



TEXAS TECH UNIVERSITY
Department of Geosciences™

Caprock Connections

Spring 2019



Dr. Seiichi Nagihara Contributes to the [NASA InSight Mission](#) to Mars

Dr. Seiichi Nagihara traveled to Pasadena, CA to rehearse operations of the InSight lander on the testbed at JPL. This image shows the mock-up craft with robotic arm hovering over the seismometer (orange) and heat flow probe (black). Once the operation is perfected, NASA will uplink the command to Mars. The testbed replicates the topography of Mars based on camera observations.



Dr. John Schroeder Named Senior Director of National Wind Institute

Professor Schroeder will also serve as the Technical Director for Prediction and Measurement, one of the three areas of [NWI](#) research excellence.



Alumni Reception at AAPG

The College of Arts and Sciences will be hosting an alumni reception Monday May 20, 2019 5:30-7:30 PM at the Grand Hyatt San Antonio 600 E Market Street Bonham C Ballroom, in conjunction with AAPG convention in San Antonio. All alumni in central Texas and conference attendees welcome.

Student Leadership Report: Leadership is found everywhere

by Emily Glaeser, Graduate Student (Geography)

This past January, I was honored to be apart of the [YouthMappers](#) Leadership Fellowship in Pretoria, South Africa. The goal of the fellowship was to train students in open mapping techniques that would then be implemented at their local chapter activities. The fellowship also provided an opportunity to receive professional development and leadership training while networking with local community leaders, international experts, and their counterparts from YouthMappers chapters. Twenty-two students, out of 100 qualified applicants, were selected from all over the world and they represented 15 different countries.



During the morning sessions, students attended presentations on various topics to gain knowledge, identify challenges, and understand how to solve those challenges using a variety of techniques. In the afternoons, the presentations were more hands-on, either in the lab or field. Throughout the trip the students were taken to informal settlements at the base of South African Mountains called “Alaskas” as well other cultural attractions such as a museum, a cave and the Pilanesberg National Park. Visiting and the sub-community within the Alaska helped students learn about different community living-styles in addition to demonstrating how these unplanned settlements present challenges when being mapped by YouthMappers. The museum and cave expanded our knowledge of the region and offered a bit of adventure. The fellows chose Pilanesberg National Park so we could experience the regional wildlife.

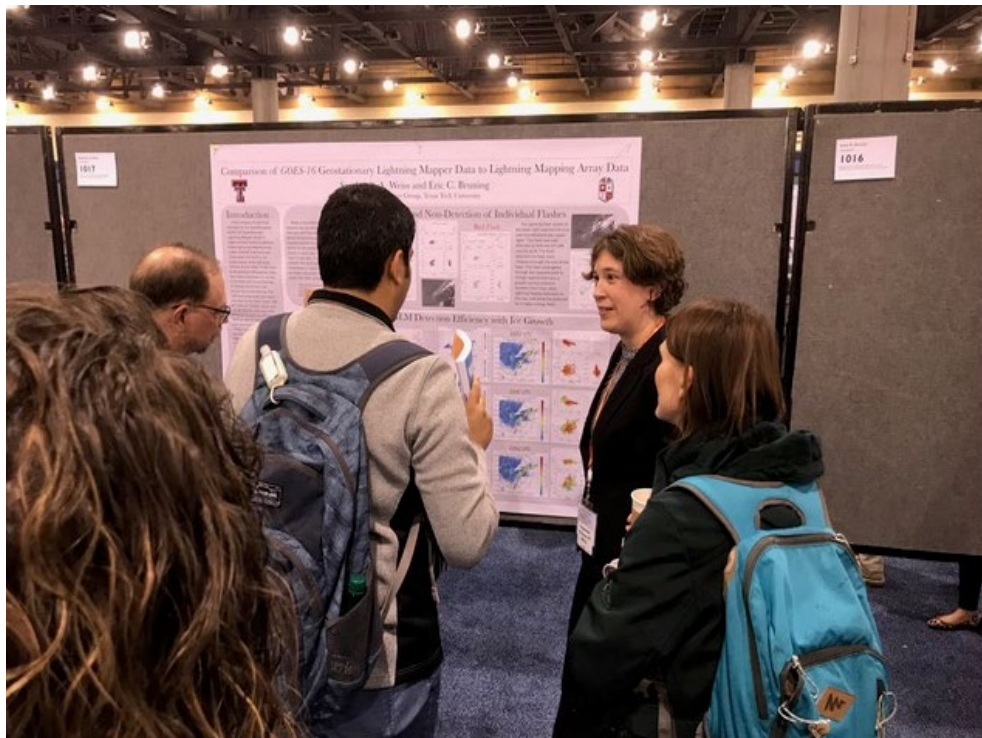


Using leadership skills, the students brainstormed ideas on how to answer questions like: How to keep YouthMappers chapters sustainable and How can YouthMappers events be more interactive and fun. Throughout the training, the students learned how to support and implement the presentation topics and discussion to better their local, as well as national and regional, community and chapter(s). At the end of the fellowship, students presented to the students and staff their idea of how to grow YouthMappers. These ideas could be individual, such as "How can my chapter connect more with other chapters around the world?" , or more broad. My presentation was over student-led language translation/interpretation for OpenStreetMap tutorials and the YouthMappers website. I plan on interpreting English into American Sign Language, ASL, with the disclaimer that "I'm not a certified interpreter but this interpretation is to offer accessibility to people who use ASL as their primary language."



Geosciences Student is the Current Outdoor 400m Hurdles Champion

Undergraduate Geosciences major, [Norman Grimes](#), works hard in the classroom and on the track. In addition to his individual title, the [TTU Track and Field](#) team has also won the BIG12 Title for the past three seasons: Indoor 2019, Outdoor 2018, and Indoor 2018. Wreck 'em Tech!



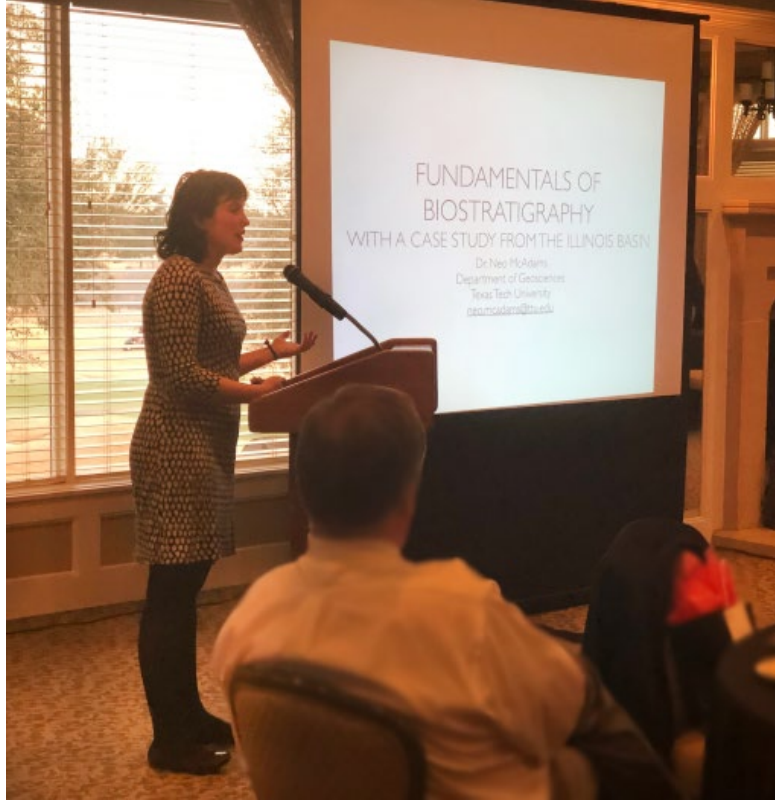
Faculty and Students present at the 99th American Meteorological Society Meeting in Arizona

Stephanie Weiss (Research Associate in Atmospheric Sciences) presents a poster at AMS (pictured above). Oral presentations were given by graduate students Abby Hutson, Austin Coleman, Alex Schueth and Jessie McDonald.



Recent Alumni Snapshot

Current students and faculty meet up with recent alumni at AMS Meeting in Arizona. From left to right: Abby Huston, 2nd left (current student); Dr. Chris Weiss, 4th (professor); Dr. Tony Reinhart, 5th (PhD ATMO 2016); Dr. Vanna Chmieliewski, 6th (MS ATMO 2013; PhD 2017) and Dr. Jenni Vanos (former TTU faculty) on far right.



Women's Energy Network Presentation

By: Neo McAdams, Assistant Professor

In March, I gave a presentation called “Fundamentals of Biostratigraphy, with a Case Study from the Illionois Basin” to the Women’s Energy Network Midland Chapter. This was their first annual Energy Fundamentals and Fashion networking event. WEN is a professional society for women in all areas of energy business. The goals of my presentation were to demystify how biostratigraphy works and what its uses are, and show a real life example of biostratigraphic correlation with my research on the Silurian of the Illinois Basin. While networking I learned more about non-geology jobs in the petroleum industry as well as the deep Texas Tech alumni network in West Texas. It truly was a wonderful experience to participate in a thriving women’s professional society event. I look forward to finding more ways to network and collaborate with industry professionals.



Congratulations to the TTU Geosciences IBA team for taking 3rd place at the Southwest Section AAPG Imperial Barrel Awards. Team members from left to right: Elyas Ainiwaer, Cameron Ramsey, Austin Bertoch, Taylor Newton, and Valerie Tewell. Advisors not pictured: Dr. Dustin Sweet and Dr. George Asquith.



Departmental History

Virginia Clair

Pilot, Geologist, Officer, Benefactor

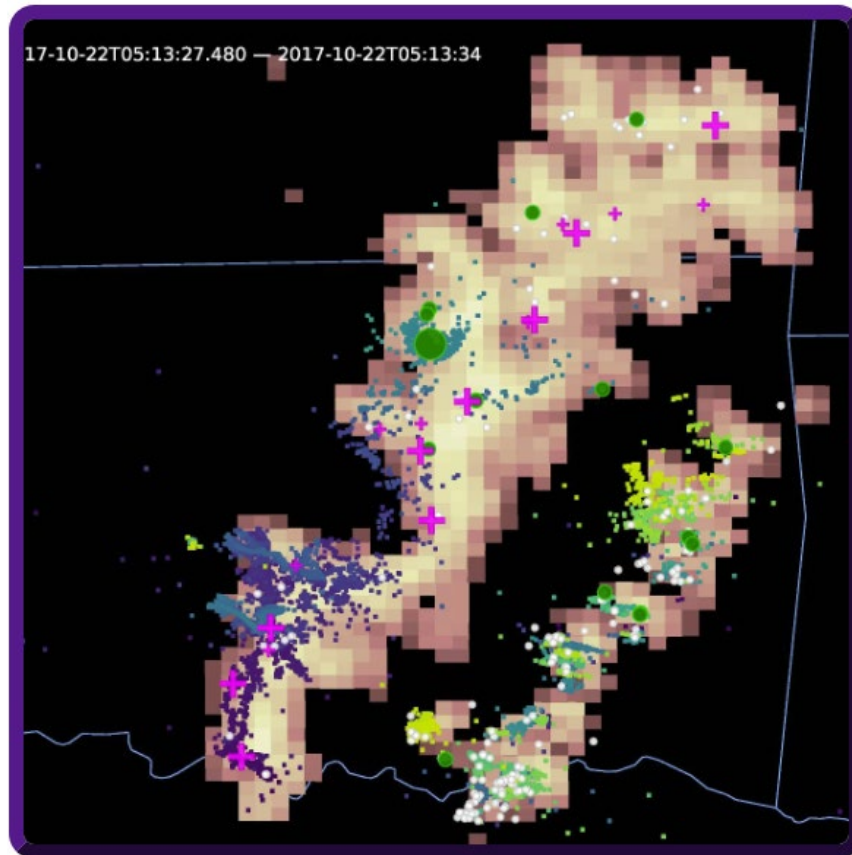
Virginia Clair earned a Master's degree in Geology in 1950 from Texas Technological College and before her death in 1991 she made provisions to establish an endowment of more than \$275,000 in the Department of Geosciences. Per Ms. Clair's wishes, this endowment has been instrumental in funding graduate research in geology for nearly 30 years.

Virginia grew up in Wichita Falls, Texas and had a passion for flying at an early age. In fact, she learned to fly before attending Texas Tech as an undergraduate to study Business Administration. She graduated from Tech in 1941 with her BBA degree and during her college year's she continued to fly, receiving her commercial license in 1943.

Ms. Clair was one of the first volunteers for the Women's Airforce Service Pilots (WASPs) and was part of the first class of women to train at Sweetwater's old Avenger Field. She later noted, "The ink was hardly dry on my commercial pilot's license when I heard about the WASPs and put in my application". During World War II she went on to serve her country in as a Captain USAFR WASP's flyer. The WASP's flew a variety of aircraft such as the P-40 Pursuit, P-47 Pursuit and C-47 Cargo transport mostly to ferry aircraft within the United States, freeing up men for overseas duty. The WASP's operated from 1942 to 1944 which was a federal civil service organization and did not qualify them for military benefits. In 1977, they were granted veteran status and in 2009 they were awarded the Congressional Gold Medal.

After her service to the country, Virginia Clair returned to Texas Tech for graduate study in Geology. Her Master's thesis *Some Fusulinidae from San Miguel County, New Mexico* remains in the thesis collection in the Department of Geosciences. Upon graduation, she worked as a petroleum geologist at Reno Oil Company in Wichita Falls, Texas. Later, Virginia became an electronic communications expert and instructor at Sheppard Air Force base, located just north of Wichita Falls, until she retired from civil service.

Science Report



Screenshot of WTLMA data-click image to open full data set.

We are all familiar with the spectacular lightning strikes to ground that accompany thunderstorms, but there are 5-10 times more lightning flashes inside the cloud! The West Texas Lightning Mapping Array (WTLMA), a network of radio receivers in and near Lubbock county, allows us to map out 100s or 1000s of points along the lightning channels for every flash in the storm. For most flashes, the lightning channels extend about 5-10 mi horizontally. The largest reach in excess of 100 miles, and near the updraft of storms there are many that are less than a mile wide.

The lightning research group at Texas Tech University found evidence that the smallest lightning flashes are found near the storm's updraft. The updraft is a region of fast upward motion in storms that is also very turbulent. The turbulence causes many small flashes because the gusty motions chop up the distribution of electricity in the cloud. More, small flashes happen when the updraft increases. In contrast, the regions with the largest flashes are found in regions of relatively smooth, primarily horizontal motions. To better understand the physics behind

these observations we have been comparing flash rate and size information to turbulence measurements using the TTU Ka-band mobile Doppler radars. Our basic research, funded by a 5-year award from the National Science Foundation, has helped establish this sound understanding of the basic science relating lightning to the rest of thunderstorm meteorology.

One of the byproducts of our basic science studies was a set of data displays that helped to visualize where large and small flashes happened in thunderstorms. In the last year, we applied our physical insights and method of summarizing flash rate and size data on maps to brand new measurements by the Geostationary Lightning Mapper on NOAA's next-generation weather satellite system. The WTLMA served as a validation dataset that verified the performance of the satellite system. Furthermore, we rapidly translated our fundamental research into displays and training material that filled a gap for the US National Weather Service. Weather forecast offices nationwide, including the Lubbock office, are using these products designed right here at Texas Tech.

The public is served through better monitoring of thunderstorms as a result. Changes to a storm's updraft drives the weather produced by a storm, including severe weather, so severe storm warnings benefit from lightning data that update each minute and depict fluctuations to the updraft. As larger lightning flashes develop later in a storm's life, depicting their extent helps to map out the total area under threat from lightning strikes and enhanced public safety.

Scenes from the Past and Present



Field Class of 1930



Field Class of 2018

Current Student Spotlight: Austin Coleman shares a snapshot of a day at NOAA's Hazardous Weather Testbed

Occupational Hazards: Texas Tech's Participation in the Hazardous Weather Testbed

By: Austin Coleman (M.S. Student)

On any typical spring day in May at the National Weather Center in Norman, Oklahoma, there's more brewing than just storms and coffee. Up the stairs and to the left one walks into a glass room abuzz with the exchange of ideas from one of the most professionally diverse group of meteorologists in the world. This is the NOAA's Hazardous Weather Testbed Spring Forecasting Experiment, and this May will mark its twelfth year of conduction. In a nearly literal realization of research to operations, the HWT SFE brings together meteorological researchers and forecasters alike to put a suite of cutting-edge forecast products to the test - by using them to forecast severe weather in real time! Divided into two programs, the Experimental Forecast Program and the Experimental Warning Program, this effort is pivotal to the improvement of forecasts on multiple time scales, from increasing tornado lead times to improving the spatial accuracy of 24-hour hail forecasts.

I first experienced the HWT SFE Experimental Forecast Program last May, although my advisor's (Dr. Brian Ancell) research group has been participating regularly over the past five years. Brian, Aaron Hill (TTU PhD student), and I led

evaluation on a product we developed to improve computer model forecasts of hazardous weather at 12- to 48-hour lead times. The technique uses a data mining approach to siphon out early forecast aspects relevant to the prediction of a later high-impact weather event and uses that important information to improve the model forecast. Up to that point my research focused on verifying and optimizing the technique objectively, and seeing the product evaluated from a forecasting perspective was truly eye-opening!

Every week, a new group of forecasters and researchers participated in the program, bringing new perspectives along with them. After explaining how the product works, we would identify the “forecast problem of the day” and focus the post-processing technique on that geographical region. The next day, we verified the forecasts together by comparing the performance of pre-processed Texas Tech model forecasts (link to the TTU system below) with our post-processed model forecasts and discussed the differences. Oftentimes, participants were interpreting and using the technique in ways that I had not previously considered. The diversity of perspectives was instrumental in going forward with the technique and solidified how crucial interdisciplinary perspectives are to a scientific conversation. This year, we return to the HWT with a similar product applied to a much broader suite of models called the CLUE (or the Community Leveraged Unified Ensemble – we meteorologists really do love our acronyms), and with potential for an active severe weather season, I am sure fascinating discoveries await!

The Hazardous Weather Testbed represents an innovative path towards the ultimate end goal of saving lives and property. By bringing researchers and forecasters into one room for an extended period we can better identify the shortcomings in current forecasting and warning techniques, explore proposed solutions to forecasting challenges, and push the boundaries of science. And of course, would it truly be a forecasting experiment without spending some time experiencing the storms being forecast?



Hands-on activity with discussion of aquifers and groundwater

“Water, Water, Everywhere” STEM Outreach

While West Texas may be geologically best known for the productive oil and gas deposits of the Permian Basin, environmental geology is also an important component of our economy, lives and deeply intertwined with the petroleum industry. In oil-rich, dust-blowing West Texas, we have a shortage of water in terms of both precipitation and surface water. The treasured Ogallala aquifer continues to decline, resulting from decades of over-withdraw. Impacts of urban development and industrial activities on the environment have become palpable, including natural occurrences of toxic elements and contamination by manmade chemicals in soils and groundwater. Additionally, the petroleum industry uses significant amounts of water for exploration and development of reserves, collectively known as the Energy–Water Nexus.

In order to meet these competing needs it is necessary to educate and train a new generation of diverse geoscientists with broad skills in Geosciences. The Department of Geosciences is addressing this need through public outreach and enhancements to the undergraduate curriculum.

Recently, a group of Geosciences faculty (Dr. Moira Ridley, Dr Juske Horita, and Dr. Neo McAdams) and volunteer students (Alex Washburn, Raven Landers, Karen Yao, and Shanice Diniz) hosted a one-day Tech

Savvy workshop titled '*Water, Water Everywhere*'. Tech Savvy is a STEM (Science, Technology, Engineering, and Mathematics) outreach program for middle-schools girls. The '*Water, Water Everywhere*' workshop focused on water and environment related issues in West Texas. Twenty-three middle-school girls from as far as away as Fort Stockton attended the workshop as well as an eager 8 year-old participant, Taylor, whose father was one of the graduate student presenters.

The workshop included an introduction to the water cycle and hands-on activities depicting groundwater and aquifers, mixed with lively discussions and interactions between faculty, student instructors and the girls. The workshop closed with an important discussion of water conservation. We plan to continue this new Tech Savvy workshop for middle-school girls, hoping that they may choose water and environment related subjects at high schools, and perhaps one-day a major in Geoscience here at TTU or another institution.

In 2017, the undergraduate BS in Geosciences was expanded to include a concentration in Environmental Geology. The department's desire to meet increasing demand for students pursuing careers in environment geology prompted the introduction of this new concentration. We added new senior-level course in Hydrogeology, which is currently taught by Dr. William Asquith (son to emeritus Dr. George Asquith) of USGS Texas Water Science Center in Lubbock, TX. Dr. William Asquith holds a Ph.D. in Geosciences as well as a Ph.D. in Civil Engineering and is an adjunct faculty member.

We are excited to announce that our first Environmental Geology BS student will graduate in May 2019 and roughly, 10% of the current undergraduate students have chosen this track. While a plurality of TTU Geosciences students continue to be interested in careers in the petroleum industry, we believe the new concentration is complimentary to providing the broad skills necessary in the field of Geosciences. A number of our graduates are successfully finding careers in industry and agencies related to environmental geosciences.



Alumni Spotlight: Chloe Beddingfield Ph.D.

Chloe Beddingfield is a native Texan from Austin who enrolled in Texas Tech University in fall 2007 and graduated in Spring 2010. She earned a Bachelor's in Geosciences: Geology with a Chemistry minor. While at Texas Tech, Chloe's undergraduate research project with Dr. Aaron Yoshinobu involved investigating the tectonics and geomorphology of features on Saturn's moon, Enceladus.

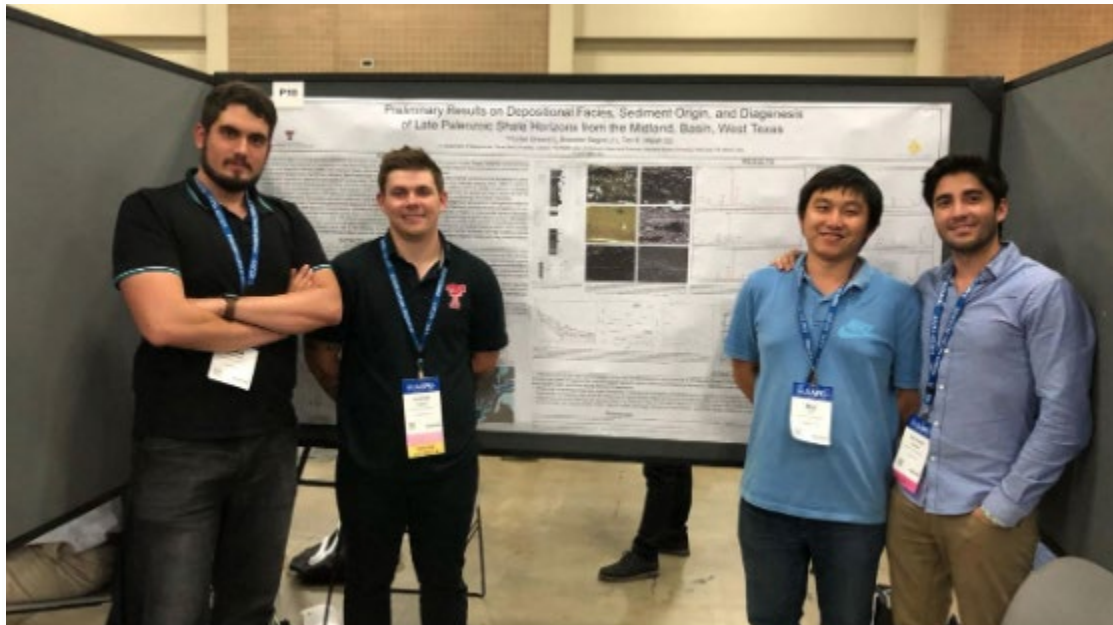
After leaving Texas Tech, Chloe accepted a research assistantship at University of Tennessee where she received her Ph.D. in Geology in summer 2015 under the mentorship of Dr. Devon Burr. Their research included the investigation of impact craters and geodynamics of the Uranian and Saturnian icy moons (Miranda, Dione, Tethys, Rhea). Following the completion of her PhD, Chloe then spend two years as a post doc with Dr. Jeff Moersch and Dr. Hap McSween studying thermal properties of impact craters on Mars using the THEMIS (Thermal Emission Imaging System) instrument onboard the Mars Odyssey spacecraft.

Currently, Chloe works for NASA as Research Scientist at The SETI Institute and NASA Ames Research Center in the Bay Area, California where she started in a CO-OP position. Being a research scientist allows for her to be involved with NASA mission work with the New Horizons extended mission to Kuiper belt

object MU69 (Ultima Thule) and the OSIRIS-REx mission to asteroid Bennu. Chloe uses processing techniques to enhance available spacecraft images to derive digital elevation models of surfaces, and derive shape models of irregular bodies to carry out her research while contributing to other projects. In addition, she is working with the Regolith Development Working Group mapping regolith using the most recent OCAMS (OSIRIS-REx Camera Suite) images of asteroid Bennu as well as identifying other geologic features on Bennu.

As a member of the New Horizons team, Chloe has helped develop a method to create a shape model for Ultima Thule. Other recent work includes investigating mass movement features on Pluto's moon Charon. She investigated the properties of large landslides on Pluto's moon Charon and found they are “long run-out landslides” which underwent friction reduction during motion.

Recent Event Snapshots



Graduate students attending and presenting at AAPG ACE in San Antonio. Left to right Luke Badurina, Hunter Green, Rui Liu, Giovanni Zaroni.



TTU Geo alumni, graduate students, faculty and staff attending the 2019 North American Workshop on Laser Ablation in Austin. Left to right Dr. Melanie Barnes, Jeff Oalman, Kevin Werts, Shane Dailey, and Dr. Kate Souders and Dr. Paul Sylvester.



TTU Students presenting at GSA Cordilleran Section Meeting in Portland, Oregon.
Katie Gates left, Shane Dailey right.

Field Camp Videos



Click the picture to view our recent Field Video from Canon City.

Donate to the [Geology Field Camp Scholarship Fund](#)



Click the picture to see graduate students study carbonates in San Salvador.