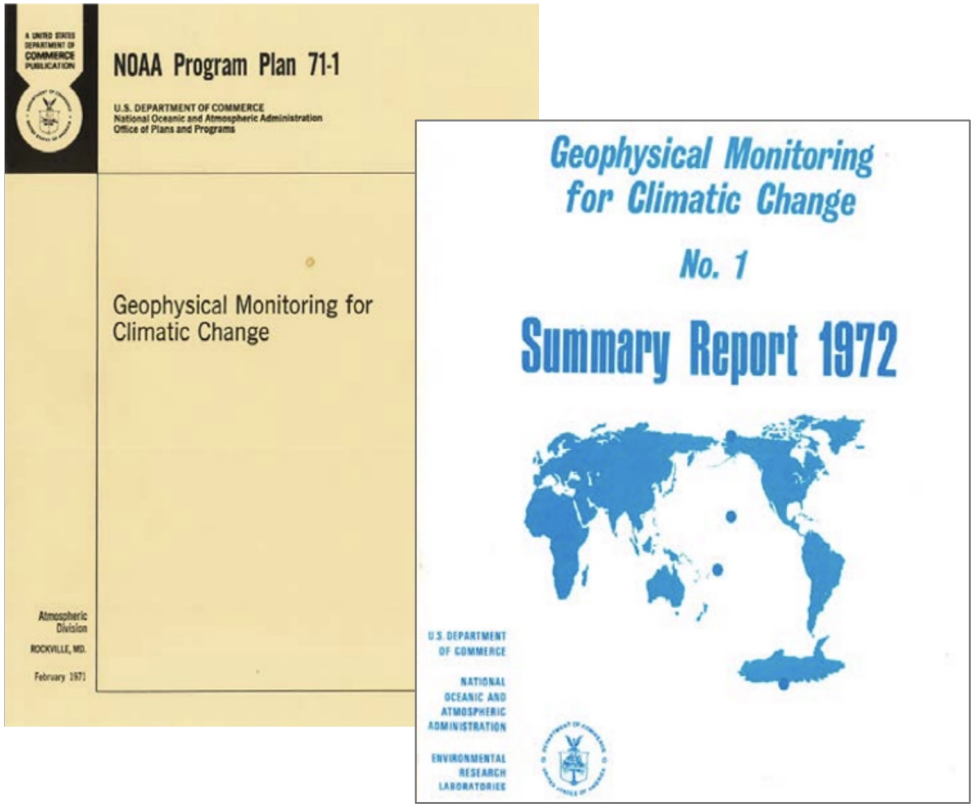
The OAR **Weather Portfolio** focuses on improving understanding and forecasting capabilities for near-term (minutes to 2 years) high-impact weather events that endanger lives and property (Weather Program Office + GSL, NSSL, PSL).

The OAR **Ocean Portfolio** focuses on improving understanding of habitats, processes, and resources in the oceanic, coastal, and Great Lakes environments (Ocean & Sea Grant Programs + GLERL, AOML, PMEL).

GML Director currently serving as the Climate Portfolio Steward (2024-2026)

GML Mission, Vision, and Research Themes 2018 Review Report and Recommendations

GML Origin



- The laboratory was created in 1972 as part of the NOAA Environmental Research Laboratories.
- The mission back then was the same as it is today – **Geophysical Monitoring for Climatic Change** – which was the Laboratory's first name.

"This program (GMCC) has its special focus in establishing a long-term time series from ground-based information."

Geophysical Monitoring for Climate Change First Summary Report, 1972

GML Mission, Vision and Research Themes

Mission:

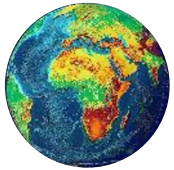
To acquire, evaluate, and make available accurate, long-term records of atmospheric gases, aerosol particles, clouds, and surface radiation in a manner that allows the causes and consequences of change to be understood.

Vision:

A society using the best possible information to inform decisions on climate change, weather variability, carbon cycle feedbacks, and ozone depletion.

Taking the Pulse of the Planet!

Research Themes 2018-2022

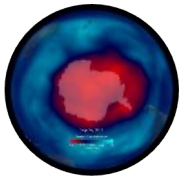


Theme 1

Tracking Greenhouse Gases and Understanding Carbon Cycle Feedbacks

Theme 2

Monitoring and Understanding Changes in Surface Radiation, Clouds, and Aerosol Distributions



Theme 3

Guiding Recovery of Stratospheric Ozone

2018 Review Panel Findings

The quality of NOAA GMD* work in every area of activity is outstanding. The relevance of GMD could not be higher.

The observatories, standards, technologies as well as its highly trained scientists and the products they release cannot be replicated or replaced …

The three themes of NOAA GMD, (1) greenhouse gases and carbon cycle; (2) ozone recovery; (3) radiation, clouds and aerosols, are the most appropriate priorities for its mission.*

GMD* is … one of the most distinguished and best-known scientific organizations in the Nation. *There is no other laboratory or organization in NOAA or the Nation charged with the monitoring activities that GMD conducts. GMD's work is to make the US "climate-ready" by collecting the best data for modelers and policymakers tasked with preparing for the century ahead.* ***GMD is as important to the Nation as the National Weather Service.***

**In 2018, GMD was a division of the Earth System Research Laboratory (ESRL). GMD became GML in March 2020.*

2018 Review Report General Recommendations 1/2

01	**Overall Recommendation:** Grow, do not shrink, GMD*.	This requires funding increases in every area, not necessarily huge, but *solid and sustained.* Federal hires, 10-12 of them divided evenly between senior Management/group leaders and more junior scientists, need to occur as soon as possible.
02	The science conducted by GMD* must expand to keep up with demands for climate-related data…	• ... in all these areas and to enable partnerships that transfer knowledge for even greater benefit to the Nation and beyond. • A fundamental change in OAR's priorities must take place if GMD is not to be destroyed one species, one unit or one facility at a time.
03	Budget and hiring plans must support their work and both need to expand to allow GMD* to better fulfill its mission.	• Funding from NOAA must be increased in every area. • The ABOs must be maintained; there is no redundancy. • The decline in numbers of Federal personnel, in particular senior staff, must be reversed. • Succession planning to attract experienced leaders and to put promising junior scientists on a career track must occur as soon as possible.
04	NOAA and GMD* both need to make GMD's work and its scientists more visible.	Actions could include: (1) more publications postings, press releases and updated personnel websites; (2) NOAA awards and promoting recognition by professional societies.

**In 2018, GMD was a division of the Earth System Research Laboratory (ESRL). GMD became GML in March 2020.*

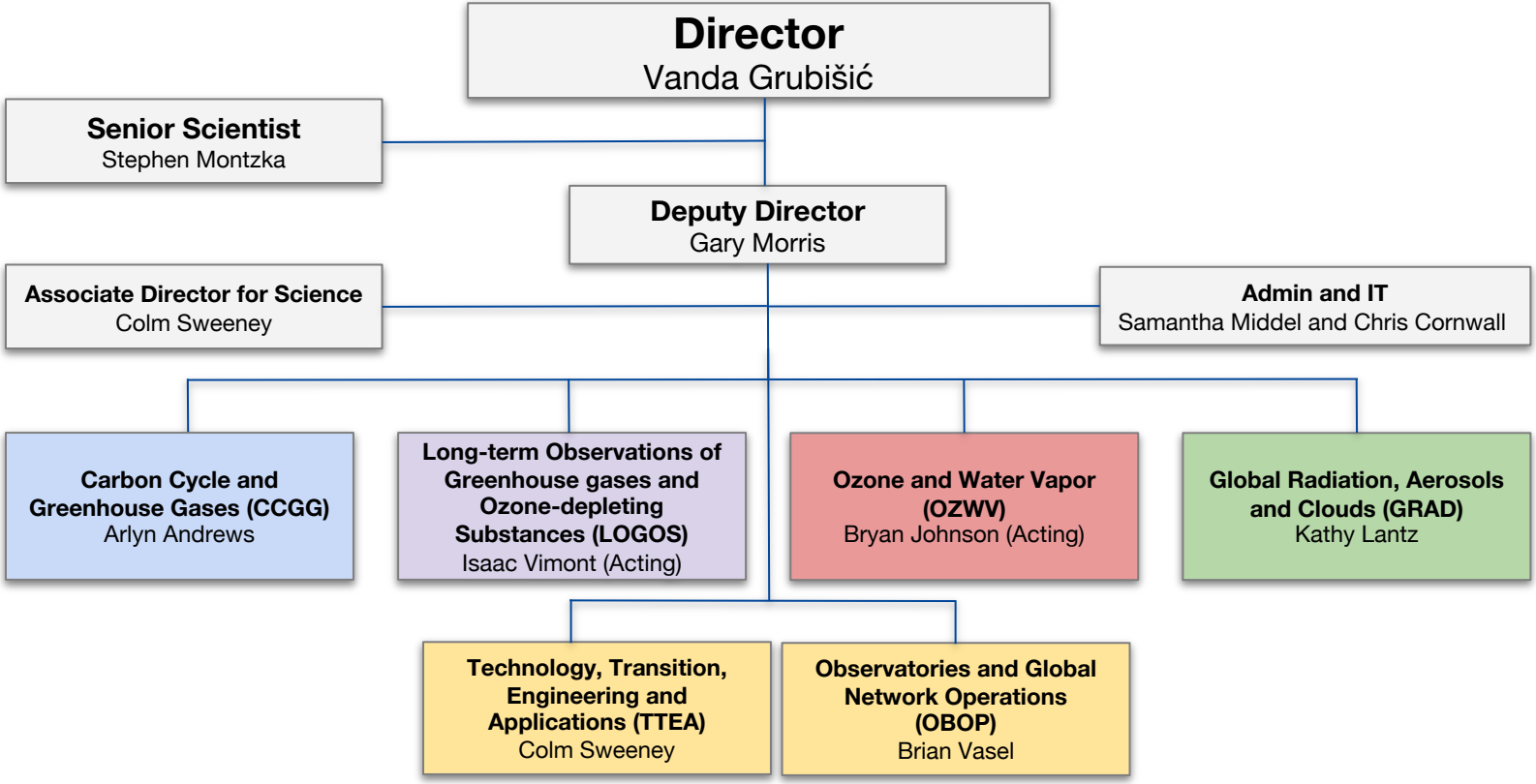
2018 Review Report General Recommendations 2/2

05	Senior management should follow best practices in working with group leaders as a team.	The current five groups should be merged into three units that match the themes. This would make two units (Rad-CA, ODS/O3) roughly comparable in core support. Consolidation should save management costs and allow personnel more time to strengthen analysis output and visibility for those two groups.
06	NOAA budgets and personnel must continue to support a range of activities …	… that follow from national and international commitments to data collection, calibration, scientific reviews and the assessment process.
07	Collaborative opportunities for all of GMD*'s groups should be better exploited …	… within GMD, across NOAA and with outside organizations.
08	With GMD* senior leadership, GHG/CC needs to develop a strategic plan that defines goals for the next 5 and 10 years …	• … along with appropriate implementation. • Better integration of measurements and models within the Theme and with NOAA's climate model Labs and beyond, should be included in such a plan.

**In 2018, GMD was a division of the Earth System Research Laboratory (ESRL). GMD became GML in March 2020.*

Organization, Budget & Personnel
Diversity, Equity, Inclusion & Accessibility

GML Internal Organizational Structure (post 2022 reorg)



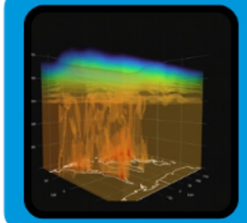
CCGG
LOGOS

GRAD

LOGOS
OZWV

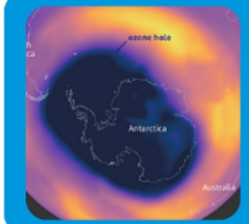
GLOBAL MONITORING LABORATORY 2024

RESEARCH THEMES



Understanding sources, transport, and sinks of greenhouse gases and climate feedback mechanisms

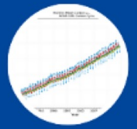
Understanding the Earth's energy balance through monitoring of clouds, aerosols, and surface radiation



Understanding stratospheric ozone recovery in a changing atmosphere

CROSS-CUTTING ACTIVITIES

SUPPORT PILLARS



Data Management

Observatories & Networks

Standards & Calibration

New Technologies

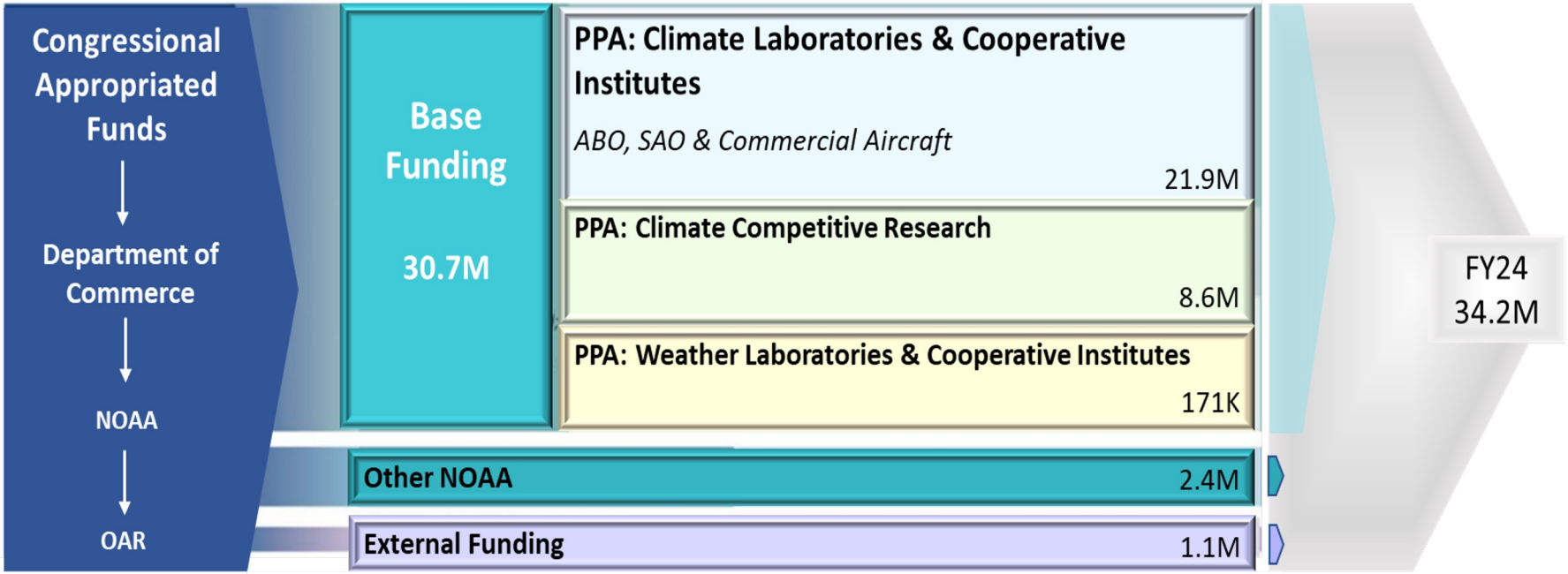
ALL

OBOP+

ALL

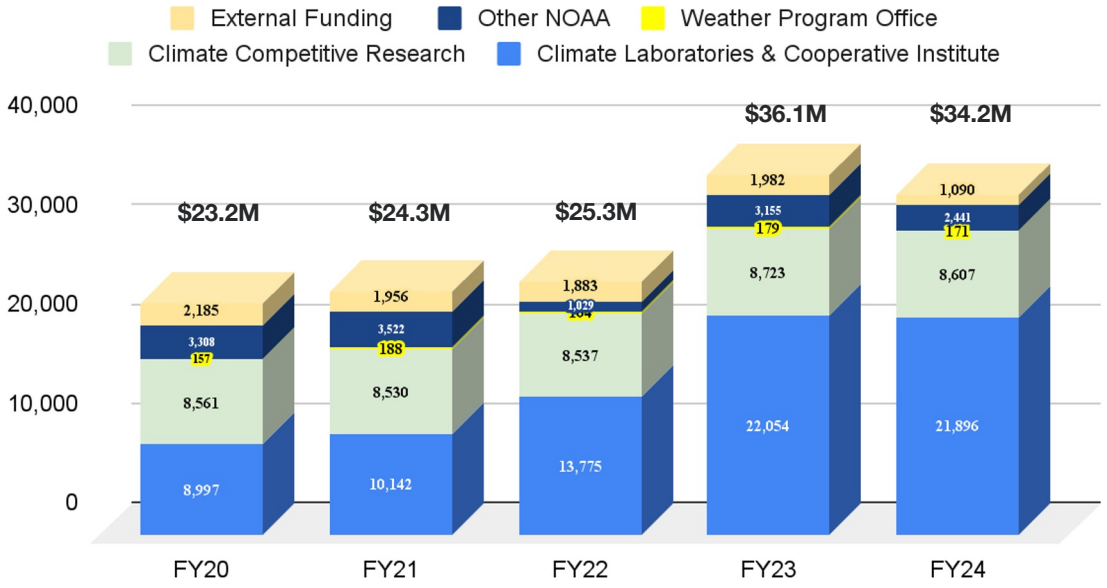
TTEA+

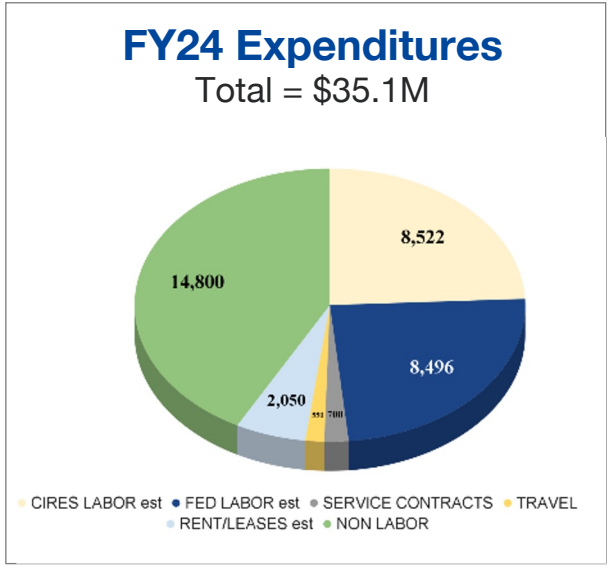
GML FY24 Funding (in $M)



GML Funding and Expenditures

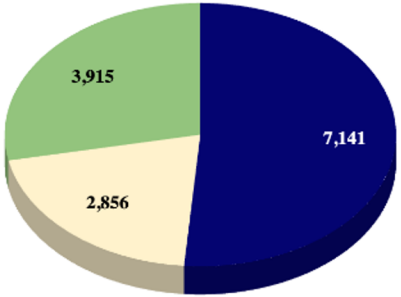
- Gradual increases from FY18 to FY23 for ABOs reconstruction/upgrades
- Significant jump in FY23 for sustained atmospheric observations (GHG measurements)



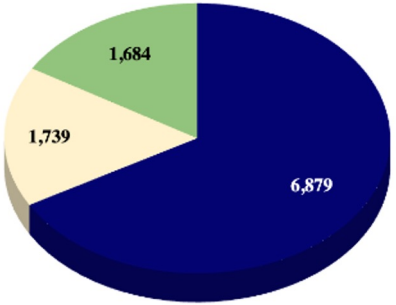


FY24 Expenditures by Themes and Support Pillars

Total: $13.9M

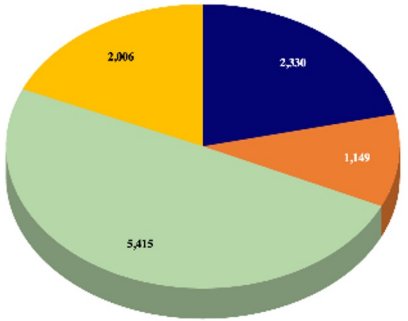


Total: $10.3M



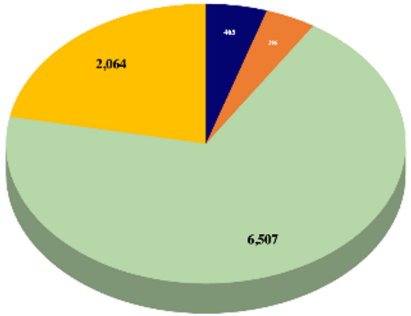
THEME 1 THEME 2 THEME 3

LABOR



Total: $10.9M

NON- LABOR



Data Management (includes data QA/QC) Calibrations and Standards Network Ops
Technological Innovation

Total: $9.4M

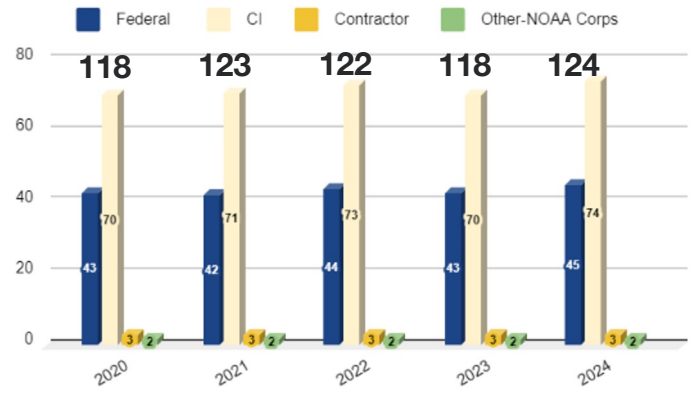
GML Staffing and Demographics

Blended Workforce:

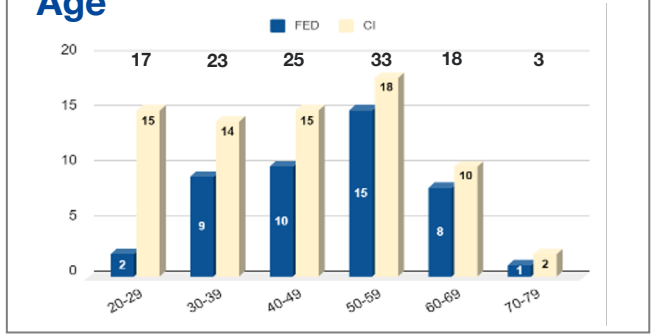
NOAA Federal + NOAA Corps + contractors + Cooperative Institutes (CIs)

Strong CI partnership with CIESRDS (CIRES, CU Boulder)

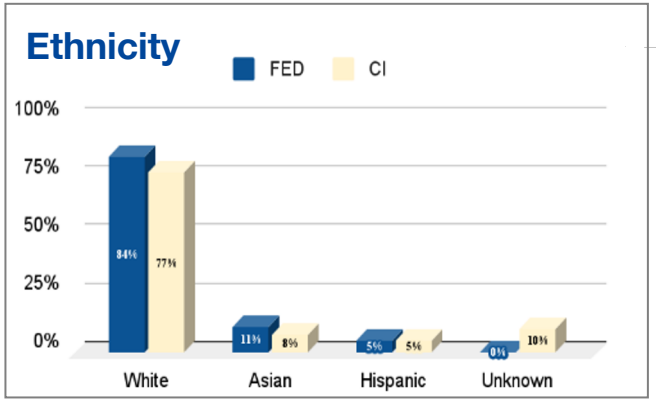
Total Numbers



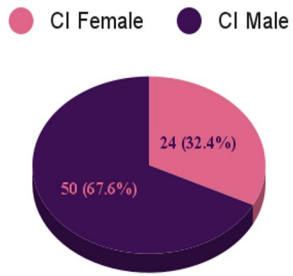
Age

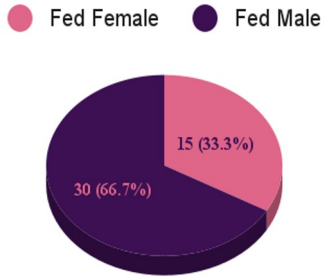


Ethnicity



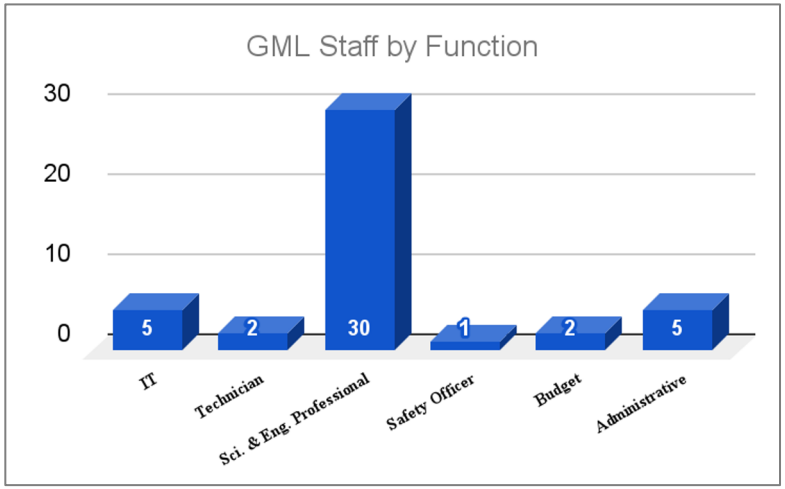
Gender

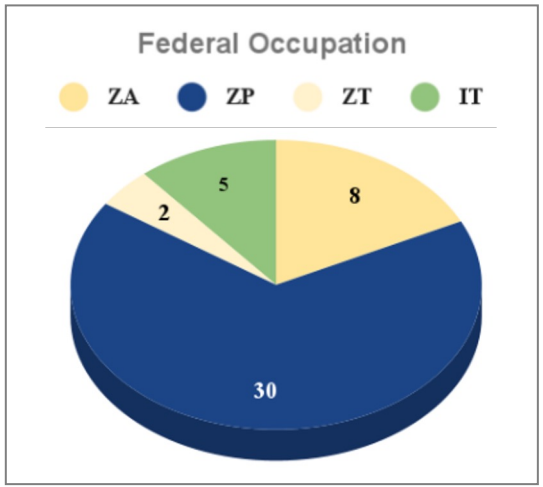




GML Federal Staff by Function and Geographic Location FY2024

- ZP job classification (Scientific and Engineering Professional includes many different areas of expertise: physicists, chemists, meteorologists, general physical scientists, engineers, even IT specialists)
- Safety Officer shared by GML (0.6 FTE) and CSL (0.4 FTE)
- Geographic distribution of NOAA federal workforce: Boulder (83.7%), Hawaii (9.3%), Alaska (4.7%), Antarctica (2.3%), American Samoa (2.3%)





Diversity, Equity, Inclusion & Accessibility (DEIA)

GML DEIA Committee Activities:

1. **Monthly Meetings:**
   a. Open to all
   b. Rotating topics
   c. Homework, discussion, action items
   d. PSL joined our group this year
   e. Rolling agenda
2. **Contribute to OAR Boulder DEIA Activities:**
   a. Membership on OAR Boulder DEIA committee
   b. Annual All Hands
   c. OAR Boulder DEI statement
   d. Actions underway:
      i. Advocated for gender-neutral bathroom in DSRC starting June 2022
      ii. Contract awarded for conversion of bathroom in August/September 2024
      iii. Contributed to NOAA West DEIA Resources Hub
      iv. Admin group 100% diversity achieved

Strategic Approach

Strategic Approach

Maintaining excellence of our observational networks

Leveraging new technologies

Advancing algorithms

Delivering high-quality data

Conducting world-class research

Understanding drivers behind trends

Fostering internal and external collaborations

Serving as an honest broker/ trusted agent

Driving national strategies on research and actions

Influencing international efforts

Strategic Planning Process

- While GML Research Plan (2018-2022) is still relevant, the Laboratory needs a new strategic plan (SP)
- The SP planning process was initiated in Fall 2023, consisting of the following parallel efforts:
  - New science plan, core of the new SP
  - ABO and Sustained Atmospheric Observations implementation plan
  - Modeling plan
  - Data management, assessment of current practices and recommendations to management for the future
  - DEIA plan

Setting the Priorities

- Legislative mandates (National Climate Protection Act (1978), Global Climate Change Program Act (1990), Global Change Research Act (1990), Clean Air Act (1990))
- Consistency with NOAA's and OAR's strategic plans and priorities, including the OAR Societal Challenges and the GML-led OAR GHG Monitoring and Information Services Science Implementation Plan
- Relevance to interagency and international plans (USGCRP, US GHG Center, US GHGMMIS Strategy, WMO G3W, UNEP Montreal Protocol, UNFCCC)
- Relevance to national and international assessments

Science Questions for the Three Research Themes

Theme 1

Understanding sources, transport and sinks of greenhouse gases and climate feedback mechanisms

- How will the partitioning of greenhouse gas sources and sinks between oceanic, terrestrial, and atmospheric domains influence and respond to a changing climate?
- What are the anthropogenic inputs of CO_2, CH_4, and other long-lived GHGs to the atmosphere?
- How will climate change impact the large-scale dynamics and composition of the upper atmosphere?

Theme 2

Understanding Earth's energy balance through monitoring of clouds, aerosols, and surface radiation

- How does surface radiation respond to changes in aerosols, clouds, ocean temperatures, and land cover?
- How does spatial and temporal variability of aerosol properties reflect changes in natural and anthropogenic sources? How do aerosol properties influence and respond to a changing climate?
- How do weather and climate impact renewable energy resource variability?

Theme 3

Understanding stratospheric ozone recovery in a changing atmosphere

- How effectively is the fully revised and amended Montreal Protocol mitigating threats to stratospheric ozone and climate change?
- How is stratospheric ozone changing? What factors are influencing those changes and how large are each of those factors?

Cross-cutting research areas and emerging research opportunities

Partnerships are Essential

53rd Global Monitoring Annual Conference

20 - 21 May 2025
Boulder, CO

Evolution from a GML forum for engaging with partners contributing to, sharing or using GML data to a large international conference.

2024:

- 329 registrants
  - **52% in person, 48% remote**
  - 143+ different organizational affiliations
  - 20+ countries
  - 5 (6) continents
- 74 presentations
  - 36 oral presentations
  - 38 poster presentations

2023 *(1st post-COVID gathering):*

- 283 registrants
  - **57% in person, 43% remote**
  - 143 different organizational affiliations
  - 24 countries
  - 6 continents (7 if our South Pole crew manages to call in!)
- 79 presentations
  - 37 oral presentations
  - 42 poster presentations

Measures of our Success

Research Highlights (2019-2024)

19 NOAA Research highlight stories. Recent ones:

July 23, 2024
NOAA and United Airlines partner to measure greenhouse gases, pollutants with high-tech flight instruments

June 13, 2024
A class of ozone-depleting chemicals is declining, thanks to the Montreal Protocol

December 20, 2023
A volcanic eruption sent enough water vapor into the stratosphere to cause a rapid change in chemistry

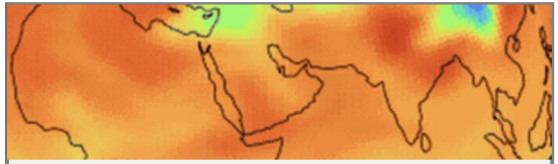
November 30, 2023
New England research project to boost off-shore wind generation

November 21, 2023
NOGAP survey completed its first flights to document greenhouse gas distribution across the U.S.

October 12, 2023
NOAA's Global Monitoring Laboratory releases CarbonTracker-Methane 2023

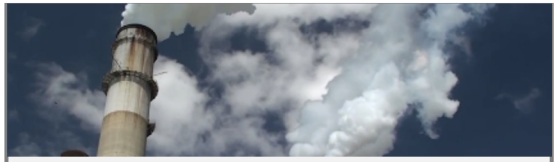
June 13, 2023
Revolutionary NOAA high-altitude research tool passes key milestone

GML Data Products Annual Releases



Carbon Tracker
1-2 times per year

Global Greenhouse Gas Trends
April



Annual Greenhouse Gas Index (AGGI)
May

Annual Peak of Atmospheric CO_2 at Mauna Loa Observatory
June

Ozone Depleting Gas Index (ODGI)
Summer

Antarctic Ozone Hole
Late October/early November

GML by the Numbers: Publications (2018-2023)

GML Bibliographic Summary Metrics
January 2018-December 2023

445
Publications

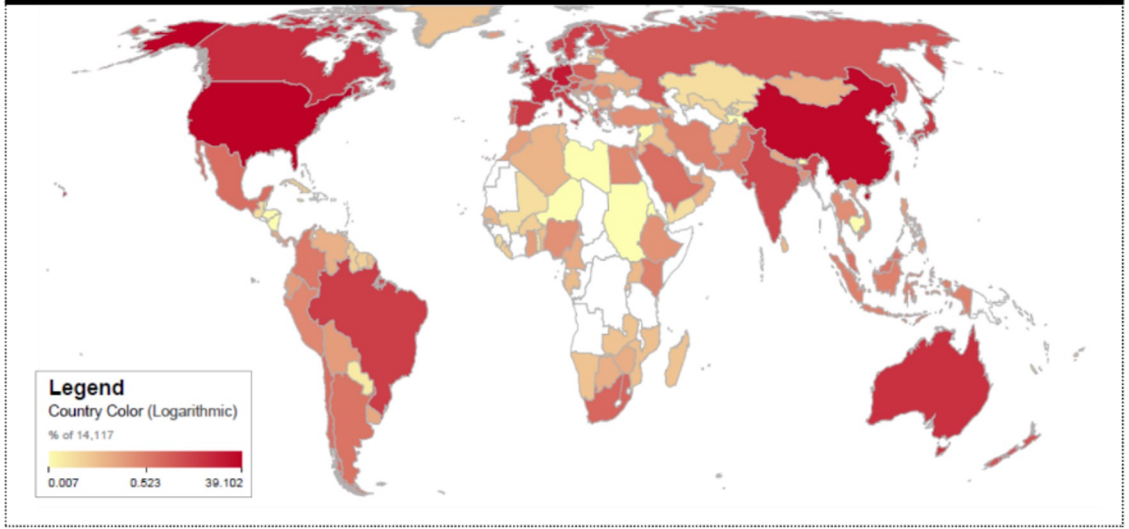
20,690
Citations from these publications

96.18%
Documents cited at least once

58
GML *h*-index

24.27%
Documents in the top 10% of publications in Web of Science-based publications

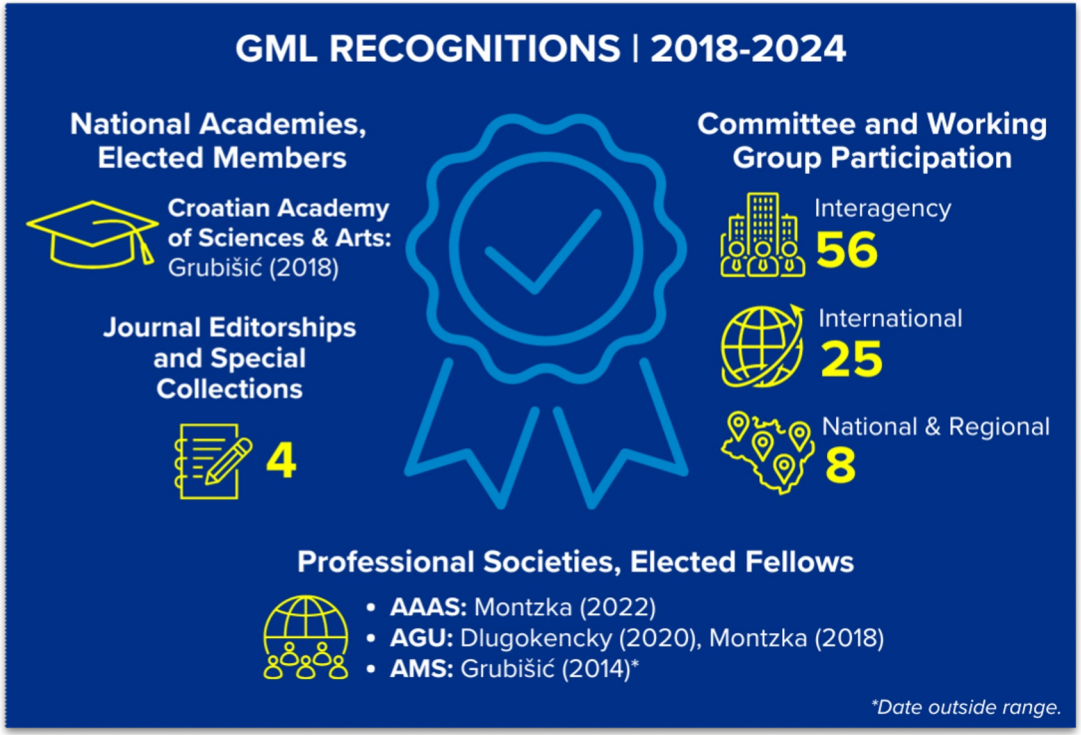
International Citations of GML Articles Published between 2018-2023



Clarivate Highly Cited Researchers

2019: Montzka, Sweeney, Miller | **2020**: Montzka, Sweeney | **2021**: Dlugokencky, Montzka, Sweeney, Miller
2022: Dlugokencky, Montzka, Sweeney, Miller | **2023**: Miller

GML by the Numbers: Awards and Recognition (2018-2024)



Role We Play at the National and International Level

National Service and Societies

United States Global Change Research Program

AGU American Geophysical Union

NDACC

ARM Climate Research Facility

NSF | neon Operated by Battelle

IARPC Interagency Arctic Research Policy Committee

NASA Carbon Monitoring System

U.S. Greenhouse Gas Center
Uniting Data and Technology to Empower Tomorrow's Climate Solutions

OCO-2

International Service and Organizations

WMO

Global Atmosphere Watch

UNEP

IOC International Ozone Commission

BIPM

GCOS

United Nations Framework Convention on Climate Change

ACTRiS Exploring the Atmosphere

GEWEX

WRMC-BSRN
World Radiation Monitoring Center - Baseline Surface Radiation Network

Sustainability of Environmental Observations

- The Mauna Loa Nov 2022 eruption highlighted the vulnerability of our long-term observing system
- Strategic focus on increasing the resilience and sustainability of our sites to ensure continuity of environmental observations and reduce our carbon footprint
- Net-zero efforts at ABOs: DOE AFFECT Grant

MLO

Grant secured to install:

- 500 kW of ground-mounted solar panels
- 1 MW battery system

Ultimate goals:

- Net-zero with respect to electricity and water
- 24+ hours of resiliency
- Scalable

SMO

Proposal to install:

- 215 kW wind turbine + 80 kW PV system
- 8 kW battery system

Ultimate goals:

- Net-zero with respect to electricity and water
- 48+ hours of resiliency

MLO will be the 1st NOAA and DOC net-zero facility on US soil

Review Structure

Day 1

- GML Overview (you are here)
- Theme 3 (Ozone and Ozone Depleting Substances)

Day 2

- Theme 1 (Greenhouse Gases)
- Theme 2 (Radiation and Aerosols)

Day 3

- DEIA
- Support Pillars (ABOs/Networks, Data Management, Standards/Calibrations)
- Wrap-Up and Takeaways

NOAA RESEARCH

Thank you!
Questions?