Newsletter

Center for GeoHazards Studies

Spring 2019

Special points of interest:

STUDENTS:

Interested in becoming more involved?

E-mail Kailey DiemKaye at kaileydi@buffalo.edu to learn about the student committee.

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The Center for Geohazards is jointly sponsored at UB by the College of Arts and Sciences and by the School of Engineering and Applied Sciences.

Letter from the Director: Dr. Greg Valentine

The Center for Geohazards Studies has had a busy and productive year, including the following items:

- We co-sponsored the International Glaciological Society conference in Buffalo in June 2018. This conference brought together international leaders in glacier science under the coordination of faculty members from UB's Geology Department. The conference included among its topics discussions about the hazards posed by changes in glaciers and ice sheets, such as sea level rise.
- The Center is co-sponsoring the upcoming 2nd Conference on Risk Analysis, Decision Analysis, and Security, which is coming up in late July 2019. This conference will be held in Niagara Falls (the previous conference was in Beijing).
- The Geohazards Field Station's new experiments on interaction of magma and water, led by Ingo Sonder, garnered much media attention as a new journal paper was published. Ingo has been featured in local media and at the national (e.g., *New York Times*) and international levels (e.g., *Der Spiegel*).
- Speaking of the Geohazards Field Station, we held a very successful workshop with about 50 international participants in July 2018. The workshop used actual field-scale experiments, with subsurface explosions mimicking volcanic explosions, to both collect new scientific data and to work out how multiple disciplines can coordinate their data acquisition. The workshop was featured in the American Geophysical Union's newsletter (https://eos.org/meeting-reports/facilitating-field-scale-experiments-in-volcano-hazards), and a scientific paper about the integrated datasets is in progress. An upcoming episode of National Public Radio's science series "Maddy about Science" will focus on the workshop.
- The Center co-sponsored two speakers for our seminar series. Natalia Deligne (GNS Science, New Zealand) is a leading expert in volcanic risk, and she spoke about the hazards posed by volcanic fields and her work with emergency planners in the city of Auckland aimed at preparation for future eruptions. Mattia Pistone (University of Laussanne, Switzerland) spoke about his research aimed at understanding whether a volcano will erupt explosively (dangerous!) or quietly emit lava flows (also dangerous, but can be walked away from).
- The Center's graduate student research grant program sponsored two student field projects. One focused on one of the cascade effects of the 2011 Tohoku earthquake in Japan. The earthquake and its tsunami damaged a nuclear power plant, which then leaked radiation into the surrounding environment, and this was the topic of Geography PhD student Misa Yasumiishi's project. A second project was conducted by Geology MS student Tyler Smith, and focused on understanding lava flow emplacement at a volcano in Idaho.

More details on the above are provided in this Newsletter. Finally, I'm very pleased to announce the awardees of the 2019 Geohazards graduate research grants (the response to the call for proposals this year was strong and resulted in proposals from several disciplines), Puneet Agarwal (Industrial Systems & Engineering) and Meredith Cole (Geology). Below are summaries of the proposals written by the proposal review committee (Chris Renschler, Ingo Sonder, and Bea Csatho).

- The committee was impressed with Puneet Agarwal's proposal entitled "Interplay of Online and Offline Social Networks for Rumor Spreading and Debunking during Hurricane Florence". The proposed research aims to study the interplay and dynamics of online and offline social networks in diffusing and debunking misinformation. It further investigates the impact misinformation has on local residents and stakeholders affected by a hurricane and attempts to identify how the interplay of these multiplex networks can be used to benefit rumor control and emergency response efforts.

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Continue from page 1 (Letter from the Director)

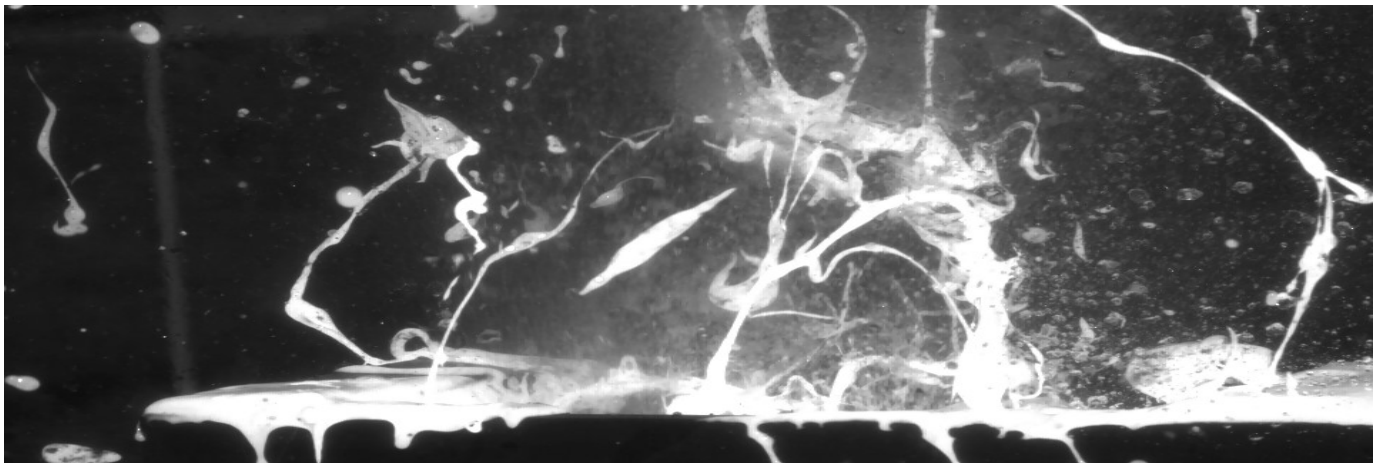
The results of this study will have an impact in providing valuable insights to policy makers and emergency responders with respect to mitigating the contagion of misinformation in online and offline environments utilizing effective rumor control and debunking strategies. The proposal was clearly written and the committee members evaluated that the proposal plan is feasible as presented. The three committee members also agreed that the proposed research will enhance the applicants career in gaining a PhD degree in Industrial & Systems Engineering advancing also other disciplines of research relevant to Geohazard Studies.

- Meredith Cole's proposal stood out in terms of clarity of the proposed project activities and its applicability to improve our understanding of caldera forming eruptions. The committee is excited to support her project titled "Caldera Vent Structures: Insights from Grizzly Peak caldera, CO, and Gabbs Valley caldera and Quinn Canyon Range, NV". It will investigate evidence of the interaction of eruption jets in caldera forming events with its own, previously deposited, caldera filling material. Such interaction could cause many of the observed complexities in the massive deposits that extend hundreds of kilometers from its source. Caldera formations are particularly hard to investigate due to the physical extent, and the age of their deposits. Their size makes them a large potentially global threat, and that puts the topic in the focus spot of Geohazards studies. Cole is very well prepared to conduct the studies she proposed, which consist of precise field studies, careful analysis and integration with existing or new models. The funding will support parts of Cole's field studies and analysis, which are part of her PhD project. The committee is convinced that her contribution to the field will be significant.

These two proposals were selected from a field of interdisciplinary proposals that were all quite interesting. Congratulations Puneet and Meredith!

-Greg Valentine

Research Update: Geohazards Field Station



Example of medium intensity magma-water interaction activity. The video snapshot shows melt fragments, water, and steam as they exiting the interaction container vertically.

First Results of Magma-Water Interaction Research at the Rock Melting Facility *By Dr. Ingo Sonder*

After initial construction and testing period, first results on intense interaction of magma and water were summarized in an article of the Journal for Geophysical Research (doi: 10.1029/2018jb015682). The results are promising, and show that the chosen experimental design is working well. We get significant interaction intensity variations depending on melt-water mixing speeds, melt column height and, to a lesser degree, water amount. Challenges that had to be overcome include the development of an interaction container that is reusable, withstands melt temperatures of >1,350 °C, and ensures that thermally induced deformations are small enough to allow for a robust design of water injection portals through the container side walls. Ongoing challenges are an improved sensor integration into the container assembly, and progress with collection of ejected material, specifically the fine part. Experiments will continue this year in a slightly modified setup, addressing non-homogeneous magma-water mixing location scenarios.

Student Research Award Recipient - Tyler Smith

"Inflated flow emplacement and eruption duration at Rock Corral Butte, Idaho"

The most abundant type of volcano on Earth's land surface is monogenetic scoria cones or small shields. Monogenetic volcanoes – which erupt only once before going extinct – are commonly found within volcanic fields, some of which are located near major populations around the world and are still considered active today. The Eastern Snake River Plain (ESRP) in southern Idaho contains hundreds of monogenetic basaltic volcanoes, and the most recent eruption was <2000 years ago, meaning the ESRP is still volcanically active. These monogenetic volcanoes are poorly understood, especially regarding their lava field emplacement, which is relevant to volcanic risk assessment for nearby communities. Rock Corral Butte (RCB) is a monogenetic shield in ESRP that erupted ~55,000 years ago, and provides an excellent opportunity to analyze and interpret basaltic lava flow-field emplacement. For this project, I analyzed and interpreted the RCB lava flow-field in terms of surface morphology, lava petrology, and modeling of eruption and emplacement parameters such as flow velocity, eruption duration, and lava-flow cooling rates. My work reveals how lava surface features can be used to reconstruct complex flow histories, as well as gain greater insight into the eruption styles and durations for hundreds of other volcanoes in the ESRP and other volcanic fields. Through funding from the Center for Geohazards Studies, a 4-day field campaign was mounted, and 15 thin sections were made from samples collected from the field. With field assistance from Dr. Tracy Gregg (UB), Dr. Susan Sakimoto (SSI) and her son Elliott, I was able to investigate both the proximal and distal regions of the RCB lava field for which there is no adequate geographic data. I am thankful to the Center for Geohazards Studies for supporting my field work that was crucial to this project.

Photo of Tyler Smith at Rock Corral Butte in Snake River Plain of Idaho.

Student Research Award Recipient - Misa Yasumiishi, Ph.D. Candidate

"Soil research in Fukushima, Japan: Assessing radioactive contamination levels and Distribution patterns"

In March 2011, strong earthquakes and large tsunamis hit northeastern Japan on the Pacific Ocean side. The disaster is now called, 'The 2011 Tohoku Earthquake and Tsunami.' The Fukushima Daiichi Nuclear Power Plant is located on the coast. The loss of power at the plant due to the tsunamis led to the meltdown and subsequent hydrogen explosions that spewed radioactive elements into the atmosphere. What the Fukushima region experienced, was a combination of both natural and man-made disasters.

Much research on radioactive contamination has been done following the Chernobyl Nuclear Power Plant accident in 1986. The knowledge gained from that research has helped the Japanese researchers cope with problems from the nuclear disaster in Fukushima. However, there have been some challenges because of the differences in the climate, topography, geology, vegetation, and land use in the Fukushima region, versus those in the Chernobyl region.

Japan is located in the Ring of Fire, a tectonically active zone, and the geology in the Fukushima region is mostly composed of Paleozoic metamorphic rocks and Paleo-Mesozoic igneous rocks (Forest Management Center. 2017). The mountains in Japan are not as high or as rugged as those mountains in areas such as the Swiss Alps, but are low-rising mountains with streams that create microtopographies throughout the region. These mountains are covered with deciduous and conifer trees, and litter accumulates on the forest floor. Soil types in my study site vary from dark to brown forest soils, mineral soils, and volcanic ash-originated soils, called Kuroboku, or Andosol, among them. The annual rainfall in the area exceeds 1,000 mm and the area also experiences intensive rainfall during the rainy and typhoon seasons. In my study site, the soil texture is rather sandy such as sandy loam or loamy sand.

The focus of my research is to identify the current distribution patterns of radionuclides, specifically Cs-137, in my study site, in this particular climate and topography, and determine what factors have affected those patterns. My study site is located about 20 miles northwest of the nuclear plant and is about 0.2 square miles in size. The site consists of former rice paddies and forests. Since my discipline is geography, I am attempting to apply GIS concepts to my research methods.

It now has been eight years since the initial fallout in Fukushima, and most of the Cs-137 is still concentrated in surface soil layers because radiocesium becomes adsorbed to clay structures by its positive charges. However, the Cs-137 in the Fukushima region appears to have migrated downwards into the soil faster than in the Chernobyl regions. In one-quarter of my samples, 90% of Cs-137 concentration is spread across a more than 10 cm depth. This indicates a faster downward migration compared with the samples from the Chernobyl affected regions over the same time period after the Chernobyl accident (Ivanov et al. 1997). Also, the effect of elevation and slopes on Cs-137 concentration patterns is smaller than I had expected, possibly because of the downward mobility of Cs-137 and the intense rainfall which washes off the surface soils in one precipitation event with force. But there are many more factors that I still need to look into. I am hoping that findings from my research will contribute to radioactive contamination assessment and mitigation in future incidents.

Photo of study site in Iitate Village, Fukushima, Japan (August 2018)

Upcoming Events : Conference on Risk Analysis, Decision Analysis and Security

WORKSHOP ANNOUNCEMENT: The Second Conference on Risk Analysis, Decision Analysis, and Security in Buffalo/Niagara Falls, NY, USA, July 30 - August 2, 2019.

Website: http://www.eng.buffalo.edu/~jzhuang/Conference13/index.html
Conference Chair: Dr. Jun Zhuang (University at Buffalo) and Dr. Chen Wang (Tsinghua University)

Following the successes of the First (June 23-26, 2013) and Second (August 2-5, 2015) Conference on Validating Models of Adversary Behavior, Buffalo/Niagara Falls, NY, and the First Conference on Risk Analysis, Decision Analysis and Security, in Beijing, China, July 21-23, 2017, we are organizing the Second Conference on Risk Analysis, Decision Analysis, and Security in Buffalo/Niagara Falls, NY, USA, July 30 - August 2, 2019. The 2019 conference will focus on the theme "Risk Analysis in the Digital Era." We are also organizing a special issue of the journal *Risk Analysis* (latest impact factor: 2.898) on the same topic: http://www.eng.buffalo.edu/~jzhuang/Papers/CFP_RA_Digital.pdf. This conference seeks submissions that conduct cutting-edge research on the rich possibilities of harnessing high-volume, high-dimensional, multi-source, and/or multi-modal data to give insights for risk assessment, risk communication, and risk management. We also welcome perspective papers discussing the scope and limitations of big data risk analytics, including managing extreme events, causality vs. correlation, and privacy, legal and ethical issues. Key areas of focus include, but are not limited to:

- Adversarial behavior analytics in homeland security
- Data-driven food safety analytics
- Aviation risk analytics with flight recorded data
- Risk analytics in humanitarian logistics
- Big data-driven optimization models
- Predictive analytics for risk assessment and risk management
- Disaster management with big data
- Blockchain risk analytics
- Social media and risk analysis
- Cyber security and risk analysis
- Artificial intelligence and risk analysis
- Machine learning and risk analysis
- Virtual reality and risk analysis
- Internet of things and risk analysis

Past Events - IGS Symposium

Local Organizing Committee: From left to right: Dr. Jason Briner, Dr. Kristin Poinar, Dr. Bea Csatho and Dr. Elizabeth Thomas

On June 3-8 2018, the climate group in the University at Buffalo Geology Department hosted an international climate meeting focusing on glacier dynamics. The International Glaciological Society (IGS) facilitated the event, which brought together about 80 glacier researchers at all career stages. The topic of the symposium was "Timescales and Processes of Glacier Dynamics", which was chosen in an effort to draw from the full, diverse set of glacier and ice-sheet research areas – Arctic and Antarctic glaciology, paleo perspectives, oceanography, geomorphology and glacial geology, cosmogenic dating, earth-system sciences, and.

Highlights of the IGS Symposium were public presentations by famed polar explorer Sebastian Copeland, American Geophysical Union president Robin Bell, and science communicator and podcast producer Shane Hanlon. The program was completed with 55 oral presentations, 26 poster presentations, and networking events and field excursions throughout the week. The conference supported attendance of >20 early-career researchers, who reported benefits related to networking, learning new science, geology of the field trips, science communication, diversity, methods of international science, interdisciplinary crossover, and new collaborations.

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Center for GeoHazards Studies

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.

Send your research updates to Barb Catalano (bac6@buffalo.edu) to be included in the next newsletter or e-blast!

Special thanks to:

Advisory Committee Members:

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Amit Goyal, Research and Economic Development
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