

# Newsletter

# Center for GeoHazards Studies

Spring, 2012

## Special points of interest:

### STUDENTS:

Interested in becoming more involved?

E-mail Sarah Ogburn at [seogburn@buffalo.edu](mailto:seogburn@buffalo.edu) to learn about the student committee.

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## Letter from the Director

This academic year has been a busy and productive one for the Center for Geohazards Studies.

Here are some recent highlights:

[Vhub.org](http://vhub.org), the cyberinfrastructure platform for volcanology research that is being developed in collaboration with the University of South Florida and Michigan Technological University, reached the mid-point of the initial project. A meeting of the VHub External Advisory Committee, chaired by **Dr. Chaitan Baru** (San Diego Supercomputing Center), resulted in much positive feedback about accomplishments to date and important recommendations to implement for the remaining two years of the developmental grant.



*Dr. Greg Valentine, in the field (2012)*

As of the writing of this article, there are over 800 registered users of **vhub.org**, representing a sizeable portion of the volcanology community. Major new international projects are adopting vhub as their online platform for collaboration, datsharing, and modeling. We continue to work with partner volcano observatories in Montserrat, Colombia, and Italy to enhance the platform for those with "boots on the ground" responsibility for hazard mitigation. If successful, the end of the four-year project will see the transition of governance of vhub.org to a body that represents the global research and hazard mitigation community.

**Geohazards Field Station** – The Center for Geohazards Studies was awarded a substantial grant, through a competitive internal process, to establish an international user facility for large-scale experiments related to geological hazards. This facility is being developed in collaboration with the **UB Multidisciplinary Center for Earthquake Engineering Research**, at the ECLIPSE Campus for Extreme Events Research in Ashford, New York. First experiments are slated to begin in July, and we are conducting a search for a Lead Scientist/Engineer and two postdoctoral researchers who will focus on getting the site up and running. Please visit [ubjobs.buffalo.edu](http://ubjobs.buffalo.edu) to learn more about the job search.

The RIT Information Products Laboratory for Emergency Response ([IPLER](http://ipler.org)) and the UB Center for Geohazards Studies are co-sponsoring a joint workshop on the application of remote sensing for disaster response and the science of geohazards, to be held at the RIT campus in Rochester, NY (30 May-1 June, 2012). Disaster can strike anywhere and

## Letter from the Director, *cont.*

at any time and place; however, our "geospatial response" to disasters can be improved through the use of remote sensing technology and knowledge of geohazard phenomenology. The RIT-UB IPLER program seeks to stimulate innovation in the remote sensing industry by (i) working with the disaster response community to understand their information needs and operational limitations, (ii) introducing them to the capabilities of remote sensing technology, and (iii) conducting research to improve our response to and mitigation of disaster events. Dr. Chris Renschler is the UB lead for this important workshop. More information can be found at <http://geohazards.buffalo.edu/conference/>.

The Center hosted two speakers for the Geohazards Seminar Series this year. **Dr. John Pallister**, who leads the US Geological Survey's Volcano Disaster Assistance Program, gave two presentations related to recent activity at Merapi (Indonesia) and Mount St. Helens (Washington, USA) volcanoes. **Prof. Kouichi Nishimura** (Nagoya University, Japan) spoke about glacial lake outburst floods, an important hazard in mountainous areas.

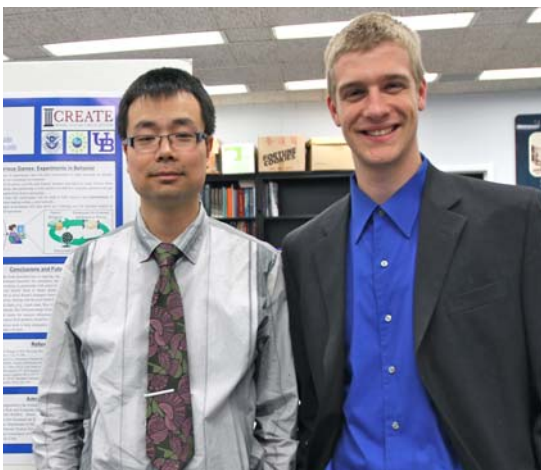
Center members are actively involved in several international organizations and initiatives, including the Executive Committee for the International Association for Volcanology and Chemistry of the Earth's Interior, the Management and Science Boards for the Global Volcano Model, and the collaborative group that forms the G-EVER1 network for earthquake and volcano risk mitigation in the Asia-Pacific region.

As we close out the 2011-12 academic year, we look forward to expanding the role of the Center for Geohazards Studies in interdisciplinary work related to the reduction of risk from natural disasters around the world. As always, please contact me or Shana DiCamillo ([shanadic@buffalo.edu](mailto:shanadic@buffalo.edu)) with ideas and suggestions; or if you are looking for potential interdisciplinary connections for ongoing or future research.

*Greg Valentine,*  
Director

## Faculty Research Update

**Dr. Jun Zhuang & PhD student John Coles**



Dr. Jun Zhuang (UB's Industrial and Systems Engineering) and his PhD student John Coles were recently recognized for two pieces of work, both related to hazards, at the Conference for the Society for Risk Analysis (SRA) in Charleston, SC. Mr. Coles was given two 2011 Student Paper Awards at the conference for work performed in partnership with Dr. Zhuang and the Army Corps of Engineers. The first award was from the Decision Analysis and Risk Specialty Group for a paper entitled, "Partnership Optimization Decision Support System (PODSS): Improving Partnership Development and Resource Allocation in Disaster Recovery Operations using Game Theory." This paper highlighted new techniques to develop heuristics for agencies responding to disasters using game theory and network analysis.

The second award was for work combining Decision Analysis techniques with Game Theory in counter-terrorism. The submission was entitled, "The Value of Knowledge-Based Decisions: Improving Terrorism Defense by Integrating Multi-Criteria Decision Analysis, Game Theory, and the Value of Information," and received the Student Paper Award from the SRA's Security and Defense Specialty Group. The authors have submitted extensions of each paper to journals where they are currently under review for publication. Both papers are available upon request from the authors.

## Faculty Research Update

### *When magma meets water – maar volcanoes and diatremes*

By Dr. Greg Valentine

Maars are intriguing volcanoes that are holes in the ground, rather than cones. In fact, the name “maar” is derived from the Latin word for “sea,” because the holes (craters) often contain picturesque lakes. In contrast to their placid appearance, the eruptions that produced maars are extremely violent, and result from hot magma (~1000 C) interacting explosively with groundwater. New research is shedding light on the energetics of these volcanoes and on the subsurface structures beneath them, which are known as diatremes. Nearly all volcanologists agree that maar eruptions involve many explosions, but some have suggested that the size of a maar crater is related to the single largest explosion. Because maars can be quite large, with craters of several hundred meters to a few kilometers in diameter, this conclusion implies tremendous energies in those large crater-determining explosions. For example, the Lunar Crater maar, about 1 km in diameter (Fig. 1A), would have required a single explosion energies of nearly  $10^{16}$  J, equivalent to about two megatons of TNT explosive. By comparing Lunar Crater maar with aspects of other small basaltic volcanoes, our work suggested that such high explosion energies demand unrealistic conditions of magma delivery and storage in the subsurface environment. Rather, it seems most likely that the large crater is the composite result of many small explosions, perhaps hundreds, which blasted material out but also disrupted the subsurface rocks in a manner that created significant subsidence.

Work in the past decade by colleagues such as James White (University of Otago, New Zealand) and his students (most notably Pierre-Simon Ross, Karoly Nemeth) has focused on the characteristics of diatremes (Fig.1B), which provide ample evidence for numerous small scale explosions. Many, perhaps most, of these explosions do not actually vent at the surface, but instead just break up and churn the rocks through which the volcano is erupting. The diatreme becomes a variably mixed mass of country rock and bits of quenched magma.

All of this raises the question, does maar crater size relate in any way to explosive energy released? The Center for Geohazards Studies is sponsoring a set of scoping experiments at the developing Geohazards Field Station at the ECLIPSE Campus south of Buffalo (see “*From the Director*” article). In July, we will prepare a set of test pits with layered materials such as sand and pea gravel. Each pit will experience a different sequence of explosions: (1) A single buried explosion with sufficient energy to make a crater ~1-3 m in diameter; (2) Three separate, successive explosions, each 1/3 of the energy of the first case, but all buried at the same location; and (3) Three separate explosions, each successively deeper than the preceding one. We will compare crater sizes, ejecta distribution, record the explosions with high-speed video, and then will excavate the underlying “diatremes.” The experiments will involve a large number of people with different instruments, and will provide a model for how large-scale experiments will work at the Geohazards Field Station. PLUS – fun science! Improving our understanding of how maar volcanoes work will allow us to better forecast the hazards that are associated with their eruptions.

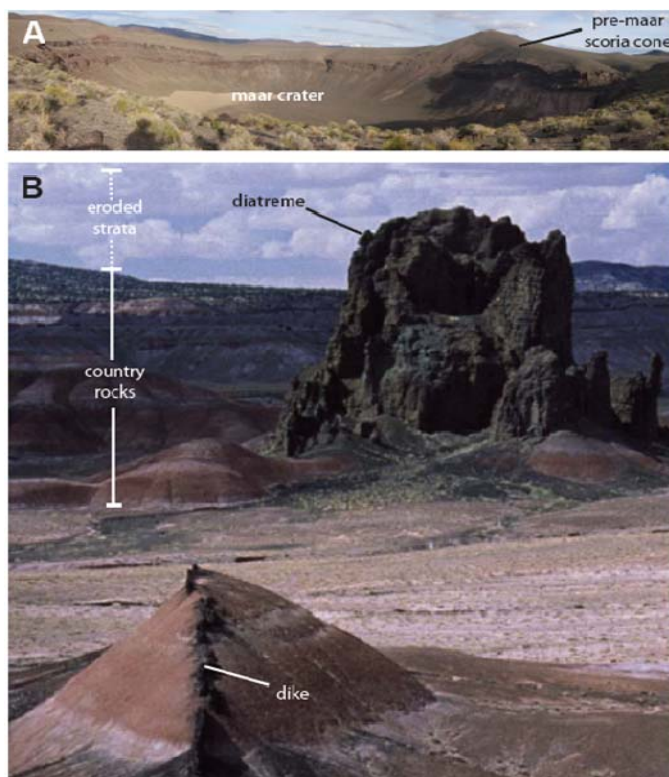


Fig 1A-Panoramic view of the 1-km diameter Lunar Crater maar (central NV). B-A diatreme that is preserved in an eroded volcanic area (Hopi Buttes, AZ) that exposes the “plumbing” of the volcanoes. (Photo by J.D.L. White)

## Student Research Grant Winners

Thank you to everyone who applied for a student research grant this year! We are pleased to announce the following recipients of funding for their strong, innovative proposals:

**Jessica Ball** (*Modeling fluid flow in lava dome hydrothermal systems*)  
**Solene Pouget** (*Improving early determination of ash cloud and simulations*)



The **Center for GeoHazards Studies** seeks to decrease harmful societal effects of natural phenomena such as volcanic eruptions, landslides, mudflows, and avalanches through research, service, and education.

Our team of scientists and engineers works together with social scientists, urban planners and public health researchers to evaluate the broader harmful impact of hazardous natural phenomena. One of our principal goals is to integrate analyses of various hazards with predictions of their effects on human infrastructure and ecosystems in order to evaluate approaches that could lead to a reduction of injury and death. Hazards that are affected or triggered by changes in climate are included within the Center's scope.

### **Special thanks to:**

#### **Board of Directors:**

*Charles Connor, University of South Florida*  
*Bernard Hubbard, U.S. Geological Survey*  
*William Rose, Michigan Technological University*

#### **Advisory Committee Members:**

*Marcus Bursik, University at Buffalo*  
*Eliza Calder, University at Buffalo*  
*Beata Csatho, University at Buffalo*  
*Abani Patra, University at Buffalo*  
*Chris Renschler, University at Buffalo*  
*Adel Sadek, University at Buffalo*  
*Michael Sheridan, University at Buffalo*  
*Natalie Simpson, University at Buffalo*

**Have changes to your employment, research interests, or contact information? Let us know at [geohaz@buffalo.edu](mailto:geohaz@buffalo.edu).**

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**Send your research updates to Shana DiCamillo to be included in the next newsletter or e-blast!**