Geophysical Institute Quarterly
Volume 19, No. 4, 2005

Alaska's Dinosaurs: Digging for Clues

ARCTIC DINOSAURS—Scientists believe that at least eight different species of dinosaur roamed the North Slope of Alaska about 75 million years ago when the landscape probably contained lush forest and vegetation similar to that found in a present-day Louisiana bayou. Artwork by Karen Carr.

At least eight species of dinosaur, four plant eaters and four meat eaters, are thought to have lived about 75 million years ago on the North Slope of Alaska. During the summer of 2005, UAF Geology and Geophysics Associate Professor Paul McCarthy will help paleontologists reconstruct the ancient environment.

To accomplish the task, McCarthy will travel to a bluff above the Colville River with paleontologist Tony Fiorillo, of the Dallas Museum of Natural History, UAF School of Fisheries and Ocean Sciences Research Associate Professor Dave Norton and UA Museum of the North Interim Curator of Earth Sciences Roland Gangloff. The bluff, known as the Liscomb Bone Bed, holds many northern dinosaur fossils. McCarthy will examine ancient soils to determine what life was like for the dinosaurs. "Was it always wet, or was it wet and then dried out? Were there tropical or temperate conditions? The soil should provide clues," McCarthy said.

McCarthy specializes in reconstructing ancient landscapes by analyzing prehistoric soils. By examining fossil pollen, leaves and wood, scientists have discovered that northern Alaska used to be much warmer, with average annual temperatures well above freezing. Research already has revealed that the area could have supported lush forests. McCarthy said he suspects the North Slope looked like a Louisiana bayou.

Northern Alaska in the time of the dinosaurs was at least as far north in latitude as it is today, McCarthy said, which leads to another mystery: how did northern dinosaurs adapt to the darkness?

The research team's goal is to gather enough evidence to document the ancient Arctic coastal ecosystem. In the process, the team may help unearth clues that could help scientists understand what a warmer Alaska will be like if observed climate warming continues.

photo provided by Dave Norton

BONE BED—Kevin May, with the UA Museum of the North, helps students prepare bones for transport from the Liscomb Bone Bed.

BONES—Hadrosaur (duck-billed dinosaur) bones were found at the Liscomb Bone Bed.

photo by Tony Fiorillo

photo by Tony Fiorillo

TRANSPORT—Dinosaur bones are transported to UAF for further study with the help of a U.S. Army Chinook helicopter.

UAF UNIVERSITY OF ALASKA FAIRBANKS

Mt. Wrangell Reacts to Sumatra Earthquake

Four seismometers in the summit of Alaska's Mt. Wrangell showed that the volcano experienced a small flurry of events about one hour after a magnitude 9.0 earthquake struck off the coast of Sumatra on December 26, 2004. The Sumatra earthquake was the world's largest since Alaska's Good Friday earthquake in 1964, which had a magnitude of 9.2.

The December 2004 activity on Mt. Wrangell is the longest-range seismic triggering of a volcano ever recorded, according to Geophysical Institute Alaska Volcano Observatory (AVO) researchers.

Mt. Wrangell, Alaska photo by Guy Tytgat

Volcanologists routinely check Alaska volcanoes for increased seismicity following large earthquakes. After the Sumatra earthquake, former AVO graduate student John Sanchez analyzed data from several Alaska volcanoes. He discovered that Mt. Wrangell, a 14,163-foot volcano about 50 miles east of Copper Center, shook with at least 14 tiny earthquakes as energy waves from the Sumatra earthquake passed through the mountain during a 10-minute period. Mt. Wrangell is about 11,000 kilometers (7,000 miles) from the epicenter of the giant earthquake.

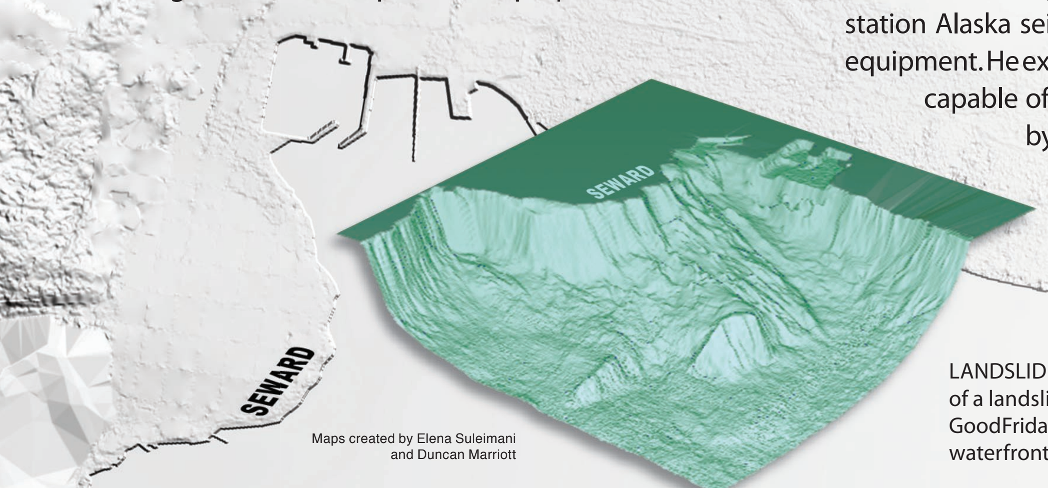
"It's very unlikely that this group of events, spaced regularly in time, happened just by chance," said Sanchez, who defended his Ph.D. thesis shortly after analyzing the

Tsunami Disaster Prompts Upgrade to U.S. Network

Shortly after the Sumatra earthquake, Alaska State Seismologist Roger Hansen traveled to Washington D.C. to summarize the current state of tsunami safety in Alaska and to explain the need for updated seismic equipment for the Alaska Earthquake Information Center.

At a U.S. Senate hearing in February 2005, Hansen also described the need for acquiring detailed ocean-floor data to assist in the creation of digital elevation maps for Alaska communities vulnerable to tsunamis. The U.S. Senate Committee on Commerce, Science and Transportation hearing was held in response to a proposed $37.5 million Bush administration program to expand the nation's tsunami-warning capabilities. The U.S. tsunami system program would upgrade 20 seismometers used to monitor seismic events in tsunami-prone areas of Alaska; fund 24-hour, seven-days-each-week staffing at Pacific and Alaska tsunami centers in Hawaii and Palmer, Alaska; provide for 32 new tsunami buoys and 38 new sea-level monitoring/tide gauge stations in the Pacific Ocean, and create an infrastructure for tsunami hazard mitigation, education and communication to remote coastal communities.

At the hearing, Hansen said that 75 percent of the 400-station Alaska seismometer network consists of outdated equipment. He explained the need for quality seismometers capable of detecting local tsunamis that don't pass by a network of deep ocean buoys before hitting Alaska coastlines. Hansen also said that more high-resolution digital elevation maps of the ocean floor near coastal Alaska towns susceptible to tsu-



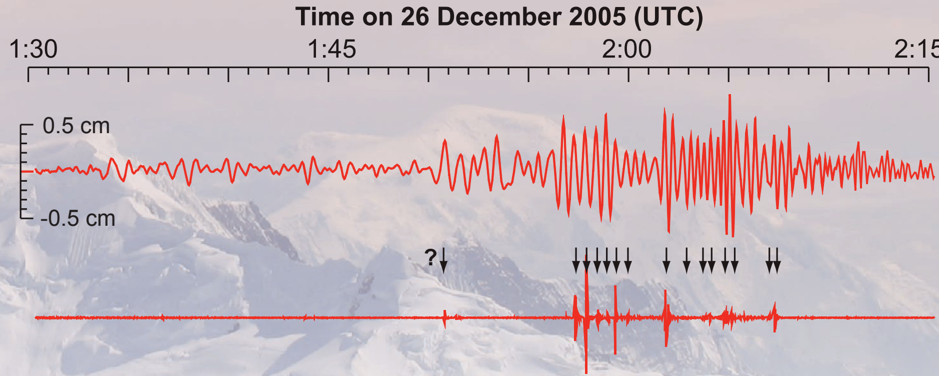
Maps created by Elena Suleimani and Duncan Marriott

LANDSLIDE—High-resolution bathymetric data show remnants of a landslide triggered in upper Resurrection Bay by the 1964 Good Friday earthquake. The slide destroyed 1,200 m of the Seward waterfront and generated tsunami run up to 30 feet above normal.

Mt. Wrangell data. A check for seismicity at other Alaska volcanoes, including those in the Aleutian Islands and those at Katmai National Park, revealed that Mt. Wrangell was the only one that seemed to react to the Sumatra earthquake. Mt. Wrangell has a history of sensitivity to earthquakes. Mt. Wrangell's north crater heated up after the 1964 Alaska earthquake, according to Geophysical Institute Professor Emeritus Carl Benson, and Mt. Wrangell's internal earthquakes decreased for five months after the magnitude 7.9 Denali Fault earthquake of 2002, according to Sanchez and colleagues, including Research Professor Steve McNutt.

Mt. Wrangell's reactions could be related to weak points within the mountain or fluid-filled cavities that react to shaking in different ways, the researchers say.

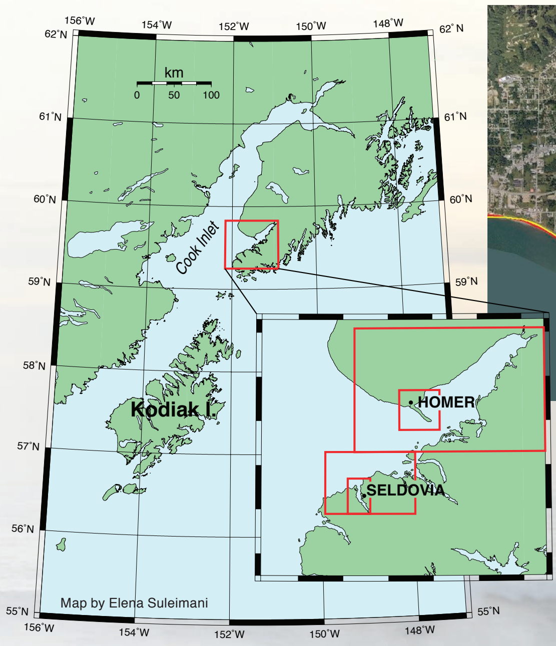
An analysis of the Sumatra earthquake's affect on Mt. Wrangell, authored by Assistant Professor Michael West, Sanchez, and McNutt, was published in a special May 2005 issue of the journal Science.

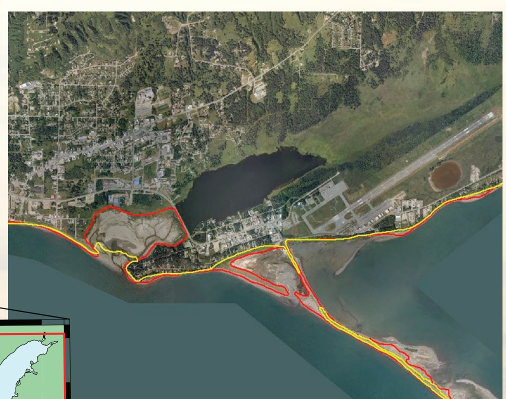


WAVES—The Alaska Earthquake Information Center seismogram provided by Michael West, above, shows ground shaking recorded in Alaska after the Sumatra earthquake. The top waveform shows the ground shaking up to 1.5 cm about an hour after the earthquake. These waves occurred slowly, taking a half a minute or more. The lower waveform shows 14 earthquakes and one unidentified source of shaking at Mt. Wrangell as the waves passed. The small, local earthquakes occurred only when the ground was lifted by more than a quarter centimeter. This is the first time triggered earthquakes have been linked to a specific cycle of ground motion.

namis are needed. Geophysical Institute Research Analyst Elena Suleimani, and others, including Rod Combellick, of the Alaska Division of Geological and Geophysical Surveys, have produced tsunami inundation maps of three communities on Kodiak Island to show city and emergency services managers what parts of coastal cities are most vulnerable. Suleimani is finalizing inundation maps for Seldovia and Homer, and is working on one for Seward. Sitka is next on the list. The inundation maps are marked with colored lines that show which areas could be flooded during a variety of tsunami scenarios. To produce similar maps for other areas, researchers need detailed topography and bathymetry data, of at least 25-meter resolution, of the sea floors surrounding Alaska coastal communities.

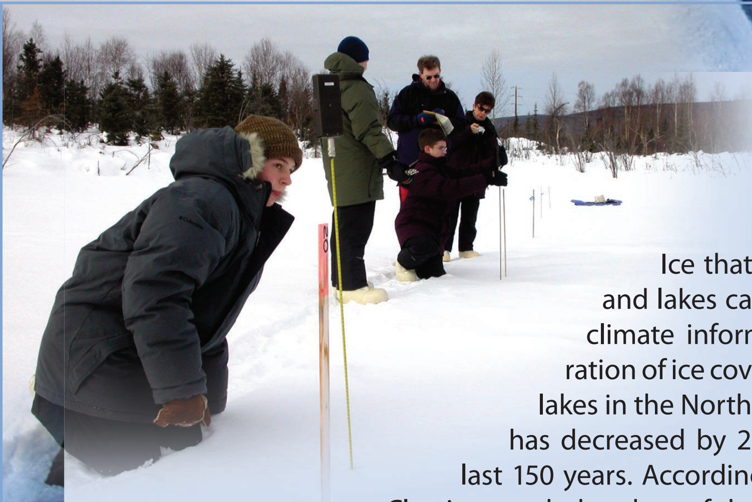
At the hearing, Hansen introduced the Alaska Tsunami Center and Observatory, which brings together the Geophysical Institute, the UAF Institute of Marine Science and the Arctic Region Supercomputing Center in a virtual laboratory to provide a central point of contact for teaching, research and service.





Map by Rod Combellick; data by Elena Suleimani

TSUNAMI SCENARIO—The map above shows tsunami inundation scenarios for Homer, Alaska. Red lines mark areas flooded by water after the 1964 (M9.2) Good Friday earthquake. Yellow lines show possible areas of inundation that could result from a M 7.5 earthquake on the Border Range Fault. Numerical grids of increasing resolution (like that shown at left) were used to calculate tsunami scenarios for Homer and Seldovia.



Alaska Lake Ice and Snow Observatory Network

Ice that forms on rivers and lakes can yield valuable climate information. The duration of ice cover on freshwater lakes in the Northern Hemisphere has decreased by 20 days over the last 150 years. According to Nenana Ice Classic records, breakup of the Tanana River is now 5.5 days earlier than it was in 1917.

Geophysical Institute Research Professor Martin Jeffries has established a network of 17 lake-ice observatories from Barrow to Seward called the Alaska Lake Ice and Snow Observatory Network (ALISON). At most of those observatories, science and math teachers and kindergarten through 12th-grade students from villages, towns and cities gather data on lake ice. In the spring of 2005, seven students and a teacher from Somers High School in Somers, Connecticut (pictured above), traveled to Alaska to help take ALISON measurements, including snow depth and temperature at sites near Poker Flat Research Range.

Through ALISON, Jeffries provides students and teachers with the opportunity to gather climate-related information that had been missing from scientific records until now.

photo by Martin Jeffries

ALISON—Students from Anvil City Science Academy in Nome, Alaska, drill into ebullition bubbles in lake ice.

The Geophysical Institute Quarterly is published as a public service by the University of Alaska Fairbanks Geophysical Institute Public Information Office: Kathryn Bertram, editor; Vicki Daniels, publications specialist/editor; Deborah Coccia Manning, designer; Lynda McGilvary, publications supervisor; Ned Rozell, writer. Free subscriptions are available by e-mail at info@gi.alaska.edu, by phone at (907) 474-7558, by fax at (907) 474-7125, from the address above, or online at http://www.gi.alaska.edu. UAF is an affirmative action/equal opportunity employer and educational institution.

GEOPHYSICAL INSTITUTE
University of Alaska Fairbanks
903 Koyukuk Drive
P.O. Box 757320
Fairbanks, AK 99775-7320

Address Service Requested

Nonprofit Organization
U.S. Postage
PAID
Permit No. 2
Fairbanks, Alaska