

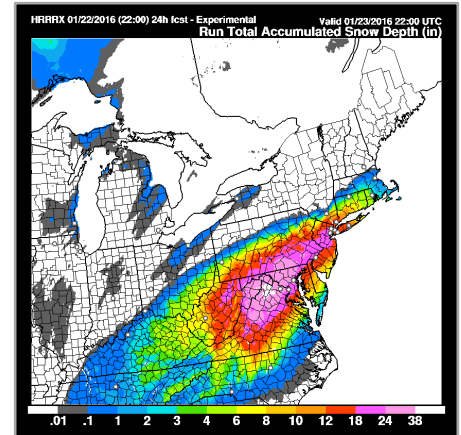
Earth System Research Laboratory Global Systems Division

2016 Research Highlights

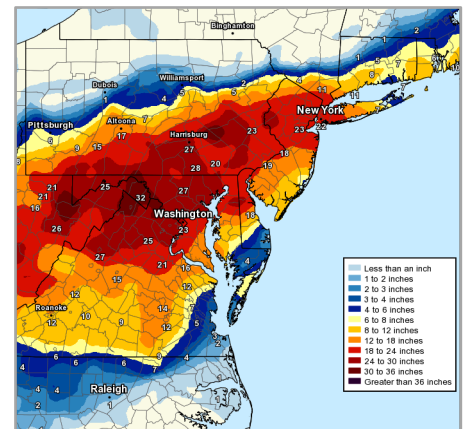
www.esrl.noaa.gov/gsd/

High Resolution Rapid Refresh (HRRR): GSD developed NOAA's newest severe weather model that pinpoints severe storms up to 15 hours in advance.

- HRRR was developed by researchers at NOAA's Earth System Research Laboratory Global Systems Division (GSD), and was put into NWS operations in the fall of 2014. GSD continues research to improve this model.
- The HRRR is the first and only weather model to produce
 - 15-minute weather snapshots updated every hour
 - resolution sharp enough to predict individual storms
 - uses grid points about two miles apart.
- The HRRR can pinpoint neighborhood-sized threats such as storms that could produce tornadoes, heavy precipitation that can lead to flash flooding, and heavy snowfall.
- With predictions of these hazards out to 15 hours, forecasters can provide more information so the public can prepare with hours to spare.
- The HRRR accurately predicted snowfall amounts in the January 22-24, 2016 Eastern U.S. snow storm that killed 58 people and caused at least \$2 billion in damage.

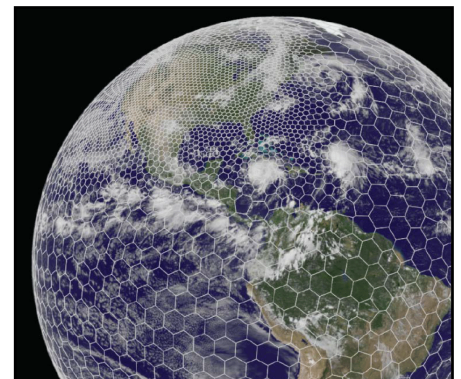


The HRRR's prediction of snowfall amounts (above) compared to observed snowfall amounts (below). The HRRR was very accurate.



Next Generation Global Prediction System (NGGPS): A 5-year research to operations initiative to build the foundation for the next NWS global weather forecast system.

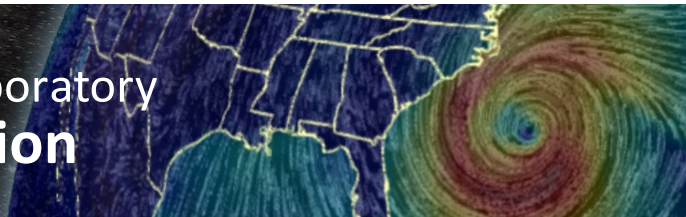
- NGGPS goal is to extend the weather forecast to 30 days.
- The prediction system will have a global domain with thunderstorm-scale nests to support severe weather. The two candidate models are MPAS (Model for Prediction Across Scales), and FV3 (Finite Volume). MPAS offers global meshes with local refinement, and FV3 offers grid stretching and 2-way nesting.
- Working with the NWS, GSD supports NGGPS with expertise in high-performance computing, physics, data assimilation, modeling, and verification.
- GSD is leveraging ongoing work with the High-Impact Weather Prediction Project (HIWPP) dynamic core inter-comparison study to assist with the NGGPS program.
- GSD has improved the performance speed of MPAS by 50%, and improved FV3 by 25%.



MPAS is one of two models that are candidates in the Next Generation Global Prediction System initiative.

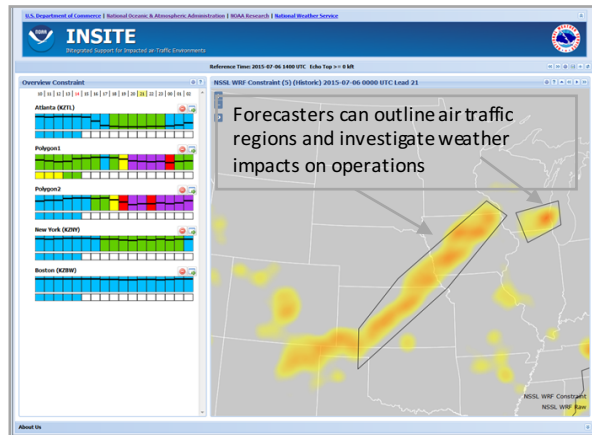


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INSITE: A prototype tool that uses weather and air traffic data to identify potential weather impacts to aviation operations.

- **Integrated Support for Impacted Air Traffic Environments (INSITE)** incorporates weather observations, several forecast products, and near-real time air traffic.
- Users can interact with INSITE to outline potential problem areas and determine the severity of the constraints on aircraft flow within that region.
- NWS forecasters can use INSITE to inform FAA Air Traffic Managers about potential weather problems so they can re-route air traffic. INSITE will transition to Initial Operating Capability at the National Weather Service in 2017.



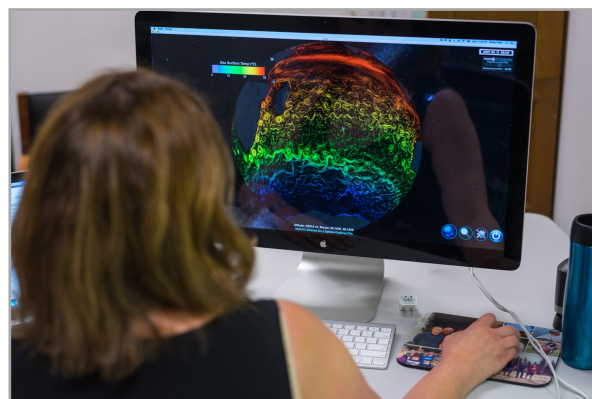
GSD's prototype INSITE tool helps forecasters see the potential impacts of hazardous weather to aviation operations. Source: NOAA GSD

SOS Explorer™: 3D Earth science on your laptop

- Science on a Sphere Explorer™ is a downloadable flat screen version of its popular Science on a Sphere® usually found at museums and science centers.
- Stunning science visualizations of the dynamics of Earth's weather and climate, plate tectonics, and more can now be shared in the classroom impacting thousands of school children around the world.
- Tools included in the application allow users to zoom into, probe, and graph the data, and add their own material including websites, videos, pictures, and placemarks.
- Lesson plans and pre-programmed tours through standards-relevant topics are provided in the download to make the product more accessible to teachers.
- A full version of SOS Explorer™ is available to classroom and museum educators, but SOS Explorer™ Lite is free to anyone with a computer.
- SOS Explorer™ datasets include Blue Marble, Age of the Seafloor, Hurricane Sandy, Cumulative Hurricane Tracks, Real-time Earthquakes, Nighttime Lights, Surface Temperature, and Sea Surface Currents and Temperatures. A full list of datasets can be found at: http://sos.noaa.gov/SOS_Explorer/



A commercial aircraft is forced to change its route to avoid thunderstorms. Source: NOAA GSD



SOSx™ flat screen software makes Earth system data accessible. Source: NOAA GSD