ALASKAN DIGITAL ELEVATION MODELS

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

Cassidys Pt.
Cassidys Head
Bay
Cold Bath Shoal
FIG
HOWE
HOWE
Cable Ferry
FIR
Cables

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. The elevation modeling work, done in collaboration with the National Tsunami Hazard Mitigation Program (NTHMP), is providing near-continous coverage of U.S. coasts in support of NOAA's role in protecting life and property and conserving and protecting natural resources.

Data identified as coming from the NOAA National Geophysical Data Center are provided for public use from many academic, federal, state and other sources. For a complete list of sources see the Technical Reports developed for each DEM, available online.

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. coastline 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 United States except for Hawaii. The U.S. Tsunami Warning Centers were established in the mid-twentieth Century largely due to the devastating impact that Alaska's earthquakes and tsunamis wrought on U.S. coasts.

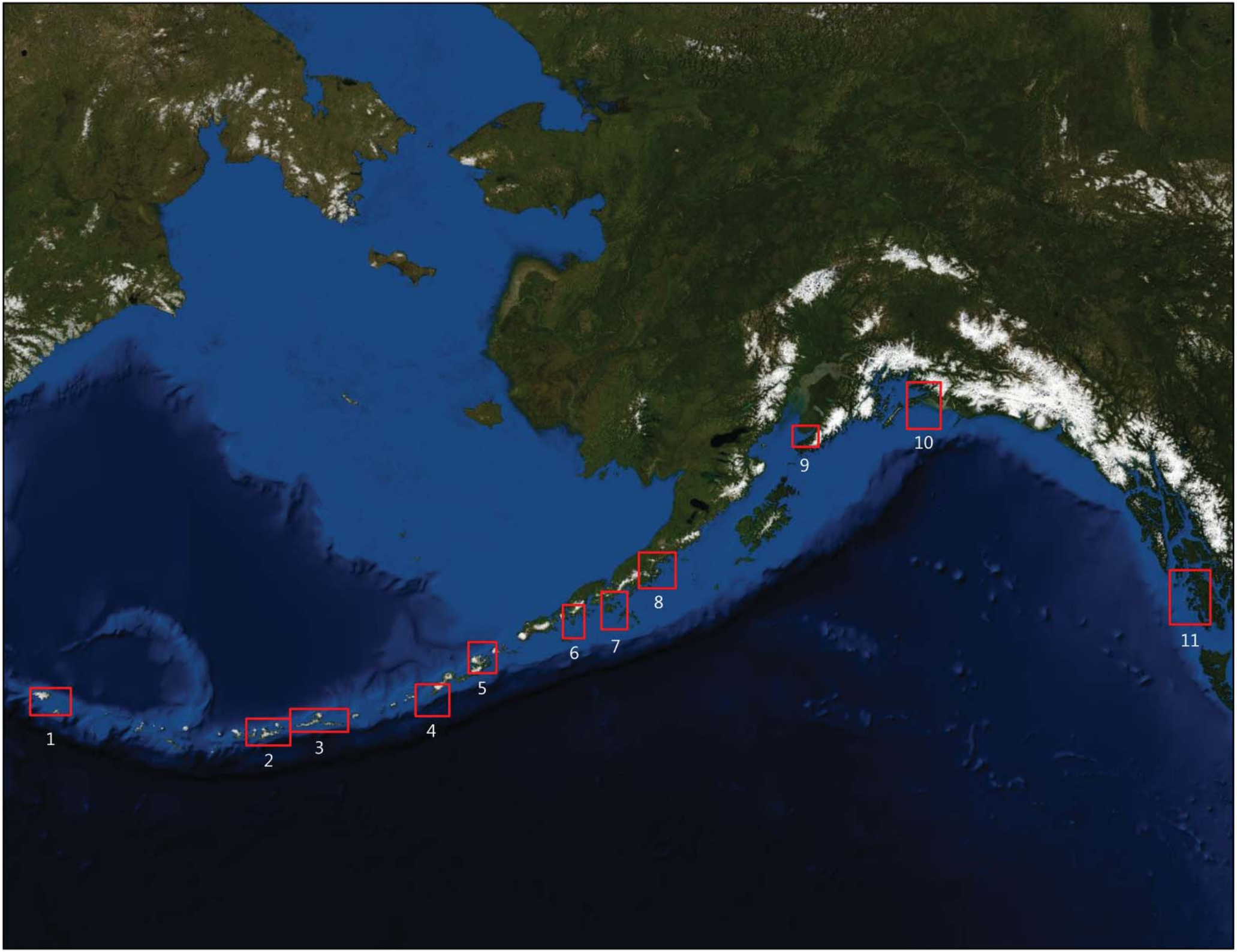
An active tectonic plate boundary stretches along the Alaskan Aleutian Islands, producing powerful earthquakes and containing active volcanoes. Additionally, Alaska is at risk from tectonic activity anywhere along the Pacific Ocean "Ring of Fire." The highest tsunami run-up ever recorded was in Lituya Bay, Alaska on July 10th, 1958. The tsunami resulted from a nearby magnitude 8.3 earthquake, which caused a landslide that generated a wave 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, which caused landslides and tsunamis, devastated many 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 presented here provide a glimpse of 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



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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 high relief and mountainous terrain 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?

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

DIGITAL ELEVATION MODEL

Adak, Alaska

NOAA Knows...

ADAK, ALASKA

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

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.

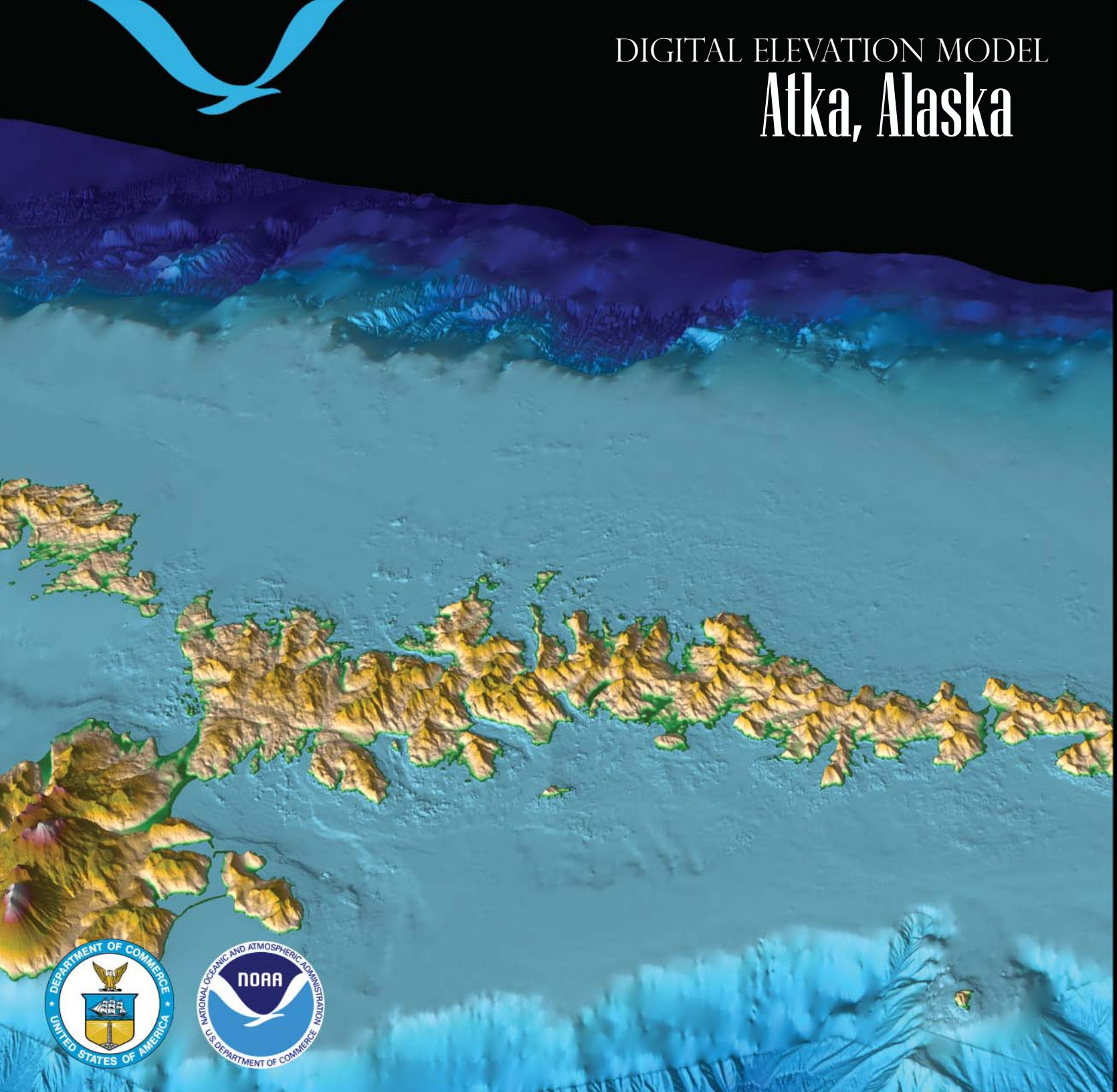
Who Provided the Data?

- NOAA Office of Coast Survey (OCS)
- 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



NOAA Knows...

ATKA, ALASKA

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

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. Integrated coastal DEMs, combined with modeling and planning, can help communities become more resilient to coastal hazards.

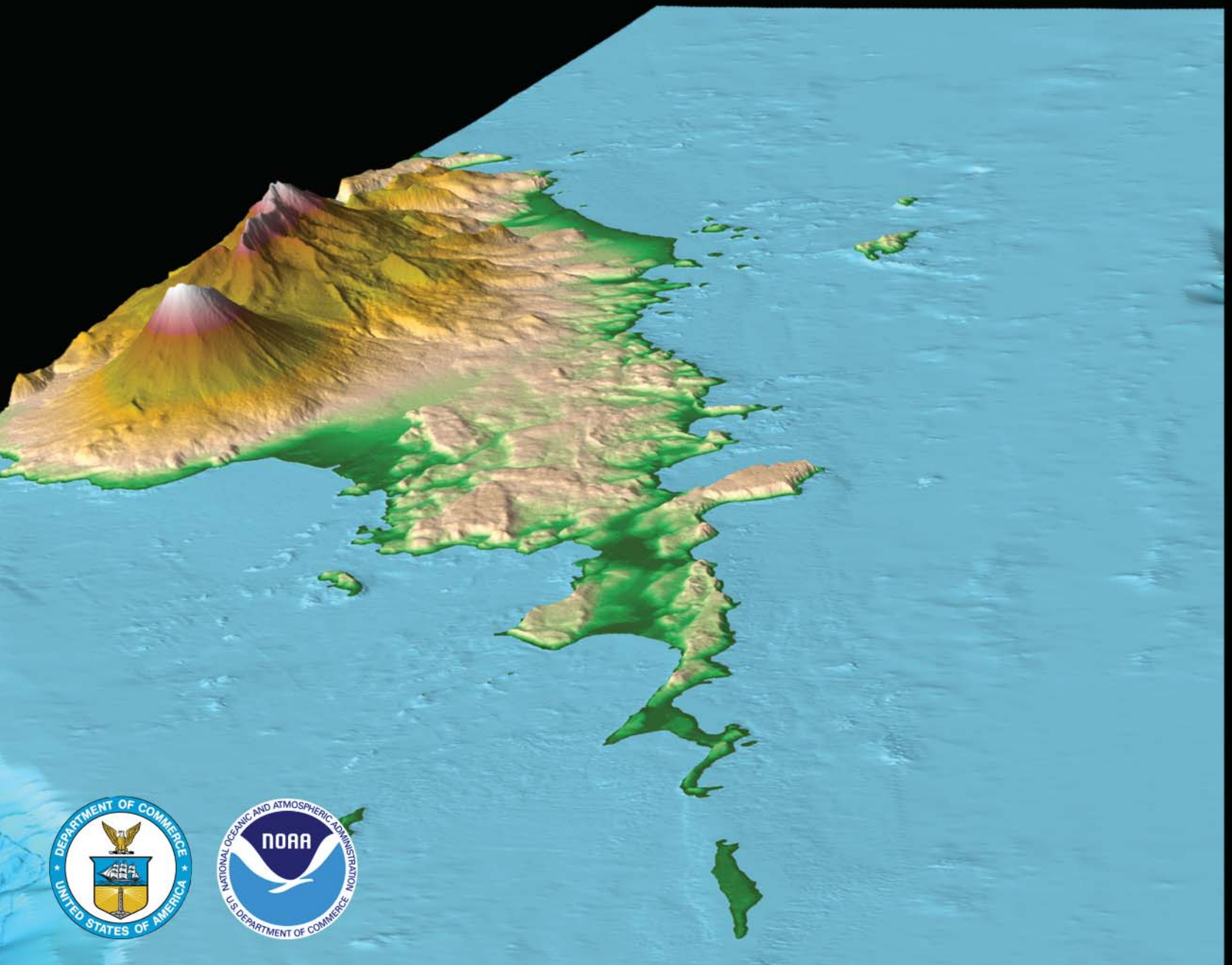
Who Provided the Data?

- NOAA Office of Coast Survey (OSC)
- NOAA 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



NOAA Knows...

NIKOLSKI, ALASKA

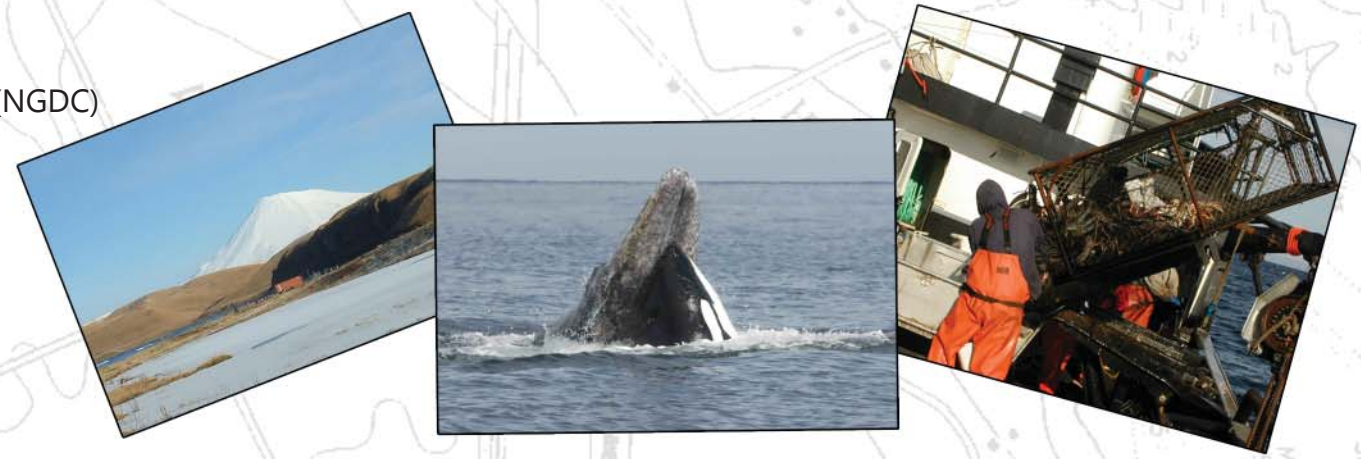
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

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 about 40 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. Its most recent eruption followed an earthquake on March 11, 1957 that generated a tsunami. Thanks to the Warning System, the tsunami generated high waves but caused no deaths in Hawaii. Umnak 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.

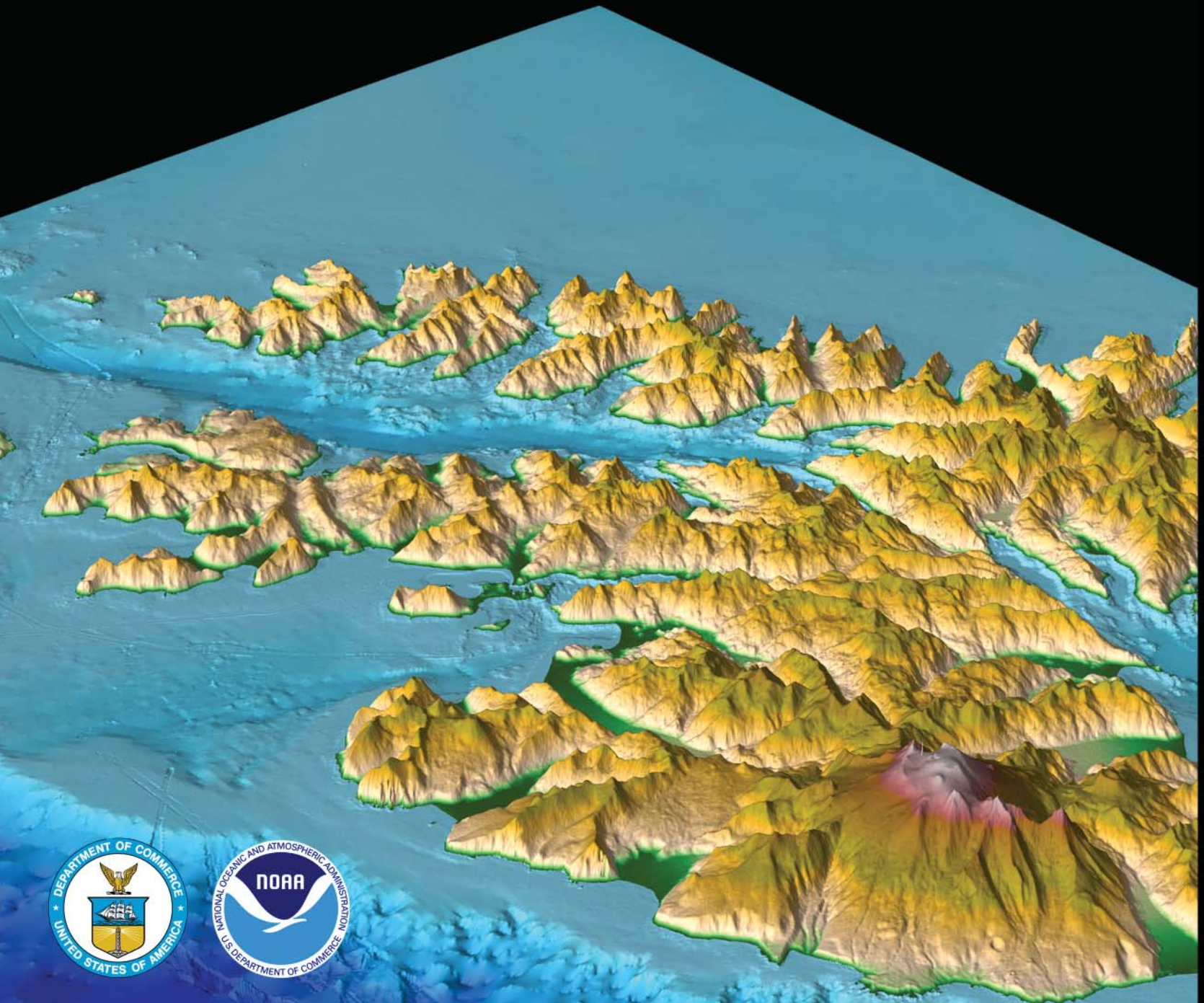
Who Provided the Data?

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



DIGITAL ELEVATION MODEL

Dutch Harbor, Alaska



NOAA Knows...

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

DUTCH HARBOR, ALASKA

Why Model Dutch Harbor, Alaska?

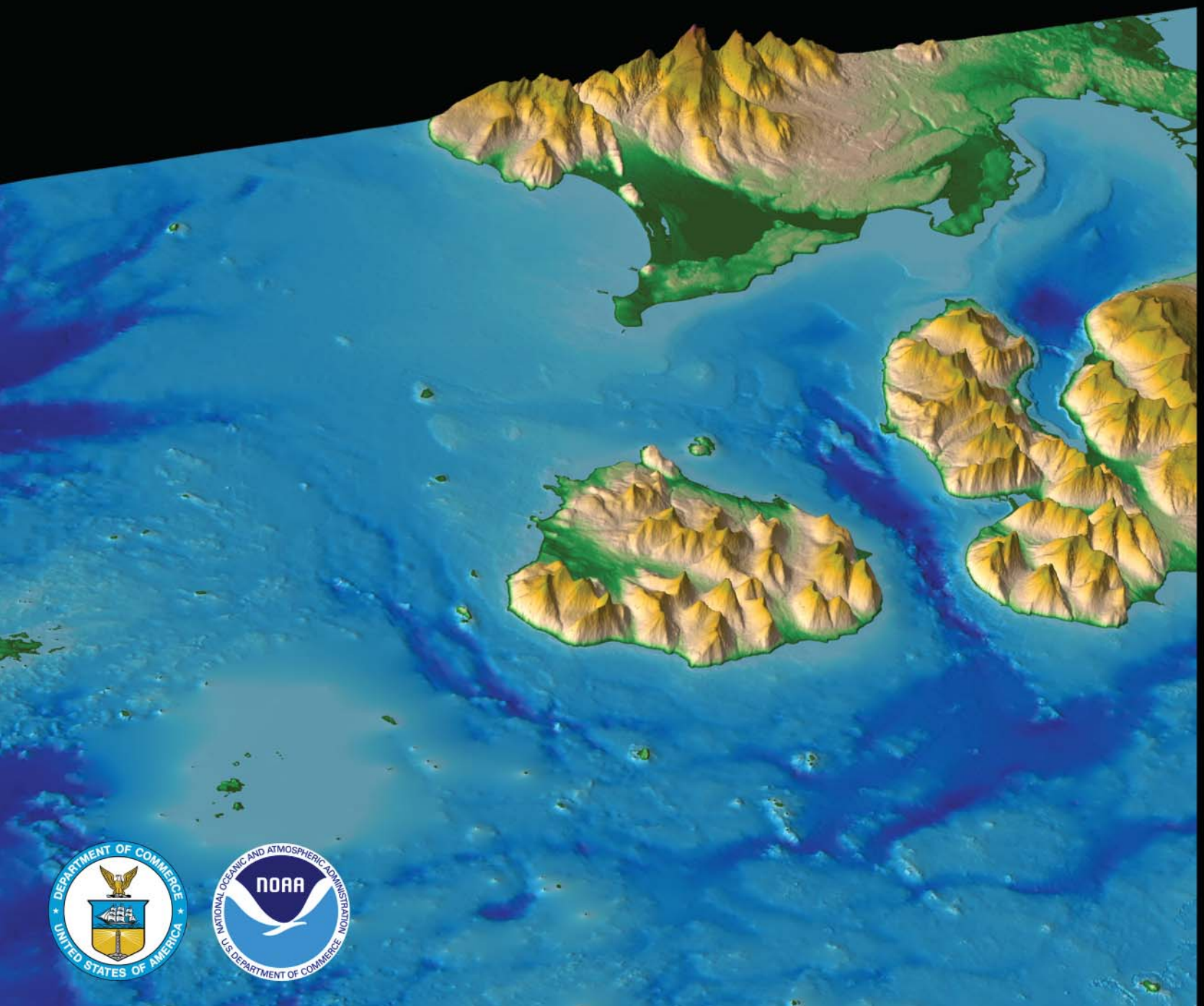
Dutch Harbor is the name of the port for the City of Unalaska, the 11th largest settlement in Alaska. The port, located on small Amaknak Island, is connected by a bridge to the rest of the city on Unalaska Island, which is one of the largest islands in the Aleutian chain. In the 2000 census, there was a population of around 8,000 people on all of 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 30 meters high that obliterated the Scotch Cap lighthouse on nearby Unimak Island. The several deaths there and the 159 deaths in Hilo, Hawaii, provided the impetus to establish the U.S. tsunami warning system.

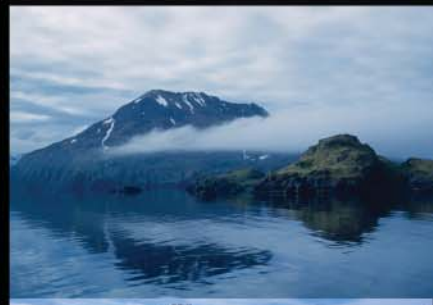
Who Provided the Data?

- 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

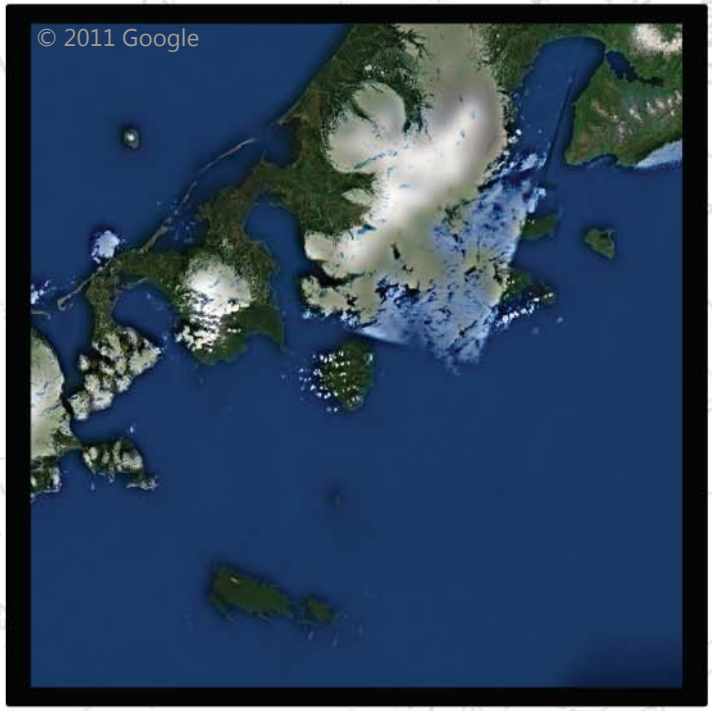




NOAA Knows...

KING COVE, ALASKA

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



Why Model King Cove, Alaska?

King Cove, founded in 1911, 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 waves over 30 meters— resulting in extensive damages and loss of life. Today, King Cove has a total population of almost 800 people, most of whom are involved with the seafood and fishing industry. It 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 devastating tsunamis. 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.

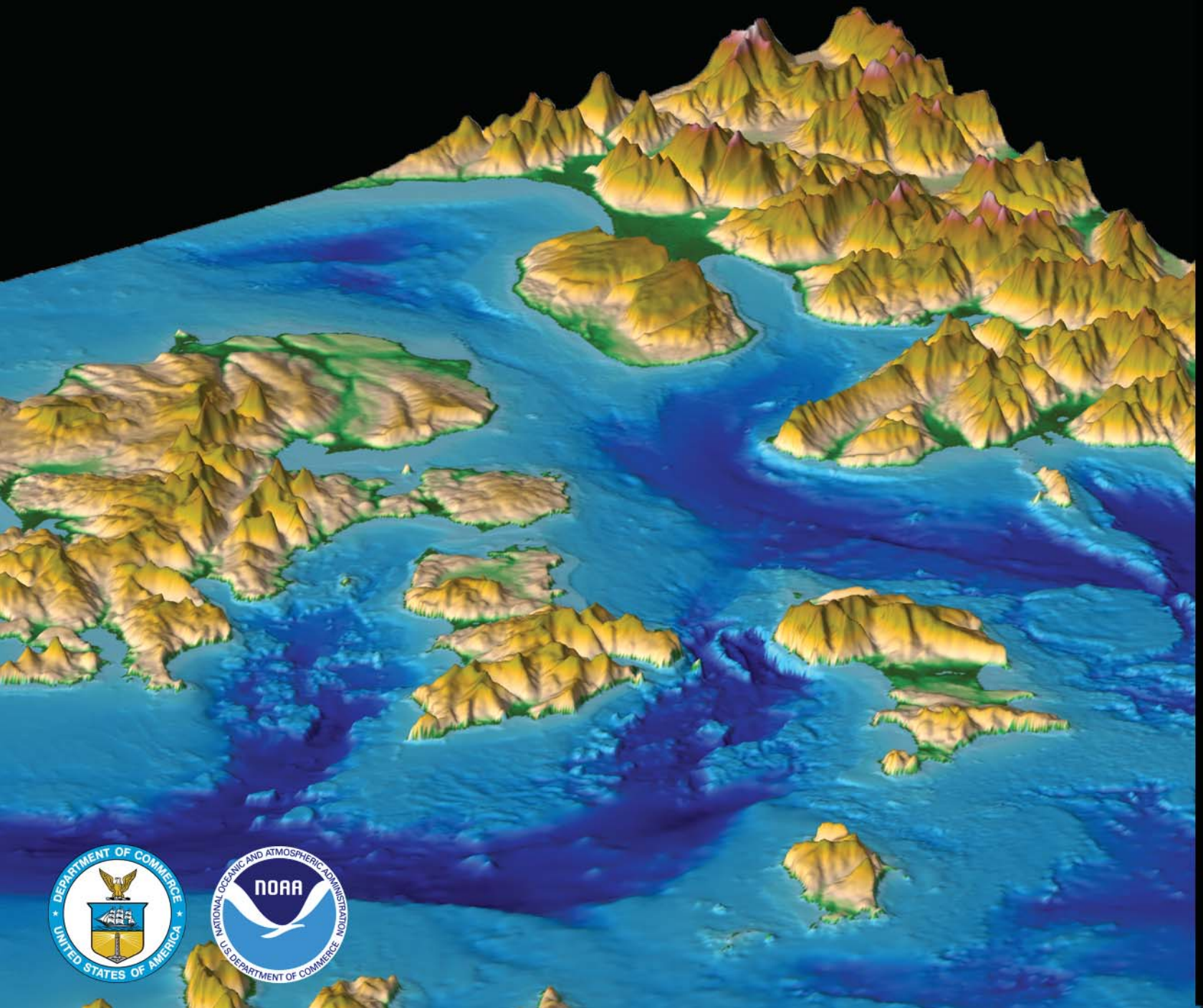
Who Provided the Data?

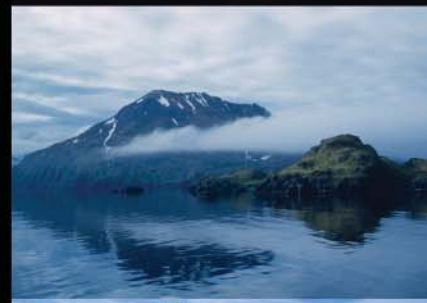
- NOAA National Ocean Service (NOS)
- NOAA Office of Coast Survey(OCS)
- NOAA National Geophysical Data Center (NGDC)
- National Geospatial-Intelligence Agency (NGA)
- U.S. Fish and Wildlife Service (FWS)
- U.S. Geological Survey (USGS)
- U.S. Army Corps of Engineers (USACE)
- Scripps Institution of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

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

DIGITAL ELEVATION MODEL

Sand Point, Alaska

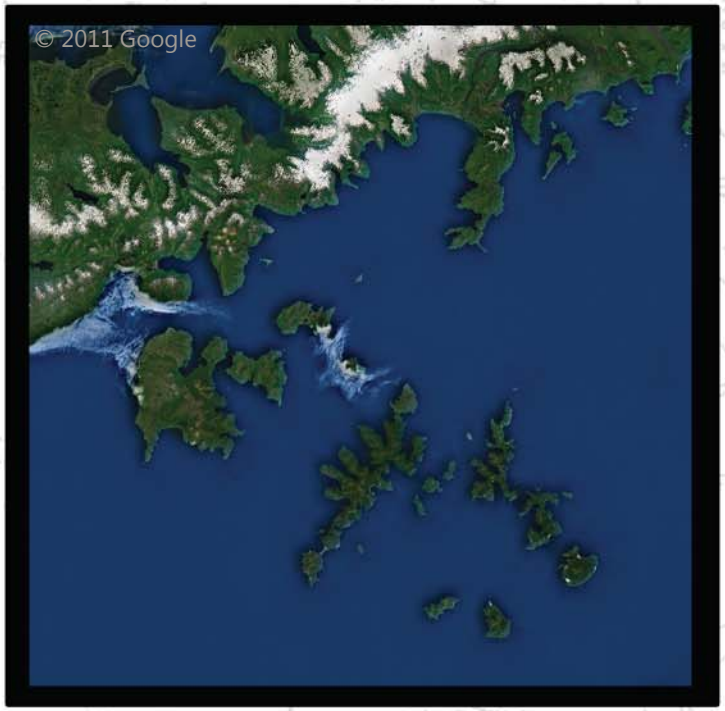




NOAA Knows...

SAND POINT, ALASKA

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



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.

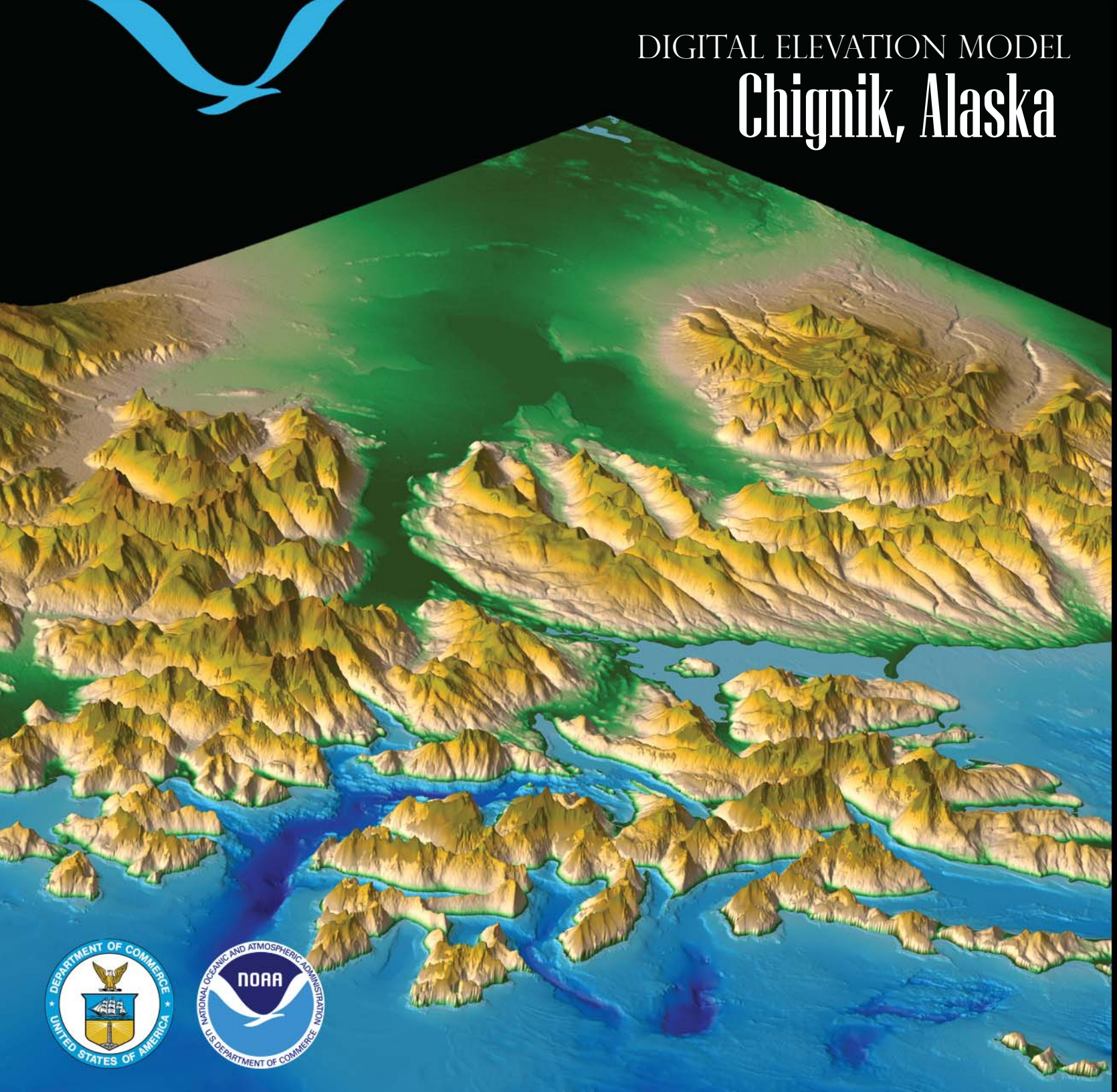
Who Provided the Data?

- 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

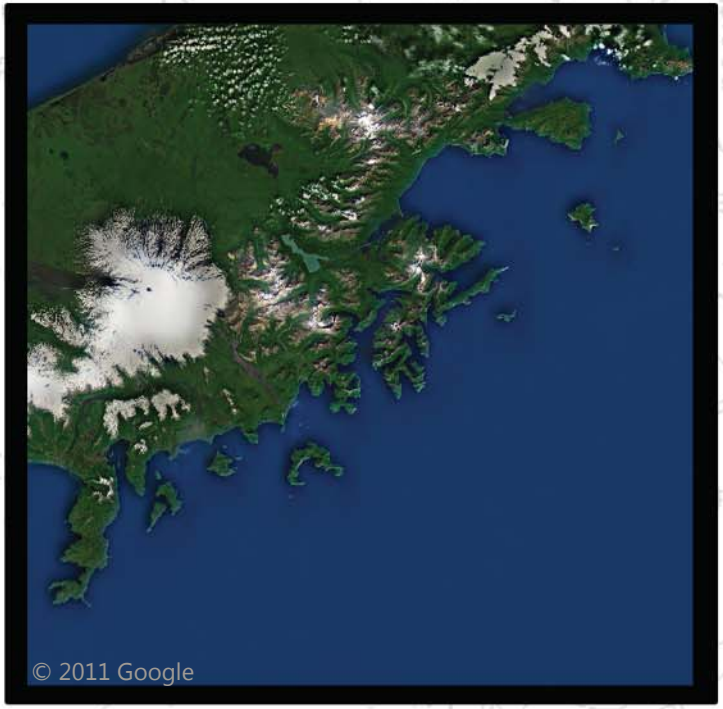
Chignik, Alaska



NOAA Knows...

CHIGNIK, ALASKA

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



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 in tectonically active regions of the Pacific Ocean, such as offshore of Japan and Chile. DEMs, when used for 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

NOAA Knows...

KACHEMAK BAY, ALASKA

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

Why Model Kachemak Bay, Alaska?

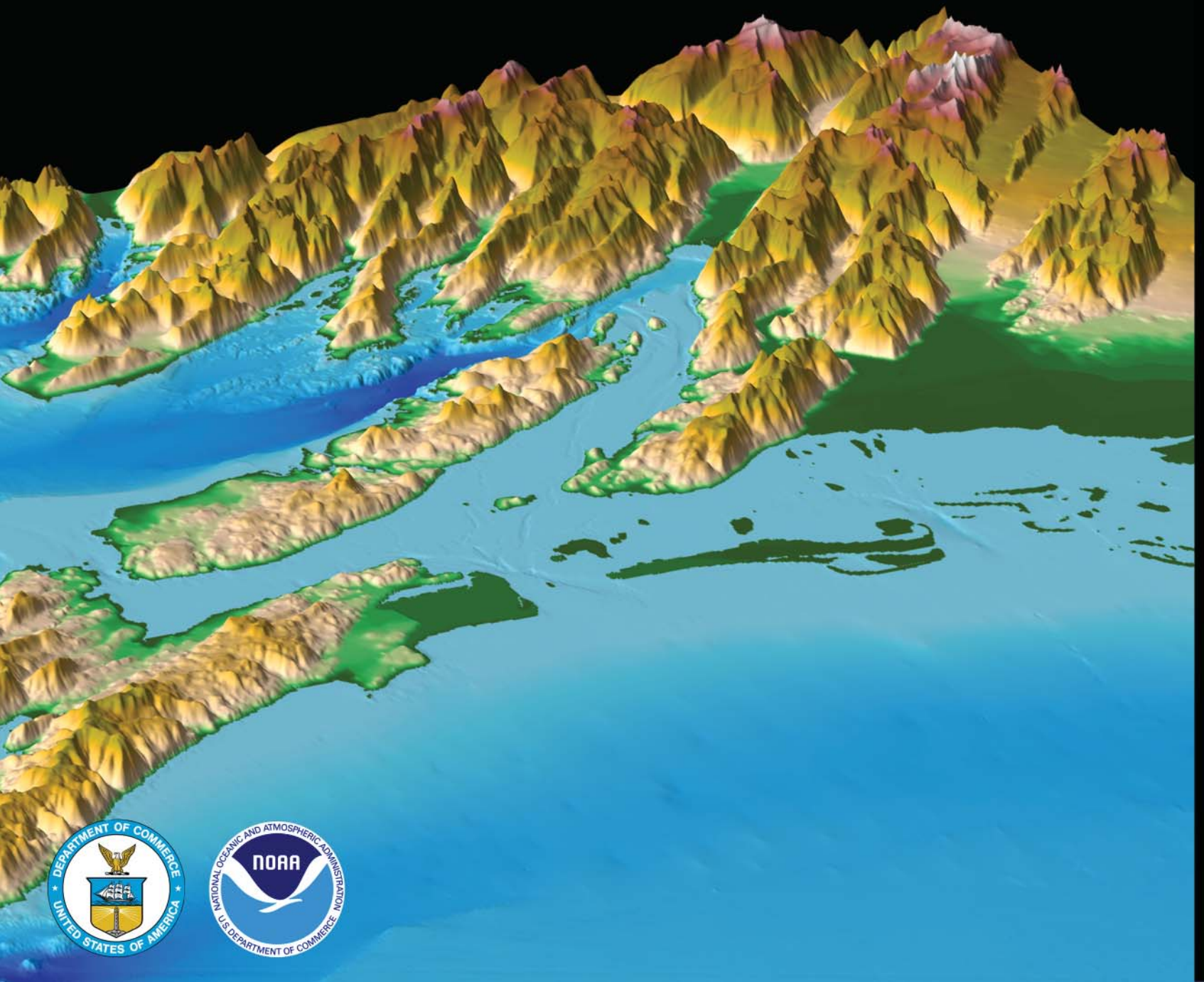
Kachemak Bay is one of the largest and most unique estuary environments in the country. By road, the bay lies 225 miles south of Anchorage. This critical habitat area is home to the coastal communities of Homer, Seldovia, Port Graham and Nanwalek. The communities consist of hundreds of year-round residents, 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 in Prince William Sound caused a major tsunami resulting in flooding and caused the Homer Spit to subside by at least 1.5 meters. Tectonic subsidence in regional towns caused major structural damages to local buildings. Destroyed dockside 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 "Hydropalooza" coastal mapping project in Kachemak Bay.

Who Provided the Data?

- Kachemak Bay National Estuarine Research Reserve (KBRR)
- The Kenai Peninsula Borough
- NOAA National Geophysical Data Center (NGDC)
- NOAA National Ocean Service (NOS)
- NOAA Office of Coast Survey (OCS)
- NOAA 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



NOAA Knows...

CORDOVA, ALASKA

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

Why Model Cordova, Alaska?

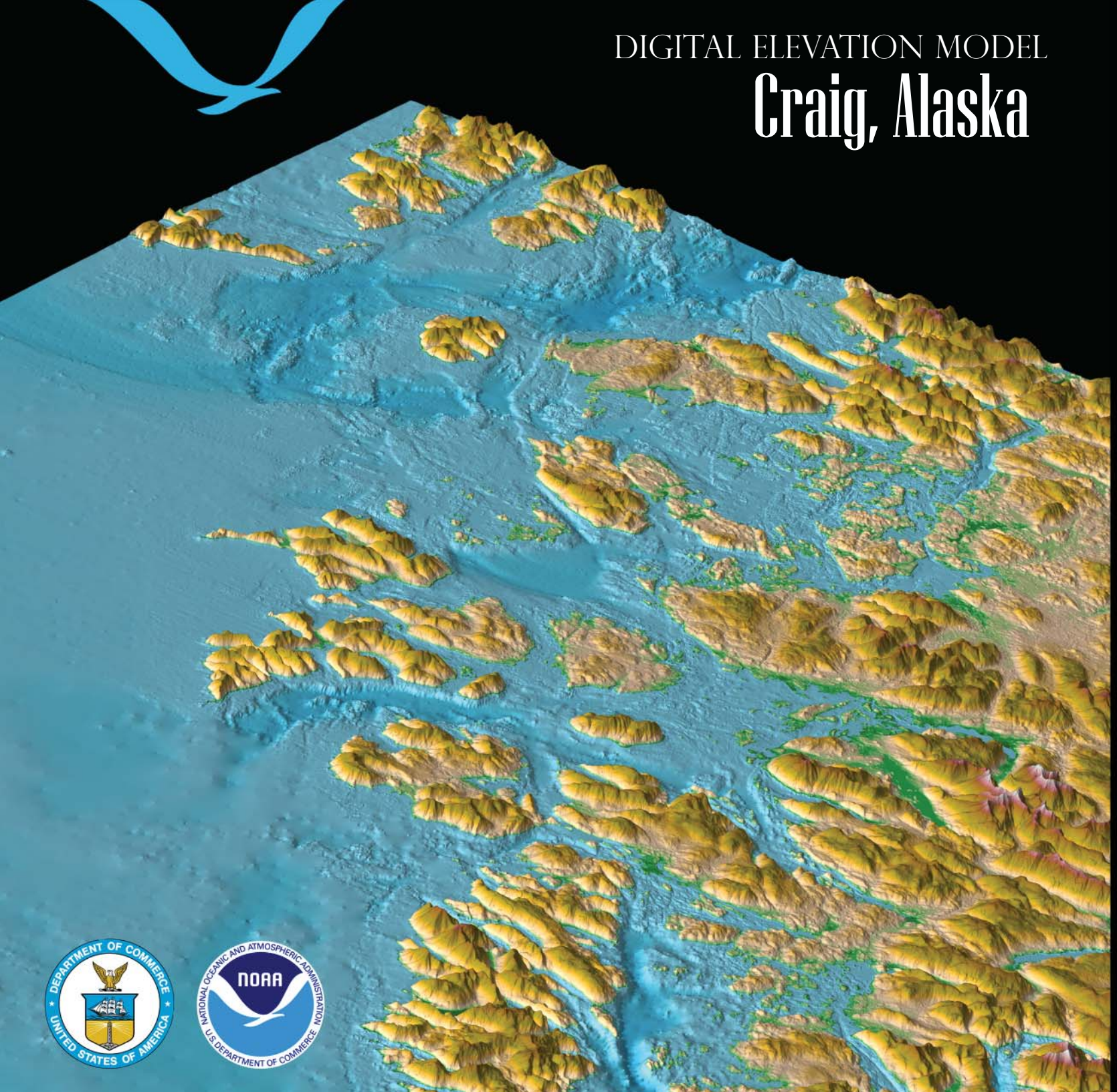
Cordova is a small town on the eastern side of the Prince William Sound. The coastal community has a population of roughly 2,500 people, most of whom are employed by the commercial fishing industry. Cordova came into the public eye after the Exxon Valdez oil tanker ran aground on the Bligh Reef, to the 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 magnitude 9.2 Good Friday Alaskan Earthquake and ensuing tsunamis caused 139 deaths and $430 million dollars in damages. The event resulted in the establishment of a second U.S. Tsunami Warning Center. The earthquake caused major vertical displacements around Prince William Sound, with up to 15 meters of uplift reported, and tsunami wave heights of up to six meters. The tsunami resulted in 106 deaths in Alaska, 13 deaths in California, 5 deaths in Oregon, and severe damages in Hawaii. DEMs and current modeling efforts can lessen the risks associated with coastal hazards, including tsunamis, storms, and hazardous spills.

Who Provided the Data?

- NOAA National Ocean Service (NOS)
- NOAA 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
- NOAA National Geophysical Data Center (NGDC)

DIGITAL ELEVATION MODEL

Craig, Alaska



NOAA Knows...

CRAIG, ALASKA

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

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 over 4 meter 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 National Ocean Service (NOS)
- NOAA 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/

Cassidys Pt.
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This flipbook is part of a "Regional DEM Series" that is based on the work of a team of NOAA 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

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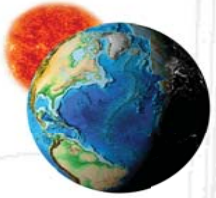
Photographs from NOAA Photo Library
http://www.photolib.noaa.gov/

Editors and contributors: Barry Eakins, Lisa Taylor, Susan McLean, Loren Pahlke, Heather McCullough, Pamela Grothe, Christopher Amante, Elliot Lim, Kelly Carignan, Matthew Love, and Dorothy Friday



CIRES