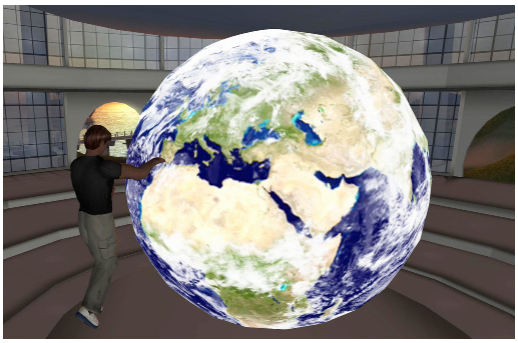
Earth System Research Laboratory
Global Systems Division
Putting tools in the hands of users



Top and bottom. GSD puts tools in the hands of those managing U.S. airspace with Next-Gen.
Second. GSD's state-of-the-art high-performance supercomputer and award-winning facility at NOAA's Earth System Research Laboratory in Boulder, Colo. NOAA photo.
Third. GSD's visualization tool Science On a Sphere ® is featured on NOAA's "islands" in the online world Second Life. NOAA image.

What Does The Global Systems Division Do For The Nation?

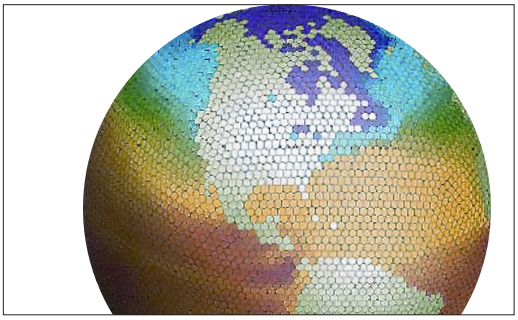
The Global Systems Division (GSD) of the Earth System Research Laboratory (ESRL) conducts research and development to provide NOAA and the nation with systems that deliver global environmental information and forecast products ranging from short-term local weather predictions to longer-term global climate forecasts.

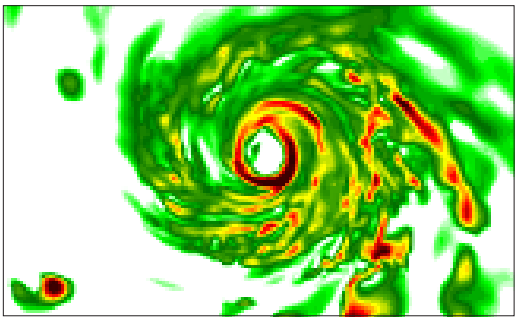
GSD Scientific Goals

- Developing and improving local-to-global weather prediction models.
- Investigating high-performance computer architectures as a vehicle for handling the enormous computational demands of global-scale environmental models.
- Developing environmental information systems to support weather and climate prediction for aviation, homeland security, public land management, rail and road transportation, federal/state/local emergency managers, and other constituents.
- Bringing new regional-to-global atmospheric observing systems to maturity.

Recent Accomplishments

- GSD creates information systems that support the National Weather Service, the Federal Aviation Administration, Department of Homeland Security, the Department of Defense, and others, including international agencies.
- GSD developed and continues to evolve the cornerstone system of the National Weather Service Forecast Office, the Advanced Weather Interactive Processing System (AWIPS), including a state-of-the art Local Analysis and Prediction System (LAPS) used to monitor and predict severe weather.
- GSD is developing state-of-the-art weather forecasts, verification tools, and information technology services for the Next-Generation Air Transportation System (NextGen). This Congressionally-mandated, multi-agency, and private sector partnership aims to increase the efficiency of the nation's airspace while maintaining high levels of safety.
- GSD leads an ESRL-wide effort to develop the FIM global model, and collaborates on various other ESRL research including the Hydrometeorological Test Bed, air quality modeling, and data assimilation activities.
- GSD develops and collaborates on forecast models to increase accuracy and specificity of weather forecasts—including storms, heavy precipitation, and other hazardous weather—for applications in aviation, energy, severe and fire weather, and others.
- GSD operates advanced, high-performance computing systems that provide essential infrastructure for weather and other environmental research.





Top. GSD staff train National Weather Service forecasters in probabilistic techniques, to better describe uncertainty in forecasts. Photo by Will von Dauster, NOAA.
Middle: GSD is developing a new global grid-point weather model called FIM, in collaboration with the National Centers for Environmental Prediction. NOAA image.
Bottom. GSD researchers are collaborating to improve hurricane modeling and prediction with the FIM and H-WRF models in NOAA's Hurricane Forecast Improvement Program. NOAA image.

- GSD educates current and future generations about the changing Earth with innovative technology; the unique 3-D visualization tool Science On a Sphere® and a presence in the virtual world of Second Life as well as an educational environmental game simulation.

What's Next For GSD?

During the next five to ten years, GSD will continue to support NOAA in the following areas:

- Develop modeling and assimilation techniques and information systems to improve the short-range weather forecasting necessary for severe weather watches and warnings, heavy precipitation events, water management, air quality forecasting, renewable energy production, and fire weather prediction.
- Develop advanced visualization and decision aids to allow faster and more comprehensive access to critical information by decision makers and researchers.
- Develop the global Earth system modeling and assimilation techniques needed for global chemical transport and regional climate simulations.
- Support NOAA in high-performance computing through new computing technology and improved software engineering practices.
- Conceive, design, and test the forecast impact of meteorological observing systems, with an emphasis on integrated observing systems employing a large range of measurement systems.
- Anticipate and respond to customers' needs in an ever-changing technological world through new program development, collaborations, and enhanced environmental science education.

Research Partnerships

GSD partners with two of NOAA's Cooperative Institutes, to provide research and teaching in many disciplines of the environmental sciences: the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado at Boulder, and the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University in Fort Collins. GSD is supported by a commercial service affiliate.

www.esrl.noaa.gov/gsd

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