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New geologic hazards facility to bring volcano field study to U.S.

By Christina Hernandez | Sep 30, 2010 | **0** Comments

There aren't any volcanoes in upstate **New York**. But within the next decade, a 700-acre field station at the **University at Buffalo** could become one of the only facilities worldwide where researchers can study volcanic properties on their own terms.

The geologic hazards facility, though still millions of dollars and several years away, is already in the planning stages. I spoke last week with **Greg Valentine**, professor of geology and director of the university's **Center for Geohazards Studies**, about how the facility will improve on the current model of volcano research.

How will the facility be developed and used?

It's going to be designed and set up in phases. Our early focus is going to be on volcanic processes. One of the simple things we're going to do is look at the formation of volcanic craters and the structures beneath them. [That] is really important for interpreting the geologic record, but also for finding some economic resources. For example, diamonds are found in volcanic structures beneath a certain type of crater. We'll be doing a series of controlled explosions at different depths and looking at the effects of single explosions versus multiple explosions.

Some of the more complicated things we're interested in, but will take a longer time include pyroclastic flows. Most people [think of lava flows] when they think about volcanic flows. They're not very dangerous because you can usually get out of the way. Many volcanoes create explosive flows that go out across the landscape at [high] speeds. The flows are a mixture of hot gas and particles. These are hard to take measurements on in nature because eruptions are very unpredictable. They're also extremely hostile environments. You can't really, in a controlled way, set up measurements in a pyroclastic flow. [The scientific community is] developing some technology that allows you to take measurements on pyroclastic flows from a distance using remote sensing. But when we test those out on real

volcanoes, it's not a controlled situation. We don't know what source of the pyroclastic flow was like, what its initial velocity was [or] the details of its inner structure.

The idea with the experimental field station is to be able to replicate pyroclastic flows on the scale large enough to capture most of the physical processes. We can do it in a controlled way, so we know exactly what the conditions are that are causing the pyroclastic flow. We can set up instrumentation along the path of the flow, so we can take detailed measurements. We can also use these remote sensing techniques to take measurements just as we would at a real volcano, but now we'll have additional information to help calibrate the remote sensing. We're going to get new insight into how these pyroclastic flows work.

How do researchers currently study volcanoes?

To study a volcano you have to spend a lot of time there. You don't know exactly when it's going to erupt. One of the ways we try to understand pyroclastic flows is by looking at the deposits they leave behind. [You can] try to reconstruct the processes that made those deposits. [Some researchers do smaller-scale experiments] to try to understand pyroclastic flows. These look at flows of particle and gas in a laboratory scale. There have recently been some larger-scale experiments at **Bari University** in **Italy**. They built a large cannon that represents a volcanic conduit. They filled it with volcanic material, pressurized it and pointed the cannon up to let it erupt vertically. Sometimes that created pyroclastic flows. The other approach is computer modeling. We try to set up systems of equations that represent the physical processes important in pyroclastic flows. The problem is we have no way of validating those models unless we do the full-scale experiments.

Who will use the new geologic hazards facility?

We're setting it up using a user facility model. It's the same way that a facility like **CERN** in **Switzerland** is used. There will be infrastructure there that supports a variety of experiments. Anybody in the world who wants to take advantage of that to do a specific experiment could do that.

Will you do experiments on any hazards other than volcanoes?

We're starting off with an emphasis on volcanoes because there's a major gap there experimentally. That includes processes like mud flows and avalanches because those also occur in volcanoes. In the long term, we want this facility to be useful for a broader range of geological hazards.

Talk about the safety issues involved.

That's part of the reason we need a large area with the ability to be outside. The facility we're looking at is part of a 700-acre campus for field scale experiments. We can do explosions

outside and people can be far away. We can build [bunkers] for some experiments, so we can do the experiment in a more controlled environment.

You met this month with researchers from around the world to discuss the science needs and infrastructure priorities for the new facility. What's the next step?

We're putting together a report that summarizes the workshop. That's going to be going to the **National Science Foundation**, which funded a large part of the workshop. We'll be setting up an executive committee to have all these groups and countries represented [and to work on a funding strategy]. We have an online collaboration hub called **VHub**. We're going to use that as a platform for the results of the workshop. There will be a discussion board, so we can get ideas.

This is part of a bigger effort that's being led by the University at Buffalo. This field area is 700 acres. That's being designated as a campus at the University at Buffalo dedicated to large -scale experiments on topics related to extreme events. The geological hazards field station that we've been talking about is going to be one of several field stations at this campus. The others are going to be focusing on other issues and probably on an engineering perspective.

Image: Greg Valentine / By Douglas Levere, University at Buffalo

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