Eruption required 24-hour staffing

The explosive eruptions of Augustine Volcano on January 11-28, 2006, and the multitude of resulting data, caused around-the-clock staffing at the Alaska Volcano Observatory in Fairbanks. The Geophysical Institute tapped into the volcano in ways scientists only dreamed of during its last eruption in 1986.

"We have a tremendous number of different data streams coming in," said Steve McNutt, UAF Volcanology Group leader. "It's as good as anything else, anywhere else, in the world."

AVO is a joint program of the Geophysical Institute, the United States Geological Survey, and the State of Alaska Division of Geological and Geophysical Surveys.

photo by Guy Tytgat

2006

background photo by Cyrus Read, AVO-USGS

1986

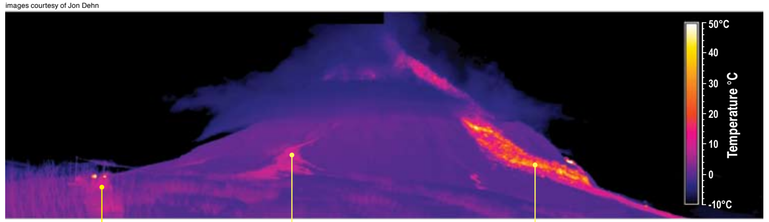
1976

Active Augustine

Augustine Volcano has been active in the recent past with 10 eruptions since 1909. Major eruptions of the volcano occurred in 1976 and 1986, as seen in the photos at left by former Geophysical Institute Professor of Geophysics Juergen Kienle. The hut in the foreground of the 1986 eruption photo was leveled by a pressure wave.

Twenty years later, the 2006 eruption of Augustine Volcano, pictured above, has captured the interest of Geophysical Institute scientists.

images courtesy of Jon Dehn



helicopter warm debris flow blocky lava flow

***NEW LAVA FLOWS**—An infrared image and a photo of Augustine Volcano taken March 25, 2006, reveal fresh lava flows. Hot lava from the summit is seen flowing on the right side of the image. Warm debris flowing down valleys exhibit lower temperatures. A helicopter is visible to the left with a warm running engine.*

cover and back page background photos by Guy Tytgat

Geophysical Institute Quarterly, Volume 20, No. 2, 2006

The Geophysical Institute Quarterly is published as a public service by the University of Alaska Fairbanks Geophysical Institute Public Information and Education Outreach Office.

Kathryn Bertram, supervisor; **Vicki Daniels**, editor; **Deborah Cecelia Mannina**, designer; **Lynda McGilvary**, publications specialist; **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.

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

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Augustine Volcano Erupts

In January 2006, Augustine Volcano erupted explosively, sending ash clouds as high as 14,000 meters (45,932 feet) and disrupting air traffic in southern Alaska.

Augustine Volcano rises from the sea 112 kilometers (70 miles) southwest of Homer, Alaska, and 290 kilometers (180 miles) southwest of Anchorage. The volcano has constructed its own island about 10 kilometers in diameter in southern Cook Inlet.

From May to December 2005, a GPS benchmark located near the 1,260-meter (4,134-foot) summit of Augustine Volcano moved 2.5 centimeters (1 inch) as the volcano inflated. Possibly due to magma rising within the volcano, this slight inflation was the first scientists had seen from Augustine since it erupted in 1986, and hinted at what was to come.

UNIVERSITY OF ALASKA FAIRBANKS

The January 11, 2006, Augustine Volcano eruption captivates Geophysical Institute researchers and students

After Augustine's largest January eruption, Geophysicist Guy Tytgat looked at his computer and saw that the pressure sensor he installed on Augustine Island in early January 2006 had endured to record the action. Basically a large subaudible microphone, the pressure sensor recorded the very large air-pressure wave from that morning's explosive eruption.

Four floors above Tytgat in the Geophysical Institute, Professor Emeritus Buck Wilson and Professor John Olson saw the same signal, which took about 40 minutes to travel to the University of Alaska Fairbanks campus, where a network of infrasound microphones are spread in the boreal forest *(see below)*.

***INFRASOUND**–Ed Clark installs an infrasound sensor on Augustine Island in the photo below. The signal from the eruption on January 11, 2006, as recorded by this sensor, also is displayed.*

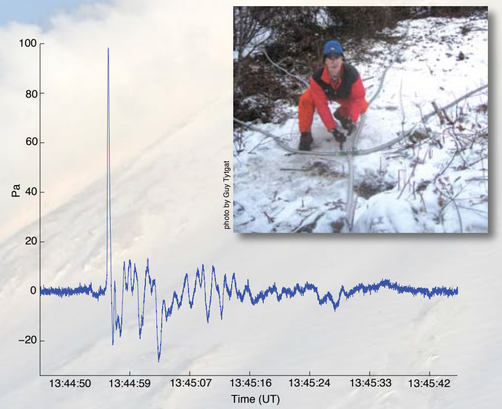


photo by Guy Tytgat

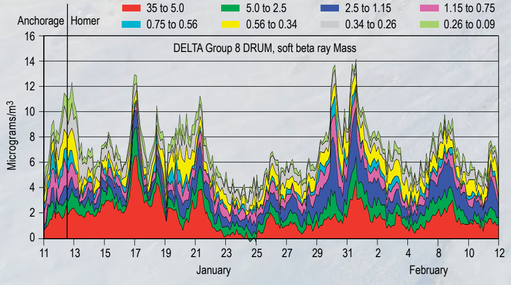

photo by Max Kaufman

***GPS**–Graduate student Tom Fournier installs a GPS site on Augustine in December 2005.*

Geophysical Institute Professor Jeff Freymueller and graduate student Tom Fournier monitored six telemetered GPS instruments and five Alaska Volcano Observatory GPS stations on Augustine Volcano *(see above)*. The explosive eruption in January 2006 destroyed three of the telemetered instruments.

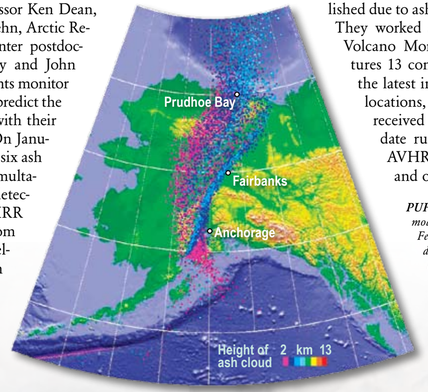
Preliminary monitoring results show Augustine started to deform in the summer of 2005. In December, the signal pointed to magmatic activity at less than a kilometer below the volcano. Augustine subsided in late January due to withdrawal of magma from a deeper source.

AUGUSTINE AEROSOLS



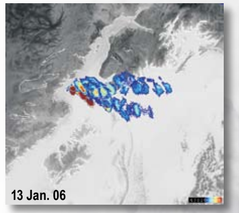
Atmospheric Scientist Cathy Cahill has sampled the air in Homer, Alaska, for aerosols since January 13, 2006. She is analyzing the chemical composition of Augustine ash in the air over time. As seen in the chart at left, Cahill was able to detect aerosols of different sizes, represented by colors, in various concentrations during the first weeks of Augustine's eruption. Cahill also analyzed her data to determine what amount and size of ash is visible to satellites, and to confirm that concentrations of ash in the air were not hazardous to human health in Homer.

Remote Sensing Professor Ken Dean, Associate Professor Jon Dehn, Arctic Region Supercomputing Center postdoctoral fellows Peter Webley and John Bailey, and staff and students monitor volcanoes from space and predict the movement of ash clouds with their Puff computer program. On January 13, 2006, they tracked six ash clouds from Augustine simultaneously. They also have detected eruptions using AVHRR and MODIS images from NOAA and NASA satellites, and tracked flights in airspace around Augustine, at times watching planes divert around no-fly zones established due to ash clouds they had tracked. They worked at times in the Satellite Volcano Monitoring Lab, which features 13 computer screens displaying the latest information about aircraft locations, GOES satellite images received every half hour, up-to-date runs of the Puff program, AVHRR, MODIS information, and other satellite data.

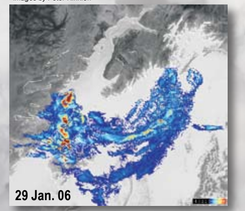


***PUFF**–The image at left shows a Puff model prediction of ash from the February 1, 2006, eruption. The ash drifted north over Anchorage, Fairbanks and Prudhoe Bay, Alaska. LIDAR instruments at Poker Flat Research Range measured ash based on these predictions.*

PUFF model by Peter Webley



images by Peter Rinkleff



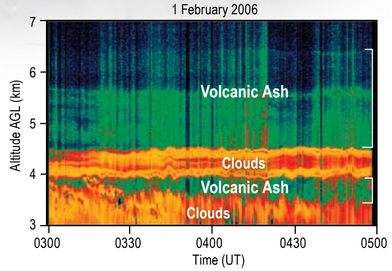
***PLUMES**–Day-long composite images of ash clouds and plumes from Augustine are shown.*

SEM image courtesy of Pavel Izbekov

***ASH**–A Scanning Electron Microscope (SEM) image of a vesicular ash particle erupted by Augustine Volcano on January 13, 2006, is shown.*

Professor Ken Sassen, Research Associate Professor Javier Fochesatto, and Associate Professor Richard Collins found evidence of volcanic ash in the air above Fairbanks after they turned on laser radar, or lidar, systems both at the Geophysical Institute and at Poker Flat Research Range on the nights of January 31 *(see right)* and February 2, 2006. The lidar is part of the Alaska Project, a collaborative scientific program between the Geophysical Institute and the National Institute of Information and Communications Technology.

***LIDAR**–At right, lidar echoes are represented in false color revealing volcanic ash embedded in clouds over the Lidar Research Laboratory at Poker Flat Research Range on the night of January 31, 2006. Lidar echoes from 3 to 7 km altitude are shown over a two hour period. Graphic by Richard Collins.*



Eruption videos and images capture the action

Geophysical Institute Professor Davis Sentman traveled to Homer, set up a low-light camera, and aimed it at Augustine. Interested in lightning that may occur above the erupting volcano, Sentman also inadvertently captured videos of pyroclastic flows–hot, gas-rich currents of dust and pumice–rolling down the mountain *(see right)*. The low-light camera has provided a new way to view an eruption that cannot be seen with the naked eye or recorded with other equipment. A low-light Augustine activity webcam is available at http://www.avo.alaska.edu/webcam.

***NEW VIEW**–Pyroclastic flows roll down Augustine in the image at right, captured with a low-light camera on March 7, 2006.*


courtesy of Davis Sentman


photos by Ronald Thomas

Geophysical Institute Research Professor Steve McNutt and research colleagues Guy Tytgat and Ed Clark collaborated with Paul Krehbiel, William Rison, and Ronald Thomas of New Mexico Tech to set up lightning detection devices *(see left)* at Anchor Point and Homer by January 27. The team detected more than 300 lightning flashes in 10 minutes starting shortly after an eruption began on January 28. Volcanic lightning occurs because of separation of charges in the ash.

***LIGHTNING DETECTION**–Pictured at left is a Lightning Mobile Array antenna mounted at Oil Point, north of Augustine Volcano. The antenna and the equipment buried under the snow at its base are used to detect lightning activity associated with ash eruptions from Augustine.*

Geographic Information Network of Alaska (GINA) personnel created images of the Augustine Volcano eruption from MODIS satellite data *(see right)*.

***20 YEARS APART**–A true-color composite satellite image of the March 27, 1986, Augustine eruption is pictured below. At right is a view of a steaming Augustine from December 12, 2005.*

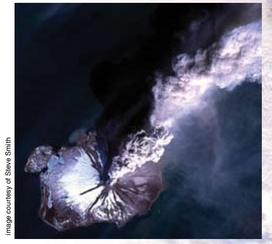


image courtesy of Steve Smith