

Earth System Research Laboratory Global Systems Division

Improving Weather Forecasts for the Nation and the World



What Does ESRL's Global Systems Division Do for the Nation?

The Global Systems Division (GSD), part of NOAA's Earth System Research Laboratory (ESRL) provides the National Weather Service (NWS) and the nation with environmental observing, prediction, computer, visualization, and information systems. These systems, after being transferred to operations, deliver forecasts and predictions of weather, including severe weather events within the next few minutes to weeks away.

www.esrl.noaa.gov/gsd/

Research Highlights:

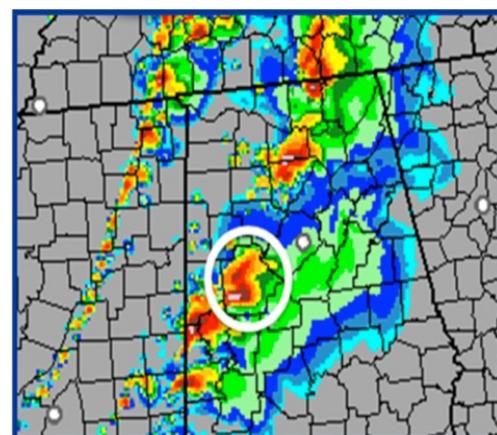
Weather Forecast Modeling: GSD is a leader in developing local-to-global scale weather prediction forecast models.

- GSD develops advanced weather models including:
 - The High Resolution Rapid Refresh (HRRR) model: Transferred to NWS operations in September 2014, the HRRR uses data from ground and satellite-based sensors, radar, and aircraft to produce a high resolution weather forecast every hour. The HRRR is also enabling the development of a new rapidly updating high-resolution forecast used to identify severe weather more quickly.
 - GSD's Flow-Following Finite-Volume Icosahedral Model (FIM): This model uses a unique grid shape to predict the motion of large weather systems globally. In October 2012, FIM accurately predicted the track and landfall of Superstorm Sandy.
- GSD develops, operates, and manages high-performance computer systems that enable NOAA's experimental weather models to run more efficiently.
 - GSD develops technologies that speed up computing by 20-30 times. The enhanced computing allows for weather models to ingest massive amounts of data and run at higher spatial resolution, which provides increased weather forecast accuracy.

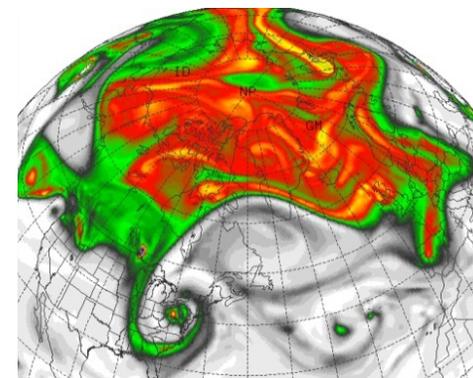
Decision Support Systems: GSD develops state-of-the-art forecast and decision support systems to improve collaboration and decision-making between forecasters, emergency managers, and the public.

These decision support systems provide decision-makers with additional tools to help them issue and communicate timely and accurate hazard information:

- In January 2015, the Meteorological Assimilation Data Ingest System (MADIS) was transferred into NWS operations, providing NOAA and the weather community a finer density higher quality surface observational database and delivery system.
- GSD's Advanced Weather Interactive Processing System (AWIPS) is the cornerstone of the NWS Forecast Offices. This system integrates weather, water, satellite, and radar data to help forecasters prepare/issue time-sensitive, high-impact warnings.
- Hazard Services, currently being developed as part of the AWIPS II, will revolutionize and streamline NWS operations by integrating legacy tools into a common interface for issuing timely and accurate information and building a two-way communication platform for collaboration among decision-makers.



HRRR (High Resolution Rapid Refresh) experimental 9-hour forecast of thunderstorms for April 27, 2011 in the southeast U.S. The Tuscaloosa tornadic storm, indicated by the white circle, was predicted with county-scale accuracy. Source: NOAA ESRL

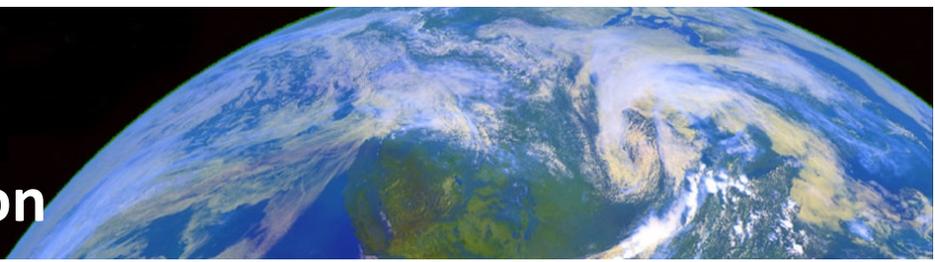


FIM (Flow-Following Finite-Volume Icosahedral Model) experimental forecast of Superstorm Sandy's track and intensity at landfall Source: NOAA ESRL



A NOAA National Weather Service AWIPS-II workstation in Boulder, CO. Source: NOAA/Will von Dauster

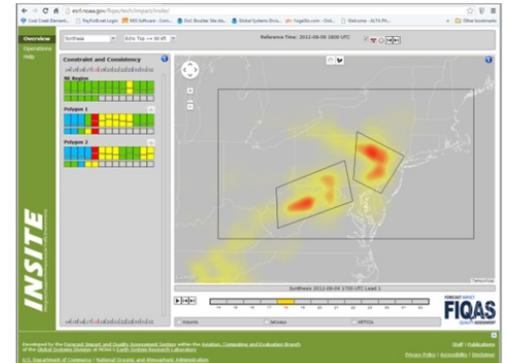
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More GSD Research Highlights:

Decision Support Systems continued:

- The **I**ntegrated **S**upport for **I**mpacted **A**ir-**T**raffic **E**nvironments (INSITE) tool uses model forecasts to identify the location of dangerous storms, ice, turbulence, and areas of low visibility for the Federal Aviation Administration (FAA). Forecasters use this information to collaborate with aviation decision-makers who manage aircraft traffic.
- GSD performs in depth studies to assess the quality of forecasts to ensure that the most accurate weather information is provided to aviation traffic planners to help avoid unnecessary traffic delays and safety.



INSITE (**I**ntegrated **S**upport for **I**mpacted **A**ir-**T**raffic **E**nvironments) transforms weather information to identify constraints to aviation operations.

Source: NOAA ESRL

Outreach Technology: GSD builds technology that educates current and future generations about our changing Earth.

GSD's Science On a Sphere® (SOS) global display system uses computers and video projectors to display animated weather and geophysical data on the outside of a six foot diameter sphere. GSD continues to develop SOS both technically and as an educational tool to explain Earth system science in an intuitive and captivating way to people of all ages and educational backgrounds.



Elementary students are treated to the SOS® display.

Source: Will von Dauster

What's Next for GSD?

- GSD leads the new High Impact Weather Prediction Project (HIWPP) funded by the Disaster Relief Appropriations Act of 2013. HIWPP is designed to help U.S. weather computing and modeling be competitive with weather models worldwide. HIWPP is projected to enhance early weather forecasting of high impact weather events like hurricanes, floods, and blizzards from hours up to several months in advance.
- Due out in 2015, the next generation of SOS Explorer™, powered by TerraViz™, will allow for the visualization and education of climate, weather, ocean, and Earth sciences to be shown on a flat screen display.



HIWPP Logo
Logo Design by Annie Reiser/ESRL

Research Partnerships

GSD has research partnerships with NOAA's Cooperative Institute for Research in Environmental Sciences (CIRES) at University of Colorado and the Cooperative Institute for Research in the Atmosphere (CIARA) at Colorado State University. Other partners include the NWS, FAA, Department of the Interior, Department of Energy, National Science Foundation, the private sector, and other academic and research institutions worldwide.

Budget and Staff

The Fiscal Year (FY) 2016 President's budget request for GSD through NOAA Oceanic and Atmospheric Research (OAR) is \$13.7M. The FY 2015 enacted funding for GSD is \$10.9M and the FY 2014 enacted funding was \$10.8M. GSD is located in Boulder, CO and employs 184 people.

Did You Know?

The 100th Science on a Sphere® was installed in August 2013 at NOAA Headquarters in Silver Spring, MD. SOS is now seen by an estimated 33 million-plus people annually on 117 systems in 21 countries, 28 U.S. states, Washington D.C., and the U.S. territory of American Samoa.

For more information on the Global Systems Division,
visit <http://esrl.noaa.gov/gsd/>