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EARTH SYSTEM MONITOR

A guide to NOAA's data and information services

INSIDE

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

NOAA's National Ocean Service: America's Oceans and Coasts – Safe, Healthy, and Productive

Jack Dunnigan, NOAA Assistant Administrator for the National Ocean Service

At the National Ocean Service (NOS), we focus on safe, healthy, and productive oceans and coasts for the entire Nation. Our mission includes NOAA's legacy maritime navigation programs, as well as requirements for ocean and coastal stewardship. Maritime transportation is the engine of our economy. We help provide the information that moves America—from aviation, surface, and marine weather to marine navigation information; hazardous spill and incident support; and accurate and consistent positioning information underpinning everything we do. But the story doesn't end there; NOS marine navigation data also supports other ocean sciences and coastal requirements, magnifying the benefit of NOAA's investment in its transportation information services.

▲ Jack Dunnigan

Maritime transportation moves over 95 percent of the goods that come in and out of America, including 48 percent of the oil needed to meet our energy requirements. In the last 50 years, maritime trade has doubled. The next doubling worldwide will take only 30 years, as the pace of change quickens. The marine transportation system is also a critical element of homeland security, with over 360 ports serving as border gateways and a means of military mobilization.

Safe navigation is important for both the economy and national security. Even a brief lapse in the flow of goods has the potential to paralyze our country. For example, in December 2004 a longshoreman strike in Los Angeles and Long Beach left container ships lined up outside the harbor loaded with toys and rotting holiday foods. Hurricane Katrina was another demonstration of the effects of a partial Marine Transportation System (MTS) closure. After Katrina passed, key oil and gas ports were shut down to make certain they were clear of marine debris. This action caused a short spike in gas prices.

An incident such as an oil spill or ship bridge strike can have the same effects, whether at a local, regional, or national level. The *ATHOS I* oil spill of 264,000 gallons of fuel oil in the Delaware River is a good example. This river was closed for 24 hours and then partly shut for 11 days to allow clean-up of nearly 57 miles of shoreline in New Jersey, Pennsylvania, and Delaware. As this port system generates $19 billion in annual revenue, the spill caused a loss of millions per day to the port and commercial shippers, on top of the estimated $150 million the U.S. Coast Guard and responders spent to clean up and restrict traffic for survey and recovery operations.[1]

To meet the requirements for safe navigation, the NOS Offices of Coast Survey (OCS), the National Geodetic Survey (NGS), and the Center for Operational Oceanographic Products and Services (CO-OPS) work together to deliver a suite of products and services for mariners that includes nautical charts, real-time tides and currents, updated shoreline, and the National Spatial Reference System (NSRS). Commercial shippers, recreational boaters, the Coast Guard and Navy, pilots, and port authorities all rely on NOAA for these and other navigation products and services.

OCS manages hydrographic data and updates nautical charts, relying on both NOAA fleet and contractor surveys of U.S. waters for depths and navigation hazards. NOAA is responsible for surveying and charting U.S. and territorial waters to the limits of the Exclusive Economic Zone (EEZ), an area of about 3.4 million square nautical miles. OCS has identified roughly 500,000 square nautical miles of the EEZ as most important to navigation. However, today we only have the capacity to survey about 3,000 square nautical miles a year—less than 1 percent of the navigationally significant waters. We are continually exploring alternatives, such as Integrated Ocean and Coastal Mapping (IOCM), and developing technologies, such as VDatum and autonomous underwater vehicles (AUVs), to obtain more chart-quality data. VDatum, also known as the National Vertical Datum Transformation Tool, is a

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[1]U.S. Coast Guard, retrieved July 9, 2008, from http://www.uscg.mil/D1/response/jrt/05presentations/athos.pdf and https://www.piersystem.com/go/doc/651/109428/.

Letter from the NODC Director

▲ Margarita Conkright Gregg, Ph.D.

This *Earth System Monitor* issue focuses on NOAA's goal "to support the Nation's Commerce with Information for Safe, Efficient, and Environmentally Sound Transportation." NOAA provides information, services, and products for transportation safety and for increased commerce on roads, rails, and waterways. Jack Dunnigan, NOAA Assistant Administrator for the National Ocean Service (NOS), provides a glimpse into how NOS is meeting the needs of today and tomorrow by providing the information "that moves America."

NOAA's Satellite and Information Service (NESDIS) operates Data Centers for Climate, Geophysics, and Oceans. Through these data centers, NESDIS provides and ensures timely access to global environmental data and information services and develops science products. The data centers support all of NOAA's mission goals by ensuring efficient and effective archive and access to NOAA's data holdings. The following examples demonstrate how these centers are supporting the commerce and transportation services NOAA provides.

In 2005, storm surge and winds from Hurricane Katrina left huge amounts of wreckage and waste in the northern Gulf of Mexico. Although this region's surface waters now appear calm, sunken marine debris poses a hazard to boats and fishing gear. The National Oceanographic Data Center (NODC) is working with local, State, and Federal stakeholders to determine their marine debris data needs and to develop methods of disseminating this information in an effective, efficient manner. In September 2006, NOAA began conducting underwater surveys off the coasts of Louisiana, Mississippi, and Alabama. NOAA is using these data to create debris maps to assist boaters and guide removal of the debris.

The National Geophysical Data Center (NGDC) collects and analyzes data to generate the World Magnetic Model. This model calculates the strength and orientation of Earth's magnetic field for a given time and position and declination, the directional difference between true and magnetic north. This information is critical to navigation because it is used to provide the most accurate compass rose on all nautical charts. NGDC also supports commerce and transportation through the National Geodetic Survey group. This group manages information from the Continuously Operating Reference Stations (CORS) program, which provides data to surveyors seeking precise positions and researchers working to improve Global Positioning System performance.

The National Climatic Data Center (NCDC) is the authoritative source for historical climate data and information used to make climate change assessments. The November 2007 conference, *NOAA Data and Information for a Changing Climate*, helped highlight some of these needs with topics such as Assessing Future Sea-level Rise, Anticipating Extremes and Transient Weather Disruptions, and Understanding Market-to-Market Climatic Norms.

In addition, NESDIS and NOS support U.S. commerce and transportation by providing data and information to the NOAA National Weather Service (NWS). From real-time data provided through the NEXRAD Doppler radar network, to severe storm forecasts, to networked observing systems, NWS services and products are critical in reducing risks throughout the interconnected U.S. land, air, and water transportation systems.

We hope this *ESM* issue introduces you to the many products and services being developed by NOAA to meet the growing needs of our Nation's rapidly expanding commerce and transportation systems. ■

Margarita

EARTH SYSTEM MONITOR

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Comments should be directed to Andrew Allegra, Managing Editor.

Email: esm@noaa.gov
Phone: 301-713-3277 x152
Fax: 301-713-3302

Editing and Layout
Mindy Gaines, Tara Mairs, Marc Pulliam, Sheri Phillips

The mailing address for the *Earth System Monitor* is:
National Oceanographic Data Center
NOAA/NESDIS E/OC
SSMC3, 4th Floor
1315 East-West Highway
Silver Spring, MD 20910-3282

U.S. DEPARTMENT OF COMMERCE
Carlos M. Gutierrez, Secretary

National Oceanic and Atmospheric Administration
Conrad C. Lautenbacher, Jr., Under Secretary and Administrator

(America's Oceans and Coasts continued from page 1)
partnership effort with NGS and CO-OPS to build a system to convert mapping datasets collected at one datum (or reference level) to another. This will allow disparate datasets to merge, expanding the utility of data collected for one purpose to a more multipurpose benefit. VDatum will also help to streamline new hydrographic survey work and reduce the time it takes to get data to mariners. AUVs are another force multiplier as they allow a ship to collect more mapping data in a shorter period of time.

NGS manages the shoreline mapping program, which produces a seamless, digital database of the national shoreline and a database of aerial photography. This program provides critical data necessary for NOAA's nautical charts, coastal zone management, essential fish habitat mapping, coastal ocean science, flood maps, emergency planning, storm surge inundation models, and a host of other uses. NGS also manages and maintains the NSRS, the national coordinate system that specifies latitude, longitude, height, scale, gravity, and orientation throughout the Nation. Through its nationwide network of Global Positioning System (GPS) Continuously Operating Reference Stations (CORS), NGS can provide very precise positions horizontally and is working to enhance the vertical aspect of NSRS to achieve centimeter or better height resolution. Called "height modernization," this effort integrates GPS with traditional leveling, gravity work, and remote sensing information. The accurate heights realized through height modernization are essential for a wide variety of activities and applications, including transportation, sea-level rise estimation, flood plain mapping, storm surge modeling, habitat restoration, coastal zone management, site-specific farming, construction, mineral extraction, and seismic and infrastructure monitoring.

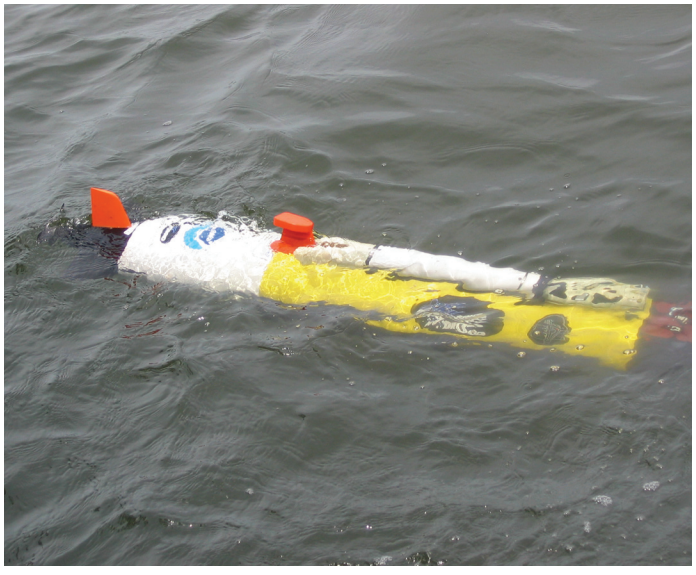
Another new initiative that will provide myriad benefits is GRAV-D, or Gravity for the Redefinition of the American Vertical Datum. This effort aims to collect airborne gravity data throughout the United States to create a new national vertical reference system based on a geoid model. This will vastly improve our ability to measure accurate heights. The existing geoid model contains potential meter-level errors, especially in coastal regions. Serious ramifications can result from these errors, such as unreliable elevation data being used to map and plan for flooding, storm surge prevention efforts, and coastal restoration activities. Improving the geoid also benefits current predictions, VDatum transformations in the coastal regions, and various other ocean observation parameters.

CO-OPS provides the navigation community, first responders, and others with access to real-time data and current speed and direction predictions, water level information, and meteorological data through the National Water Level Observation Network, the National Current Observation Program, and Physical Oceanographic Real-Time Systems (PORTS®). These systems enable safer and more efficient vessel routing, tsunami and storm surge warnings, emergency response operations to spills of hazardous materials, homeland security, and real-time control of harbor maintenance dredging, among other uses. PORTS® in particular is a very useful tool, given its relatively low cost and the potential benefits to the environment and the economy from avoiding accidents. Recent economic studies of Tampa Bay and Houston have found that PORTS® provides millions in economic benefits to the surrounding regions. Both reports have documented a 50 percent or greater reduction in groundings associated with the establishment of their PORTS®, benefiting the public through safer transportation and a healthier environment.

These NOS programs supporting navigation safety also improve efficiency. For example, coastal ocean forecast modeling and reliable, timely information allow cargo and container vessels to load more heavily and to time arrivals and departures more accurately, all while maintaining a high confidence in navigation safety. NOAA data details the limited channel depths available in most U.S. ports, allowing port operators to maximize throughput and economic gain with less risk to the environment.

NOS's Navigation Services elements reduce the risk of accidents on U.S. waterways, but accidents can still happen. When they do occur, the potential for serious injury to lives, property,

▲ The NOAA ship *RAINIER* is designed and outfitted primarily for conducting hydrographic surveys in support of nautical charting.



▲ AUV used in ocean research projects.

and the environment is compounded by the fact that over half the cargo transported by ships in U.S. waters is oil or other hazardous materials. NOS's Office of Response and Restoration (OR&R) stands ready for these situations by conducting environmental assessments and providing critical scientific support to first responders such as the U.S. Coast Guard, the Environmental Protection Agency, and the Federal Emergency Management Agency. OR&R responds to incidents on average more than twice each week—primarily oil spills, but also hazardous materials releases, abandoned vessel searches, and whale strike casualties. This year, OR&R's response requirements are up by about 66 percent.

NOS constantly seeks to improve its program capabilities, but we also have to respond to many new challenges affecting the Nation's economic and environmental security. For example, one emerging issue is global climate change impact on Alaskan and Arctic sea ice. On September 16, 2007, ice covered just 1.59 million square miles—a million square miles less than the average over the last 30 years, according to the National Snow and Ice Data Center. This retreat poses significant threats and opportunities for maritime commerce, security, economy, and resource management in Alaska and the Arctic region. Regional oil and gas development, fisheries expansion, new port destinations, and sea routes for commerce and tourism are all potential beneficiaries of sea ice melt and are the primary drivers of public demand for NOS Services in Alaskan and Arctic waters. But the region also has unique safety and environmental considerations, and NOAA and its partners must act quickly and strategically to adapt existing NOS service delivery capabilities to these new requirements.

NOS continues to improve on its existing products and services for the safe movement of vessels transiting U.S. waters. Yet NOS also realizes the need to plan ahead and remain flexible without lessening quality to better meet the dynamic 21st Century requirements. We never lose sight of the interdependence of NOAA's transportation information and the requirements for protecting the special maritime areas under our care. ■

NOAA Integrated Ocean and Coastal Mapping:
Map Once, Use Many Times

Roger L. Parsons, NOAA IOCM Coordinator

Between 1979 and 2005, the population of U.S. coastal counties increased by more than 45 million; an estimated 160 million people now live within 50 miles of the coast. The rapid development of coastal areas over the past few decades has greatly increased the risk from natural disasters and their associated economic impacts.

The most recent comprehensive assessment of the Nation's marine transportation systems reports that cargo moving through U.S. coastal waters contributes over $742 billion annually to the gross domestic product and provides employment to more than 13 million citizens. This assessment also reports that over $111 billion is contributed to the U.S. economy from recreational and commercial fishing activities.[1]

Ocean and coastal geospatial data and their derivative mapping products and decision-support tools provide the essential framework required for monitoring, accessing, and managing our dynamic and economically critical coastal zone. This information helps to ensure safe maritime operations and give scientists a better understanding of our impact on coastal ecosystems. These data also support emergency response activities and environmental recovery operations and help identify ways to enhance the resilience of coastal ecosystems.

In order to better understand and manage the ocean and coastal zones, agencies at all levels of government—Federal, State, and local—as well as the private and nonprofit sectors collect and map many types of geospatial information. These data are acquired using a diverse range of specifications and protocols and at varying spatial and temporal scales. With a large and varied user community, our ability to identify, share, and leverage mapping resources is a challenge.

What are OCM and IOCM?

Ocean and Coastal Mapping (OCM) is not merely the collection of elevation and bathymetry data. OCM encompasses the acquisition of physical, biological, geological, chemical, economic, and archaeological characteristics and boundaries of ocean and coastal areas, resources, and sea beds through the use of acoustics, satellites, aerial photogrammetry, light and imaging, direct sampling, and other mapping technologies. OCM also encompasses the management and dissemination of these data and the development of mapping technologies, tools, and products.

Integrated Ocean and Coastal Mapping (IOCM) is the practice of acquiring, integrating, and disseminating ocean and coastal geospatial data in a way that permits these data and their derivative products to be easily accessed and used by the greatest range of users and purposes. IOCM requires intra-agency and interagency coordination and collaboration with a focus on streamlining operations, reducing redundancies, improving efficiencies, developing common standards, and stimulating innovation and technological development. "Map once, use many times" is the core concept of IOCM.

Multi-use Mapping Data

A 2004 National Research Council (NRC) assessment of national needs for coastal mapping and charting concluded that the users of ocean and coastal geospatial data shared several common requirements that were not being met by Federal mapping agencies, including NOAA. These include the need for a consistent spatial framework for coastal data that allows a seamless transition from onshore to offshore; increased collection and availability of data, including land cover, shallow-water bathymetry, seafloor imagery, habitat distribution, and classification standards; national standards and transformation protocols that allow easy data exchange; and easy access to up-to-date digital, geospatial data, imagery, and mapping products.

The Nation relies on NOAA for accurate and timely ocean and coastal mapping data, products, and tools. Since the Survey of the Coast was established by President Thomas Jefferson in 1807—to provide nautical charts to the maritime community for safe passage into American ports and along our extensive coastline—NOAA and its predecessor agencies have been mapping the ocean and coastal areas of this country. Today, NOAA's mapping interests are extensive; they include hydrographic surveying and nautical charting, shoreline mapping and change detection analysis, tide and water level observations, benthic and coral habitat mapping, coastal hazard assessment and ecosystem restoration, flood inundation and sea-level rise modeling, and the inventory and assessment of living, nonliving, and archeological resources.

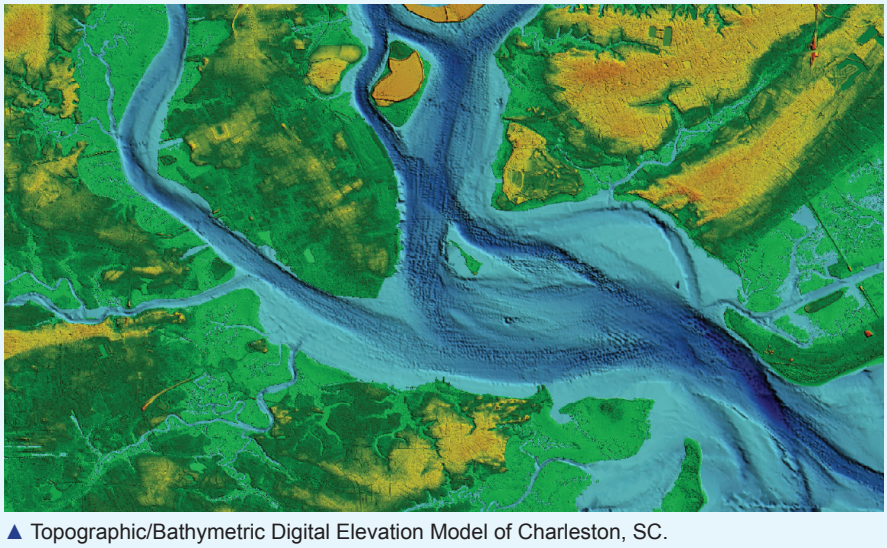
The President's U.S. Ocean Action Plan, on the heels of the 2004 NRC assessment of national needs for coastal mapping and charting, directed Federal mapping agencies to coordinate their OCM activities and leverage data collection and mapping resources. It came as no surprise to Federal mapping agencies that multipurpose standardized data were essential. In response to the U.S. Ocean Action Plan, the Joint Subcommittee on Ocean Science and Technology (JSOST) established the Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) in 2006. Co-chaired by NOAA, IWG-OCM seeks to facilitate the coordination and leverage data collection and mapping resources across the Federal sector as well as with State, industry, academic, and nongovernmental mapping interests. Through interagency coordination and collaboration, IWG-OCM seeks to embed IOCM concepts within the national OCM community.

Development of Mapping Tools

IOCM's success depends on the development and availability of tools that facilitate the efficient use of data and support informed decision making. Tools developed by NOAA, such as the Vertical Datum Transformation Tool (VDatum) and Digital Coast, are essential.

VDatum is a tool for transforming elevation data from one vertical datum into another and for blending bathymetric and topographic datasets into a digital elevation model (DEM). Such transformations are necessary when data from diverse sources need to be combined or compared. The goal is to develop a seamless nationwide VDatum utility to facilitate more effective sharing of vertical data through national elevation and shoreline databases. This is a critical first step toward developing a national shoreline.

Digital Coast is being developed to provide the total package needed by state, local, and nonprofit organizations not only offering easy access to downloadable data, but also the data-specific training, sample applications, and tools needed to address coastal issues. A partnership with networks such as the National Association of Counties, the Association of State Floodplain Managers, the National States Geographic Information Council, and The Nature Conservancy helps guide the design and content of the interactive website. By providing examples and best practice guidance to managers and linking them to the data and tools necessary,



▲ Topographic/Bathymetric Digital Elevation Model of Charleston, SC.

the Digital Coast is aimed at improving policy making in the coastal zone regarding land use planning, habitat conservation, water quality, and hazards resilience.

Collaborative Mapping Opportunities

Data acquisition and product development partnerships are key to an integrated approach to mapping. NOAA's National Geodetic Survey (NGS) has recently completed acquisition of 22,652 tide-coordinated color and near-infrared digital aerial images and airborne topographic light detection and ranging (LIDAR) data in support of a NOAA IOCM project in North Carolina. This project supports the IOCM vision by demonstrating and enhancing the coordination of ocean and coastal mapping activities to maximize the usefulness of the data and products to a broad internal and external constituency. Project partners and participants include representatives from ten different Federal and State agencies, including multiple National Ocean Service program offices, university partners, and private sector partners. The project area extends from Cape Henry, Virginia, to Ocracoke Island, North Carolina. "The geospatial data products to be generated and supplied as a result of this project include coastal orthophotos (aerial photos that have been geometrically corrected such that they have constant scale and can be used as planimetric maps) and LIDAR point cloud data (detailed representation of the Earth's surface consisting of the complete set of three-dimensional points from which the laser beam was reflected) in addition to NGS's conventional shoreline data products." All of these datasets will be disseminated by NOAA via a web portal, which will be accessible through an IOCM project website and the Geospatial One-Stop Web portal, a catalog of geospatial information and an E-Government initiative mandated in the President's Management Agenda.

▲ Examples of data products being supplied through the NOAA-North Carolina IOCM project: color orthophoto (top), near infrared orthophoto suitable for shoreline delineation (middle), and lidar point cloud data color-coded by elevation (bottom).

Another demonstration of IOCM in action is the California Seafloor Mapping Project. The California State Coastal Conservancy, NOAA, U.S. Geological Survey, and U.S. Army Corps of Engineers have partnered with numerous State seafloor mapping interests to acquire multiuse seafloor mapping data and develop derivative products that will improve decision making in coastal California waters. Leveraging State, Federal, and private sector resources, the seafloor off the California coast will be mapped out to three nautical miles. A wide variety of users will use these data for numerous purposes, including: updating NOAA nautical charts; supporting the designation of marine reserves and protected areas; understanding coastal sediment transport and

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ASOS: Watching and Reporting Weather Elements

Michael Wolfe, Staff Engineer, Delta Epsilon Technologies, LLC

Each day, as millions of Americans make their way to work, local radio stations report the high and low temperatures recorded at nearby airports. This is possible because Automated Surface Observing Systems (ASOSs) measure and report these temperatures.

While a few ASOSs are installed at parks and downtown centers, most are installed at airports; therefore many believe that the main contribution of these systems is to the aviation community. ASOS does fulfill the critical role to provide round-the-clock, minute-by-minute observations to pilots and air traffic controllers. However, ASOS is designed to support weather forecast activities and aviation operations and, at the same time, support the needs of the meteorological, hydrological, and climatological research communities.

The ASOS program is a joint effort of the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DoD). NWS administers and maintains the ASOS equipment, while FAA and DoD provide oversight and share financial responsibilities with NWS. The ASOS systems serve as the Nation's primary surface weather observing network.

The Basics of ASOS

ASOS reports the following weather elements:

- Sky conditions such as cloud height and cloud amount up to 12,000 feet
- Surface visibility up to 10 statute miles
- Basic present weather information such as the type and intensity for rain, snow, and freezing rain
- Obstructions to vision like fog, haze, and/or dust
- Sea-level pressure and altimeter settings
- Air and dew point temperatures
- Wind direction, speed, and character (gusts and squalls)
- Precipitation accumulation
- Selected significant remarks, including variable cloud height, variable visibility, precipitation beginning/ending times, rapid pressure changes, pressure change tendency, wind shift, and peak wind

When ASOS detects significant changes, it produces special observations. If an ASOS detects rapidly decreasing visibility, a "special" observation will be reported to the pilots and air traffic controllers. This "special" observation can also warn local automobile traffic. For example, a message might go out over the NOAA Weather Radio, local radio stations, and TV stations to warn the public of the decreased visibility.

Climate models rely heavily on as many data points as possible. Accurate information, more frequently, and from more locations is a key factor in improving the output of the models. ASOS is a major player in providing this data. The continuous stream of observations contributes to the ever-increasing accuracy of forecasts. NWS, other government agencies, universities, private industry, and media outlets use results from the models to make critical decisions.

Twice a day the ASOS information is electronically retrieved by the world's largest active archive of weather data—NOAA's National Climatic Data Center (NCDC). At this point, the data becomes part of the historical climate data record for the United States. From there, the data ASOS reports has almost infinite applications.

Transportation

As the ASOS creates minute-by-minute observations, it supplies aviation-critical information to pilots approaching the airport via radio and to the airport operations such as air traffic controllers, pilot briefing stations, and airport control centers on video displays. The same computer-generated voice broadcast made available to pilots is also available to the public by dialing the local ASOS telephone number.

The ASOS observations are an important part of the areas' forecasts. They also contribute to the watches and warnings broadcast to the public. The watches and warnings assist pilots to navigate around active weather such as thunderstorms. The ability to predict these types of weather events is increased by

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▲ ASOS installed near an airport tower.

News Briefs

New High-Tech Research Ship to Serve NOAA's Flower Garden Banks Sanctuary

On June 27, 2008, NOAA christened a new, state-of-the-art research vessel that will enhance the study and protection of Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. The 83-foot *R/V Manta* will operate out of the sanctuary's headquarters in Galveston, Texas.

▲ *R/V Manta* maneuvering.

"This technologically advanced research vessel is a vital addition to our fleet," said Daniel J. Basta, director of NOAA's Office of National Marine Sanctuaries. "The *Manta* will open new windows onto the marine life and habitats of the Flower Garden Banks Sanctuary while helping us protect this special place for future generations."

The twin-hulled *Manta* features a laboratory equipped with the latest scientific instruments; air compressors to allow divers to refill scuba tanks at sea; and a recompression chamber to enhance diver safety. The vessel can hold up to 25 people, deploy robot subs and other ocean exploration tools, and cruise at speeds up to 35 knots.

In addition to being a platform for exploring the sanctuary and surrounding waters, the *Manta* will also serve as a patrol vessel to enforce sanctuary regulations and a floating classroom. Teachers will be regular visitors aboard the *Manta* to watch and learn as scientists conduct research.

NOAA Satellites Primed for Spike in Summer Distress Calls

As the summer heat lures more boaters, campers, and hikers to the great outdoors, NOAA satellites are primed for an inevitable spike in distress signals from emergency locator beacons.

So far this year (through August 1, 2008), 188 people have been rescued in the United States. In 2007, a record 353 people were rescued from potentially life-threatening emergencies thanks to NOAA's polar-orbiting and geostationary satellites. These spacecraft are part of the international Search and Rescue Satellite Aided Tracking System, called COSPAS-SARSAT.

This high-tech system uses a network of satellites to quickly detect and locate distress signals from emergency beacons onboard aircraft and boats and from handheld personal locator beacons.

"During the summer, we typically see a big jump in rescues because more people are out enjoying the warm weather," said Chris O'Connors, Program Manager for NOAA-SARSAT. "But anyone planning to hike or camp this summer in a remote area where cell phone service is not reliable, or sail a boat far from shore, should not leave home without an emergency beacon registered with NOAA."

When a satellite pinpoints a distress signal within the United States, or its surrounding waters, the information is relayed to the SARSAT Mission Control Center. The information is then sent to a Rescue Coordination Center, operated either by the U.S. Air Force, for land rescues, or the U.S. Coast Guard, for maritime rescues.

Older emergency beacons operate on the 121.5 and 243 megahertz (MHz) frequencies. These beacons will be phased out by February 1, 2009, and 406 MHz beacons will become the new standard. Key reasons for the switchover include the ability of the 406 MHz beacons to be detected instantly. These beacons are more accurate and provide search and rescue responders with important registration information—features the older beacons do not offer.

For more information on satellites and COSPAS-SARSAT, visit www.noaa.gov/satellites.html and www.sarsat.noaa.gov.

Northern Wildfire Smoke May Cast Shadow on Arctic Warming

The Arctic may get some temporary relief from global warming if the annual North American wildfire season intensifies, according to a new study by researchers at NOAA and the University of Colorado. Smoke transported to the Arctic from northern forest fires may cool the surface for several weeks to months at a time, according to the most detailed analysis yet of how smoke influences the Arctic climate relative to the amount of snow and ice cover.

"Smoke in the atmosphere temporarily reduces the amount of solar radiation reaching the surface. This transitory effect could partly offset some of the warming caused by the buildup of greenhouse gases and other pollutants," said Robert Stone, an atmospheric scientist with the university and NOAA Cooperative Institute for Research in Environmental Sciences (CIRES) and lead author of the study, which appears in the *Journal of Geophysical Research*.

How much solar energy is prevented from reaching the surface depends on the smoke's opacity, the elevation of the sun above the horizon, and the brightness of the surface, according to the study.

Stone and his research colleagues analyzed the short-term climate impact of numerous wildfires that swept through Alaska and western Canada in 2004. That summer, fires burned a record 10,000 square miles of Alaska's

interior and another 12,000 square miles in western Canada.

A NOAA climate observatory near Barrow, Alaska, provided the study's data. Smoke observed at Barrow was so thick that at times visibility dropped to just over one mile. The aerosol optical depth (AOD), a measure of the total absorption and scattering of solar radiation by smoke particles, rose a hundredfold from typical summer values.

"The heating of the smoke layer and cooling of the surface can lead to increased atmospheric stability, which in turn may keep clouds from forming," said Stone. "We think that this influence of smoke aerosol on clouds further affects the balance of radiation reaching the surface in the Arctic."

Research observatories as far away as Greenland and the Svalbard archipelago north of Norway also recorded elevated AOD values over several weeks during the 2004 summer, suggesting that the climate footprint of the North American wildfires was far-reaching. Smoke from the same fires also was observed as far south as the Gulf of Mexico.

To conduct their analysis, Stone and colleagues looked at how a range of smoky conditions might change the amount of solar radiation reaching the Earth's surface. Models showed that the cooling caused by future forest fires would depend on the severity of the fire season and on the geographic dispersion of smoke.

The authors cautioned, however, that the full climate impact of Arctic aerosols, including smoke particles, is still not entirely clear. For one thing, smoke particles captured within clouds or deposited on snow may change the brightness of these objects, further affecting the amount of solar radiation absorbed by the surface.

Also, aerosols such as smoke affect the absorption and scattering not only of solar radiation, but also of longwave or thermal radiation within the atmosphere. The impact of aerosols on longwave radiation, which dominates at night and during the long, dark winter season in the Arctic, has yet to be quantified.

New NOAA Ocean Observing System Keeps Shipping Safe

Mariners can now get free real-time information on water and wind conditions for the Port of Pascagoula, Mississippi, from a new NOAA ocean observing system at the port. The NOAA Physical Oceanographic Real-Time System (PORTS®) provides water level, current, salinity, wind speed and direction, and bridge clearance information through an easy-to-use Web portal.

Administered by the NOAA Center for Operational Oceanographic Products and Services, PORTS® can significantly reduce the risk of vessel groundings and increase the amount of cargo moved through the port by enabling mariners to safely use every inch of dredged channel depth.

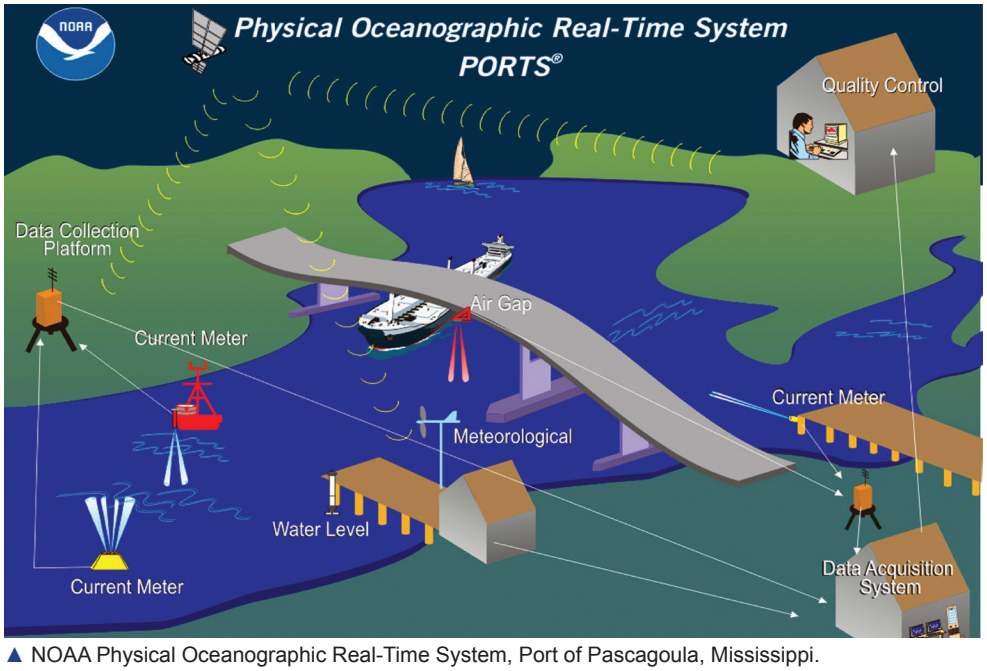
"The real-time oceanographic and meteorological information provided by PORTS® will not only provide commercial and recreational mariners with reliable navigational information for safe and efficient travel but will also enhance local weather and coastal marine forecasting," said Mississippi Senator Thad Cochran. "I am proud to have this important technology located in the Port of Pascagoula."

The Pascagoula system brings the number of operational PORTS® around the Nation to 15. Estimates of economic benefits directly attributed to PORTS® range from $7 million per year for Tampa Bay to $16 million per year for Houston-Galveston.

"Navigation safety is vital to recreational boaters, the commercial fishing industry, as well as the shipping industry," said Mark McAndrews, Director of the Port of Pascagoula. "PORTS® offers state-of-the-art technology that will be available 24/7 to assist in navigation preparation. The system will also provide important data for search and rescue, weather forecasters, Federal agencies, and emergency management offices."

The Port of Pascagoula is the largest of the state's 16 ports. Collectively, Mississippi's ports contribute $1.4 billion and some 34,000 direct and indirect jobs to the state's economy.

For more information on PORTS®, visit www.tidesandcurrents.noaa.gov/ports.html.



▲ NOAA Physical Oceanographic Real-Time System, Port of Pascagoula, Mississippi.

(ASOS continued from page 7)
the frequency of ASOS observations whereas traditional human observations are produced hourly. ASOS is always on, watching and reporting.

Decisions to take off and land aircraft are made everyday based solely on the information reported by the local ASOS. For example, if you are waiting to board a plane and the weather reported by ASOS is not favorable for take off, your flight may be delayed. Likewise, if you are already in the air and ASOS reports an unfavorable change in the weather, your flight may be diverted to land at another airport.

If an unfortunate aviation accident occurs, one of the first things the National Transportation Safety Board (NTSB) investigators look for is the weather data before, during, and after the incident. That information is available from every ASOS. The local equipment stores 12 hours of sensor data and up to 30 days of observations. The remote dial-in capability allows a technician to access and download this information without visiting the site.

Commerce

The historical climate records influence commerce in the United States, however, there may be subtle ways the casual observer does not notice. For example, the construction industry changes the design of materials based on historical weather data. The techniques and materials used to manufacture plywood for roofs may be altered based on wind speeds measured during the previous ten-year period. Contractors and inspectors have to learn when to use the new products and how to install them. This activity started with the data measured, in part, by ASOS.

The legal profession uses weather information regularly to prove or disprove judicial cases if the environmental conditions may have influenced the circumstances of a case. Common examples where weather or climate data influence legal issues include: traffic accidents, construction delays, damage to property, and work-related accidents to name a few. Meteorologists use hourly surface weather observations and monthly climate summaries to testify about whether or not human and/or environmental conditions were the cause of liability in a legal argument. Testimony based on the data is important information that can provide objective facts to help determine the outcome of a case. The data used can be traced to ASOS observations.

▲ ASOS observations are used in the development of severe weather forecasts, helping to reduce accident events.

Insurance companies use the historical climate data to help them assess and manage risk. For example, when a hurricane makes landfall they want to know how strong the winds were, how much rain fell, and how fast. Insurance companies use the information to determine how and where future insurance coverage will be sold. Data are also used to determine if an insurance claim is justified and ultimately paid.

The Future of ASOS

Since the completion of the initial ASOS system design in 1991, ASOS has been continuously improving and evolving. Engineers and technicians maintaining the equipment have made many changes to keep the equipment functioning as well as an automated system can. With the changes came increased capabilities, better and more reliable measurements, and reduced maintenance. The complex algorithms used to create the observations from the sensor measurements are always under review as the new sensor capabilities and features are incorporated. ■

(Coastal Mapping continued from page 6)
sand delivery; identifying geologic fault dynamics; describing tsunami potential and developing seamless topographic/bathymetric DEMs; characterizing National Marine Sanctuary resources; and supporting ecosystem-based management decisions.

Looking Ahead

As IOCM continues to expand, IWG-OCM and the Federal mapping community are working to improve the efficiency of the Nation's OCM activities. A national ocean and coastal mapping inventory is presently being developed. This inventory will offer a clearinghouse for ocean and coastal geospatial data and interpretative information and a registry of planned, current, and completed data acquisition activities. The inventory will reduce duplication of geospatial data acquisition efforts; increase data sharing; make OCM data more accessible; and provide opportunities to develop cooperative activities. The OCM inventory is being compiled within the Geospatial One-Stop Web portal.

The implementation IOCM within NOAA and throughout the national ocean and coastal mapping community is a major step toward ensuring better management of and long-term sustainability of our Nation's ocean and coastal zones. The economic value and environmental importance of our Nation's coastal and marine ecosystems require that we invest in and ensure progress on Integrated Ocean and Coastal Mapping. ■

[1] An Assessment of the U.S. Marine Transportation System, *A Report to Congress*, U.S. Department of Transportation, September 1999.

Commerce and Transportation Data, Products, and Information

Poster Designed By: Sheri Phillips

NESDIS Intern Project Has Successful First Year

Angela R. Sallis, Outreach Coordinator, NODC - National Coastal Data Development Center

What is metadata? Not many people know metadata is informational data about data, but the six students who recently completed a summer internship created by the National Oceanographic Data Center's (NODC's) National Coastal Data Development Center (NCDDC) can tell all about it and much more.

Partnering with the Northern Gulf Institute, Jackson State University, and the NOAA Satellite and Information Service (NESDIS) Diversity Council, NCDDC created the NESDIS Northern Gulf Institute Minority Internship Program to provide career opportunities in geospatial metadata management and coastal ecosystem metadata creation for undergraduate and graduate students. NCDDC targeted students, colleges, and degree majors from diverse communities.

"Our ultimate goal," explained NCDDC Director Russ Beard, "is [to] train and educate the students and at the same time provide an avenue to the tremendous career opportunities at NOAA."

The interns worked on unique datasets at The Trent Lott Geospatial and Visualization Research Center with the help of their NCDDC mentors. The 2008 interns included the following – from Jackson State University: Tisha Brown, Computer Science, Master's Degree candidate; Gregory Jones, Technology Education, Master's Degree; Cassandra Patrick, Biology, Master's Degree, and Epidemiology and Biostatistics, Master's Degree; Quannesha Trimble, Biology, Master's Degree candidate; and Whitney Venson, Computer Science; and from Hinds County Community College: Jessica Vaughan, Geographic Information Systems.

NCDDC and its partners plan to expand this project in 2009. ■

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