



U.S. Coast Guard photo by  
Petty Officer 2nd Class Charly Hengen

## SEA ICE EXPERTS AID FUEL DELIVERY TO NOME

In January 2012, Andy Mahoney leaned his drill into the spine of a bluish-white pressure ridge in the Nome Harbor in northwest Alaska.

Less than a month before, Mahoney, a research assistant professor at the Geophysical Institute, was contacted by officials from the Alaska Department of Environmental Conservation with an urgent request: Could he bring his sea ice expertise and drills to Nome? The community of 3,500 residents was badly in need of diesel fuel to heat their homes and run their generators. The need was great enough to spur a risky mid-winter fuel delivery, but how close could the fuel tanker *Renda* get?

Despite help from graduate student Josh Jones, Mahoney said work on the ice was slow going, but it provided crucial information—two pressure ridges were present. The first ridge formed at the mouth of the harbor and was about 26 feet thick. The second ridge lay about 150 feet outside the harbor. The ice between the two ridges was 10 feet thick, indicating it was composed of multiple layers of ice rafted atop one another. Offshore of the second ridge, the sea ice was three feet thick. The conditions meant the *Renda* would have to moor outside the harbor and transfer its fuel via a one-half-mile-long hose.

Nome got fuel 12 days after Mahoney supplied his assessment and the story of the successful delivery went global.

“It provided an excellent learning experience regarding who needs to know what about sea ice in order to safely operate in the Arctic coastal waters in winter,” he said.



KNOM Radio Mission, Matthew F. Smith

**DRILLING FOR SEA ICE DATA**—The ice survey conducted by Andy Mahoney (above) and graduate student Josh Jones was instrumental in the 2012 Nome refueling effort as it indicated the Russian fuel tanker, *Renda*, would be unable to enter Nome Harbor.



KNOM Radio Mission, David Dodman



# FIELDWORK ON BEZYMIIANNY: VOLCANO OFFERS OPPORTUNITIES AND INSIGHT

At the curve of the planet where the Aleutian Arc rams into Russia, the volcanoes of the Kamchatka Peninsula rise shoulder to shoulder. Here, near the junction of three crustal plates, Geophysical Institute researchers have gotten to know Bezymianny Volcano, a Russian counterpart to Mount St. Helens. During the last five years, they have also developed lasting partnerships with Russian scientists and created research opportunities for graduate students across the U.S. and in Russia.

GI Research Associate Pavel Izbekov has led five years of fieldwork on the project, known as the Partnership for Volcanological Research and Education. Bezymianny Volcano cooperated with eight eruptions during the years of the project.

The National Science Foundation funded the program to help build a community between U.S. and Russian volcanologists and to conduct research on a volcano that behaved in a similar fashion to Mount St. Helens in Washington. During a 1956 eruption, the top half of Bezymianny collapsed as the volcano experienced “lateral blast.” Twenty-four years later, Mount St. Helens erupted that same way, killing 57 people and wiping out wildlife,



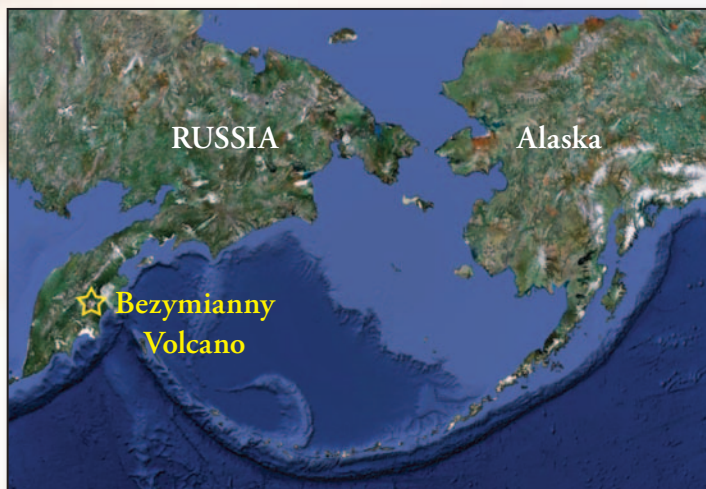
plants and buildings in a 200-mile swath. Researchers think Bezymianny Volcano might be helpful in predicting the future of Mount St. Helens.

“Bezymianny is a serious volcano, a dangerous volcano,” Izbekov said. “If you imagine Bezymianny near Portland, it would be a nightmare. It erupts twice a year. By comparing systems, we can maybe see what future awaits Oregon and Washington state.”

In five years of Kamchatka fieldwork, Izbekov, Research Associate Professor Michael West and Professor Jeff Freymueller have helped 42 students from all over the world perform research on Bezymianny, installing a dense network of seismic stations and Global Positioning System receivers. Students also collected gases and rocks from the volcano, some of them right after eruptions.

“Many of our samples were hot,” Izbekov said.

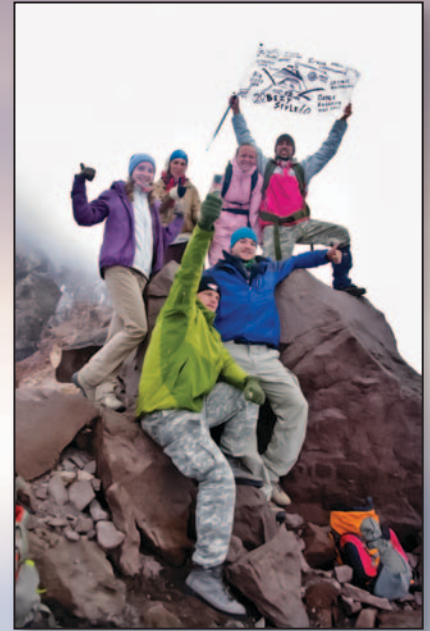
The GI researchers partnered with Russian colleagues who helped with the difficult logistics when trying to get



Google Earth image

**RUSSIAN VOLCANO**—Bezymianny Volcano is a stratovolcano in central Kamchatka. Prior to its noted 1955-56 eruption, the volcano was considered extinct. Recently, the volcano has experienced an uptick in activity making it of particular interest to scientists. With help from graduate students, a network of seismic stations was installed on the volcano for improved monitoring.





equipment through customs in Russia.

"The big field trip every summer was one massive, chaotic, fun, maddening, difficult, rewarding experience," West said. "There's no project I've ever loved as much as this or one that has been as frustrating."

Taryn Lopez is a University of Alaska Fairbanks graduate student who traveled to the Kamchatka Peninsula for three field seasons, getting to know Bezymianny, Shiveluch and Karymsky volcanoes, as well as Mount St. Helens. She uses measurements of sulfur dioxide and other volcanic gas samples she and others collected for part of her doctoral work.

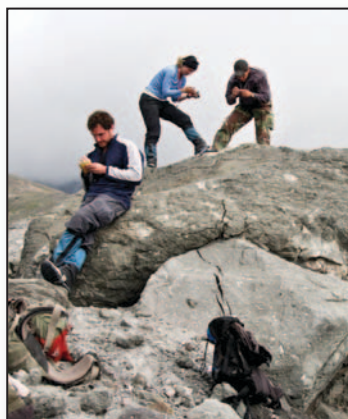
"We always went in the field as teams, so sometimes a geophysicist would help me collect gas measurements, and then the next day I would help carry batteries for the seismologists," Lopez said. "The end result of this is that we all learned a lot about other disciplines and techniques, and learned a lot about volcanoes in general."

"I enjoyed getting to know our Kamchatkan colleagues and their culture," Lopez said. "The Kamchatkan people are kind-hearted, beautiful, and tough. They always make time for you, and love to have fun."

"As a team we survived extended confinement due to poor weather, heightened volcanic unrest and evacuation, volcanic eruption, injury and sickness, and I can't think of a group of people I would have rather been with."

So far, eight doctoral theses have resulted from the program and four masters' theses. More important to Izbekov, several of the students are now collaborating on research with Russian scientists they met during the program's field school.

"This was just a foot in the door for them," Izbekov said. "One of our major goals was to make students comfortable and able to do science in a foreign country."



**RESEARCH EXPERIENCE**—Photos, from top left, depict the magnificent trio of Bezymianny, Kamen' and Kliuchevskoi volcanoes, with Bezymianny steaming; a July 2007 hike to the caldera rim of Bezymianny; a summit photo from Zimina Volcano in July 2010; Sergey Ushakov (in mask) collecting volcanic gas samples at the Bezymianny dome; the 2008 field team with Bezymianny and a Russian MI-8 "flying school bus" in the background. And, in the photo at left, researchers Steve Turner (Harvard), Theresa Kayzar (University of Washington), and Vasily Shcherbakov (Moscow State University) collect samples from 2007 eruptive deposits on Bezymianny. The rock in the photo is a volcanic bomb that flew out of the vent.

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

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## Prime location for capturing the aurora

Geophysical Institute space physicists Hans Nielsen and Donald Hampton assisted Steven Powell of Cornell University during a NASA sounding rocket launch on Feb. 18, 2012. Research Assistant Professor Hampton coordinated all ground-based optical measurements. Nielsen, GI associate director and principal investigator for the institute's effort, observed the night sky from Fort Yukon to better define the aurora through which the rocket flew. The mission relied heavily on ground-based observations—utilizing cameras positioned in Fort Yukon, Venetie and at the University of Alaska Fairbanks Toolik Field Station. The 2012 launch season marked the first time ground optics were based in Venetie. There, cameras were situated almost directly beneath the rocket as it reached its highest point, an advantageous view for capturing high-resolution images of the auroral display.

Researchers at Cornell University, Dartmouth College, the University of New Hampshire, Southwest Research Institute, the University of Oslo and the GI will analyze data collected by the rocket, the National Science Foundation sponsored Incoherent Radar at Poker and the ground-based imagers. The collaboration is aimed at improving models of Earth's upper atmosphere and understanding the impact of space weather on satellite communications.

**MISSION ACCOMPLISHED**—The 46-foot NASA sounding rocket launched from Poker Flat Research Range on Feb. 18, 2012 at 8:41 p.m. is seen here, well into its second stage. Photo by Craig Heinselman.

