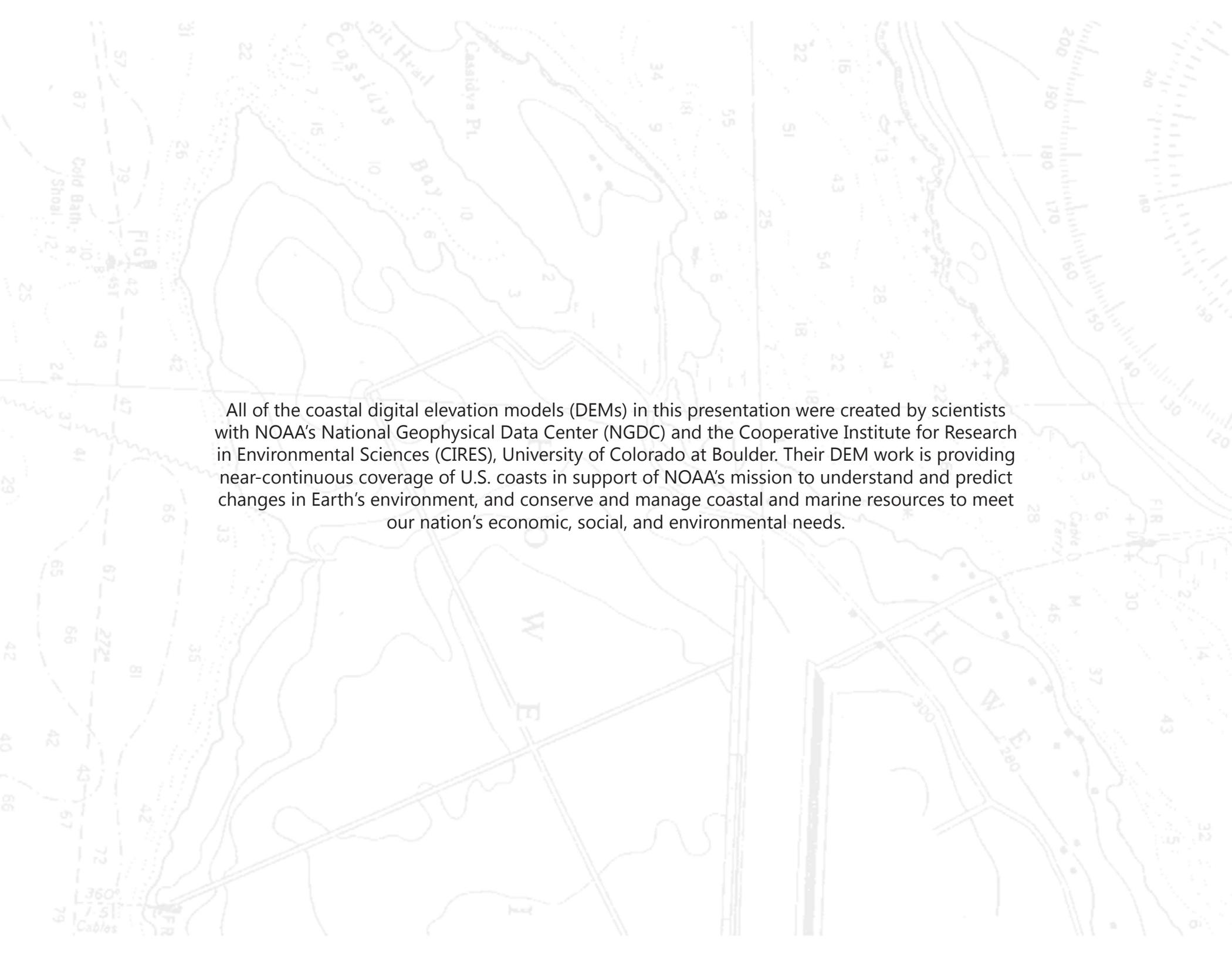




ALASKAN DIGITAL ELEVATION MODELS

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

A topographic map of Howe Island, Oregon, showing contour lines, roads, and geographical features. The map includes labels for 'Howe Island', 'Casida's Pt.', 'Cold Bath Shoal', and 'Howe Island'. Contour lines are labeled with numbers such as 2, 3, 5, 6, 8, 9, 10, 12, 13, 15, 16, 18, 22, 25, 28, 30, 31, 32, 34, 35, 37, 40, 42, 43, 45, 46, 47, 48, 51, 54, 55, 57, 65, 66, 67, 72, 79, 81, 86, 93, 95, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300. The map also shows a road network and various points of interest.

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.

ALASKA

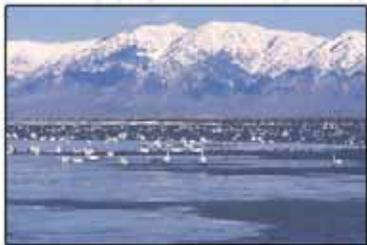
Alaska is the largest state in the United States of America. One-fifth the size of all of the lower 48 states combined, it boasts a land mass of 570,374 square miles. Alaska is known for its mountains, tundra, boreal forests, and coastal habitats. Alaska is home to the nation's greatest concentration of glaciers, the nation's northernmost city (Barrow) and westernmost city (Adak), and the tallest mountain on the North American continent (Denali). Alaska is also the largest seafood-producing state in the U.S. The state's 47,000 miles of coastline make up two-thirds of the U.S. total and are integral in supporting wildlife, fisheries, and commerce.

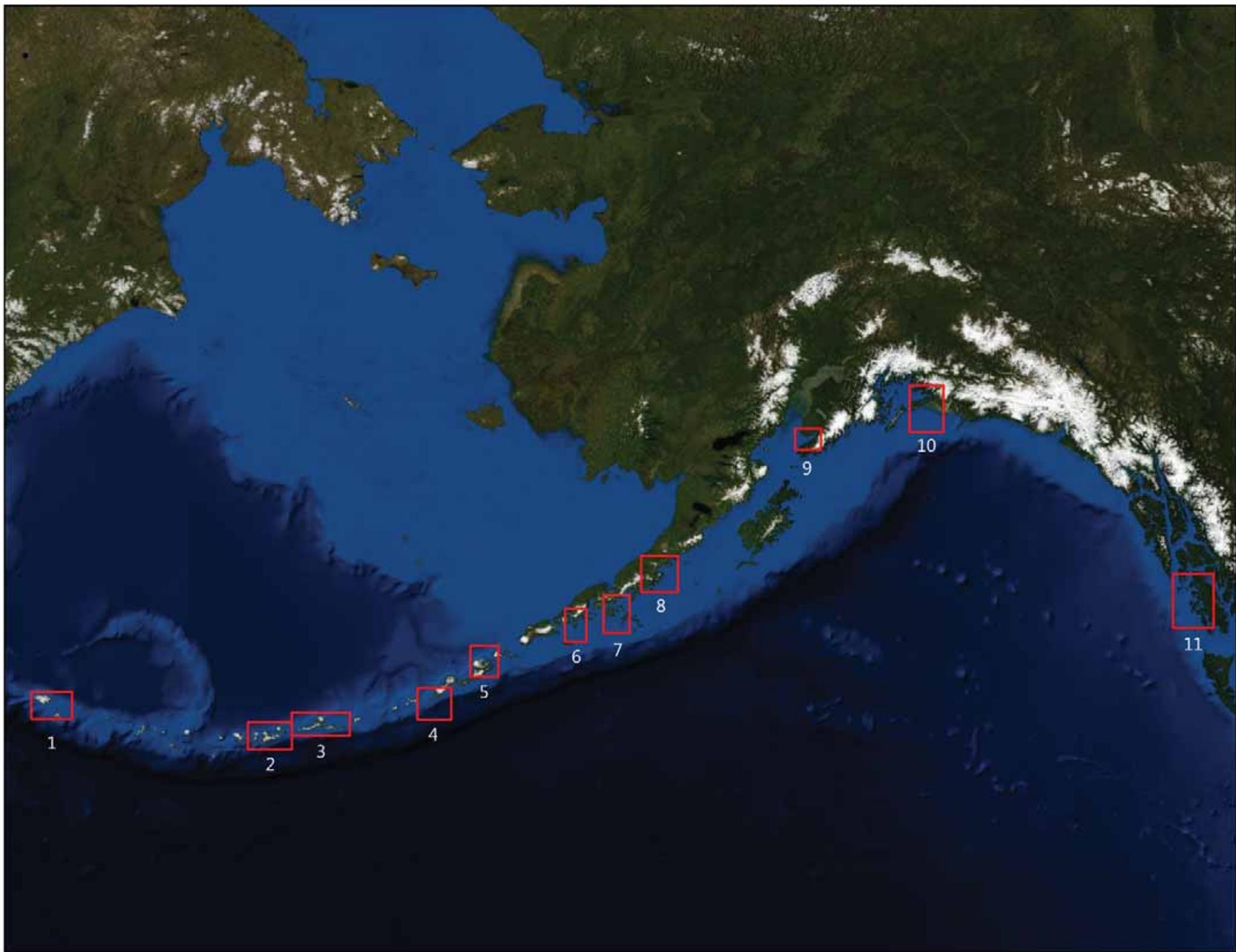
Communities and people who live along the Alaskan shore are vulnerable to coastal hazards such as tsunamis and sea-level change— with more tsunami-related deaths in Alaska than anywhere else in the U.S. except for Hawaii. Alaska's history of devastating tsunamis and earthquakes necessitated the establishment of the U.S. and Pacific Tsunami Warning Centers in the mid-twentieth century.

An active tectonic plate boundary stretches along the Aleutian Islands, producing powerful earthquakes and containing some of the world's most active volcanoes. Alaska is also at risk from tectonic activity anywhere along the Pacific Ocean "Ring of Fire." The highest tsunami run-up ever recorded was in Lituya Bay, Alaska from a July 10th, 1958 magnitude 8.3 earthquake, which caused a landslide that generated a tsunami with a run-up of 525 meters. On April 1st, 1964, Alaska experienced North America's largest earthquake, the 9.2 magnitude Good Friday Earthquake. The earthquake, including the landslides and tsunamis it spawned, devastated many local communities. The event resulted in \$430 million in damages and the deaths of approximately 139 people.

The National Geophysical Data Center's DEMs provide detailed, accurate depictions of U.S. coasts that are used by NOAA for tsunami forecast and warning. DEMs can be used by scientists, coastal managers, and policy makers to manage marine ecosystems and coastal resources, coordinate planning and mitigation efforts, and better understand the impacts of natural hazards. The DEMs in this presentation provide a glimpse of the integrated bathymetry and topography of some of Alaska's most vulnerable coastal communities.

1. Shemya
2. Adak
3. Atka
4. Nikolski
5. Dutch Harbor
6. King Cove
7. Sand Point
8. Chignik
9. Kachemak Bay
10. Cordova
11. Craig





DIGITAL ELEVATION MODEL
Shemya, Alaska



NOAA Knows... SHEMYA, ALASKA

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



Why Model Shemya, Alaska?

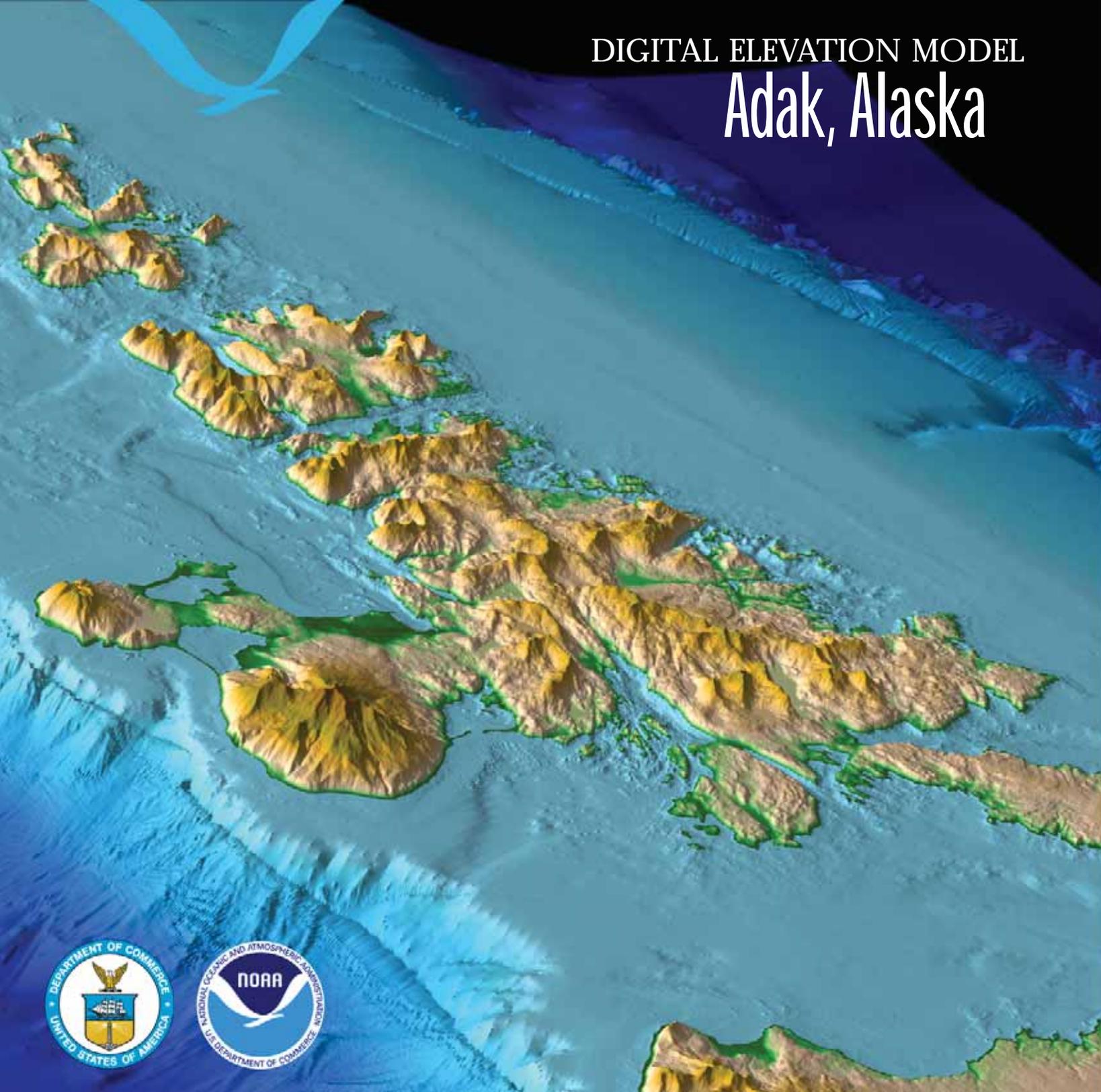
Shemya is located on the easternmost island of the Semichi Island Group, on the western end of the Aleutian Island chain of Alaska. The Shemya DEM includes Shemya Island, Nizki Island, Alaid Island (the Semichi Islands), Agattu Island to the southwest, and Attu Island to the west. The topography in the area varies from low-lying, wave-cut platforms on the Semichi Islands to the high relief and mountains on Attu and Agattu Islands. Shemya served as a military base from World War II until the late 1990s. The station currently operates as a radar, surveillance, weather, and aircraft refueling station with a population of approximately 30 full time residents. In 1965, Shemya recorded a tsunami of over 10 meters resulting from a nearby 8.7 magnitude earthquake. The epicenter was located about 500 kilometers to the southeast in the Rat Islands. Mapping and DEM modeling are important tools in the area since this part of Alaska is one of the most seismically active regions in the world, and has recorded many of the largest earthquakes in recent history.

Who Provided the Data?

- National Geophysical Data Center (NGDC)
- NOAA's Office of Coast Survey (OCS)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Geological Survey (USGS)



DIGITAL ELEVATION MODEL Adak, Alaska





Why Model Adak, Alaska?

Adak is located in the Andreanof Islands of the Aleutian Islands Chain of Alaska. The Adak DEM encompasses Adak Island, Kagalaska Island, Little Tanaga Island, Umak Island, Great Sitkin Island, Igitkin Island, and the eastern half of Kanaga Island. Tall coastal cliffs and mountains dominate the landscape, with steep slopes continuing offshore into deep-water canyons. Adak is the southernmost town in Alaska and is located 350 miles west of Dutch Harbor. The town has a population of just over 300 people and served as a military base from the onset of World War II until the late 1990s. The current economy is based on the fishing and hunting industries, and the island provides support for U.S. and foreign fishing fleets. A portion of the island lies within the Alaska Maritime National Wildlife Refuge, managed by U.S. Fish and Wildlife Service. Located in one of the most seismically active regions in the world, Adak is vulnerable to tsunamis and other natural disasters. NOAA regional tsunami modeling efforts and NGDC's DEMs can help lessen the community risks associated with future severe storms and tsunami events.

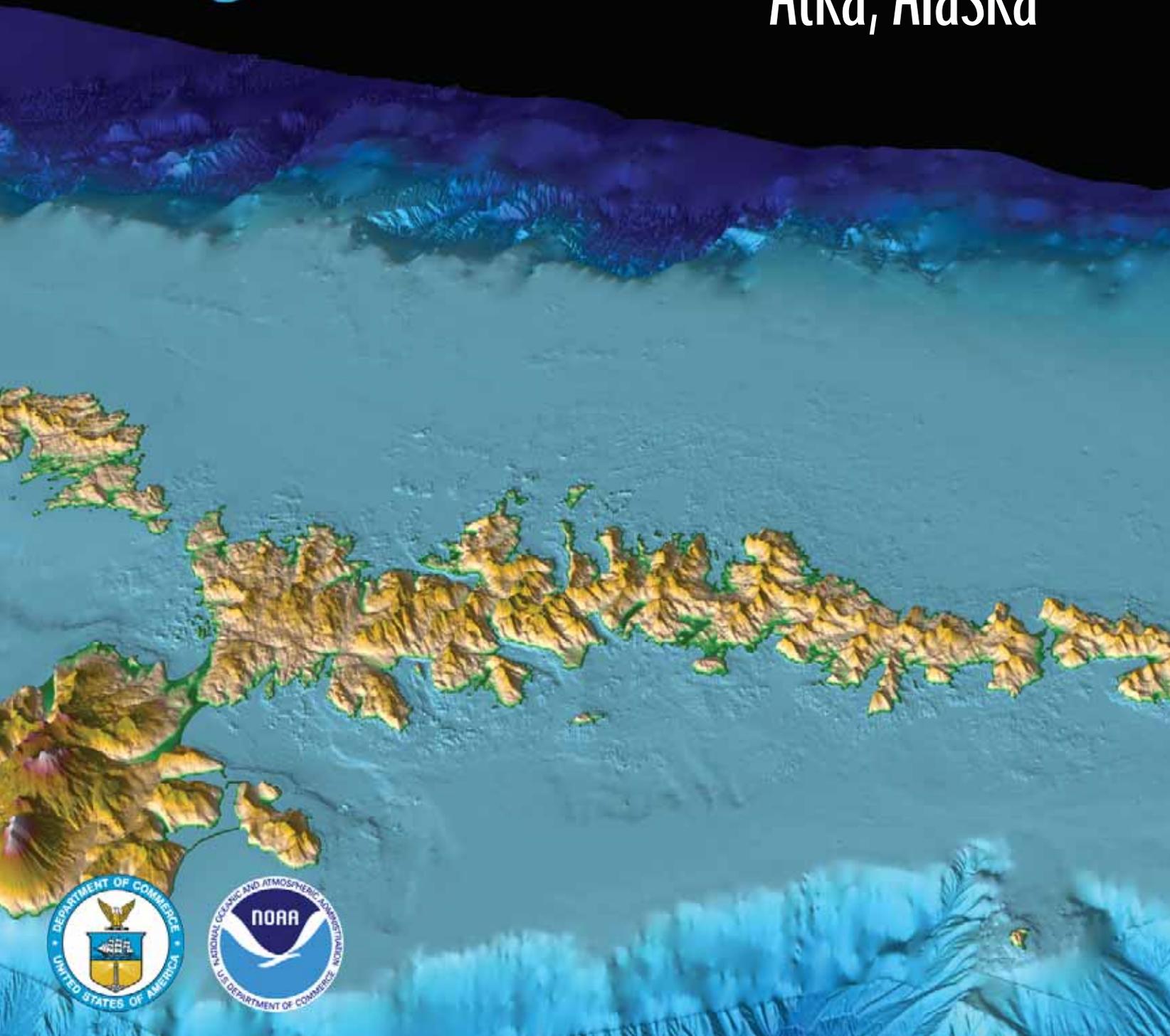
Who Provided the Data?

- NOAA Office of Coast Survey (OSC)
- U.S. Fish and Wildlife Service (USFWS)
- The U.S. Geological Survey (USGS)
- University of California
- Scripps Institute of Oceanography (SIO)



Photo Credit: <http://www.commerce.state.ak.us/dca/photos/>
and U.S. Fish and Wildlife Service National Digital Library

DIGITAL ELEVATION MODEL Atka, Alaska





Why Model Atka, Alaska?

The low-lying town of Atka, with a population of fewer than 100 people, lies along a small bay on the east side of Atka Island, one of the Andreanof Islands of the Aleutian Islands chain. The island is mountainous, with the Korovin Volcano on the northernmost side of the island as its highest point. The volcano, which exhibits small eruptions periodically through its summit vents, is part of the underlying Atka shield volcano system that is driven by the tectonic plate interactions of this seismically active area along the northern Pacific 'Ring of Fire.' The Atka shield volcano system spans most of the northern peninsula of Atka Island, causing small vents and thermal activities throughout the island. Due to the area's seismic nature and geographic location, the Aleutian Island Chain is volcanically active, experiences frequent earthquakes, and has a very high tsunami hazard. Tsunami modeling efforts and integrated coastal DEMs can help to prevent damages associated with hazardous coastal events.

Who Provided the Data?

- NOAA Office of Coast Survey (OSC)
- National Geophysical Data Center (NGDC)
- U.S. Fish and Wildlife Service (USFWS)
- The U.S. Geological Survey (USGS)
- National Aeronautics and Space Administration (NASA)

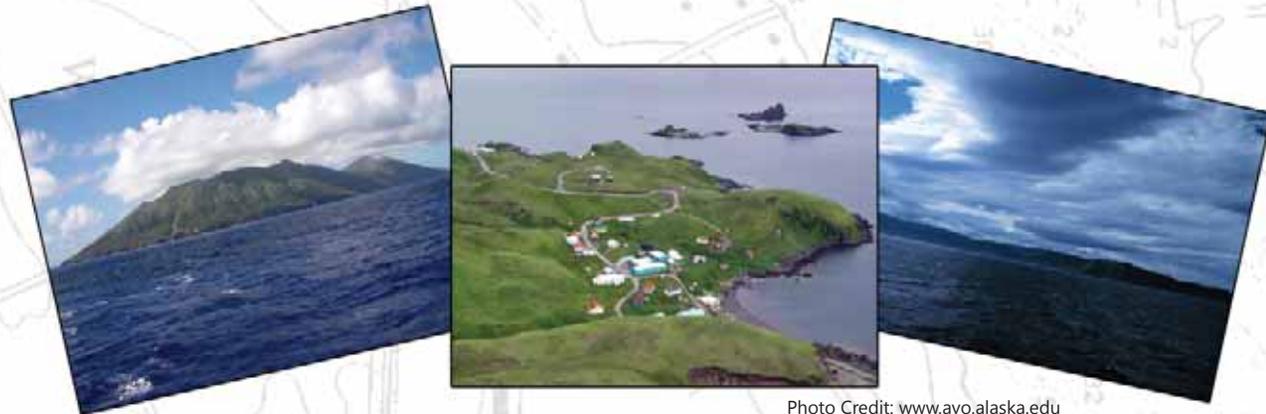
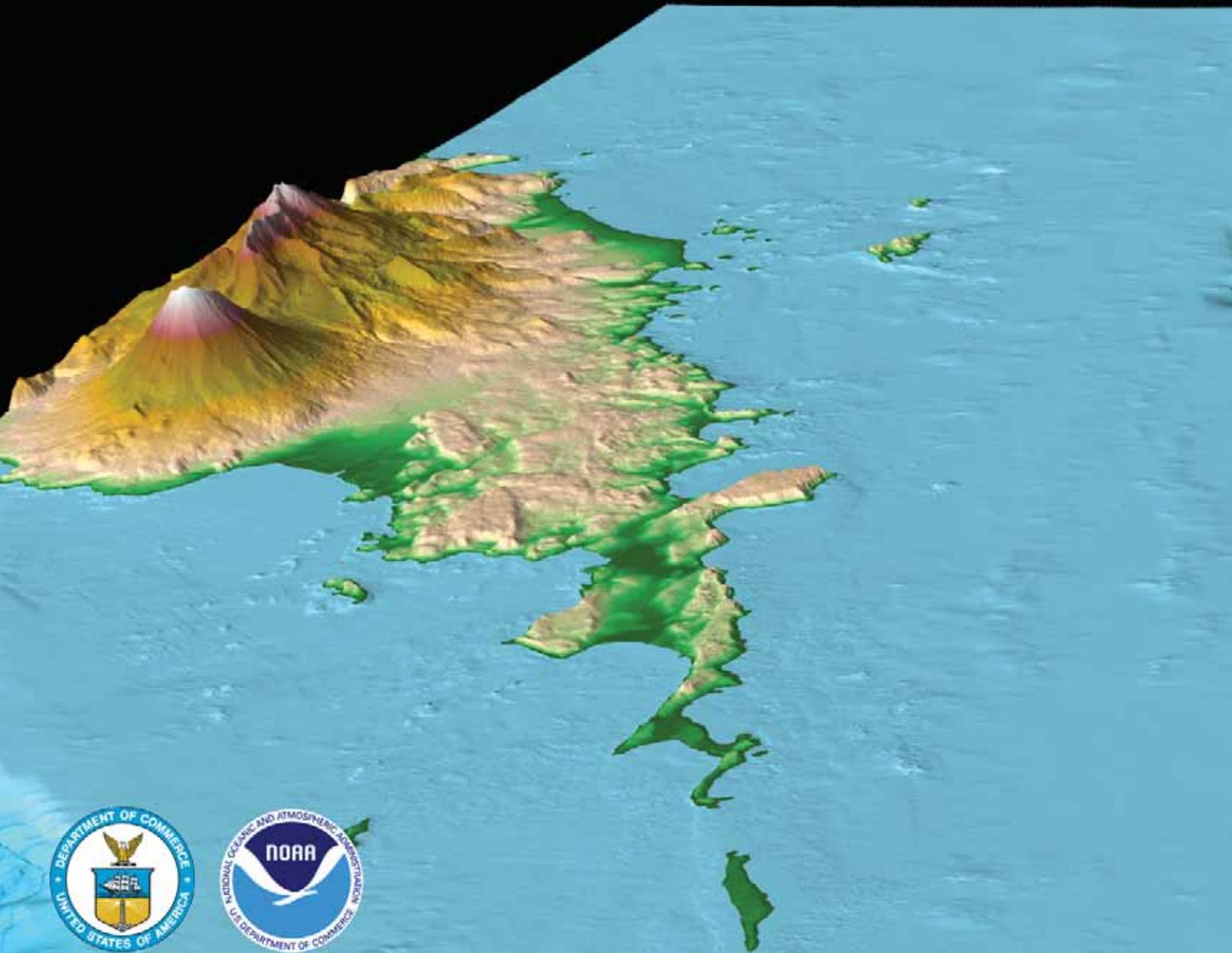


Photo Credit: www.avo.alaska.edu

DIGITAL ELEVATION MODEL Nikolski, Alaska





Why Model Nikolski, Alaska?

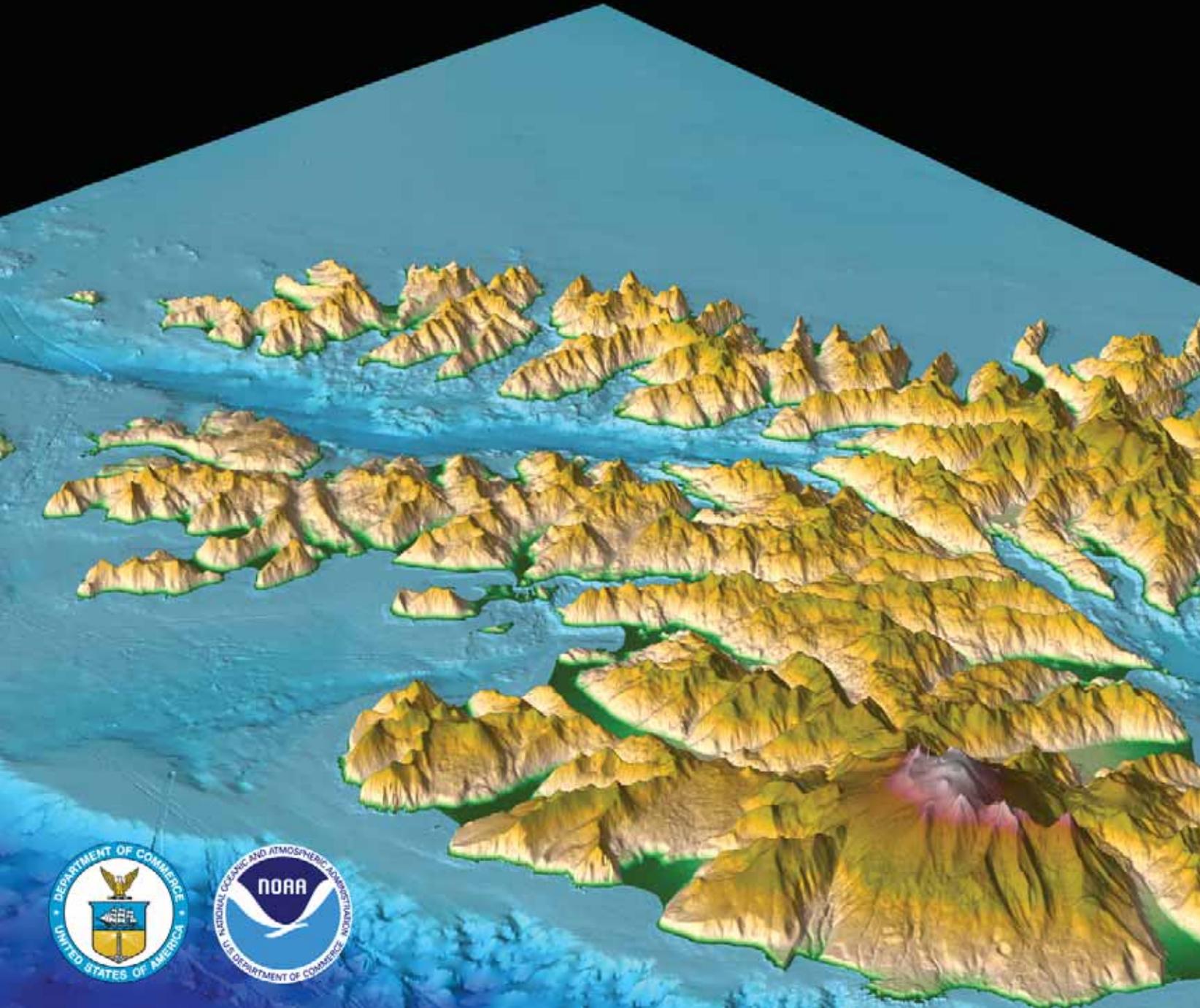
Nikolski is a remote town located on Umnak Island. The island is part of the Aleutian Island chain, and covers an area of 133 square miles. The town has a total population of only 39 people, but Nikolski is thought to be one of the oldest continuously occupied communities in the world, with archaeological evidence of human life dating back 8,500 years. Currently, fishing, along with sheep and cattle ranching, sustain the local community and economy. On a clear day, the horizon on the island is dominated by Mount Vsevidof, a stratovolcano and the highest point on Umnak Island. Mount Vsevidof is approximately 10 kilometers wide at its base and steepens from 15 degrees to 30 degrees near the peak. Its most recent eruption was caused by an earthquake on March 11, 1957. Umnak Island is both volcanically and seismically active, increasing the risk of local tsunamis. The island is also at risk from distant tsunamis, generated elsewhere in the Pacific basin. Integrated bathymetric and topographic DEMs help Alaskan communities minimize the impacts of coastal hazards.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- National Geophysical Data Center (NGDC)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Geological Survey (USGS)
- National Aeronautic Space Administration (NASA)



DIGITAL ELEVATION MODEL Dutch Harbor, Alaska





DUTCH HARBOR, ALASKA



Why Model Dutch Harbor, Alaska?

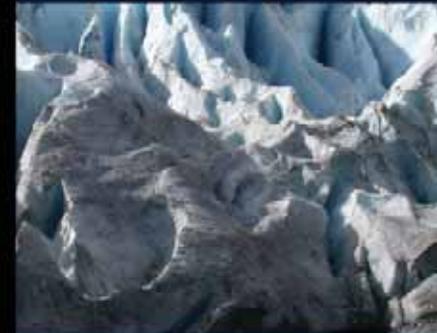
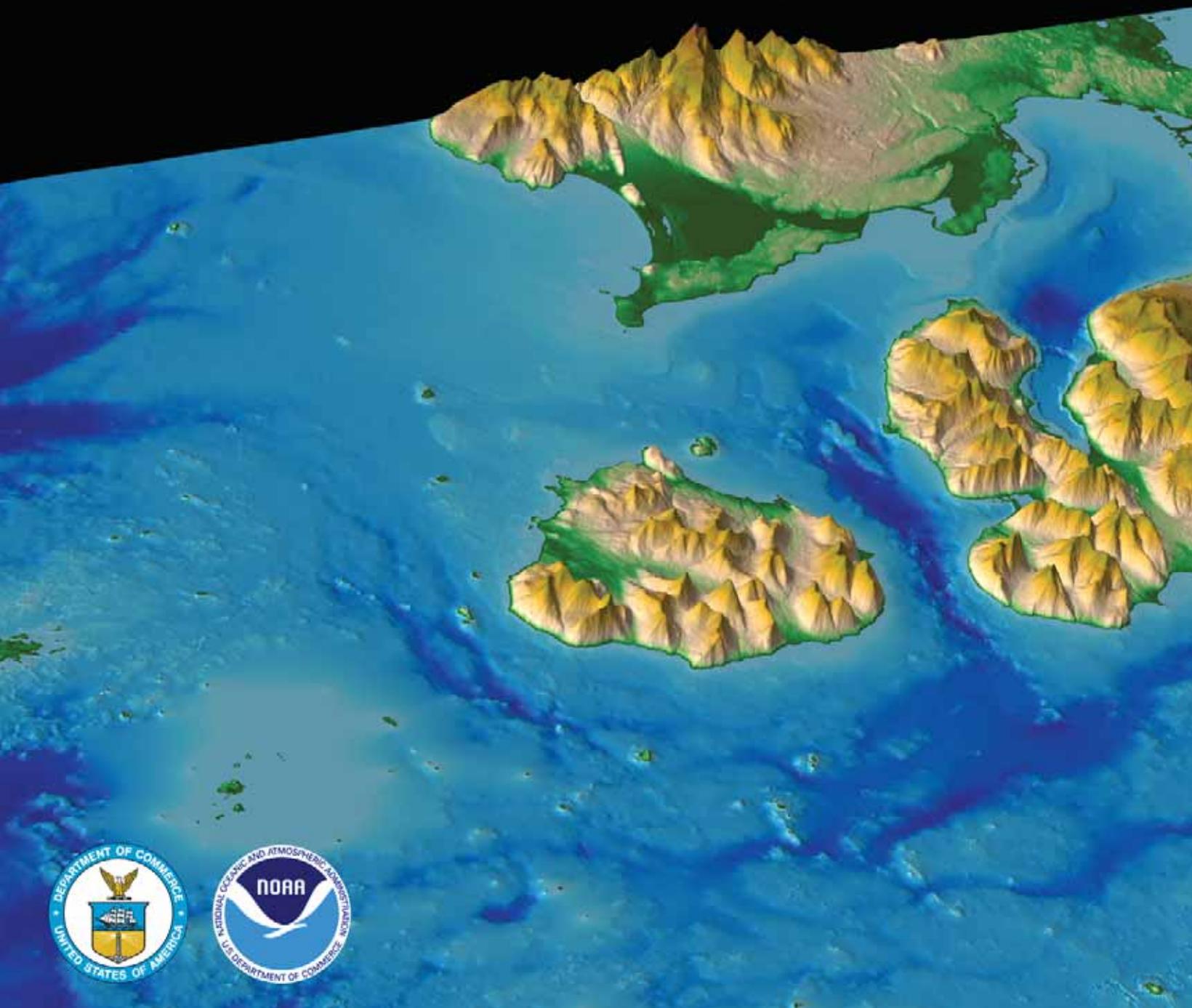
Dutch Harbor is the name of the port for the City of Unalaska, the 11th largest settlement in Alaska. The port, located on small Amaknak Island, is connected by a bridge to the rest of the city on Unalaska Island, which is one of the largest islands in the Aleutian chain. In the 2000 census, there was a population of 8,162 on the Aleutian Islands, of whom over half were living in the main settlement of Unalaska. The economy of Unalaska is based on shipping and transportation, and commercial fishing. In fact, Dutch Harbor has been the country's top fishing port for the total amount of fish landed for over 20 years. Though it caused only slight damage to Dutch Harbor, the large April 1st (April Fool's Day) 1946 earthquake just south of Unalaska Island generated a tsunami greater than 100 feet high that obliterated the Scotch Cap lighthouse on nearby Unimak Island. The several deaths there and the 159 in Hilo, Hawaii, provided the impetus to establish the tsunami warning network for the Pacific region.

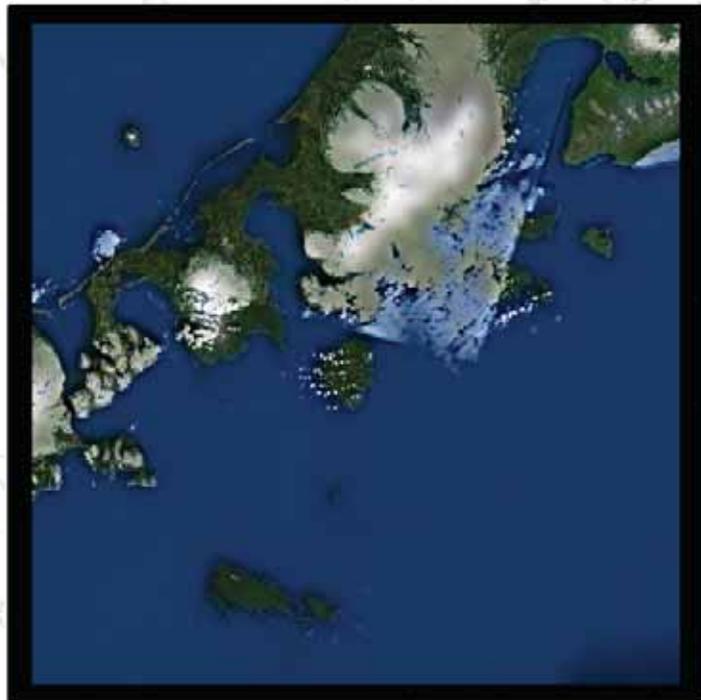
Who Provided the Data?

- NOAA Office of Coast Survey (OSC)
- NOAA's National Ocean Service (NOS)
- National Geophysical Data Center (NGDC)
- Alaska Department of Natural Resources
- U.S. Fish and Wildlife Service (USFWS)
- The U.S. Geological Survey (USGS)



DIGITAL ELEVATION MODEL King Cove, Alaska





Why Model King Cove, Alaska?

King Cove is located on the southern side of the Alaska Peninsula, near the start of the Aleutian Island chain on a sand spit fronting Deer Passage. In 1788 a large earthquake ruptured at least a segment of the plate boundary extending from Kodiak Island to Unga Island. The strong ground motion and resultant landslides generated multiple tsunamis with extensive damage and loss of life. King Cove was founded later in 1911. Today, the village has a total population of almost 800 people, most of whom are involved with the seafood and fishing industry. King Cove is home to the largest seafood processing facility in Alaska. The coastal community is located in one of the most seismically active regions of the world subject to earthquakes, landslides, and tsunamis such as the one in 1788. In addition to locally generated tsunami risks, King Cove and the Alaska Peninsula are at risk from tsunamis generated elsewhere in the Pacific, posing a hazard that communities and economies need to prepare for and mitigate against.

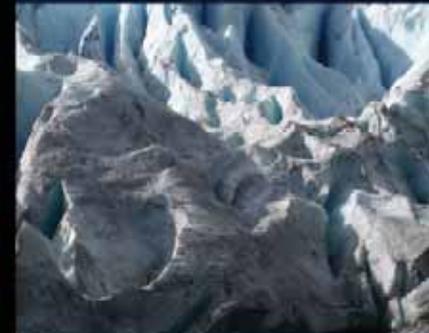
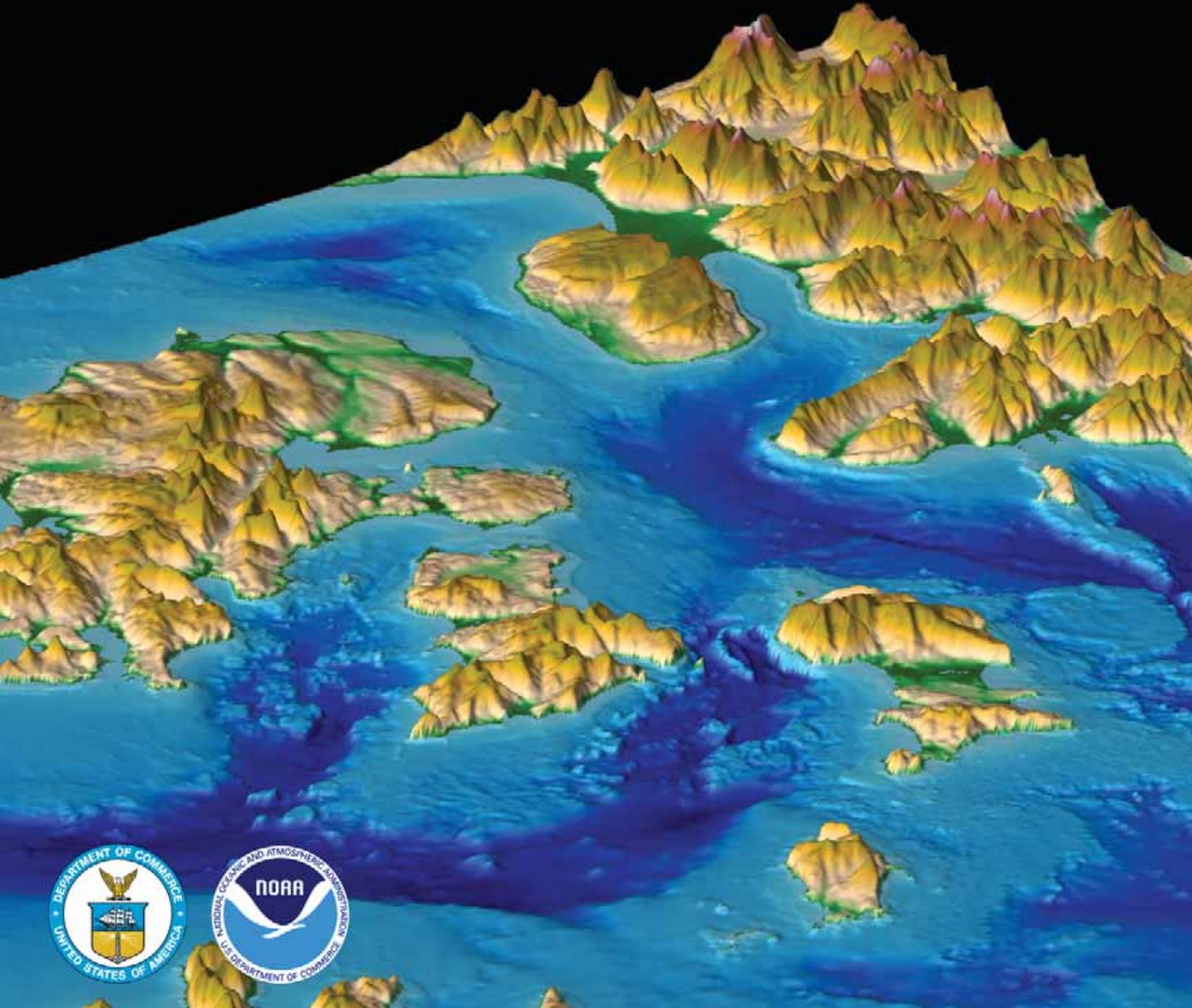
Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey(OCS)
- National Geophysical Data Center (NGDC)
- National Geospatial-Intelligence Agency (NGA)
- U.S. Fish and Wildlife Service (FWS)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- Scripps Institution of Oceanography (SIO)



Photo Credit: www.aleutianseast.org, www.statesymbolsusa.org, www.cityofkingcove.com

DIGITAL ELEVATION MODEL Sand Point, Alaska





SAND POINT, ALASKA



Why Model Sand Point, Alaska?

Sand Point is located along the eastern portion of the volcanic Aleutian Island chain, in Humboldt Harbor at the northwestern end of Popof Island. Popof and Unga, along with Nagai and other smaller islands, make up the Shumagin Islands, a chain of volcanic islands southeast of the Alaska Peninsula famous for their rugged landscape. The Shumagin Islands are sited on the continental shelf 350 km southwest of Kodiak Island and have suffered in the past from massive earthquake and landslide generated tsunamis. The islands are located in the "Shumagin Gap," an area between Unimak Island and the Shumagin Islands that seems to have not experienced a major rupture to release stress accumulated since around 1903. The city of Sand Point was founded in 1898 by a San Francisco fishing company as a trading post and cod fishing station. Today, it is home to the largest fishing fleet in the Aleutian Chain. In addition to supporting tsunami forecast and warning, integrated topography-bathymetry DEMs can help communities to prepare for other coastal inundation hazards.

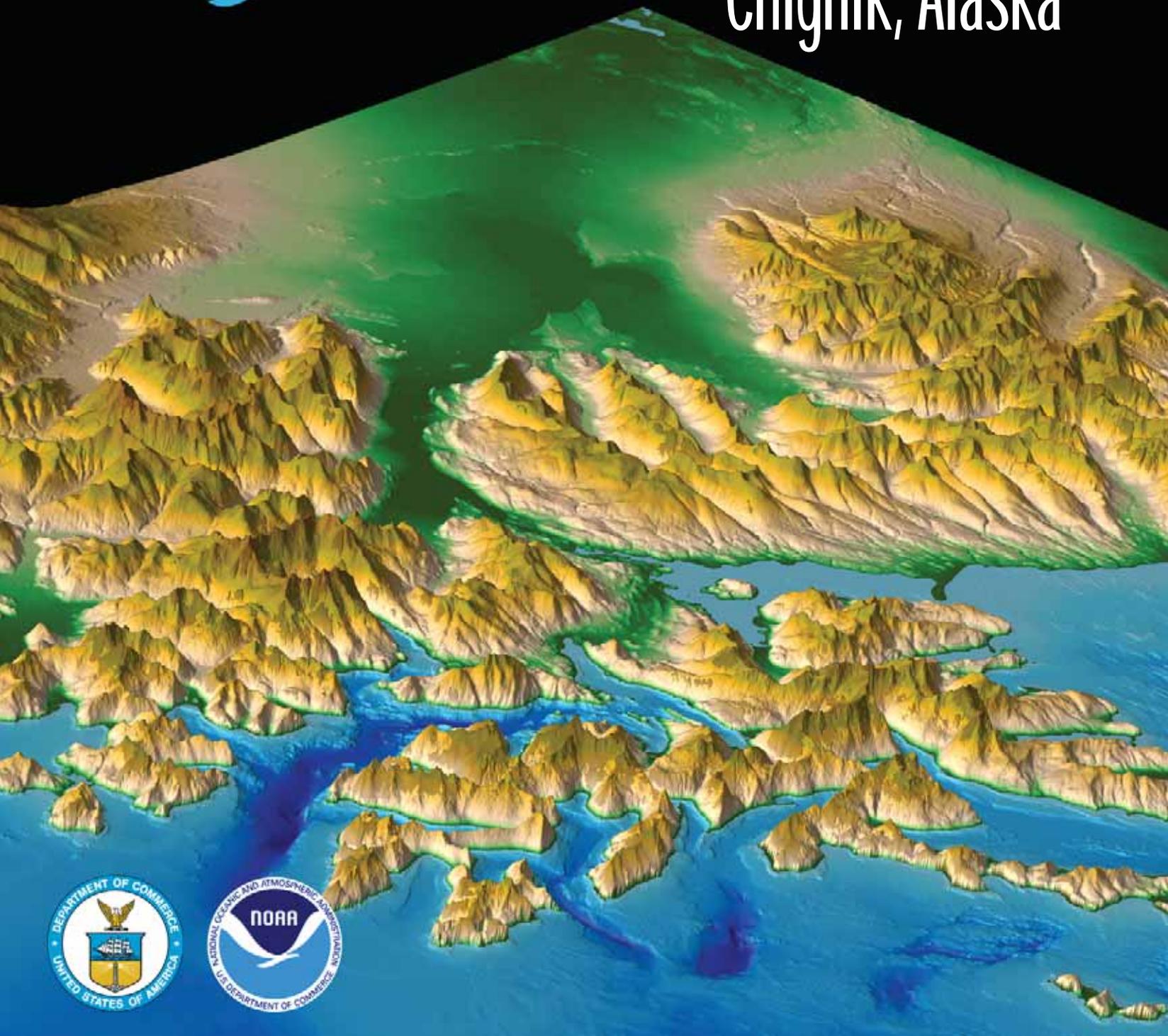
Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- National Geodetic Survey (NGS)
- U.S. Fish and Wildlife Service (USFWS)
- U.S. Geological Survey (USGS)
- National Geophysical Data Center (NGDC)



Photo Credit: <http://www.commerce.state.ak.us/dca/photos/>

DIGITAL ELEVATION MODEL
Chignik, Alaska





Why Model Chignik, Alaska?

Chignik is a small fishing village with a population of about 80 people. It is located at the base of the Aleutian Islands, approximately 450 miles southwest of Anchorage and 250 miles southwest of Kodiak Island. Chignik consists mostly of part-time summer residents who live the remainder of the year in either Kodiak or Anchorage. The town's part-time residents participate in the fishing industry, and reside in Chignik only for the salmon season. Chignik's proximity to the Aleutian subduction zone increases its risk of experiencing damaging local tsunamis, earthquakes, and landslides. Chignik is also at risk from "distant" tsunami events generated elsewhere in the Pacific, such as Chile and Japan in what is sometimes called the "Pacific Ring of Fire." DEMs, used when modeling coastal hazards, can help lessen the risks and damages associated with possible future storms or tsunami events in the Chignik area.

Who Provided the Data?

- NOAA Office of Coast Survey (OSC)
- National Geophysical Data Center (NGDC)
- National Geospatial-Intelligence Agency (NGA)
- U.S. Fish and Wildlife Service (USFWS)
- The U.S. Geological Survey (USGS)

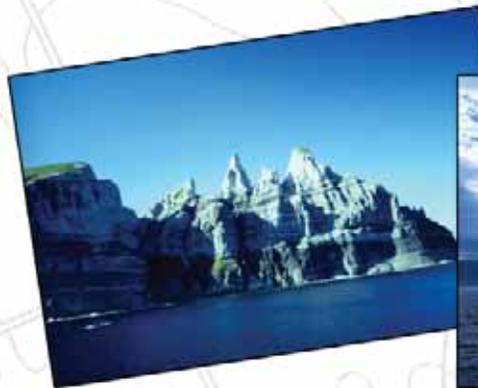


Photo Credit: <http://www.commerce.state.ak.us/dca/photos/>

DIGITAL ELEVATION MODEL Kachemak Bay, Alaska





KACHEMAK BAY, ALASKA



Why Model Kachemak Bay, Alaska?

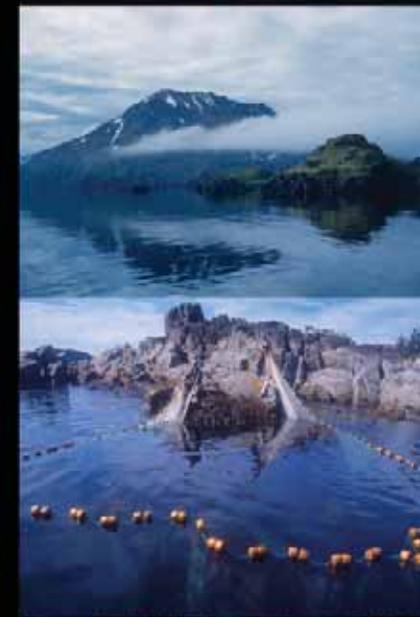
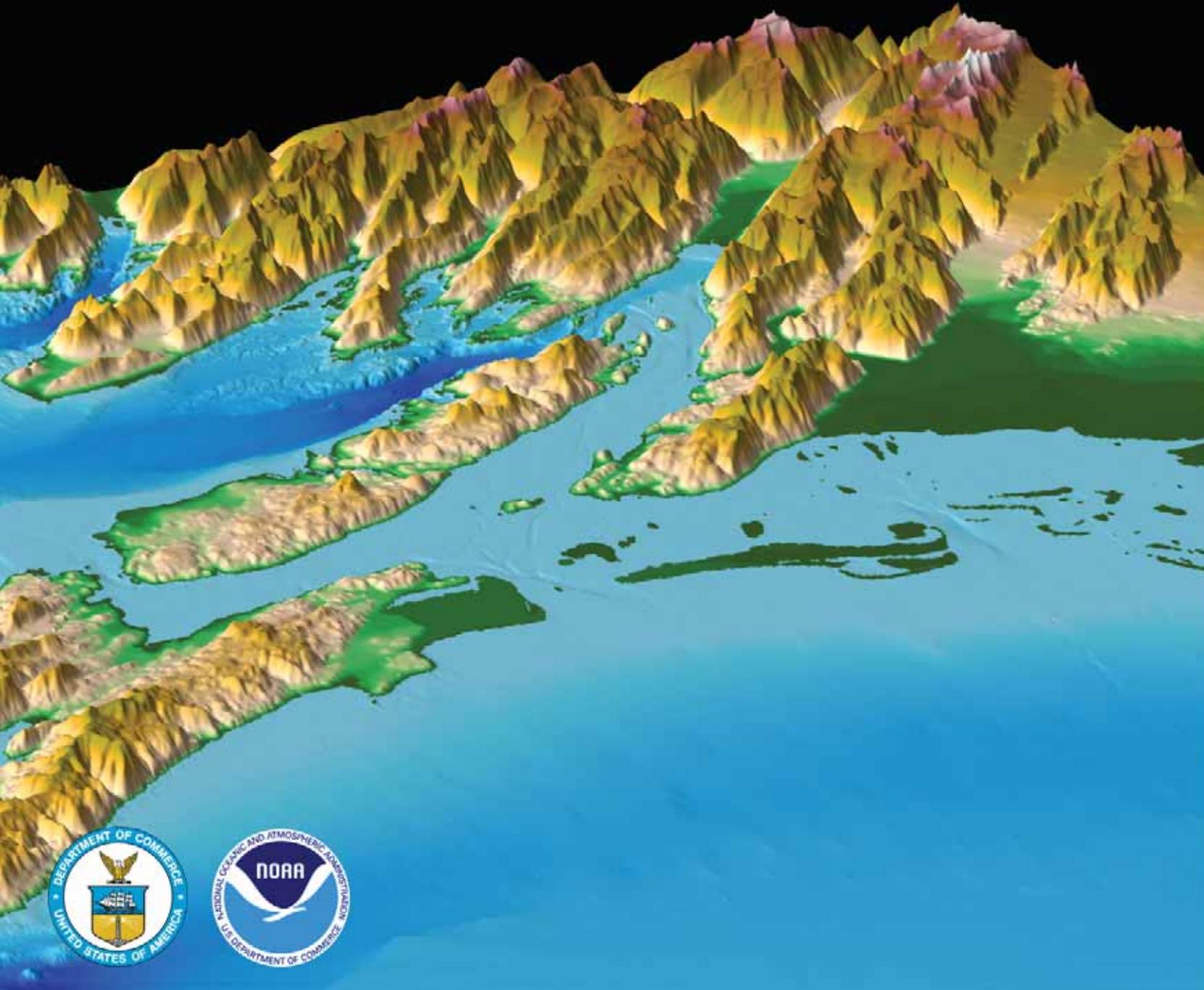
Kachemak Bay is one of the largest and most unique estuary environments in the country. By road, the bay lies 225 miles south of Anchorage. This critical habitat area is home to the coastal communities of Homer, Seldovia, Port Graham and Nanwalek. The communities consist of hundreds of year-round residents, most of whom are employed through the commercial fishing, shipping, or transportation industries. Kachemak bay is prone to severe and unpredictable weather. It also experiences some of the largest tides in the world—up to nine meters. In 1964, the magnitude 9.2 “Good Friday” Alaskan earthquake caused the Homer Spit to subside by at least 5 feet and generated small waves in the area. Tectonic subsidence in regional towns caused major structural damages to local buildings. Destroyed dock-side canneries and businesses in Seldovia were relocated to Homer, making it the new economic center of the southern Kenai peninsula. NOAA’s tsunami modeling and DEM mapping efforts include a large amount of high resolution data that was acquired in 2008 as part of collaborative “Hydro-palooza” coastal mapping project in Kachemak Bay.

Who Provided the Data?

- Kachemak Bay National Estuarine Research Reserve (KBRR)
- The Kenai Peninsula Borough
- National Geophysical Data Center (NGDC)
- NOAA’s National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- Coastal Services Center (CSC)
- Alaska Department of Fish and Game (ADFG)
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service (USFWS)
- National Geospatial Intelligence Agency (NGA)
- National Aeronautics and Space Administration (NASA)



DIGITAL ELEVATION MODEL Cordova, Alaska





Why Model Cordova, Alaska?

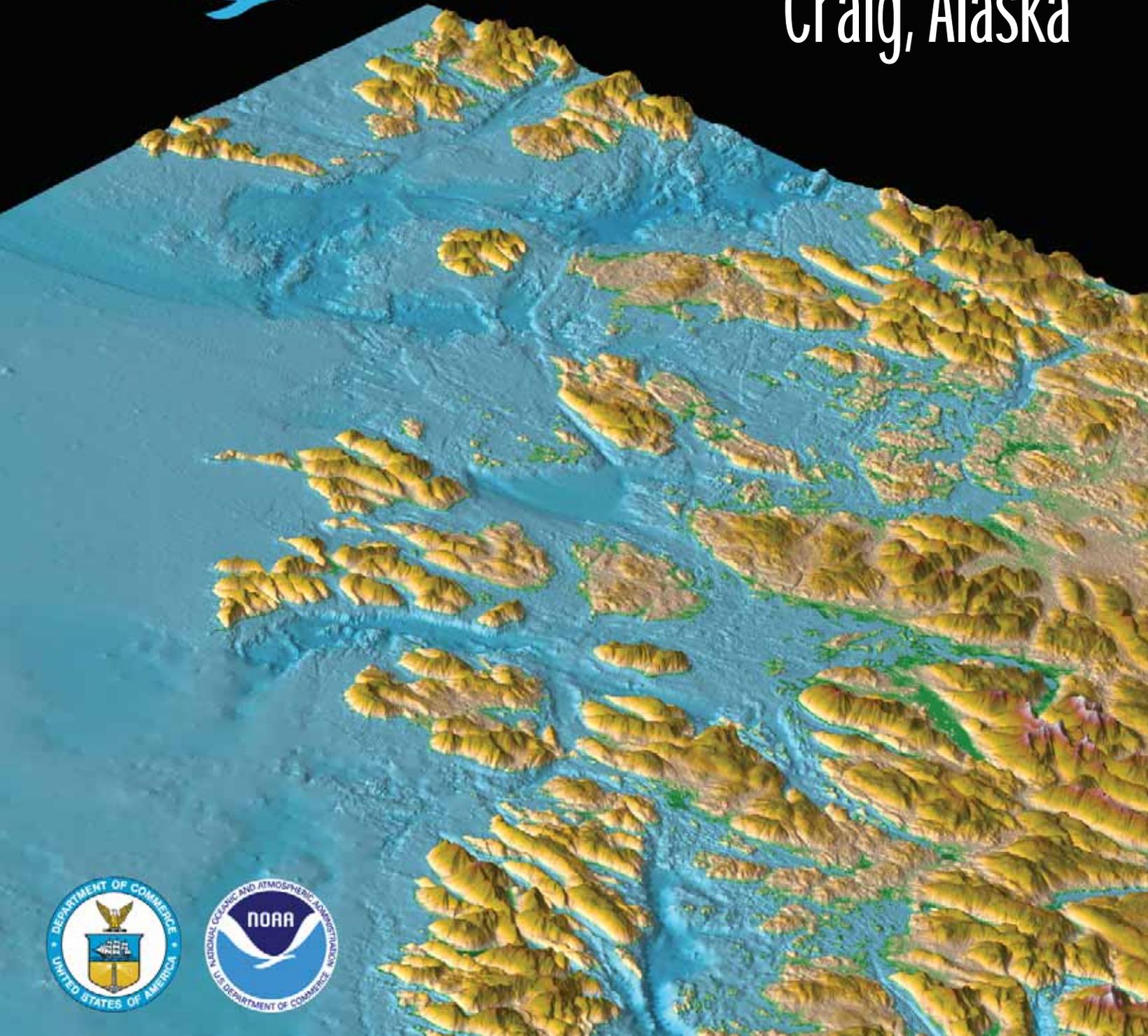
Cordova is a small town on the eastern side of the Prince William Sound. The coastal community has a population of roughly 2,500 people, most of whom are employed by the commercial fishing industry. Cordova came into the public eye after the Exxon Valdez oil tanker ran aground on the Blich Reef, to the northwest of the town. The disaster severely impacted the local ecology for years afterwards. The area has been carved by glaciations, creating many fjords and passageways, islands, and rocky shores. The Prince William Sound region has frequent earthquakes, putting the residents of Cordova at risk for tsunamis. On March 27th, 1964, the Good Friday Alaskan Earthquake registered 9.2 on the Richter scale, and generated large tsunamis in the area from tectonic uplift and local underwater landslides. The earthquake caused major vertical displacements around Prince William Sound, with up to 15 meters of uplift reported, and tsunami wave heights up to six meters. Over 100 Alaska residents died from the event and it resulted in millions of dollars in damages. DEMs and current modeling efforts can lessen the risks associated with coastal hazards, including tsunamis, storms, and hazardous spills.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- The Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service
- Alaska Department of Natural Resources
- National Geophysical Data Center (NGDC)



DIGITAL ELEVATION MODEL
Craig, Alaska





CRAIG, ALASKA



Why Model Craig, Alaska?

Craig is a town located on the western coast of Prince of Wales Island and supports a population of about 2,000 people. Geographically, Prince of Wales Island is located in the southernmost region of Alaska (southeast Alaska), near British Columbia. The Island is the fourth largest island in the United States, spanning an area of more than 2,600 square miles and including roughly 990 miles of coastline. The island exhibits intense natural beauty and the morphology in the area is characterized by mountainous terrain, deep fjord-like channels, U-shaped valleys, streams, lakes, and bays. The local economy and citizens rely on commercial fishing, fish processing, and the timber industry. Craig is located in a seismically active area, and the 1964 Alaskan Earthquake was reported to have caused 14 foot tsunami waves in the region. Integrated coastal relief DEMs can help communities plan for and mitigate the impacts of coastal inundation events, including tsunami and storm surge events.

Who Provided the Data?

- NOAA's National Ocean Service (NOS)
- Office of Coast Survey (OCS)
- The Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service (USFWS)
- Alaska Department of Natural Resources (DNR)

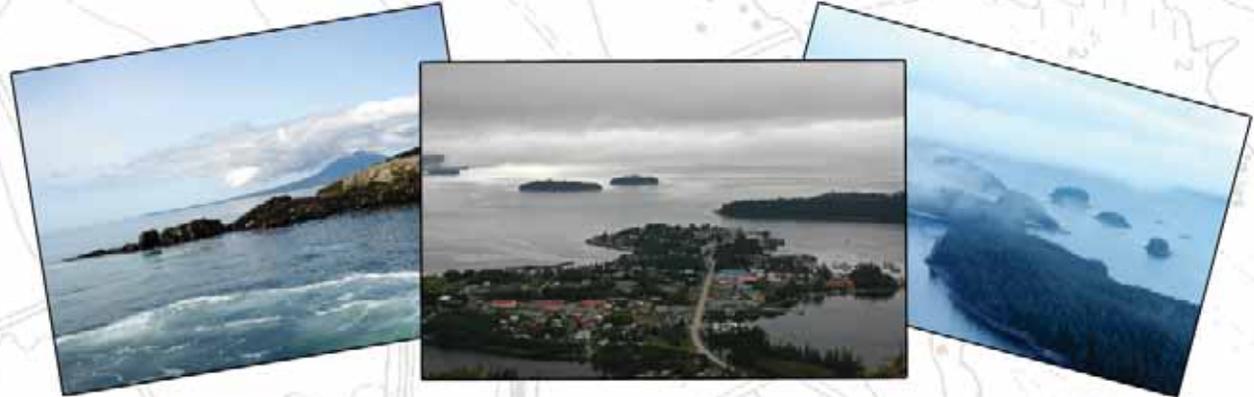
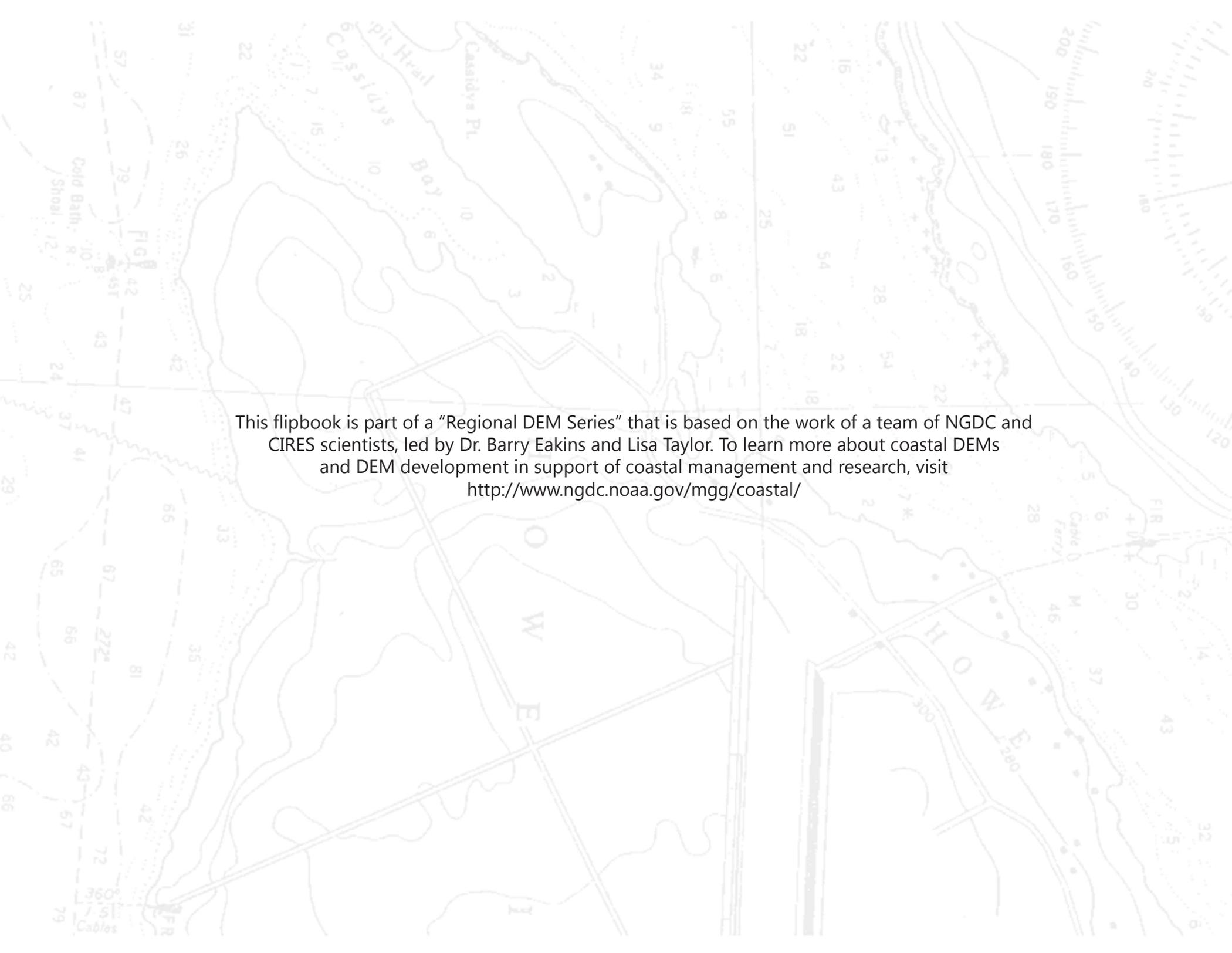
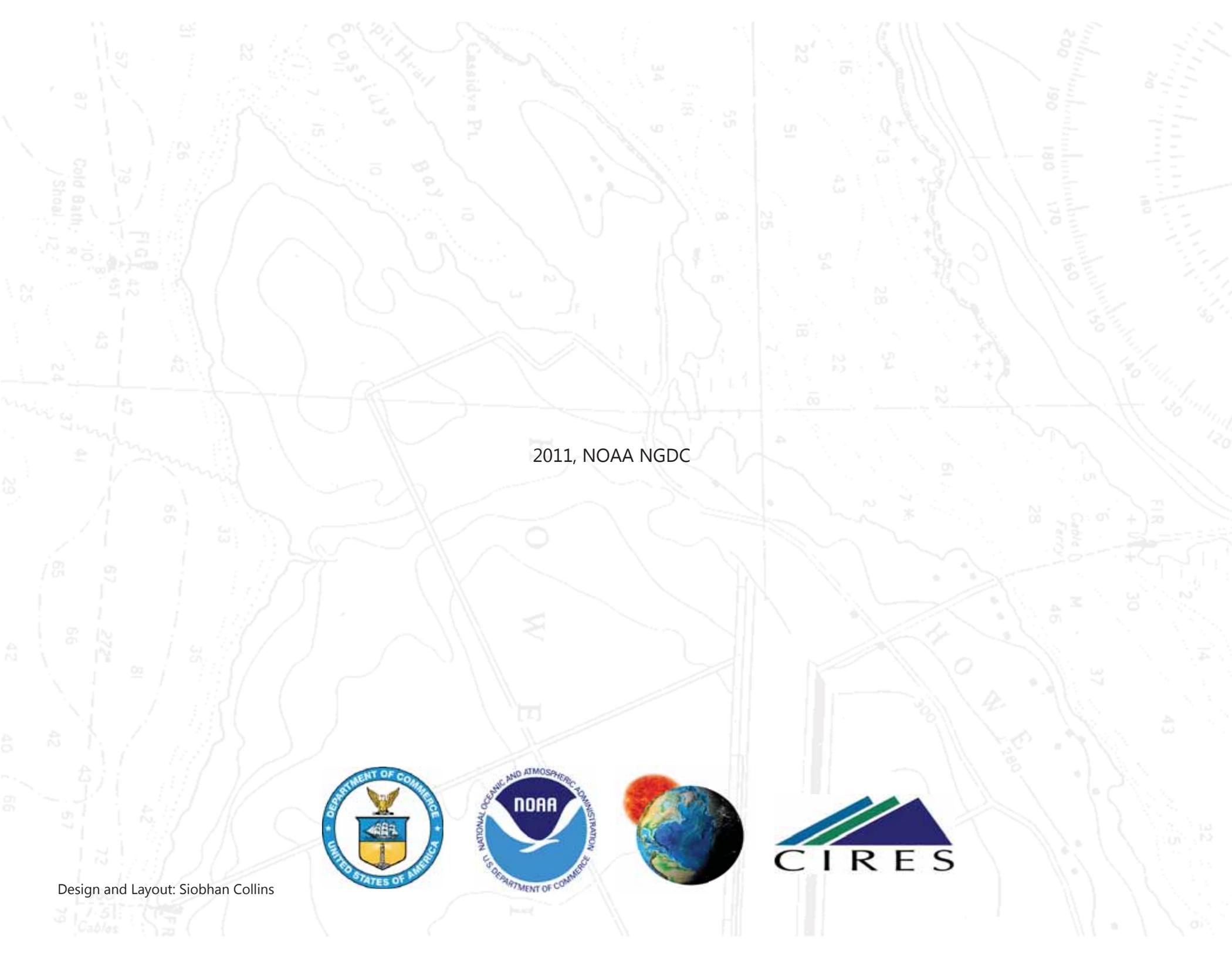


Photo Credit: <http://www.commerce.state.ak.us/dca/photos/>

A topographic map of a coastal area, likely Casidy's Pt. and Cossidys Bay. The map features contour lines, a road network, and various geographical features. A text overlay is centered on the map. The text reads: "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/>".

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/>



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