Simulating volcano eruptions, one blast at a time

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UB geologist Greg Valentine recently conducted an experiment to simulate volcanic eruptions, a test he hopes will provide insight into one of Earth's most powerful and mysterious natural disasters.

(Phys.org) -- A voice carried across the treeless plateau: "Fire in the hole! The range is now active."

Two dozen people fell silent before a muffled blast sent a geyser-like shower of crushed gravel, limestone and asphalt roughly 50 feet in the air. Moments later, standing at the blast site, University at Buffalo geology professor Greg Valentine gave an impromptu assessment.

"That was great. It was exactly what we expected," said Valentine, PhD, director of UB's Center for Geohazards Studies.

The experiment, a rare large-scale attempt to simulate volcanic eruptions , is drawing international attention because it will provide much-needed insight into one of Earth's most powerful and mysterious natural disasters. If that wasn't enough, it may help mining companies find diamonds.

When most people think of volcanoes, images of exploding mountain tops come to mind. There is another type of volcano, however, called a maar. They feature large craters, often topped by a pool of water, near mountain ranges. Maars range from a few hundred feet to more than a mile across.

The UB-funded experiment, which took place on land owned by Cheektowaga-based Calspan Corp., focused on maars. It unfolded over several days in July. The idea, according to Valentine, was not to determine how or when eruptions will occur, but rather to figure out what happens during and after an eruption.

Do subsequent eruptions cause the crater to expand? Will the volcano spew enough ash to affect air travel, as did the 2010 volcanic eruption in Iceland?

To help answer those questions, Valentine and researchers built three test beds, each 12-feet-by-12-feet square, and packed them with gravel, limestone and asphalt, 3 to 3-1/2 feet deep. Explosives roughly as powerful as a grenade were placed in post holes and detonated.

Because volcanic eruptions are naturally occurring, each with their own distinct features, it isn't possible to exactly replicate one, Valentine said. But the test beds are an accurate barometer to base conclusions on because researchers can control the strength of the blast, he said.

The experiment drew the attention of Jacopo Taddeucci, PhD, a

volcanologist at the National Institute of Geophysics and Volcanology in Rome, Italy. He flew into Buffalo for the occasion to use high-speed cameras to record the explosions.

"Large-scale experiments like this are quite rare," he said in between blasts.

It also piqued the interest of Manoranjan Majii, PhD, an assistant professor of mechanical and aerospace engineering at UB. Majii used the experiment to test software he developed that provides near instantaneous 3-D imagery of Earth's surface, including craters.

While it's too early to draw conclusions, the experiment could provide insight into the location of diamonds. The valuable gemstone is brought close to Earth's surface by the funnel-shaped mass of magma and broken rock that form under volcanoes, Valentine said.

He will spend the next few months analyzing results of the experiment before reporting his findings in a yet-to-be determined academic journal. For the time being though, Valentine said he is happy with the results.

"I've learned more today, without analyzing this entirely, as I would if I spent an entire year reading technical papers."

Provided by University at Buffalo