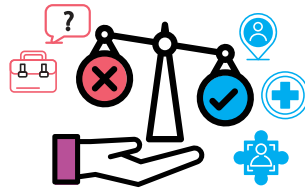


Precision Forecasting

GSL is a world leader in the development of storm-scale to global-scale environmental prediction models and advanced data assimilation systems.

- Boundary layer studies
- Fire weather & smoke research
- Verification and assessment
- Clean energy predictions
- Aviation support



Decision Support Tools

GSL develops tools that streamline the weather decision-making process for NOAA's National Weather Service, Federal Aviation Administration, and the public.

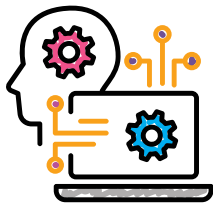
- User inspired
- Range of scenarios
- Impact based
- Protect public health



Earth System Prediction

GSL leverages the expertise of the weather community beyond NOAA to accelerate the emerging scientific and technological advancements of Earth system prediction models.

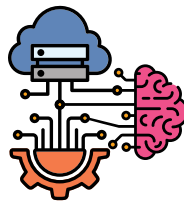
- Physics and chemistry
- Coupled models
- Atmospheric composition
- Sub-seasonal to seasonal
- Innovative assessments



Machine Learning and Artificial Intelligence

GSL uses machine learning and artificial intelligence to help filter and sort vast amounts of satellite data efficiently.

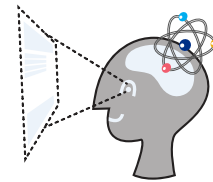
- Detects areas of active weather
- Improves fire weather forecasts and smoke observations
- Nowcasts deep convection for heavy rain events
- Detects tropical cyclone intensification



Scientific Computing for Novel Architectures

GSL's computing research drives scientific and technical innovations.

- Increases compute power at minimum cost
- Supports development of advanced weather models
- Robust software engineering practices



Weather Informatics and Visualizations

Visualizations can make it easier for the public to understand and interact with data.

- Approachable data
- Informative images
- Relevant insights
- Shareable information
- Engage users



Public Safety

Each year the American public collectively receives \$31B in benefits from weather forecasts.¹

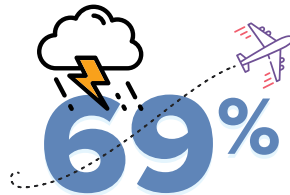
GSL's data delivery and decision support systems are the cornerstone of operations in all 122 NOAA National Weather Service forecast offices. These systems are used to streamline the hazardous weather warning process.



Hazardous Weather

Extreme heat, floods, tornadoes, and other types of hazardous weather cause hundreds of deaths in the U.S. and billions of dollars in damage each year.⁴

GSL develops weather models and technology to help communities prepare for extreme weather.



Transportation

69% of flight delays are caused by weather, costing passengers and the aviation industry about \$30B each year.²

GSL developed the flagship Rapid Refresh (RAP) and High-Resolution Rapid Refresh (HRRR) models used daily by the FAA and the aviation industry to safely route aircraft around hazardous weather in the air and at terminals.



Air Quality

Wildfire smoke contributes to thousands of deaths each year in the U.S.⁵

GSL is co-leading the new Fire Weather Testbed to improve forecasts of fire weather, fire ignition, spread, behavior and hazardous air quality from wildfire smoke.



Clean Energy

NOAA wind forecasts result in \$150 million in energy savings every year.³

GSL's weather models help the energy industry plan for the variable nature of wind and solar energy, and can help target the most beneficial locations for clean energy development.



Extreme Rainfall

Atmospheric rivers cause 80% of flood damage at an average estimated cost of \$1.1 billion annually on the West Coast of the U.S.⁶

GSL researches ways to better predict extreme rainfall rates that cause flash flooding.

Footnotes:

1 https://journals.ametsoc.org/view/journals/bams/90/6/2008bams2604_1.xml

2 <https://www.faa.gov/nextgen/programs/weather/faq/>

3 <https://research.noaa.gov/2022/05/18/noaa-wind-forecasts-result-in-150-million-in-energy-savings-every-year/>

4 <https://www.ncei.noaa.gov/access/billions/>

5 <https://www.sciencedirect.com/science/article/abs/pii/S0048969723012305?via=ihub>

6 <https://phys.org/news/2021-10-atmospheric-river-storms-costly-climate.html>