

2022

NOAA/Global Systems Laboratory Charter

NOAA/Office of Atmospheric and Oceanic Research

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Vision Statement

Forecast systems that deliver solutions

Mission Statement

Lead research and directed development through the transition of environmental data, models, products, tools, and services to support commerce, protect life and property and promote a scientifically literate public.

GSL Core Values

- Science-Driven - stewards of science
- Diversity - committed to creating a diverse workforce
- Innovation - encouraging new ideas, creativity, and future vision
- Inclusion - interacting and collaborating with others to achieve our shared goals
- Public Service - responsive to the public and society for the greater good
- Agility - ability, and willingness to change as conditions and requirements change
- Excellence - striving to be the best at what we do in our research and public service
- Integrity - Adhering to moral and ethical principles

GSL Grand Scientific Challenge

Provide actionable environmental information through the research and development of rapidly updating global storm-scale prediction and innovative decision support capabilities to reduce societal impacts from hazardous weather and other environmental phenomena.

Statutory Authority and/or Charge Under NOAA Strategic Plan

GSL is aligned under:

- Weather Research and Forecasting Innovation Act of 2017 15 U.S.C. § 8501, air chemistry and air quality research: Clean Air Act as amended, 42 U.S.C. §§ 7401-7431, Tsunami Warning, Education, and Research Act of 2017, Title V, 33 U.S.C. § 3201 note, NOAA's Weather-Ready Nation goal, and the NOAA Ocean and Atmospheric Science Education Program (33 USC 893a).
- Bipartisan Infrastructure Law of 2021 - On November 15, 2021, President Biden signed the Infrastructure Investment and Jobs Act (IIJA) (Public Law 117-58, also known as the "Bipartisan

Infrastructure Law”) into law. The Bipartisan Infrastructure Law is the largest long-term investment in our infrastructure and economy in our Nation’s history. It provides \$550 billion over fiscal years 2022 through 2026 in new Federal investment in infrastructure, including in roads, bridges, and mass transit, water infrastructure, resilience, and broadband.

GSL’s research specifically addresses several objectives of this guidance:

- Reduce loss of life, property, and disruption from high-impact events
- Improve transportation efficiency and safety
- Improve freshwater resource management
- Create a more productive and efficient economy through environmental information relevant to key sectors of the U.S. economy
- Improve public literacy in Science, Technology, Engineering, and Math (STEM)

GSL is also excited to partner with the upcoming Earth Prediction Innovation Center (EPIC) to fulfill the authorization in the National Integrated Drought Information System Reauthorization Act of 2018 (Public Law (P.L.) 115-423) to improve the transition of research into operations by creating a community global weather research modeling system.

GSL is aligned with the following organizational goals:

- **DOC:** Drive U.S. innovation and global competitiveness, expand opportunity and discovery through data, reduce extreme weather impacts
- **NOAA:** Make equity central to NOAA’s mission, build a climate-ready nation
- **OAR:** Drive innovative science, make forecasts better, detect changes in the ocean and atmosphere

GOALS

Goal 1: Invest in people, partnerships, and organizational performance

A healthy, diverse, high-achieving, agile, and enthusiastic staff that is empowered and supported by a forward-thinking administrative and IT support staff and infrastructure, and that enables diverse perspectives and effective internal and external collaboration to achieve high-impact results.

Goal 2: Develop state-of-the-art Earth-system prediction capabilities

A computationally efficient and scale-agnostic next-generation earth system prediction capability that is mission-relevant, using advanced techniques in assimilation, physical and atmospheric composition processes, and verification, and leverages a broad range of observations for improved forecasts.

Goal 3: Revolutionize communications, products, and services to enable informed decision-making

Environmental information systems and impact-based verification services that are useful and actionable. Decision-makers and the public have access to clear visualizations and communications of weather and climate risk leveraging social, behavioral, and economic science. These services should use a centralized data source, cloud storage, and cloud computing that informs decision-making associated with the potential impact of environmental hazards.

Products and Technologies

Among the list of technologies such as numerical weather models, data assimilation techniques physics parameterizations, high-performance computing system tools, information systems, and decision support and verification systems that are transferred from GSL to operations or applications in NOAA, other agencies, and the private sector, include:

Earth System Prediction

- Regional: Rapid Refresh (RAP) and High-Resolution Rapid Refresh (HRRR) models, Rapid Refresh Forecasting System (RRFS), modeling for renewable energy
- Global models: GEFS-Aerosols, WRF-Chem
- Physics packages: Convection (Grell-Freitas), boundary layer, land surface
- Atmospheric Chemistry
- Data assimilation: Radar, satellite, surface, and other observations into forecast models
- Fire Weather and the grand precipitation challenge
- Model evaluation and verification

Decision Support

- Advanced Weather Information Processing System (AWIPS) Critical hardware, software, and science innovations for the Advanced Weather Information Processing System (AWIPS)
- Hazard Services
- Data processing: Meteorological Assimilation Data Ingest System (MADIS), Advanced Quantitative Precipitation Information System
- Assessments and Verification

Advanced Technologies

- High-performance computing science
- Machine Learning/Artificial Intelligence
- Science On a Sphere suite of tools

Strategic Partnerships

As one of NOAA's premier research laboratories, the GSL enables operational weather forecasters to produce the best forecasts using state-of-the-art technology that incorporates the latest science. GSL has a history of successfully transitioning research into advanced products and services for operations. GSL values its strong relationships with the following organizations:

- National Weather Service (NWS) researchers and forecasters
- NOAA research laboratories
- NOAA National Centers for Environmental Prediction
- Federal Aviation Administration (FAA)
- National Center for Atmospheric Research (NCAR)
- University of Colorado and the Cooperative Institute for Research in Environmental Sciences (CIRES)
- Colorado State University and the Cooperative Institute for Research in the Atmosphere (CIRA)
- Joint Center for Satellite Data Assimilation (JCSDA)
- NOAA testbeds: Developmental Testbed Center (DTC), Hazardous Weather Testbed (HWT), Aviation Weather Testbed, and Hydrometeorology Testbed (HMT), Fire Weather Testbed (FWT)
- Earth Prediction Innovation Center (EPIC)
- Unified Forecast System (UFS) Community
- Taiwan Central Weather Bureau
- Private sector

Future Directions

Our goals accelerate progress towards our grand challenge to provide actionable environmental information for our customers that include the NWS, FAA, NOAA testbeds, the public, and others.

Invest in people, partnerships, and organizational performance.

- Balance portfolio funding toward long-term research and short-term development.
- Build collaboration across the laboratory.
- Champion a healthy organizational environment.
- Develop plans for career growth and succession of employees.
- Modernize the Information Technology infrastructure.
- Nurture, develop and expand strategic partnerships.

Develop state-of-the-art Earth-system prediction capabilities.

- Advance data assimilation concepts and techniques.
- Advance research of physical and atmospheric composition processes in Earth-system models that affect such things as air quality, human health, and weather systems.
- Research and develop short-range to subseasonal prediction capabilities.
- Develop leading-edge forecast verification and validation techniques and tools.

- Work with our partners, including other OAR Labs, to develop next-generation Earth-system models in concert with advances in high-performance computing technologies.

Revolutionize communications, products, and services to enable informed decision-making.

- Improve ways to discover, distill, store, and provide access to diverse, high-volume environmental data and observations.
- Develop applications with improved analysis, visualization, verification, and decision support capabilities.
- Research and develop techniques to improve understanding and effectively communicate weather impacts to educate society.
- Ensure that investments improve the skill, efficiency, and delivery of products, tools, and applications to operations