EAST COAST DIGITAL ELEVATION MODELS

Coastal Models Supporting our Nation's Needs through Science and Technology

FIR
Cable Ferry
H O W E
H O W E
Cassidys Pt.
Cassidys Bay
Pit Head
FIG
Cold Bath Shoal
272°
FR

All of the coastal digital elevation models (DEMs) in this presentation were created by scientists with NOAA's National Geophysical Data Center (NGDC) and the Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado at Boulder. Their DEM work is providing near-continuous coverage of U.S. coasts in support of NOAA's mission to understand and predict changes in Earth's environment, and conserve and manage coastal and marine resources to meet our Nation's economic, social, and environmental needs.

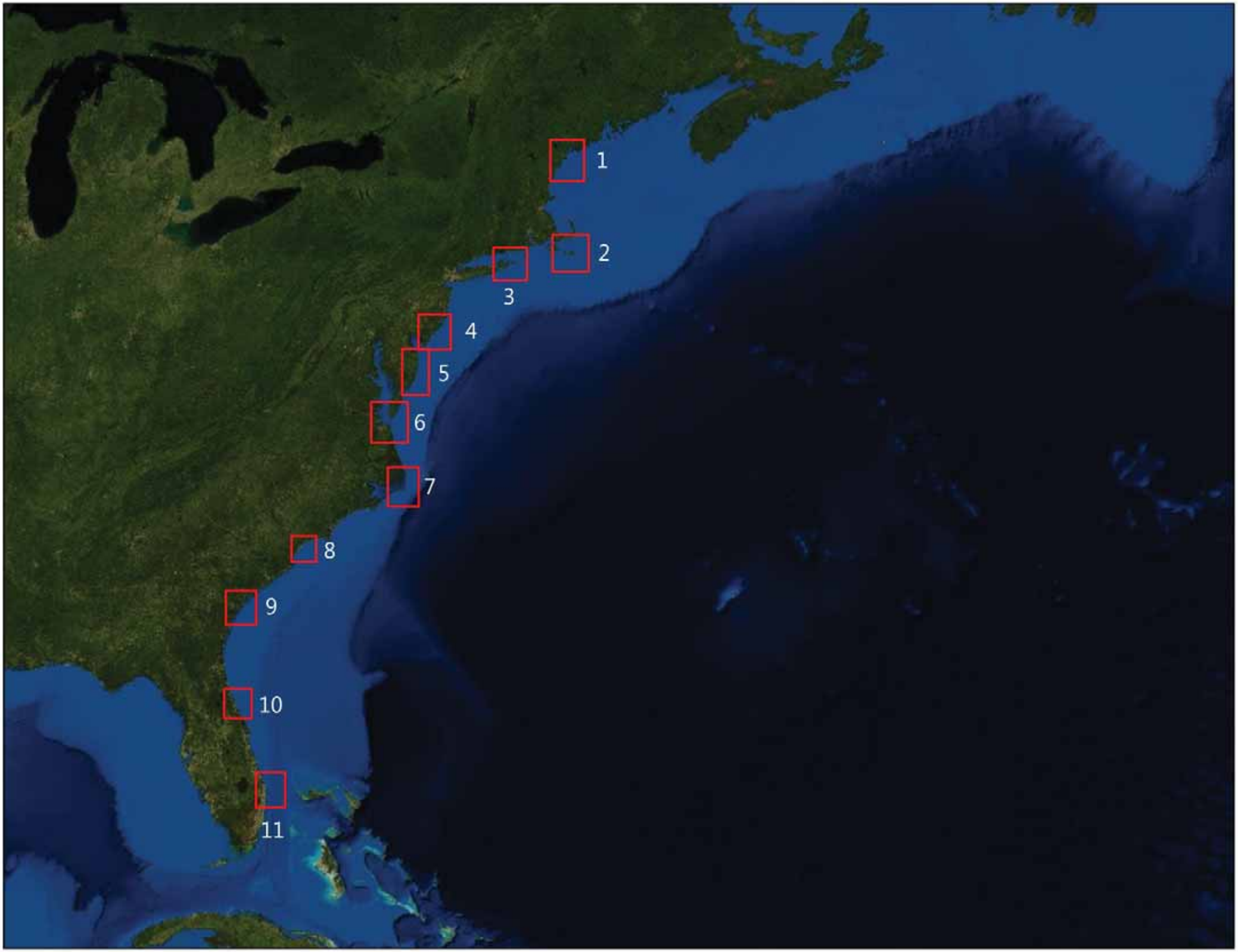
EAST COAST

The Eastern Seaboard of the United States includes some of the largest metropolitan areas in the country, including Boston, New York City, Washington D.C., and Miami. Stretching from Maine to Florida, over one third of the country (more than 100 million people) live along the East Coast, fueling commerce, tourism, urban development, and transportation routes. The region is rich in history, natural beauty, and culture. Given the significant seasonal use of beaches and island vacation resorts along the coast, advanced planning for coastal inundation events and evacuations are essential for the safety of visitors and residents alike.

Although the U.S. Atlantic coast has rarely been impacted by tsunamis, the communities and people who live on the Atlantic coast, especially near estuaries, inlets, and bays, are at risk for coastal storm events and inundation. Destructive hurricanes and "nor'easters" frequently travel up the coast, fueled by currents in the Gulf Stream. These storms cause coastal flooding, coastal erosion, and high-gust winds. Each year, hurricanes cause millions of dollars in damage and often, in some of the larger events, significant loss of life. Tsunamis are very rare and do not pose the same risk to the region. However, the 1929 Grand Banks earthquake and evidence of past submarine landslide events, remind us that the East Coast has experienced tsunamis in the past.

NOAA's DEMs provide detailed, accurate depictions of U.S. coasts that are used by our State partners in the National Tsunami Hazard Mitigation Program. These DEMs and the underlying data can also support scientists, coastal managers, and policy makers in effectively managing marine ecosystems and coastal resources, coordinating planning and mitigation efforts, and better understanding the impacts of coastal hazards. The DEMs in this booklet provide a glimpse of the coastal relief for some of the cities along the U.S. East Coast.

1. Portland, ME
2. Nantucket, MA
3. Montauk, NY
4. Atlantic City, NJ
5. Ocean City, MD
6. Virginia Beach, VA
7. Cape Hatteras, NC
8. Myrtle Beach, SC
9. Savannah, GA
10. Daytona Beach, FL
11. Palm Beach, FL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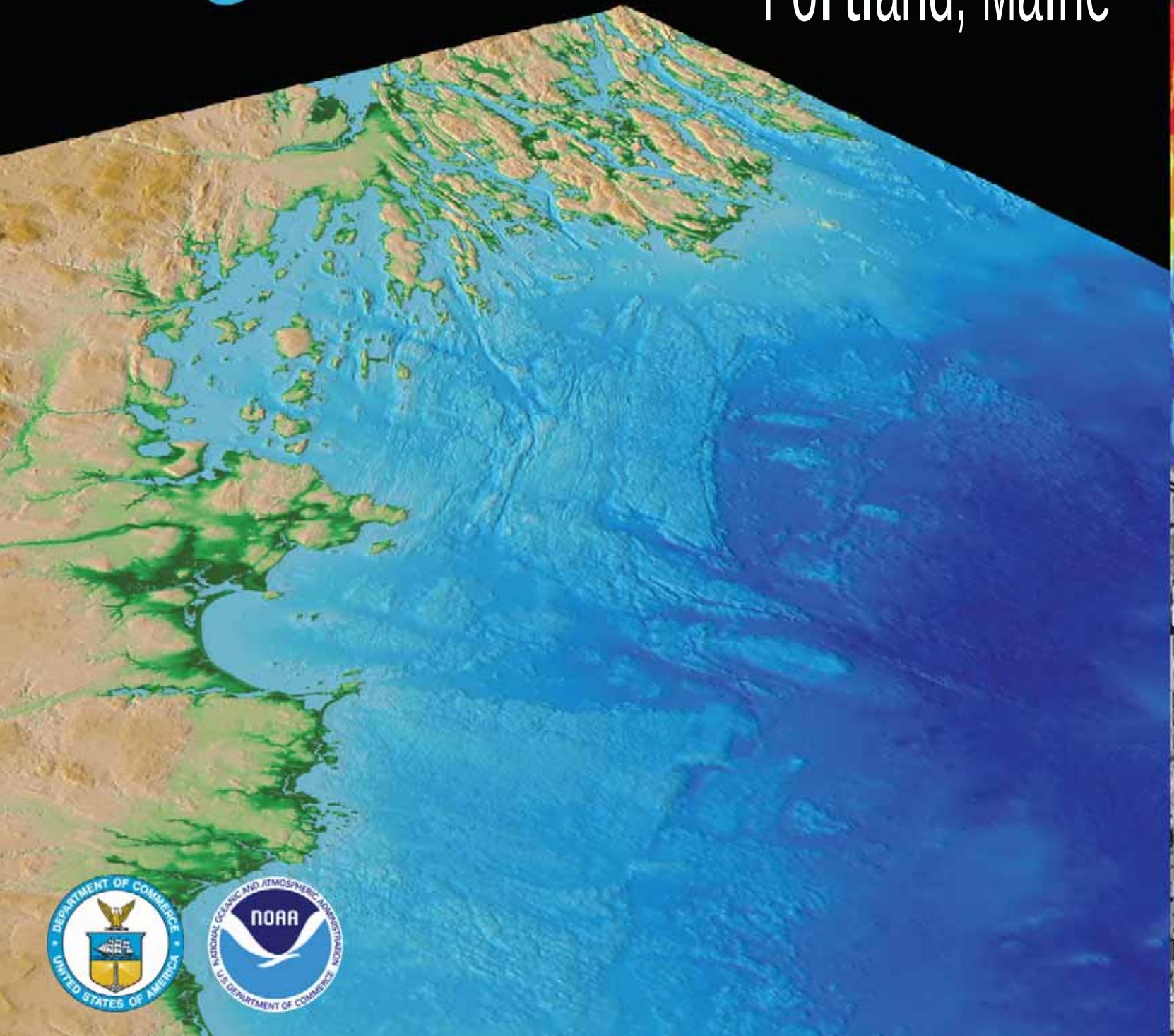
DIGITAL ELEVATION MODEL

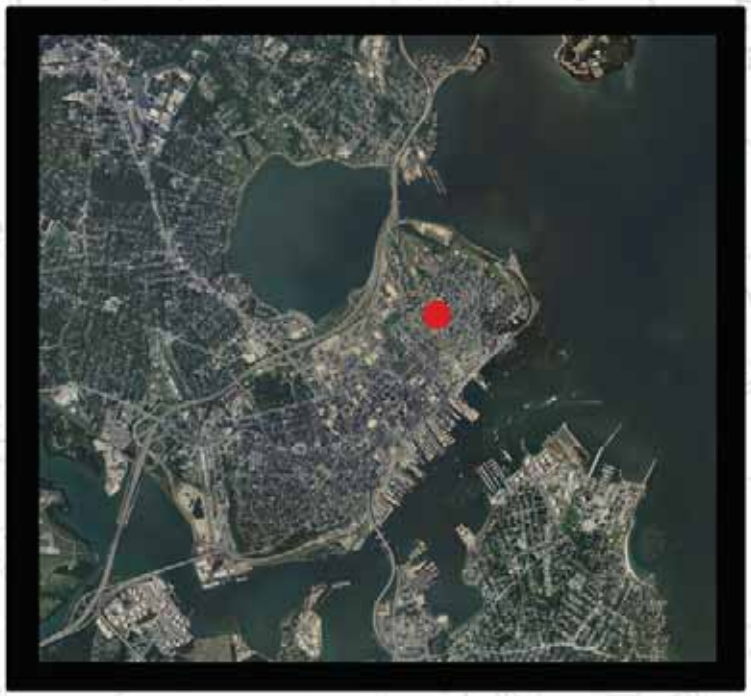
Portland, Maine



NOAA Knows....

PORTLAND, MAINE

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



Why Model Portland, Maine?

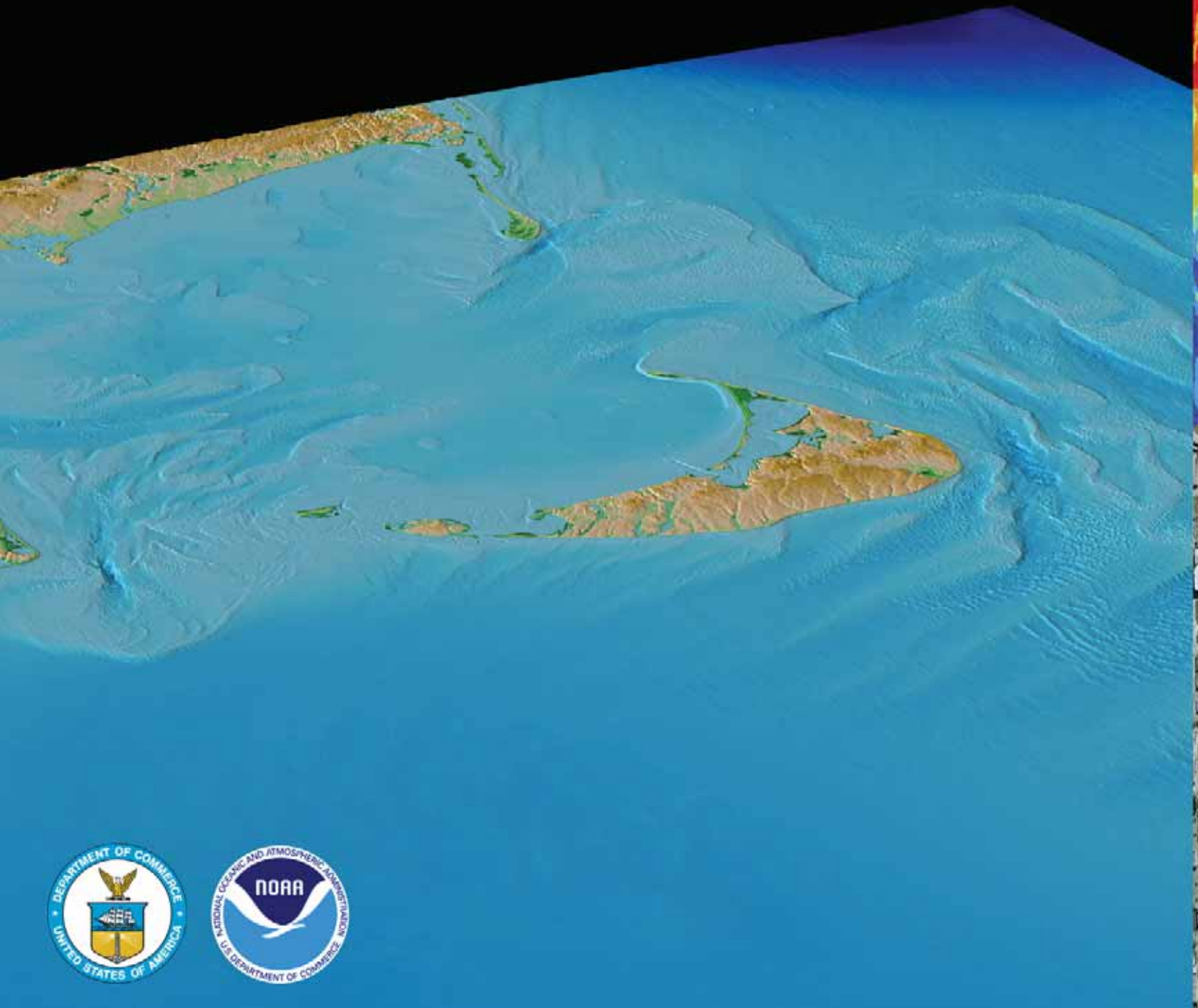
Portland is the largest city in the state of Maine, with an estimated population of over 60,000 people. Portland is located on a Peninsula in Casco Bay, on the Gulf of Maine, about fifty miles north of the New Hampshire border. As Maine's primary shipping and manufacturing center, petroleum transportation accounts for much of the traffic through the port. In addition, the city produces paper, processed foods, leather, and machinery. Maine is famous for its "rockbound coast" buttressed by rugged, unchanging cliffs of stone. Rocky points in the area, such as the famous Portland Head cliffs, show little change after a hundred years of storms. Maine's bedrock is very strong and consolidated and resists erosion from waves and weather. Other parts of the Maine coast, however, have a "soft coast" of loose or unconsolidated materials that are subject to erosion. Although a slow, steady rise in sea-level is the underlying reason for modification of the coast, the more noticeable erosion occurs quickly during individual storms or landslide events. The Portland DEM serves as an important tool for community planners when preparing the community for coastal inundation and storm events.

Who Provided the Data?

- Office of Coast Survey (OSC)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- The University of New Hampshire (UNH)
- Maine Office of Geographic and Environmental Information (MEGIS)

DIGITAL ELEVATION MODEL

Nantucket, Massachusetts



NOAA Knows....

NANTUCKET, MASSACHUSETTS

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

Why Model Nantucket, Massachusetts?

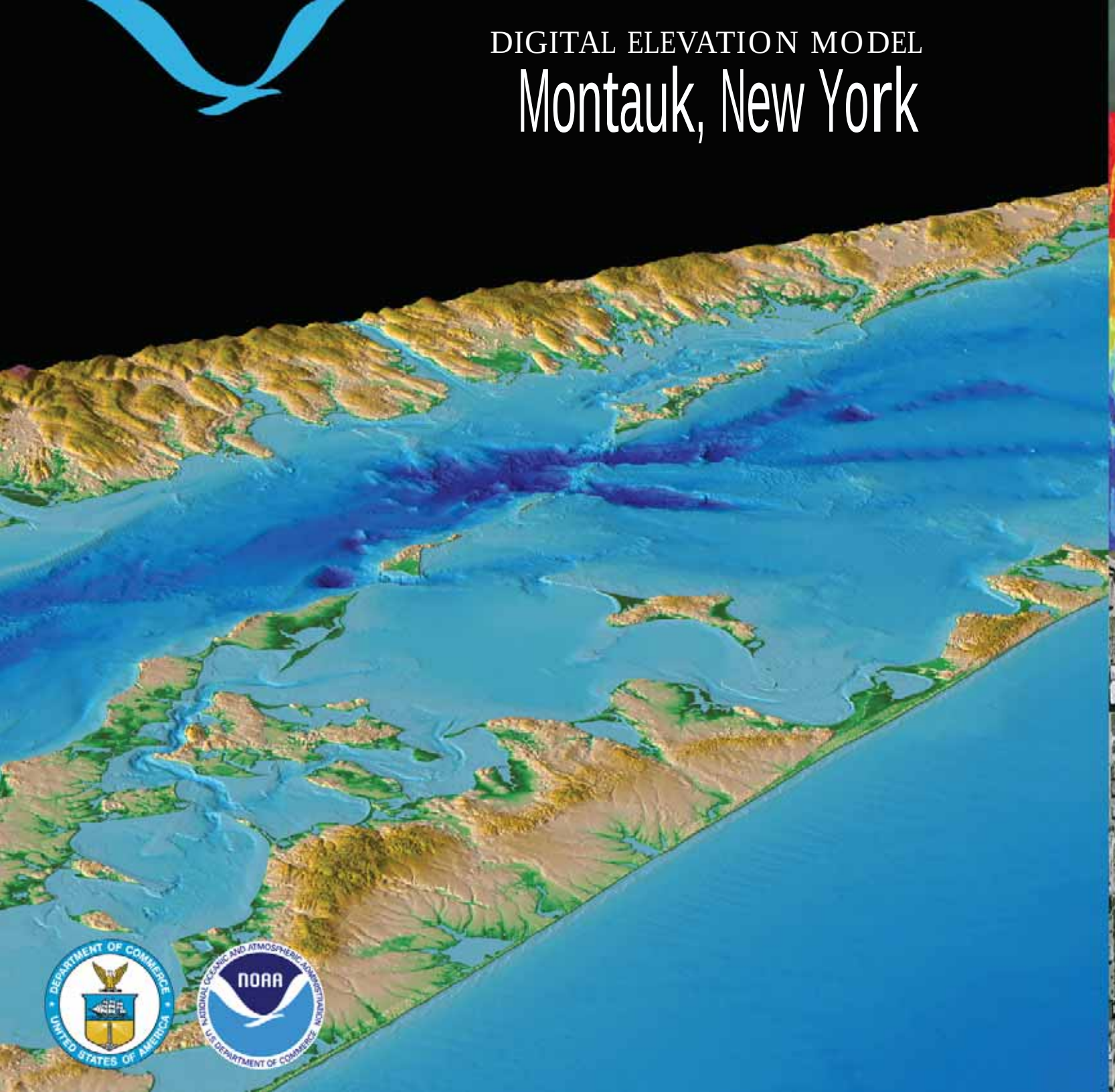
The Nantucket DEM covers the coastal region surrounding the town of Nantucket, Massachusetts on Nantucket Island. It spans Nantucket Sound— from Martha's Vineyard on the west to Nantucket Island on the east, and north to Cape Cod— and extends into the Atlantic Ocean. Nantucket's population more than quadruples in the summer season, as tourists and summer residents flock out to the island for its natural beauty, quaint New England feel, and beautiful beaches. The coastal morphology of the Cape Cod and Nantucket Sound region varies rapidly as alongshore currents move sediments near the coast. For example, in April 2007, a breach was opened along the southern shore of Katama Bay on Martha's Vineyard, dramatically altering current dynamics and sediment erosion, migration, and deposition in the area. In addition, strong hurricanes and "Nor-easters" can considerably alter the coastlines and breakwaters in the area— posing risks for communities in close proximity to the shoreline. The Nantucket DEM is an important tool in helping community planners with hazard mitigation and damage prevention tactics during future coastal storm events.

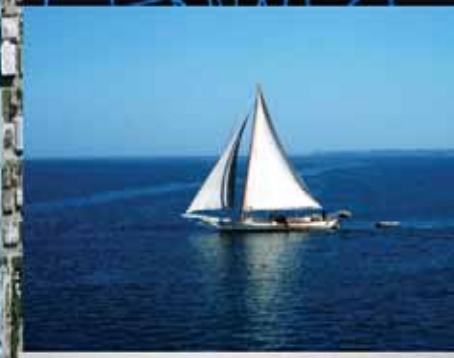
Who Provided the Data?

- Office of Coast Survey (OSC)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- Massachusetts Office of Geographic and Environmental Information (MassGIS)

DIGITAL ELEVATION MODEL

Montauk, New York





NOAA Knows....

MONTAUK, NEW YORK

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

Why Model Montauk, New York?

Montauk is located on the South Shore of Long Island and has a population of more than 4,000 people. The town is located on the tip of South Fork peninsula and boasts the largest commercial and recreational fishing fleet in all of New York State. The saltwater fishing in Montauk is world renowned. The town's seaside position, 20 miles off of the Connecticut coast, has also made it useful for Army, Navy, Coast Guard, and Air Force facilities. Tourists visit Montauk to fish, surf, and experience the history— but also to enjoy its natural beauty through the several state parks that exist in the area. While rarer than the famous "Nor'easters" and hurricanes that cause flooding and coastal inundation, submarine landslides along the Atlantic continental slope have the potential for generating locally destructive tsunamis. The DEM of the area will help local planners prepare the community in the face of future storm events.

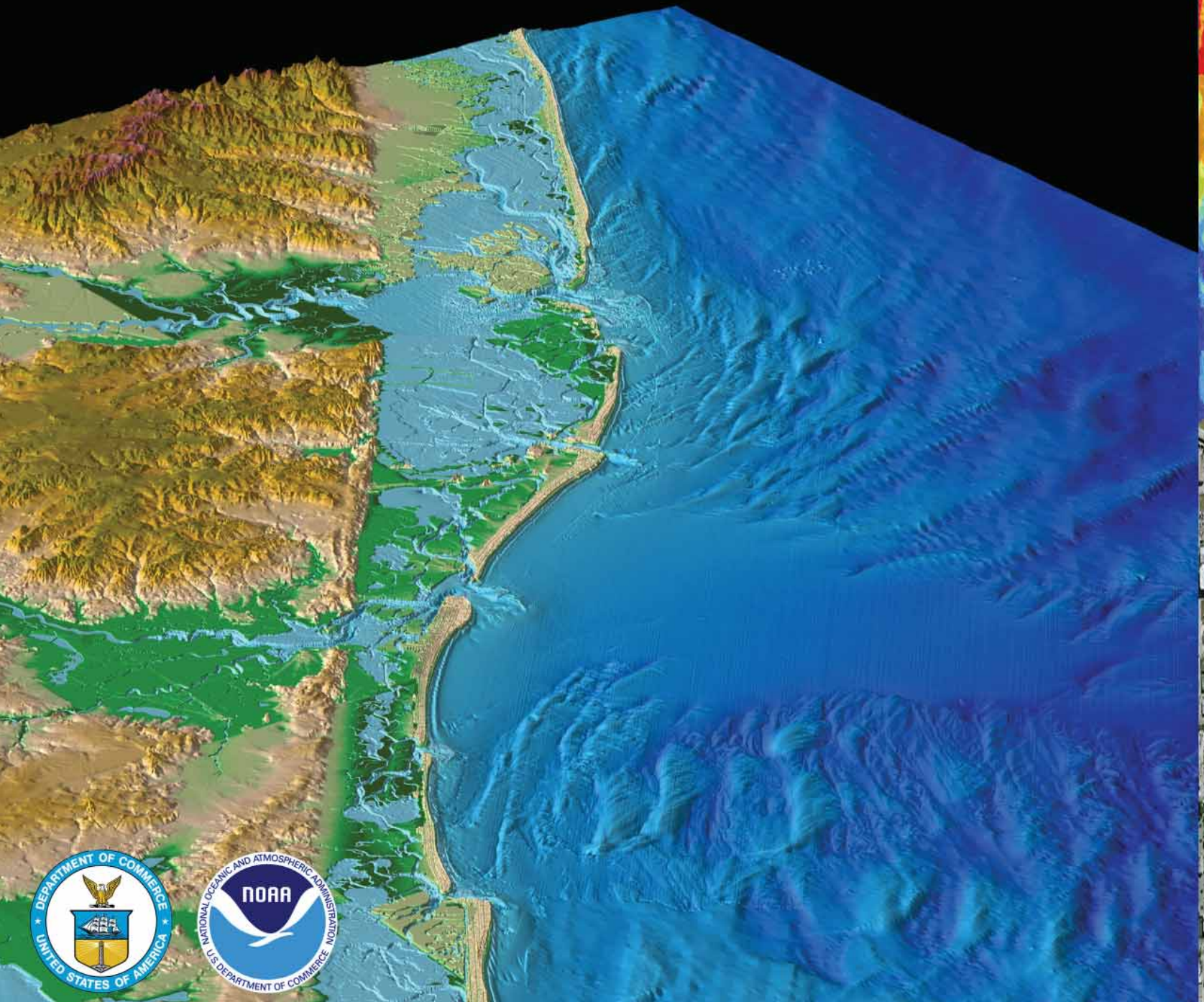
Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)

Photo Credit: http://www.nan.usace.army.mil/fimp/

DIGITAL ELEVATION MODEL

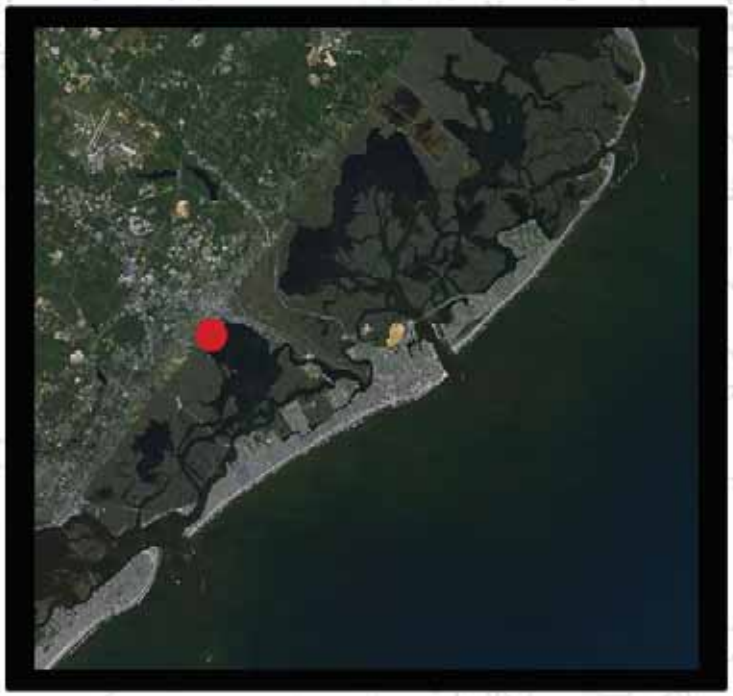
Atlantic City, New Jersey



NOAA Knows....

ATLANTIC CITY, NEW JERSEY

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



Why Model Atlantic City, New Jersey?

Atlantic City is located along the southern New Jersey Atlantic seaboard, just north of the mouth of Delaware Bay. Many rural communities surround Delaware Bay, while rapidly growing suburban and developing urban populations are popping up in the region along the Atlantic coast. New Jersey's coastal economy is focused mostly on tourism, but also on commercial and recreational fishing. The nearby Outer Coastal Plain supports the economy by providing habitat to wildlife, migratory birds, and marine life. Barrier islands to the east protect the wetlands and white-sand beaches. Coastal processes such as wave action, along shore currents, and tidal cycles continually re-shape and modify the New Jersey coastline. The 1929 Grand Banks earthquake that generated a more than two foot tsunami in Atlantic City is the region's only confirmed tsunami. However, the densely populated New Jersey coast is at risk from many natural hazards: storm surge, erosion, and coastal flooding— making DEM modeling an important tool for hazard managers and local planners.

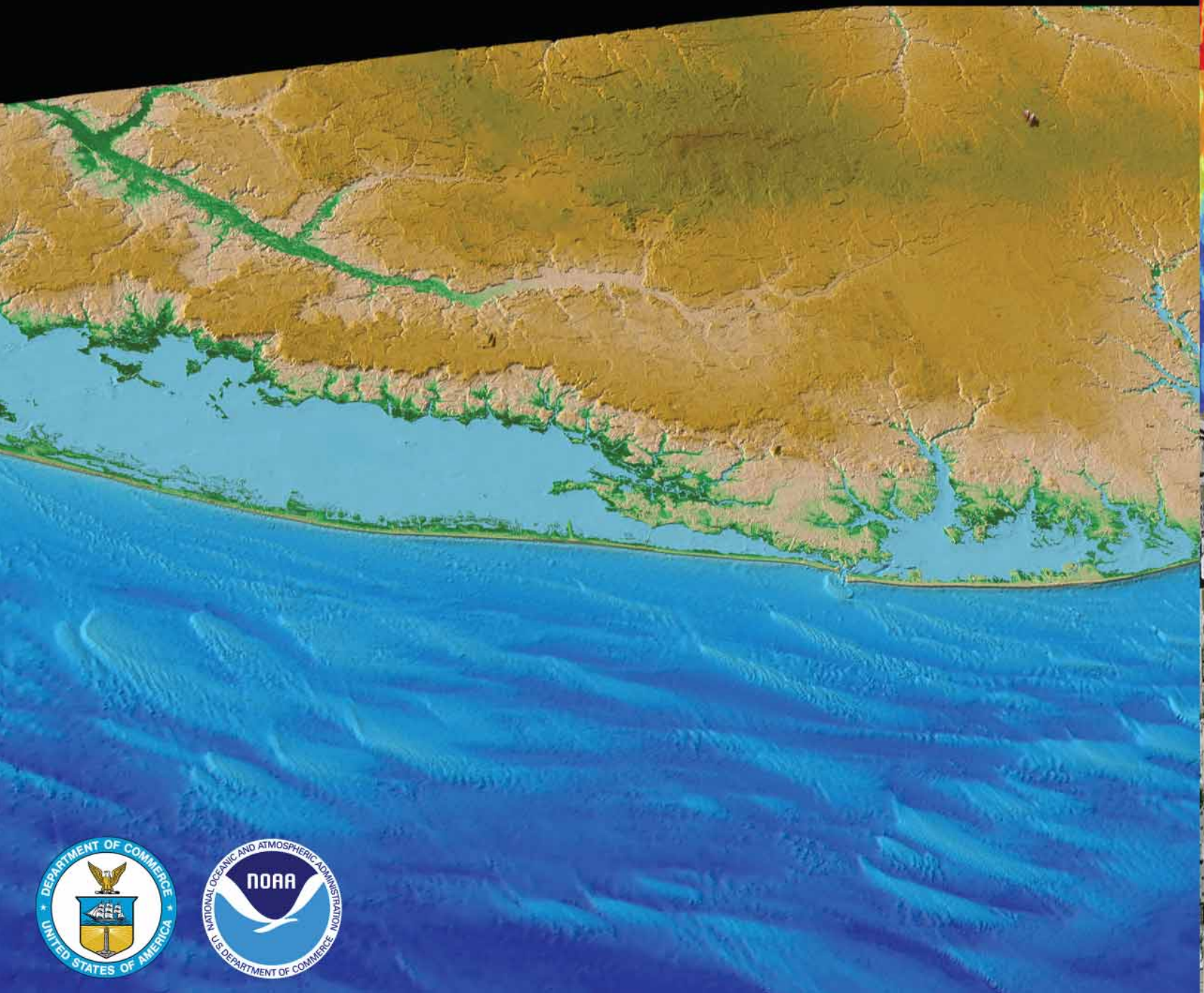
Who Provided the Data?

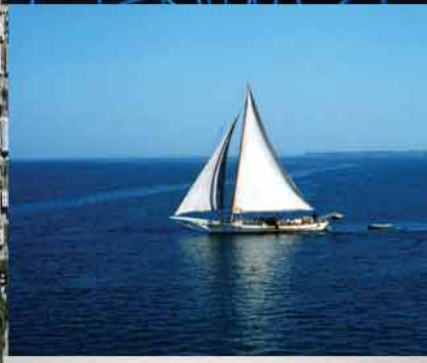
- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- Joint Airborne LiDAR Bathymetry Technical Center of Expertise (JALBTCX)

Photo Credit: http://nj.gov/nj/about/gallery/

DIGITAL ELEVATION MODEL

Ocean City, Maryland

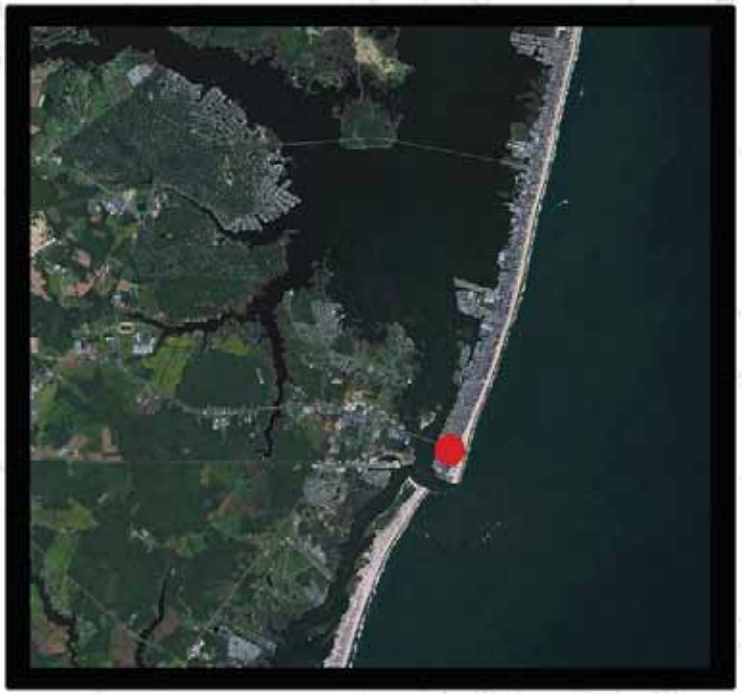




NOAA Knows....

OCEAN CITY, MARYLAND

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



Why Model Ocean City, Maryland?

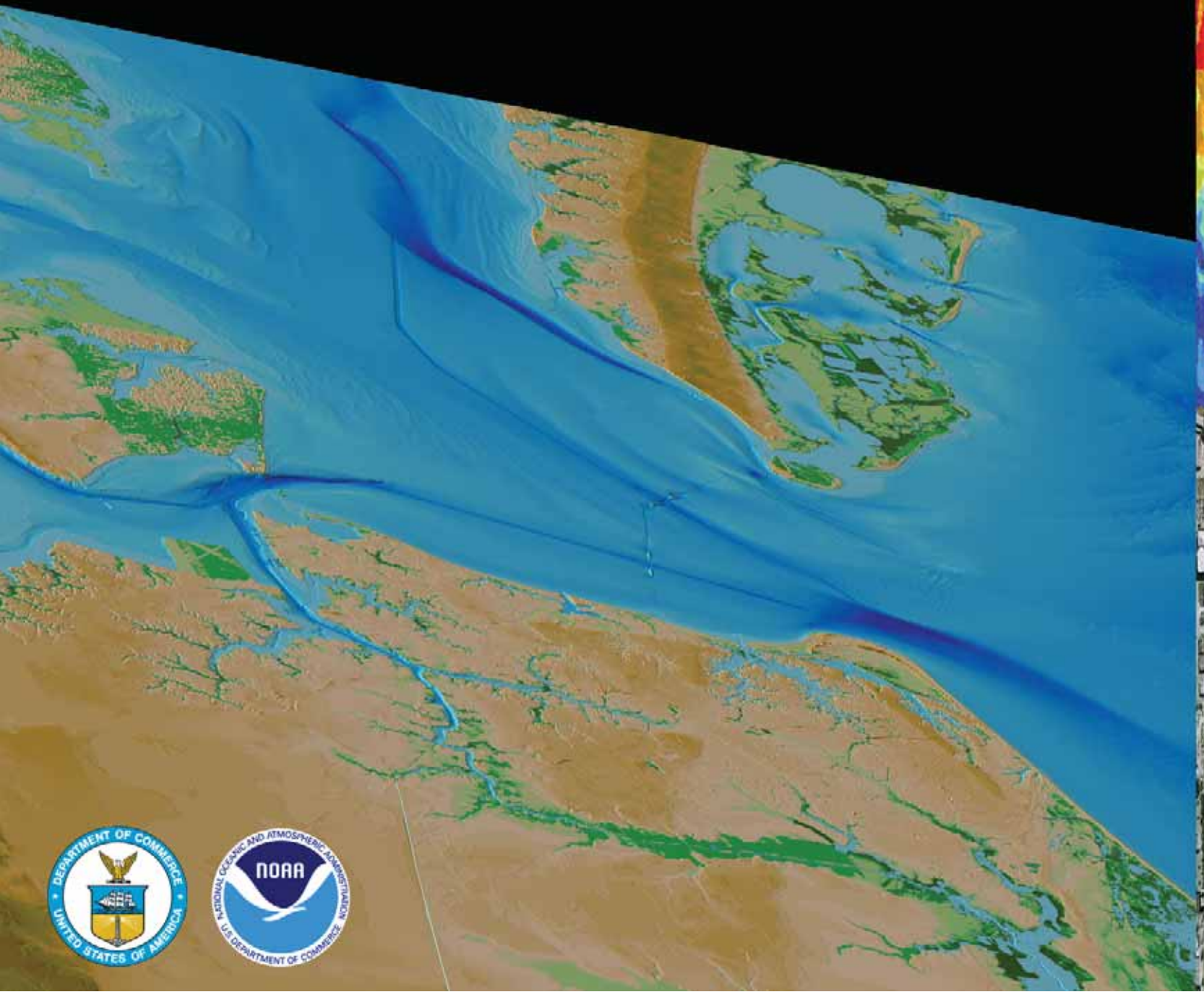
The Ocean City DEM includes the dynamic barrier islands, Fenwick and Assateague, located off of the Delaware, Maryland and Virginia coasts. Ocean City, a popular vacation destination for many residents on the Eastern Seaboard, is easily accessible to more than 30 million people. Each year, approximately eight million people visit the area to enjoy the beach front and local activities. The two barrier islands are unstable environments with constant erosion, deposition, and migration of sediment from wave action. Along with general sediment transportation issues, rising sea level is a concern for coastal managers and property owners. To help stabilize the barrier islands, Ocean City uses beach nourishment and dune stabilization projects to protect their beaches and communities. In 1933, a hurricane opened up the current Ocean City Inlet, prompting the U.S. Army Corps of Engineers to build two stone jetties to stabilize the navigation channel. While far rarer than hurricanes, Ocean City did experience tsunami waves of over one foot from the 1929 Grand Banks earthquake. Tsunamis, along with greater risks from coastal hurricanes and the low elevations in the area, make the Ocean City DEM a useful tool for local planners, inundation modelers, and hazard managers.

Who Provided the Data?

- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)

DIGITAL ELEVATION MODEL

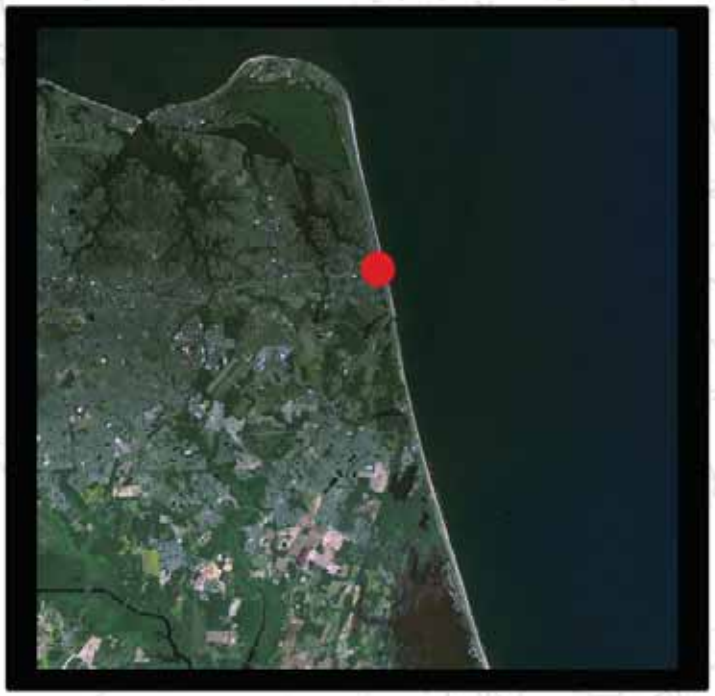
Virginia Beach, Virginia



NOAA Knows....

VIRGINIA BEACH, VIRGINIA

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



Why Model Virginia Beach, Virginia?

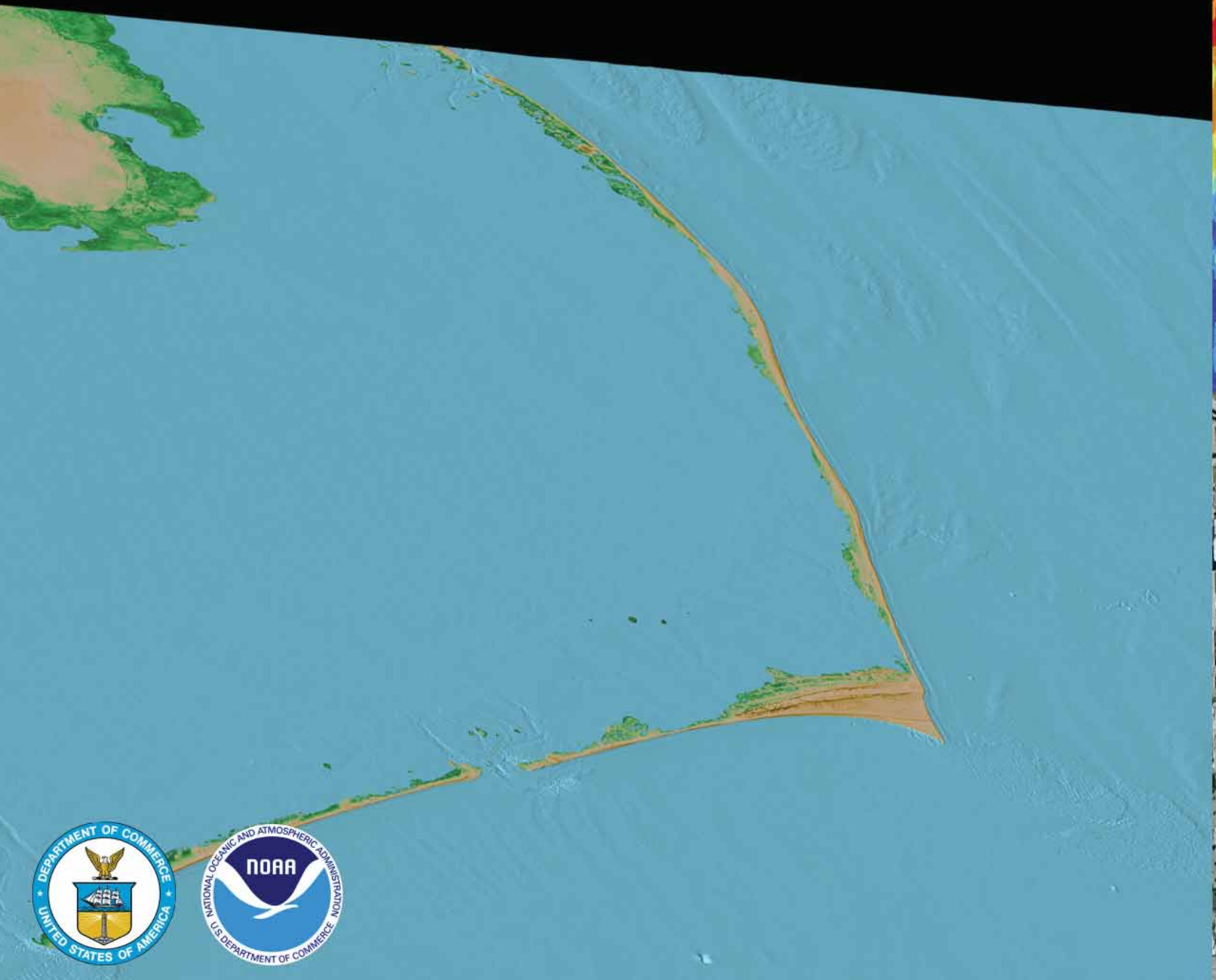
Virginia Beach is a vacation resort city located on the Atlantic Ocean near the mouth of the Chesapeake Bay. It is the most heavily populated city in the commonwealth of Virginia, with close to 500,000 residents. The area boasts several state parks, historic sites, protected beach fronts, military bases, and universities. Along with its heavy commerce and agricultural industries, the city serves as a main transportation hub via its network of shipping and rail lines. The DEM of Virginia Beach also covers the coastal area surrounding the city, including Norfolk, Portsmouth, Chesapeake, Hampton, and Newport News— all of these low-lying cities are prone to hurricane damage and inundation. Virginia Beach is located within the geologic region called the Atlantic Coastal Plain: a thick basement layer of igneous and metamorphic rock overlaid with a thick wedge of sediments that increases in thickness and dips towards the shoreline. The area has long shorelines, frequented ports, and heavily populated coastal communities. These factors make Virginia Beach a high risk area for inundation events. Elevation modeling in the area will help local managers and hazard planners mitigate future storms and hazards.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OSC)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- National Geodetic Survey (NGS)
- Coastal Survey Development Laboratory (CSDL)
- Virginia Coast Reverse-Long Term Ecological Research (VCR/LTER)
- University of Virginia (UVA)

DIGITAL ELEVATION MODEL

Cape Hatteras, North Carolina



NOAA Knows....

CAPE HATTERAS, NORTH CAROLINA

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

Why Model Cape Hatteras, North Carolina?

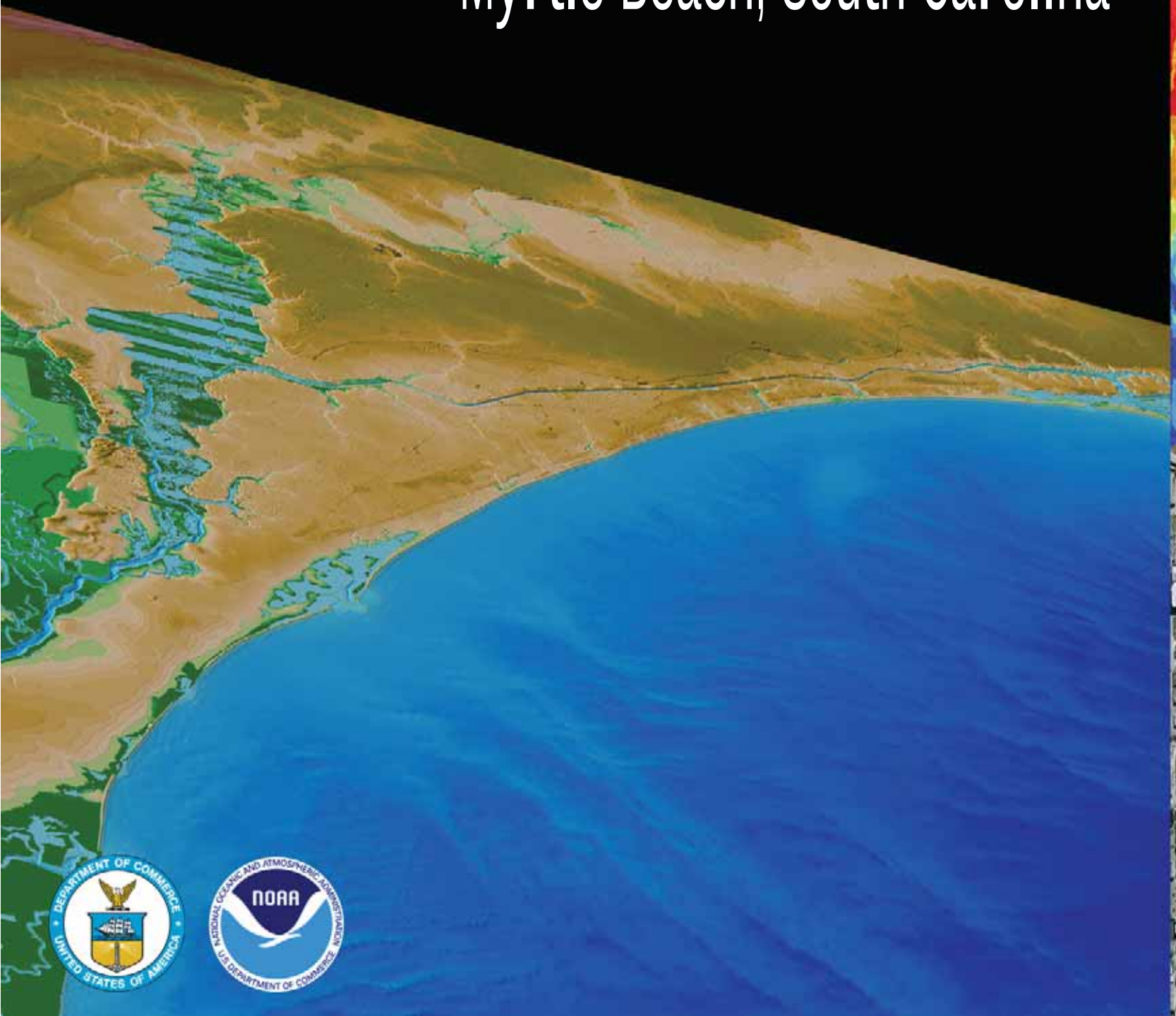
Cape Hatteras is located on Hatteras Island, a low-lying sandy barrier bar that is bordered by the Atlantic Ocean to the east and by Pamlico Sound to the west. Hatteras Island makes up a small piece of what is called the North Carolina "Outer Banks," a series of islands along the eastern coast of North Carolina that form a quiet sound and protective barrier for the mainland. Beautiful beaches in the area make Cape Hatteras and the Outer Banks a popular tourist destination. The coastline on Hatteras Island is constantly changing due to two colliding currents, the Labrador and the Florida, that create turbulent waters, perilous seas, high shoals, and shallow sandbars. The Cape Hatteras National Seashore is a protected area that spans over 30,000 acres, and includes the Hatteras, Bodie, and Ocracoke Islands. In contrast to the remainder of the Outer Banks, it is one of the largest stretches of undeveloped seashore on the U.S. Atlantic coast. Overall, the area is an infamous target for northbound hurricanes, which have been known to devastate the area and the surrounding beach front. The DEM of Cape Hatteras is an important tool for local hazard mitigation and community planning, and will help professionals in understanding the risks associated with high storm events and coastal inundation.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- National Geophysical Data Center (NGDC)
- U.S. Army Corps of Engineers (USACE)
- University of New Hampshire's Center for Coastal and Ocean Mapping/Joint Hydrographic Center (CCOM/JHC)
- North Carolina Division of Emergency Management Floodplain Mapping Program (NCDEM-FPMP)

DIGITAL ELEVATION MODEL

Myrtle Beach, South Carolina



NOAA Knows....

MYRTLE BEACH, SOUTH CAROLINA

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

Why Model Myrtle Beach, South Carolina?

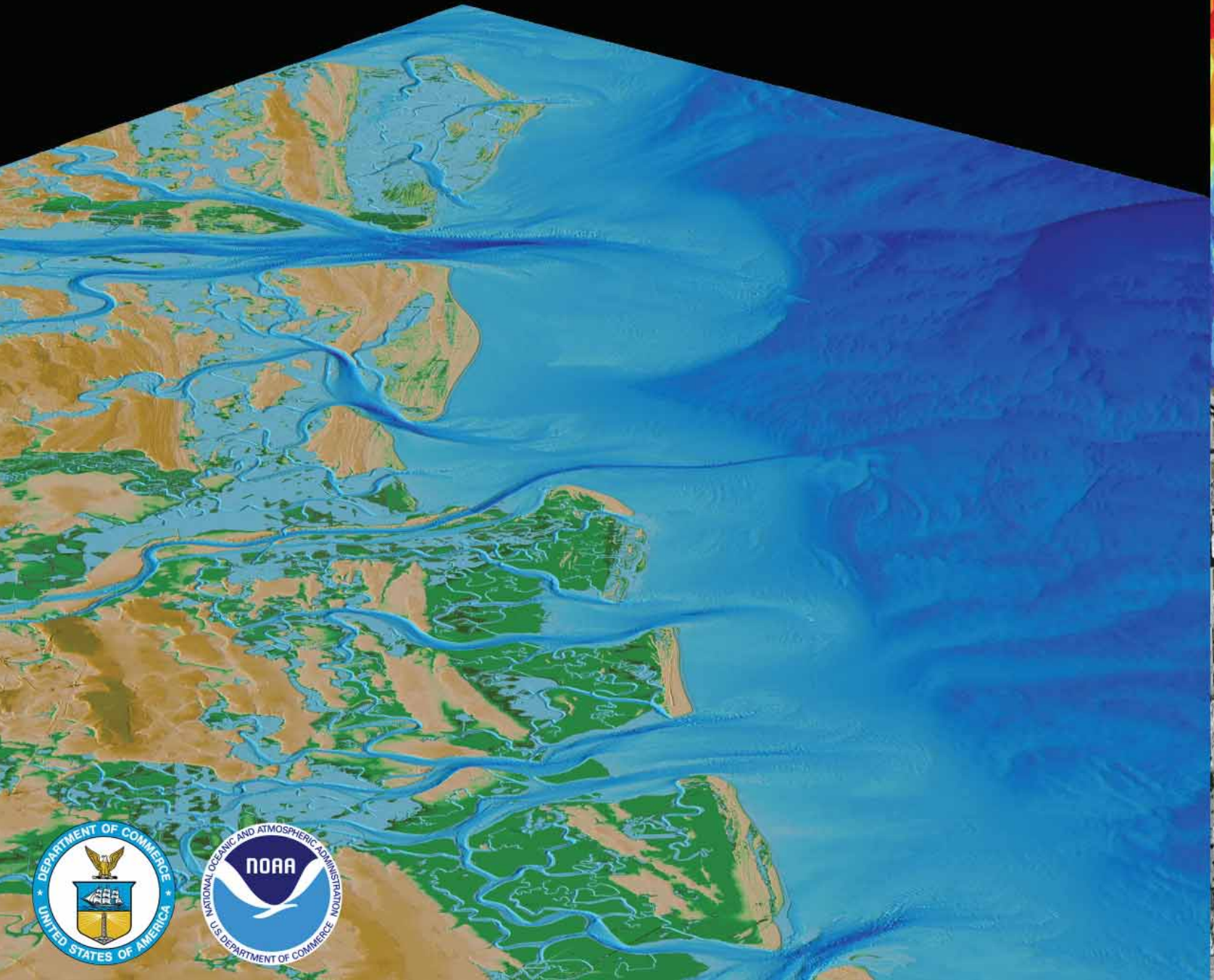
Myrtle Beach is located in the northeastern part of South Carolina, along a strip of resort towns known as the "Grand Strand." The city is situated on a close-in island, between the Atlantic Intracoastal Waterway to the west and the Atlantic Ocean to the east. The city of Myrtle Beach is one of the fastest growing metropolitan areas in the United States, with a city population nearing 100,000 and a regional population over 350,000. Known for its wide sandy beaches and numerous golf courses, the Myrtle Beach area is one of the major coastal resorts and tourist destinations along the South Atlantic seaboard, attracting over 14 million visitors a year. Geographically, about half of the land area of South Carolina is part of the South Atlantic Coastal Plain, which is fringed by the Sea Islands and separated from the mainland by salt marshes, lagoons, and sounds. The area is extremely vulnerable to flooding and damages caused by fierce northbound hurricanes, which have been known to devastate the area and the surrounding beach front. The DEM of Myrtle Beach is an important tool for local hazard mitigation and community planners in understanding the risks associated with future high storm events and occurrences of coastal inundation.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- National Geophysical Data Center (NGDC)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- Coastal Carolina University (CCU)
- Coastal Science and Engineering, Inc. (CSE)
- Horry Count County, South Carolina

DIGITAL ELEVATION MODEL

Savannah, Georgia



NOAA Knows....

SAVANNAH, GEORGIA

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

Why Model Savannah, Georgia?

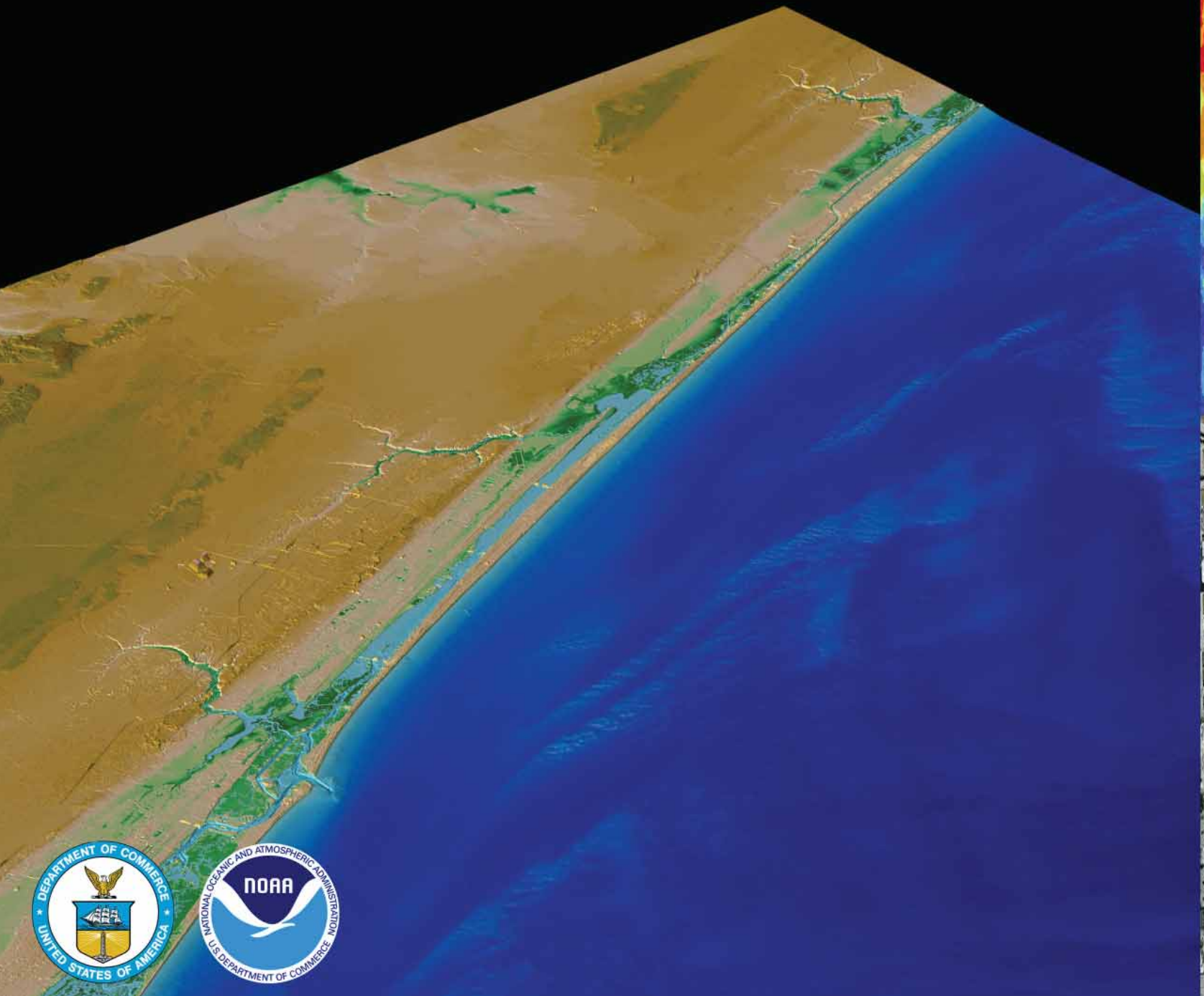
Savannah is an important seaport, industrial center, historical player, and cultural hub in the southern United States. Savannah is located along the Atlantic coast of northern Georgia, and the DEM of Savannah provides coverage of the area surrounding the Savannah River— including easternmost Georgia and the southern tip of South Carolina. The region is characterized by its barrier islands, tidal inlets, extensive sand shoals, and wide tidal marshlands. The barrier islands were formed by river deposition and by sea level fluctuation in the Pleistocene. River inlets in the area are characterized by sandy shoals formed as large sediment loads which pose as threats for traveling watercraft. Sediment deposition, alongshore currents, tidal cycles, and wave action modify the shoreline seasonally. Inland marshlands form a network of creeks, steams, and estuaries that are prone to seasonal and tidal flooding. The area is extremely vulnerable to flooding and damages caused by hurricanes and coastal storms. The DEM of Savannah is an important tool for local hazard mitigation and community planners in understanding the risks associated with future high storm events and coastal inundation.

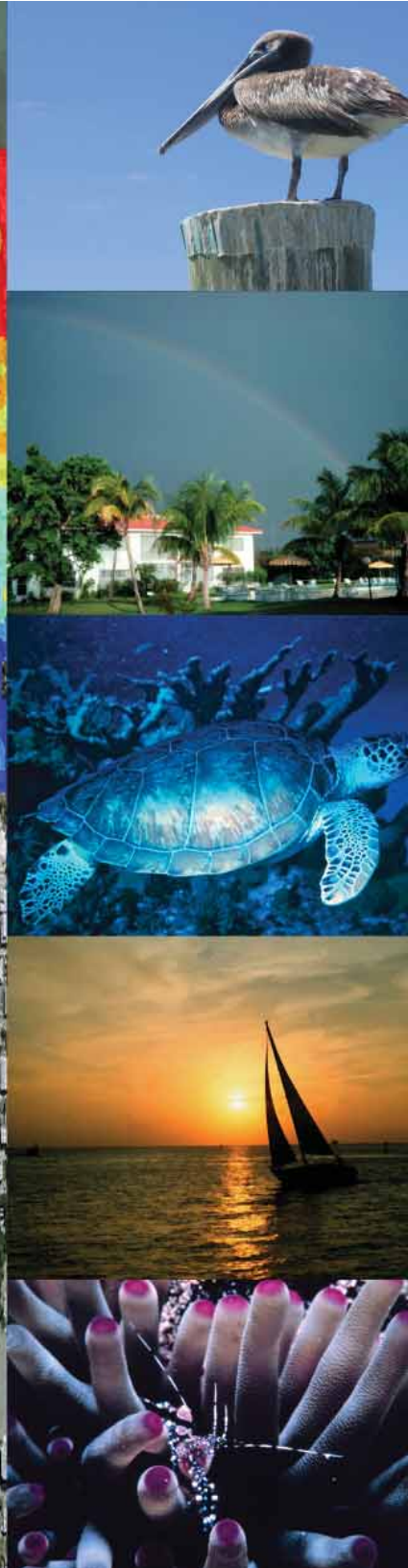
Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- National Geophysical Data Center (NGDC)
- National Geodetic Survey (NGS)
- U.S. Army Corps of Engineers (USACE)

DIGITAL ELEVATION MODEL

Daytona Beach, Florida

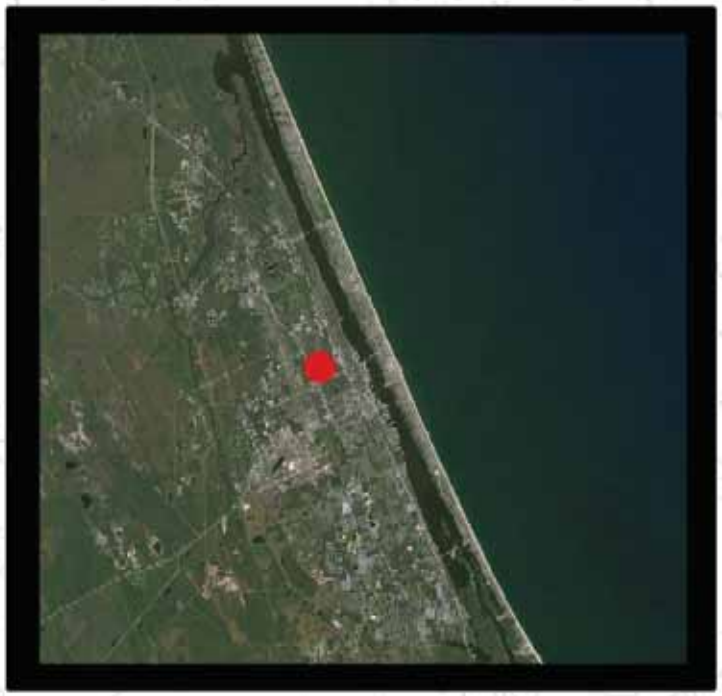




NOAA Knows....

DAYTONA BEACH, FLORIDA

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



Why Model Daytona Beach, Florida?

Daytona Beach, a popular vacation destination spot, is bordered to the north by Palm Coast, Flagler Beach, and Ormond Beach, and to the south by Daytona Beach Shores and New Smyrna Beach. The region includes a long, heavily populated sandbar that is largely isolated from mainland Florida by the Halifax River lagoon. The entrance to the lagoon, whose banks provide anchorage for numerous ships and sailing vessels, is through the mouth of Ponce de Leon Inlet. The Atlantic Intracoastal Waterway, which stretches from Miami to Maine and is maintained by the U.S. Army Corps of Engineers, passes through the Halifax River lagoon. The Atlantic shoreline near Daytona Beach is a dynamic system. Sand is constantly being moved by wind, waves, and tidal action. Shorelines, islands, spits, bars, and dunes change shape, migrate, shrink, grow, and even disappear as part of dynamic natural processes in the area. Coastal storms along fragile low lying communities such as Daytona Beach pose risks associated with floodwater inundation, and DEMs help to model risks and prevent damages in these communities.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- National Geophysical Data Center (NGDC)
- U.S. Army Corps of Engineers (USACE)
- Florida Fish and Wildlife Research Institute (FWRI)
- U.S. Geological Survey (USGS)

DIGITAL ELEVATION MODEL

Palm Beach, Florida

NOAA Knows....

PALM BEACH, FLORIDA

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

Why Model Palm Beach, Florida?

Palm Beach is an affluent coastal town made up of nearly 100,000 residents. Located between Jupiter and Lake Worth, it is a popular tourist location and is frequented in the winter months. The area is known for golfing, birding, boating, diving, and an array of other outdoor pastimes. Geographically, Palm Beach is the easternmost town in Florida and is located on a 16-mile long barrier island with white sand beaches that stretch into the Atlantic Ocean. Some of the strongest hurricanes in history, such as the San Felipe-Okeechobee Hurricane of 1928, have caused heavy casualties and extensive destruction to the area. Hurricanes are of major concern to current residents, especially since the low-lying area is extremely vulnerable to flooding. It is very important to assess how the community may be affected by a storm surge or tsunami wave. The DEM of Palm Beach is an important tool in understanding how these events may affect or alter possible impending flood waters.

Who Provided the Data?

- National Geophysical Data Center (NGDC)
- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- U.S. Army Corps of Engineers (USACE)
- Japan's Ministry of Economy, Trade, and Industry (METI)
- National Aeronautics and Space Administration (NASA)
- South Florida Water Management District (SFWMD)
- County of Palm Beach
- Florida Department of Emergency Management (FDEM)

This flipbook is part of a “Regional DEM Series” that is based on the work of a team of NGDC and CIRES scientists, led by Dr. Barry Eakins and Lisa Taylor. To learn more about coastal DEMs and DEM development in support of coastal management and research, visit http://www.ngdc.noaa.gov/mgg/coastal/

2011, NOAA NGDC

Design and Layout: Siobhan Collins