As the core of NOAA's research enterprise, OAR’s mission is to understand and predict the Earth system in order to improve NOAA science, service, and stewardship. OAR conducts its mission through:

1. Sustained global ocean and atmospheric observations on the state of the Earth’s environment and how it is changing (i.e. collect environmental intelligence);
2. Mission-critical research to understand, model and predict the Earth system;
3. Technology development to provide the foundation for next generation NOAA products and services; and
4. Translation of observations, knowledge and technological advances into operational products, services and applications.
OAR component laboratories, programs, and Cooperative Institutes are the foundation of a nimble and flexible organization focused on agency operational needs but poised to respond to emerging requirements. In addition to the subset of capabilities explicitly focused on emergency response, OAR scientists and technicians are prepared to adapt existing and develop new capabilities to respond to natural and man-made disasters.

Examples of activities that provide ongoing and direct support of NOAA operational lines:

**Atmospheric Dispersion:** The Air Resources Laboratory (ARL) provides direct support to NWS for operational HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) issues, related dispersion modeling products, and conducts research and development to improves predictions. The model is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. This includes simulations of airborne materials such as gases, nuclear, and chemical materials. The latest version of HYSPLIT incorporates NOS’s Areal Locations of Hazardous Atmospheres (ALOHA) capabilities.

**Hurricane Field Program:** The Atlantic Oceanographic & Meteorological Laboratory (AOML) provides scientific support for all hurricane flights on NOAA aircraft. The in situ and remotely-sensed observations are critical to helping forecasters make accurate predictions during a hurricane; and helping hurricane researchers achieve a better understanding of storm processes, thereby improving their forecast models.

**Tsunami Forecasting:** The Pacific Marine Environmental Laboratory (PMEL) conducts research, development and implementation of improved models to increase the speed and accuracy of NWS operational forecasts and warnings and improved methods to predict tsunami impacts on the population and infrastructure of coastal communities.

**High Resolution Weather Models:** The High Resolution Rapid Refresh (HRRR) model is an experimental model that is critically dependent on the hourly cycled data assimilation system within the Rapid Refresh system (RAP), the current operational model used by NOAA’s National Centers for Environmental Prediction (NCEP). This new generation of ultra-high resolution (3 km) weather model predicted, in excellent detail, the arrival of the June 29th Washington, DC Derecho ten hours in advance.

Examples of specialized activities that can support emergency response as needed:

**Offshore Oil Spill Leak Rates:** The Earth System Research Laboratory’s Chemical Sciences Division (CSD) adapted existing technology to rapidly and accurately assess the seriousness of leaks from offshore oil wells via evaporating hydrocarbons. CSD first successfully demonstrated this approach during the 2010 Deepwater Horizon oil spill. They also provided key time-critical decision support during the 2012 Elgin disaster in the North Sea.

**Deepwater Search and Investigation:** The Office of Ocean Exploration and Research maintains and operates NOAA’s most robust underwater capabilities for search and investigation. OER personnel operate the 6000m Remotely Operated Vehicle and multibeam mapping system with mid-water column detection capabilities. Video data and information can be shared in near-real time with shore-side personnel. OER recently fulfilled a Bureau of Ocean Energy and Management (BOEM) and NOS Office of Response and Restoration request to survey a submerged oil platform that was damaged by Hurricane Ivan in 2004. Long-term efforts to quell leak had been unsuccessful. Survey results redirected repair efforts to a new location.