

# NOAA Physical Sciences Laboratory

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## ***Mission Statement and Vision***

**Mission:** The NOAA Physical Sciences Laboratory (PSL) conducts scientific research to observe, understand, model, predict and forecast weather, water and climate extremes and their impacts.

**Vision:** An informed society that uses science-based environmental intelligence to effectively anticipate and respond to threats and opportunities related to weather, water and climate extremes.

## ***Core Competencies***

### Selected Capabilities:

- ✓ Deploying existing observing technologies, and developing new technologies, to advance observation-based process understanding.
- ✓ Analyzing data and information to provide diagnostic explanations and to advance predictive understanding of weather, water and climate extremes.
- ✓ Developing and applying models to transform predictive understanding into capabilities to forecast and predict weather, water and climate extremes.
- ✓ Transforming science-based knowledge into actionable science that is readily available to support operations, applications and decision making.

## ***Charge Under NOAA Strategic Plan***

PSL is aligned under NOAA's Research and Development Vision Areas:

- Reducing societal impacts from hazardous weather and other environmental phenomena,
- Sustainable use and stewardship of ocean and coastal resources, and
- A robust and effective research, development, and transition enterprise

PSL serves the NOAA Mission:

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

### Overarching Science Goals:

- Develop new knowledge and capabilities to explain observed weather, water and climate extremes and their impacts to provide scientific information that supports NOAA's mission

- Identify new sources of predictive skill and improve predictions of weather, water, and climate extremes through observations, understanding and modeling of physical processes and phenomena of the coupled Earth system.

### ***Science Themes and Research Areas***

#### Research Foci:

- Characterize and advance prediction of subseasonal-to-seasonal (S2S) extreme weather and climate to improve forecasting.
- Enhance monitoring, observation-based understanding, and modeling capabilities to forecast hydrologic extremes (too much or too little water) critical to manage water resources.
- Increased targeted observations, process understanding and prediction of environmental conditions impacting the marine resources.

#### What We Do:

- Lead national and international field programs to observe and understand atmospheric behavior over land, oceans, ice, and snow.
- Identify early warning indicators in the Earth system to improve predictions of weather, water and climate extremes.
- Study and explain weather, water and climate extreme events by evaluating observed conditions and model simulations.
- Develop observing technologies, data analyses, and applications to support decision making for resource management
- Advance numerical representations of physical processes in forecast system models and evaluate performance to predict weather, water and climate extremes.

### ***Products and Results***

- PSL scientists have contributed to a number of national and international assessments and working groups that address critical issues in climate variability and predictability, water resources, global observing, Arctic change, extreme events, and drought. In particular, PSL scientists have worked with the Federal Climate Change and Water Working Group (C-CCWWAG), the U.S. Climate Variability and Predictability (CLIVAR) Program, the Global Climate Observing Systems (GCOS) Program, Intergovernmental Panel on Climate Change (IPCC), and many others.
- PSL archives a wide range of data in support of research, spanning gridded global climate datasets extending hundreds of years to real-time wind profiler data at a single location. The data itself and products derived from this data, organized by type, are available to scientists and the general public through the PSL website.

PSL has created a wide array of online products and tools that are openly available through its website. These products include various displays of climate, weather, and instrument data, experimental forecasts, and analysis and monitoring tools.

- PSL develops and uses a wide variety of observing systems to collect the data needed to better understand weather and climate processes. These systems continuously evolve in

response to user feedback and new scientific priorities. They are used in both research and quasi-operational settings.

### ***Customers***

PSL experimental weather and climate information, products and services are used across the U.S. and around the world by a wide range of customers within NOAA and in state/local government agencies, universities, the public sector, international research community, water resource managers, industry, as well as the general public.

### ***Partners***

PSL hosts the National Integrated Drought Information System (NIDIS) Program Office, and collaborates with local partners from the University of Colorado and Colorado State University. PSL co-leads NOAA's Hydrometeorology Testbed. These co-located activities motivate and link water research (predictions of too much or too little water) to societal needs. Other partners include: U.S. Bureau of Reclamation, California Dept. of Water Resources, U.S. Department of Energy/National Renewable Energy Laboratory, NASA, National Drought Mitigation Center, NOAA National Marine Fisheries Service/Fisheries Science Centers, NOAA National Weather Service/ National Water Center, NOAA National Weather Service/ National Centers for Environmental Prediction, NOAA Center for Earth System Sciences & Remote Sensing, Scripps Institution of Oceanography, Sonoma County Water Agency, U.S. Army Corps of Engineers, U.S. Geological Survey, and the Western States Water Council.

### ***Future Expectations***

PSL will continue to support NOAA's long-term strategic goals by conducting purposeful research to support NOAA's abilities to meet evolving national needs for information to provide early warning and inform preparedness. This approach has been, and will continue to be, at the heart of PSL's research strategy. PSL research contributes to building the strong science foundation that underpins NOAA services. Addressing gaps in science and the ability to deliver services will continue to be a major research priority for PSL, recognizing the important role of water as an integrator across weather and climate. PSL plans to pursue a strategy that balances responsiveness to needs of existing climate, weather and water services with innovation of new capabilities in anticipation of future service needs.

### **What is Next for PSL?**

During the next five to ten years advancing prediction:

- Explain the underlying causes of recent weather, water and climate extremes and assess their predictability.
- Advance the use of hydrometeorology observations and modeling in watersheds to improve scientific information for managing water resources.
- Improve understanding of the physical processes underlying subseasonal-to-seasonal variability and extremes to improve predictive skill and forecast reliability .
- Improve physical understanding of the causes of regional weather, water and climate extremes, their impacts, and evaluating model forecast performance.
- Develop regionally-specific environmental information and forecast products to protect and manage marine resources.