

The Challenges of a Changing Planet

"The research impacts in this document tell the story of some of the preeminent contributions OAR scientists and our partners have made to build the knowledge base, tools, products, and services through which we can better understand and address the dynamics of our changing planet."

In the decades and century to come, we will experience extraordinary changes on our planet, with consequences that may dramatically change the way we live our lives. Reducing uncertainty, whether in predicting future climate, severe weather, or changes in ecosystems, requires scientific research to continuously improve our understanding of the Earth as an interdependent system of ocean, air, land, and living world.

NOAA's Office of Oceanic and Atmospheric Research, or OAR, along with our partners strengthens the science that underpins NOAA's products and services. Whether improving warning lead times for tornadoes or hurricanes or understanding the response of ecosystems in a rapidly changing ocean environment, OAR's preeminent research ultimately enables solutions that prevent loss of human life, improve management of natural resources, build understanding of the Earth-system, and strengthen the economy.

How is the Nation benefiting from OAR's research?

Americans rely on weather forecasts and warnings that save lives and protect property. Technologies transitioned from OAR research labs and programs into weather forecast offices across the Nation are the backbone of today's weather services.

Though our weather forecasting capabilities have improved dramatically over the past two decades, the public expects even more accurate forecasts and earlier warnings. Working with the National Weather Service, as part of the 10-year Hurricane Forecast Improvement Project (HFIP), OAR researchers are applying expert science to extend the lead-time for hurricane forecasts from five to seven days. Over the next few years, the NEXRAD Doppler radar system will upgrade to a research-tested dual-polarized radar system to detect different types of precipitation better. In a decade, we anticipate an even more sensitive technology, Multi-function Phased Array Radar (MPAR), an innovative application of proven Navy technology. MPAR will provide longer lead times for warning on forecasts of hazardous weather.

Air safety relies on accurate and timely weather predictions. OAR is engaged in developing a single national Next Generation Air Transportation System (NextGen) for the Federal Aviation Administration (FAA). NextGen will be a conduit to tens of thousands of weather observations and forecasts updated in real-time explicitly for the FAA to reduce delays and accidents in commercial aviation.



The first Science On a Sphere®(SOS) demonstration at the Smithsonian National Zoo in Washington, D.C. SOS is an eye-opening, high tech display that translates huge scientific datasets into something the public can visualize and understand. SOS is now installed in 50 museums and other public venues all over the world. SOS was invented by Dr. Alexander E. "Sandy" MacDonald, OAR Deputy Assistant Administrator for OAR and Director of NOAA's Earth System Research Laboratory.

Defining the nature of climate change and its potential impacts has been an important part of OAR's work. Our scientists are building on the CM2.1 climate model - known as one of the best climate models in the world - to help anticipate future societal needs. Regional drought and flooding will likely intensify as a result of global warming. This impacts our ability to produce food and manage water resources. The NOAA-led National Integrated Drought Information System (NIDIS), a collaboration among numerous federal agencies and state governments, promises to provide vital information for community planners and decision makers.

The oceans are changing rapidly as a result of increasing greenhouse gases. As the ocean absorbs about 30 percent of carbon dioxide emissions, the water becomes more acidic or corrosive in a phenomenon called ocean acidification. Ocean acidification poses a potentially serious threat to the health of the world's ocean ecosystems, including economically important species. OAR researchers are at the forefront of a large, cooperative effort to monitor the oceans and Great Lakes for acidification and understand and forecast its impacts.

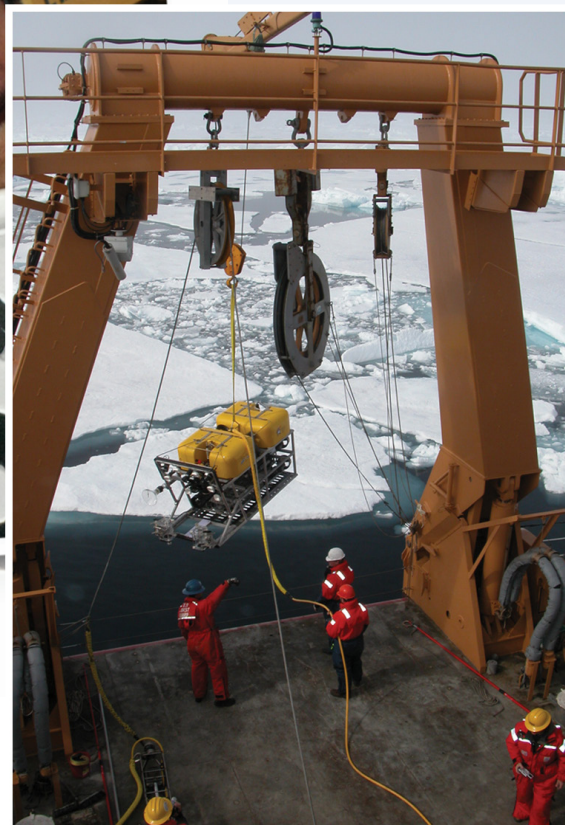
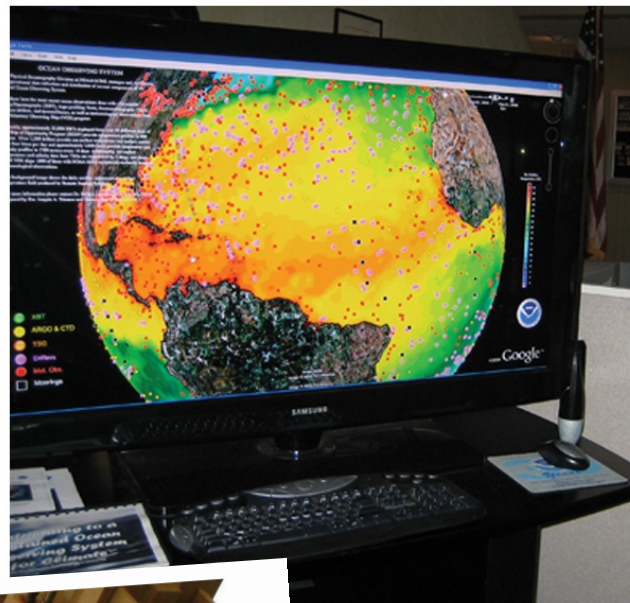
NOAA explores the global ocean with the most advanced undersea technologies.

OAR strengthens the science that underpins NOAA's products and services.

NOAA Ship Okeanos Explorer, "Americas' Ship for Ocean Exploration," is the only Federal vessel assigned to systematically explore our largely unknown ocean. Using telepresence technology, the ship provides connections from the seafloor to scientists ashore and the public at six Exploration Command Centers across the Nation.

From the bottom of the sea to the upper reaches of the atmosphere, scientists all over the world rely on sustained observations. In the ocean, new mobile platforms are being outfitted with multiple sensor payloads to measure biogeochemical changes in surface waters. For observing hard-to-access areas like the Arctic and deep into the eye of a hurricane, Unmanned Aircraft Systems (UAS) are revolutionizing NOAA's ability to monitor the global environment, improve predictive services, and enhance homeland security.

The research impacts in this document tell the story of some of the preeminent contributions OAR scientists and our partners have made to building the knowledge base, tools, products and services through which we better understand and address the dynamics of our changing planet. OAR will remain a world leader in understanding our environment – and how it impacts our health, our economy, and our future. Through OAR's research, NOAA improves the well being of the American people and our communities.



Images, top to bottom: A Google Earth display of Global Ocean Observing System data; Crewmembers Liam Vickers, Jeff Brawley, and James Deeton in NOAA's Okeanos Explorer in Bitung, Indonesia, Credit INDEX 2010: "Indonesia-USA Deep-Sea Exploration of the Sangihe Talaud Region; Unmanned Aircraft System is launched in Nov. 2007 from a moving platform to rendezvous with Hurricane Noel.