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UNH Scientist At Mount St. Helens To Wire Rumbling Volcano With Microphones

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UNH Professor Jeff Johnson will return to Durham Oct. 15 and can be reached at (603) 862-0711. He can also be reached via Email at: jeff.johnson@unh.edu.

DURHAM, N.H. -- When volcanoes rumble, Jeff Johnson listens – with microphones.

So when Mount St. Helens began stirring recently, Johnson knew he’d be making a visit to Washington State to “listen” to the volcano that erupted with such force in 1980. A Fulbright Scholar at the University of New Hampshire’s Institute for the Study of Earth, Oceans, and Space (EOS) and Department of Earth Sciences, Johnson holds a Ph.D. in geophysics.

Johnson headed to Seattle Oct. 6 to help interpret the acoustic and seismic data from Mount St. Helens as he's done for years at volcanoes across the globe.

"My primary role is to analyze and understand the recorded acoustic 'wiggles', which are a graphical representation of sound waves too low in frequency for humans to hear," Johnson says.

Colleagues from the Pacific Northwest Seismograph Network at the University of Washington and the United States Geological Survey Cascades Volcano Observatory worked in concert during the last few days to install microphones similar to the one Johnson and others have recently deployed at a volcano in Ecuador.

Says Johnson, "The first microphone was deployed at the volcano only three days ago about four kilometers from the dome of Mount St. Helens, and its information is being sent in real time via radio telemetry to the University of Washington.”

The idea, he explains, is to be able to understand when there are gas emissions (explosions or less vigorous degassing) even during periods of time that there is no clear line of sight to the dome (i.e., the explosions can't be visibly confirmed).

“We focus on ‘infrasound,’ low frequencies inaudible to humans, because this is the type of sound that volcanoes typically emit with great intensity,” he says. “Detecting and analyzing these sounds can provide an important complement to other forms of eruption monitoring.”
Mount St. Helens is one of a dozen active volcanoes where Johnson has studied volcanic infrasound. Most recently, he has been working in Ecuador at the active volcano Tungurahua. Since 1999, this volcano has threatened tens of thousands of citizens living in nearby towns and rural communities and induced mass evacuations.

Over a period of years, Johnson, in collaboration with observatory staff at the Geophysical Institute in Quito, earth scientists from the University of North Carolina, computer scientists at Harvard University, researchers at the United States Geological Survey, and engineers at University of Washington, has worked in Ecuador to better understand the threat and develop instrumentation to minimize eruptive hazards.

A successful pilot project to Ecuador was carried out in July 2004 to implement a new wireless microphone array that could better track the ongoing eruptive activity at the volcano. The instruments were installed at a remote location 11,000 feet high on the flanks of the exploding volcano. The goal was to listen to the low-frequency rumbles, which are associated with eruptive events including ashy explosions, gas exhalations and paroxysmal bursts that can eject glowing boulders the size of Volkswagens.

"Monitoring the sound radiation from Tungurahua is one of the most effective means to keep tabs on the ongoing state of the eruption at this dangerous volcano," Johnson says. "More often than not, the summit of this volcano is hidden behind dense clouds so we can’t see if an eruption is in progress. Furthermore, seismic recordings are often unable to illuminate whether an eruption has occurred because it is hard to differentiate the ground motions associated with explosion events and sub-surface earthquakes."

The wireless array of sensitive microphones at Tungurahua was situated close to the volcano’s throat, where it was able to record sound waves and transmit the data to the permanently manned volcano observatory nine kilometers away. Scientists at the observatory are then able to filter out noise and visually identify explosion events, which provide an indication of the state of volcanic unrest. Tracking this unrest over time and observing trends in explosive degassing is vital for predicting potentially catastrophic changes in eruptive behavior.

Says Johnson, "The acoustic monitoring of volcanoes is becoming more and more commonplace at volcanoes worldwide. Now that Mount St. Helens is awakening, we have the opportunity to test and utilize this important technology in our own back yard, in the United States."