2016 MSEIP Colloquium

Final Program

Date: Friday, December 2, 2016
Time: 1:00 pm to 5:00 pm
Where: MS 2.02.54

Dear students and mentors:

Thank you for taking time from your busy schedule to contribute to the success of the MORESE Program. The colloquium contains 12 oral presentations. The content covers a diverse spectrum of contemporary topics from geology, environmental science, and civil engineering. Four Ph.D. students from the Environmental Science and Engineering program will serve as a judge committee to evaluate all the presentations. Each talk will be 15 minutes maximum including questions/answers. The judge committee will evaluate the first, second, and third best presentations in terms of overall quality and professionalism. Cash awards will be given for the first place ($250), second place ($150), and third place ($100).

Judge Committee:

Seyed Ehsan Omranian – ESE PhD student

Christopher Ray – ESE PhD student

Shuang Xia – ESE PhD student

Vahid Zarezadeh – ESE PhD student

Colloquium Program

	Presenter	Mentor	Title
Climate Change and Environment			
1:00-1:15 pm	Ilana Casarez	Stephen Ackley	Methods of Analysis on Icebreaker-based Image Datasets of Arctic Sea Ice
1:15-1:30 pm	Alexander Rodriguez	Stephen Ackley	The Study on Hailstones Collected from the $1.4 Billion Historic Texas Hailstorm
1:30-1:45 pm	Michelle Ortiz	Lance Lambert	Investigation of Community Paleoecology to Better Understand Depositional Parameters of the Finis Shale in Jacksboro (Jack County), Texas
1:45-2:00 pm	Jose Silvestre	Judy Haschenburger	Assessing Bank Erosion Potential in the San Antonio River
2:00-2:10 pm	Break		
Environmental Engineering			
2:10-2:25 pm	Manuel Barrera	Jie Huang	LIGNIN : Building Material Recycling
2:25-2:40 pm	Jacob Holguin	Samer Dessouky	Novel Approach to Harvest Thermal Energy from Asphalt Pavement Roadways
2:40-2:55 pm	Lauren Orona	Heather Shipley	Determining the Charcoal in Mineral Soil after a Wildfire
2:55-3:10 pm	Yajaira Costilla	Hatim Sharif	Impact of Weather on Crashes on Texas Roadways
3:10-3:20 pm	Break		
Environmental Reconstruction			
3:20-3:35 pm	Daniel Smith-Salgado	Blake Weissling	Sea-ice Thickness Study
3:35-3:50 pm	Kuzipa Kapayi	Marina Suarez	Carbon Isotope Chemostratigraphy from Mid Cretaceous Lacustrine in Northwest China
3:50-4:05 pm	Adrianne Lopez	Marina Suarez	Reconstructing Paleoenvironments of Southwestern New Mexico Archaeological Sites
4:05-4:20 pm	Tara Fattouh	Yongli Gao	Climate Change and the Mayan Collapse: High Resolution Paleoclimate Reconstruction from Speleothem records in Belize
4:20-4:30 pm	Break		
4:30 pm	Awards		

Methods of Analysis on icebreaker-based Image Datasets of Arctic Sea Ice

Ilana Casarez and Stephen F. Ackley
Department of Geological Sciences

Abstract: Images of ice cover were taken from the Sikuliaq during the ONR Sea State cruise into the Chukchi Sea Oct -Nov 2015 by an automatic ice camera. This camera provided overlapping times with ASPeCt sea ice observations, for future comparison, and analysis. Observations were coordinated to begin approximately 5 minutes before the top of every hour and to continue until 5 minutes after the top of the hour. With 42 days on board, and the camera running several hours a day, large amounts of images were attained. It is important to note however, that the camera was not always running while ASPeCT observations were being recorded, and vice versa; ASPeCT observations were not always documented while the camera was capturing images. In order to proceed with the orthorectification and image analysis once the cruise had ended, multiple data sets of images were organized, and tables describing these sets were created in order to make the data easier to navigate. After initial organization, the next step included using these sets to select useable images to be orthorectified for further image analysis. Now that orthorectification is complete we are in the process of using GIS to approximate thickness of ice floes that correlate with specific time frames of cases to be analyzed for wave damping. Eventually these images will also be analyzed for floe size distribution and concentration during specific wave events.

Data: The data was organized and compiled into the primary directories listed below:

L1A - This dataset consists of all raw photos taken from the EISCam throughout the duration of the cruise; 15-10-04 to 15-11-03.

L1B - Files in this directory are organized by dates and times correlating with the ASPeCT Sea Ice Observations. Each individual folder contains images for that specific observation within a 10 minute period. The images are taken 5 minutes before the recorded observation time and 5 minutes after.

L1C - This dataset is a condensed version of the L1A and consists of photos taken every ten minutes that the camera was running in order to narrow down selection for orthorectification. The camera did not run continuously, only running about 6 hours at a time and beginning again arbitrarily, so times are not in uniform ten minute increments throughout the entire set.

L2C – This set is the orthorectified version of L1C set, excluding inadequate images of night time, or covered horizons.

Methods: The orthorectification process required the use of a horizon-locating code input on MATLab. With this method each useable image had a found horizon and was then converted to an aerial image. Only daytime images that showed a clear, distinct, horizon to be detected by the program could be of use. Thus, images taken at night, or with an excessive amount of cloud cover blocking the horizon could not be orthorectified properly and were excluded. Images that showed horizons that could be seen manually but could not be detected by the program because of slight cloud cover were not excluded, and instead orthorectified by using an external program to draw in an artificial horizon over the original and could then be of use. Several sets of orthorectified images were created in the process of determining what dates and times would be best for the proposed uses of the data.

Envi was used to enhance night-time images for the L1B time Lapse videos. This was only successful on nighttime images that were taken while the ships spot light was turned on. Images with no light source were unable to be enhanced and considered unusable.

GIS is being used on orthorectified images to approximate thickness of the ice floes that correlate with specific time frames of cases analyzed for wave damping. This is being done by first selecting a uniform-size boxed area within all the selected images. Within each box, approximately 50 pancake ice floe examples are selected and have their diameter visibly drawn across their surface. The diameter lines are then converted to shapefiles named after the image file and saved to a geodatabase. After completion, the attribute data representing the diameters will be exported to an excel file and assessed for approximate ice thickness based on comparison to data recorded from cut samples of pancake ice taken and measured from the field.

Results: For the L1A, a table was created to represent the times throughout the entire cruise that raw images were captured by the EIScam. Red blocks are used to represent blocks of time that images exist in the data set. Empty blocks in the table mean the EIScam was not running and no images were obtained. This is meant to be referenced in order to make it easier to find photos at specific time intervals.

For the L1B, a data table was created that consists of symbols **O**,**OI**, and **X** to represent the times and days of observations and their corresponding available images.
It is meant to be referenced in order to view the time intervals where ice observations have taken place throughout the entire cruise and when those observations have corresponding images from the EIScam. The L1B was also used to create two time-lapse videos shared on the cruise ship collaboratory. The images were taken from every hour that usable photos existed. Nighttime images that could not be enhanced due to lack of spotlight, or image quality are not present. The video is meant to be viewed as a condensed version of the L1B, displaying the images so that viewers may easily select the images, and refer to specific dates and times in L1B that can be of use. The two videos only differ in the amount of time spent on each frame. One video spends 1.5 seconds per frame, and the other spends 5 seconds per frame.

Since the EISCAM did not run continuously, not all ASPeCT Observations are documented with a file. Only observations that correlated with images that existed within 5 minutes before and 5 minutes after the written time are documented.

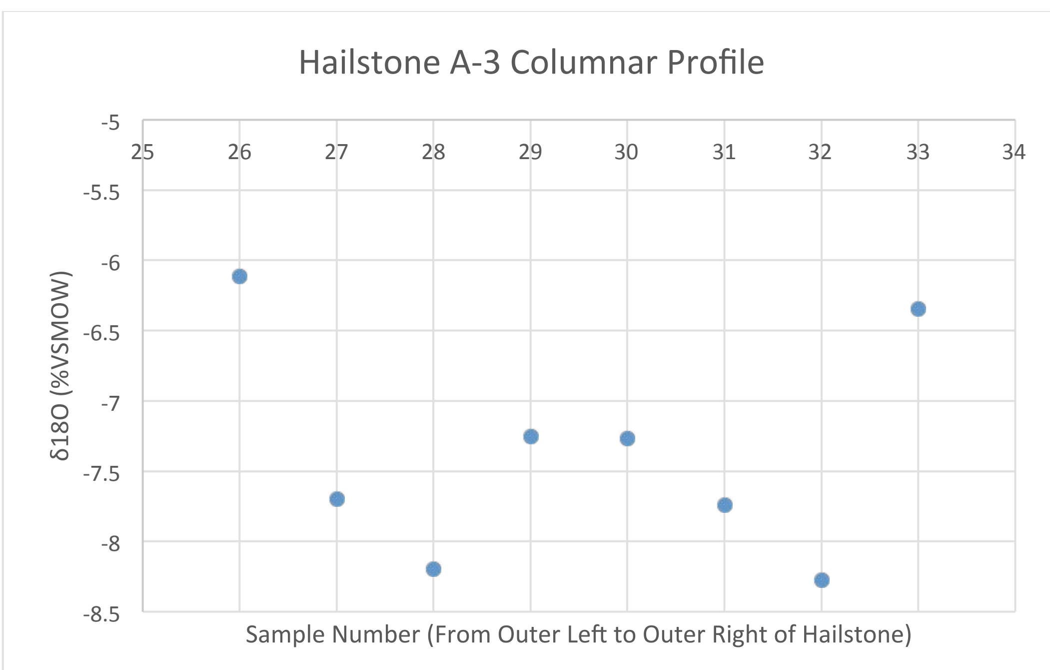
Preliminary Conclusions: We developed innovative methods of providing easier access to the very large collection (276,000 individual frames) of automatic ice camera data. This included dividing the data into collections that could be viewed, handled and analyzed in significantly easier pieces called L1A, L1B, and L1C. The L1B data set, consisting of one photo frame that coincided with an hourly visual ice observation, was assembled into a video, with each demarcated by time of collection, latitude and longitude for the full 36 days of the cruise. The video therefore allowed a series of snapshots of ice conditions for the whole cruise to be viewed in four and a half minutes and greatly sped up the selection of particular ice conditions for further analysis such as for ice types, ice concentration and floe sizes. Ongoing studies are correlating these selected data sets with satellite remote sensing data, wave measurements and heat balance analyses conducted by other investigators.

The Study on Hailstones Collected from the $1.4 Billion Historic Texas Hailstorm

Alexander V. Rodriguez and Stephen F. Ackley
Department of Geological Sciences

Abstract: On the evening of April 12th, 2016, the regions of northern San Antonio and Bexar County were hit by a hailstorm that caused a historic $1.4 billion worth of insured losses to vehicles, homes, and commercial buildings. A call for hailstones collected from the hailstorm was made on social media, where several people reached out and donated their collected hailstones to our study. We collected spherical, conical, and curvilinear triangular shaped hailstones. The hailstones also displayed examples of clear and cloudy ice, and smooth and rough textures. We were granted access to a cold room at the Southwest Research Institute where we set up a band saw to cut the hailstones in half, and took pictures of each profile through crossed polaroid sheets in order to get a clearer picture of each crystal structure. A closer examination of the crystal structure was conducted on certain hailstones by preparing ice thin sections mounted on glass slides of selected hailstones. After melting each sample in order to measure for $\delta^{18}O$, we ran 16 cut hailstones of about 10 samples each through a PICARRO. We hypothesized that an isotopic analysis of the samples collected from the hailstones would give us information regarding the structure and temperature of the storm clouds in which the hailstones were formed.

Data: We are in the process of running statistics on our entire hailstone sample collection. The following graph is of an oxygen isotope variation across spherical hailstone A-3:



The isotopic profile across the spherical hailstone A-3 displays an observable trend. This graph potentially displays the trajectory of hailstone as well as the temperature conditions of the hailstone's formation. The center (samples 29 and 30) formed under relatively cold temperatures. The developing hailstone then ascended to colder temperatures (samples 28, 31, & 32), eventually falling down to warmer conditions (samples 27, 26, & 33).

Methods: There were two methods that were followed for our hailstone project. The first method involved preparing each hailstone so that it could be photographed under transmitted light conditions and between crossed polaroid sheets. A band saw was set up in a cold room at the Southwest Research Institute where we cut each hailstone in half. We then took photos of each hailstone under said conditions. The glass thin section put under crossed polaroid sheets provided a detailed image of the crystal structures within the hailstone, while the crossed sheets of polaroid and normal lighting images of the cut hailstone provided a general picture of the hailstone and the successive layers of its formation. The second method involved cutting columnar slices from the cross sections cut from the center of each hailstone, and cutting 5 mm subsections of the columnar slice. Each 5 mm section was labeled as an individual sample. These samples are being tested through a cavity ring-down spectrometer (PICARRO) in the UTSA geochemistry lab. This method consists of taking an isotopic analysis of the columnar subsection slices taken from each hailstone. We are measuring for $\delta^{18}O$, which will provide us with the temperature conditions in which the formation of the hailstone occurred, as well as moisture content and cloud droplet size.

Results: So far, visible crystal structures give us an idea of the temperature conditions during which the layer of the hailstone was formed. An isotopic analysis will give us a closer picture of the temperature conditions through which the hailstone was formed.

Preliminary Conclusions: Structures can vary across sections of hailstones while certain hailstones display uniform characteristics. Hypothetically, finer grained crystals are a sign of colder temperature conditions, while coarse grained crystals can be a sign of warmer temperature conditions. Isotopic analysis also looks promising, as current data reflects varying temperature conditions of the storm clouds under which a hailstone was formed and a trajectory of the hailstone as it rose and grew into cold conditions, eventually falling into warmer conditions. The structure and isotope analysis will be cross-correlated to examine whether crystal shapes and sizes correlate with isotopic temperature changes as we have hypothesized.

Investigation of Community Paleoecology to Better Understand Depositional Parameters of the Finis Shale in Jacksboro (Jack County), Texas

Michelle M. Ortiz and Lance L. Lambert
Department of Geological Sciences

Abstract: The Finis Shale is part of the Cisco Group, and is early Virgilian (Late Pennsylvanian) in age. Its conodont fauna includes the first occurrence of Idiognathodus simulator, which defines the base of the global Gzhelian Stage. It is described as a dark gray to black shale (McLerran, 1991). We sampled the Finis Shale from a road cut near the southern end of Lake Jacksboro, Texas about 63 miles northwest of Fort Worth, Texas. The sample interval was roughly 9 meters, with samples taken every meter starting at 3 meters from the bottom of the section. The Finis Shale includes phosphate nodules near the bottom and middle parts of the shale. Typically, dark shales and phosphate nodules are thought to be an indicator of depositional environments that are located in an offshore setting, beneath upwelling surface waters, and in an area where there is little to no oxygen, i.e. disoxic or anoxic (Heckel, 2002).

Looking closer at the fossil distribution, it is apparent that the majority of fossils are found in the dark gray shale portion of the Finis Shale. The diversity of the fauna in this part of the section include specimens from Phyla Brachiopoda, Mollusca, Bryozoa, Cnidaria, and Echinodermata. If the sediment reflects deposition in a disoxic environment, we would not expect to see the high diversity of the faunal assemblages present. This is because most scientists would infer the deposition of gray shale to represent an environment not suitable for organisms to thrive, i.e., one with low oxygen. Understanding the community paleoecological characteristics such as organism mode of life, environmental tolerances, morphological/skeletal characteristics, and feeding habits, should help us identify whether some organisms are able to thrive in low oxygen environments. From a different perspective, understanding the depositional parameters should help us better interpret the conditions under which these fossils accumulated. The dual approach should help us redefine previous thoughts concerning faunal diversity in these type of environments.

Assessing Bank Erosion Potential in the San Antonio River

Jose Silvestre and Judy Haschenburger
Department of Geological Sciences

Abstract: Riverbank material influences the type of erosion that will occur on the bank. Riverbanks dominated by cohesive material are more susceptible to mass wasting, whereas banks made up of non-cohesive material are more susceptible to fluvial erosion. This project investigates the relation between bank material and the potential for erosion and aims to determine the dominant erosional process occurring along the San Antonio River. Field observations were collected at six study sites near the cities of Floresville and Goliad to estimate susceptibility to bank erosion using the Bank Assessment for Non-point source Consequences of Sediment (BANCS) model. Two different metrics determining the potential for bank erosion, the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) index, were computed by measuring or visually assessing bank height, bankfull height, bank angle, root depth, root density, surface protection, near-bank maximum depth, and bankfull mean depth. Preliminary results show that banks have high erosion potential, based on the mean BEHI. Moderate to high NBS values further indicate the relatively high potential for bank erosion. Additional work looks at developing a model to better explain the erosional processes occurring along the San Antonio River. This understanding will help explain riverbank morphology along the San Antonio River because the two bank erosional processes lead to different bank configurations.

LIGNIN: Building Material Recycling

Manuel J. Barrera III and Dr. Jie Huang
Department of Civil and Environmental Engineering

A. **Data**:

  a. Background: Lignin is a natural glue like substance found in plants. Its primary purpose in the plant structure is to essentially hold the cell walls together. In the production of biofuels from plant materials there is an abundance of lignin byproduct.

  b. Goal: Our goal is to take that material and to turn it into something that can be useful in strengthening soil properties, transforming it from a waste product to a possibly lucrative one. Possibly overturning the high cost of production of biofuels.

B. **Method**: Before any testing can be done we need to classify the soil that we are working with.

  a. Sieve Analysis: As with many soil testing procedures we first need to classify which type of soil we're actually working with. It is necessary to do this to better predict how this specific soil will react in a natural state by using characteristics that have already been established. The soil is first broken down into small particles as it tends to clump together when under pressure. This was done by taking small samples of the soil specimen and placing them in a pan and then manually crushing the soil.

  b. Atterburg Limit Test: By doing the sieve analysis we can then separate any of the soil that was over the #40 screen giving a much more consistent soil sample to work with for our testing. With the screened sample we can now test the soils liquidity and plasticity range and see how our sample reacts to moisture. This information will help determine remediation techniques.

  c. Proctor Test: The Proctor test is used to determine the optimum moisture content for compaction. Compaction is often used in engineering tasks which require a foundation to support a heavy structure.

  d. Unconfined Compression Test: This test is used to calculate the maximum stresses that can be placed upon the soil sample. Two 2X4 test cylinders are prepared from the soil sample and placed into the compression machine and then crushed. One sample is purely soil and the other contains the LIGNIN adhesive mixture. The stress readings are recorded and compared to each other and then the process is repeated.

C. Results

a. Sieve Analysis: From the sieve analysis we learned that the soil sample provided for our testing was bests classifies as a CL-ML with rounded gravel under the USCS.

b. Atterburg Limit: This soil was found to have a Plasticity Index of about 22 describing how the soils properties changes with added moisture and when it begins to act as a liquid.

Liquid Limit		
moisture content (m.c.)	=	42%
Number of Blows	=	25
Liquid Limit	=	42.5

Plastic Limit	20.4%

Plasticity Index	PI = LL - PL
PI =	22.04

Sieve #	Test 1 % Passing	Test 2 % Passing
4	96.77	98.85
10	74.34	76.52
20	49.91	50.36
40	23.08	27.91
60	9.85	15.07
100	2.21	4.22
140	0.78	0.98
200	0.23	0.31
PAN	0.03	0.06

Conclusions: As of now our testing is still in the early phases due to issues with material procurement and we do not have any conclusions to present.

Novel Approach to Harvest Thermal Energy from Asphalt Pavement Roadways

Jacob Holguin and Samer Dessouky
Department of Civil and Environmental Engineering

Objective: The objective of this project is to harvest thermal energy from roadway infrastructure and harness it to generate electrical power. This approach to energy harvesting taps into extracting clean energy from a pristine source; the thermal heat in asphalt pavement roadway. The mechanism under development to harvest this clean energy is not only innovative in that it uses an unexplored source of energy, but it also avoids dissipating heat back into the atmosphere thus does not contribute to the heat urban island. This project shows a great potential for powering LED for illumination at remote areas as well as sensors for monitoring pavement health structure.

Principal and Mechanism: The electrical power is harnesses by developing a thermal harvester prototype that uses Thermoelectric Generator (TEG) modules (Figure 1). The modules work by achieving a temperature gradient (or difference) between the top and bottom of the TEG. Essentially it is preferable to have one side of the TEG high in temperature and the other side as cool as possible for maximum electric power output.

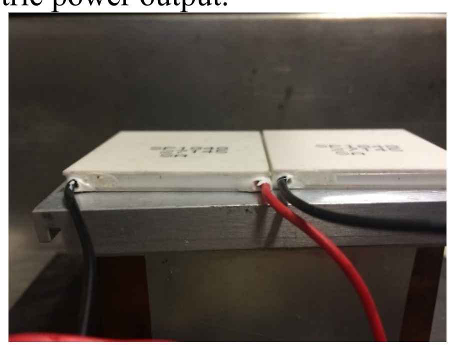


Figure 1. TEG module

These TEGs utilize what is known as the Seebeck Effect. The Seebeck Effect is a phenomenon in which a temperature difference between two dissimilar electrical conductors or semiconductors produces a voltage difference between the two substances. The result is a thermal electromotive force. Implementation of this mechanism into roadways is desirable because of the abundance and accessibility to thermal heat in the existing roadway infrastructure.

Methodology: There are four main components in the thermal harvester prototype including; a Z-shape copper panel, a TEG, insulation, and a heat sink (Figure 2a). Prior to installation in pavement, the prototype was tested in the laboratory to evaluate its functionality and performance in near-pavement conditions. After identifying the prototype materials, dimensions, and isolation method, an effort was made to allocate a pavement site on campus for field evaluation. The site was identified at the west campus in a low traffic zone close to the facility building. The site was prepared by removing 1-2" of asphalt pavement surface and digging 10" in the road-side soil (Figure 2b). The top long flange of the Thermal Harvester was placed directly underneath the pavement surface while the vertical flange was stacked against the pavement edge. The bottom short flange was used to glue the TEG to the copper panel before stack it over the heat sink. (Figure 2c). The exposed copper plate was isolated with a white PVC to reduce heat dissipation to the soil. The purpose of this z-shape design is to transfer the heat from the pavement surface through the copper plate to the top side of the TEG while the bottom side temperature is maintained by the heat sink. In doing so the necessary temperature gradient required to produce electrical power is achieved.

a) b) c)

Figure 2. a) Thermal harvester component, b) preparing site for installation and c) prototype installed in pavement

Results: After measuring the voltage and power produced by the TEGs via a power-meter it was clear that the energy being produced by the prototype shows a potential for efficient ways to obtain greater output by scaling up the design structure. Figure 3 represented a linear trend between the temperature gradient and produced voltage. Furthermore, with new improvements in the panel design greater outputs are currently being observed in the lab.

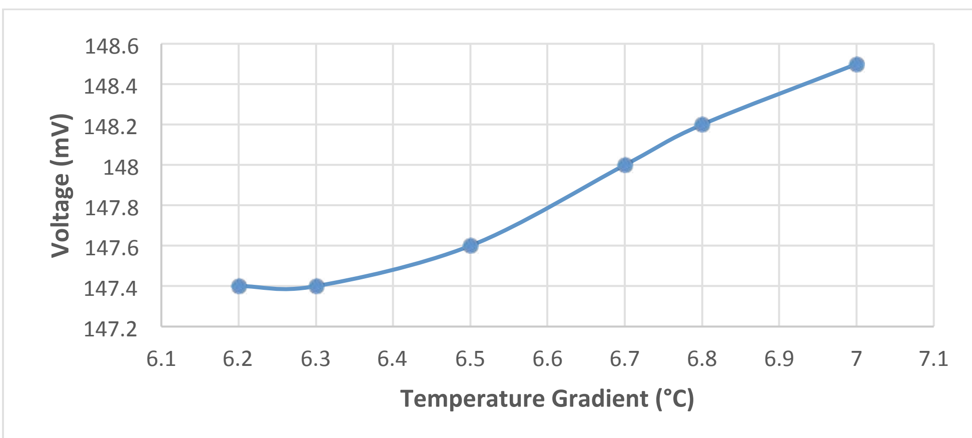


Figure 3. Relationship between temperature gradient and produced voltage

Conclusions: The developed prototype has proven the potential for harvesting thermal energy from roadway. Exploring ways to improve the configuration and efficiency of the prototype will allow for innovative ways to make use of these energy for many practical applications in roadway.

Future work: Currently, further analysis in the lab is taking place to simulate real life applications in the field and various circumstances that may exist. Also, optimization in the copper panel design and incorporating different types of TEG are currently under investigation.

Determining the Charcoal in Mineral Soil after a Wildfire

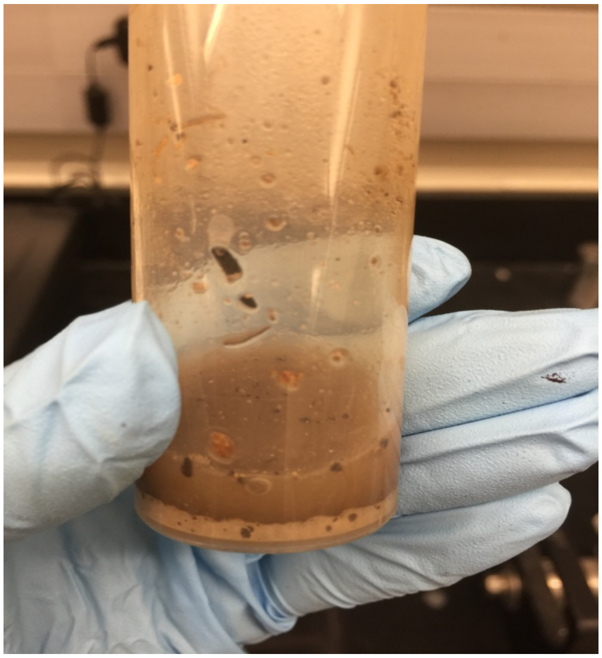
Lauren Orona and Heather Shipley
Department of Civil and Environmental Engineering

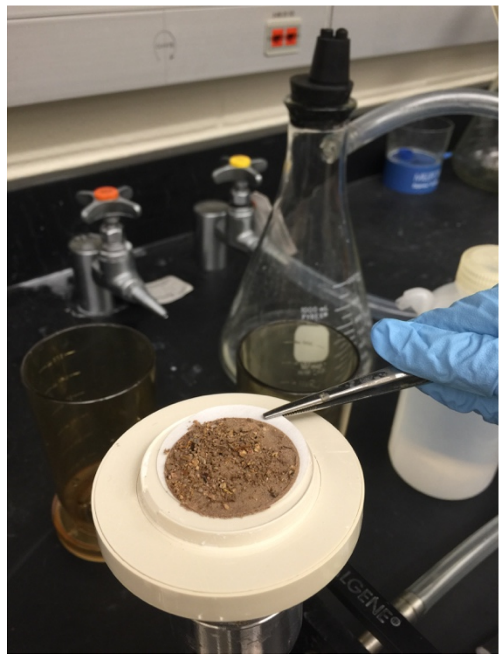
The main purpose of the research that I did was to find the amount of charcoal that is left in the mineral soil after a wildfire happen in the area of the Valles Caldera National Preserve. Valles Caldera National Preserve is located in New Mexico. The mineral soil has the following things inside, which are clay, slit, and sand fraction of soil.

Each samples were taken by sectioning off two areas, the first area is burned from the highly burned from the wild fire and the second area is lightly burned. From both locations they set two areas that are cut into five sub-plots in each section they got three tubes that went ten centimeters deep and each section is two centimeters deep. All the samples are taken from the same time of the collection date. The producer of how I collected the data for this research was by doing the following. Each of the soil samples are one gram in weight, and they are in a contained that can hold a hundred milliliters of liquid. Once I receive the samples I can start the process of the soil samples. The first part of the four-part process is by taking the samples to a lab so I can put the soil samples into a digester. Before I places the samples into the digester I put two milliliters of hydrogen peroxide and one milliliter of nitric acid. When the two liquids are mixed together with the soil it causes the organic materials to leave the soil when heated. Once forty minutes have passed I then place the samples into the digester, all the digester does is heats up the liquids that is mixed with the soil samples. Then I leave the samples in the digester for six hours or until all the gas bubbles are gone. After that period of time I take the samples to the air vacuum, which would be the second part of the process and get all the access liquid out of wet soil samples. The dry soil samples are on a whatman number two so that I have a place to transfer the samples to the oven. In the oven there is a desiccant which keeps more liquid from forming, the dry soil samples stay in the oven for overnight. The third part of the process is when I measure to the soil samples before I place the samples in the Furnas. I measure the cups without the dry soil samples then I place the dry soil samples into the cups, then each samples gets placed into the Furnas. The Furnas is the final part of the process; the Furnas burns the rest of the organic material that is left in the soil samples.

Originally I had two hypotheses that I was trying to prove so when I collected all the data, the results that I was able to collect were the soil samples that are from the plot of land that did not get affected by the wild fire has less charcoal then the areas that was affected by the wildfire. The results for the second hypothesis is that there was less charcoal in the soil as it goes lower deeper in the soil that was not affect by the wildfire, but for the soil that was burned the deeper that I went I found more traces of charcoal. The reason that I have two hypothesis is because one of the graduate students that I asked for an opinion on how to make a question said that this would be the best way to state my questions. Her name is Audrea Russie and she was the girl that helped lead me in a direction. The purpose of my research is to determine the percentage of charcoal that is in the several burned and lightly burned Ponderosa Pine Forest, which would be located in New Mexico as well.

So in the end here is a little summary of what I talked about the amount of charcoal in soil is important in the recovery of soil after a wildfire. The samples are two centimeters thick and are as deep as ten centimeters. All the data that I collected was for determining the percent of charcoal in the mineral soil samples. Altogether this research is to see how quickly the land will take to start growing in life after the wildfires. At the end of this paper are pictures of what the samples looked like in the during the process of the methods.





Impact of Weather on Crashes on Texas Roadways

Yajaira Costilla and Hatim Sharif
Department of Civil and Environmental Engineering

Abstract: Comprehension of how traffic crashes are influenced by rain is critical to road safety planning and directing. Rain instigates accidents through a combination of numerous physical properties that affect the driving situation which include the loss of friction between the road and tires, visibility past the rainfall and splashed from surrounding vehicles. This study will evaluate the impact of rain on traffic safety by performing an analysis of the crashes caused by rain in Texas from 2005 to 2014.

Objective: It is important to study the impact of rain on crashes on Texas roads because Texas has more roads than any other state and encounters many dangerous weather conditions which can involves the safety of drivers. Interpreting the relationship between weather and crashes can help create more improved safety management programs for Texas drivers.

Results: This research showed that using the correlation between rain and crashes is important because it helps identify the different variables impacting these road accidents, therefore provides alternatives for road design models and road safety programs. This information consists of the average annual rainfall and crashes from 2005 to 2014. 2007 and 2011 were the years with the highest and lowest in the graph respectively. 2007 illustrates the highest annual rainfall in the region which also has the highest crashes. 2011 shows the lowest amount of precipitation which triggered the lowest amount of crashes. When annual rainfall is compared to the annual crashes, you can see a correlation between the two, for this particular graph the correlation coefficient was 0.7 which is closer to 1 therefore describing a closer relationship between the two.

Conclusion: In this research I was able to determine the relationship between crashes and rainfall is very strong in San Antonio. There is always room for improvement when considering Texas roads, this study helps design engineers and road safety management realize we still have problems on our road when weather is considered and changes are much needed.

Sea-ice Thickness Study

Daniel Smith-Salgado and Blake Weissling
Department of Geological Sciences

Introduction: The overall objective of this project is to build on previous work on Antarctic drift station experiments by using geophysical techniques to characterize ice thickness, morphology, and mass. The data I was mainly working with was the ice thickness data collected with an EM instrument

Methods: To take these measurements the EM-31 instrument was used on the cruise ship. It operates at a single frequency with 3.66 coil spacing. The height range on the instrument ranged from about 1.7m to 4.2m. The EM instrument collects raw data such as conductivity readings at every second interval as well as the height between instrument and surface ice.

Data: The data I have been working with is the ice thickness data collected by the EM-31. The raw data was given and it was my job to organize that data into a spreadsheet, which could be later used to get an overview of travel time and distance and ice thickness changes. I started with the final day of the experiment and within this day multiple sections had to be created to represent each hour of the experiment on that given day. After taking the raw data and calculating EM height from the conductivity readings I had to calculate the thickness of the ice at every second interval. Some of the data wasn't clean so it was cleaned up and then re spaced out into even 5m sample ratings. From there we were able to have a clean resampling of thickness at 5m intervals.

Results: Based on the data I have been working with and what I know about the entirety of the project, the results are consistent with previous studies of EM ice thickness. My role in this project is not completed; further calculations for data results must be made for ice thickness on 17 more days out of the total 23 total days of the experiment.

Conclusion: A lot more work on this experiments data needs to be finalized into an organized spreadsheet. Based on the results we have already attained, ice thicknesses now seems to be consistent with studies done in the past.

Carbon Isotope Chemostratigraphy from Mid Cretaceous Lacustrine in Northwest China

Kuzipa Kapayi and Marina B. Suarez
Department of Geological Sciences

Abstract: Carbon isotope chemostratigraphy is an efficient method to correlate continental and marine stratigraphic sections. Carbon isotope excursions are associated with Oceanic Anoxic Events that characterize the Aptian to Albian time period, and can be used to identify changes native to paleoclimate variations associated with the carbon cycle. The purpose of this project is to develop a carbon isotope profile for the Xinminpu Group at the Hanxia locality in Gansu province of China.

Data/Conclusion: The average carbon-13 value of organic carbon from Gansu province is -23.57 ‰ with a minimum of -26.07 ‰ and a maximum of -21.6 ‰. This part of the Hanxia section appears to occur within the middle to upper Aptian, specifically the carbon-10 isotope excursion. Additional analyses above and below this section will be used to confirm or reject this hypothesis. If confirmed, these strata at the Hanxia locality may help elucidate potential climate change associated with the carbon-10 isotope excursion.

Method: Samples were crushed into powder form using pestles, decarbonated in 3 molar Hydrochloric acid, weighed to calculate the percentage of carbon lost, crushed again, and placed into the Costech 4010 Elemental Analyzer, which is connected to the Mass Spectrometer for data analysis.

Reconstructing Paleoenvironments of Southwestern New Mexico Archaeological Sites

Adrianne Lopez, Marina B. Suarez, Robert Hard, and Charles Frederick
Department of Geological Sciences & Department of Archaeology and Anthropology

Abstract: Archaeological localities in southwestern New Mexico were investigated to improve understanding of Holocene paleoenvironments in an area where the introduction of maize agriculture to the American southwest is thought to occur. Two trenches from near archeological sites were correlated using carbon isotopes of sedimentary organic carbon from buried soils. In addition, modern plant material was analyzed for comparison, as well as small soil carbonates and snails recovered from the trenches.

Isotopic values analyzed from trench 1 range from -24.7 to -15.7 vs. VPDB, and from trench 2 from -26.2 to -16.3 vs. VPDB. This data suggests shifting mixes of C3 and C4 vegetation likely due to changes in moisture patterns. In this setting (Chihuahuan Desert), shifts towards lower $\delta^{13}C$ values (C3 plants), represent shifts toward drier conditions supporting woody shrubs, whereas C4 grasses represent wetter conditions. Values obtained from modern plant samples average -15.8 for grasses and -25.6 for woody shrubs; consistent with the range of values obtained for buried soils. Organic plant samples have also been analyzed to compare the current isotopic values to previous plant data.

Carbonate isotope data from trench 1 plotted in oxygen vs. carbon isotope space revealed typical meteoric calcite lines that average -7.8‰ vs VPDB for oxygen and ranged from -3.0 to -0.3 ‰ for carbon. Snails recovered from trench 2 were significantly heavier in O-isotope values and lighter in C-isotope values ($\delta^{18}O$ = -3.4 and $\delta^{13}C$ = -6.1 ‰). Using a modern mean annual temperature, meteoric water responsible for precipitation of the soil carbonate was -7.4 ‰ vs VSMOW which is slightly more enriched than current precipitation that is -8.4 per mil vs. SMOW. This suggests similar conditions to today.

While much work is still needed to constrain environmental changes, the data suggest fairly significant fluctuations in vegetation and moisture conditions represented by the buried soils. Conditions likely fluctuated between dry conditions similar to today to wetter conditions represented by grasslands.

Climate Change and the Mayan Collapse: High Resolution Paleoclimate Reconstruction from Speleothem records in Belize

Tara Fattouh, Jessica Buckles, and Yongli Gao
Center for Water Research, Department of Geological Sciences

Abstract: Climate change during the Mayan Collapse was examined using two speleothems from Belize. Variations of carbon and oxygen isotopes and strontium concentration of well-dated speleothems were used to reconstruct paleoclimate changes for the Classic and Postclassic Mayan Periods. Speleothems, CH-3 and CH-4, were gathered from the Chapat Cave, western Belize. Stable isotope data were obtained using a Gasbench-II coupled with a ThermoFinnigan DeltaPlus XP IRMS. The age of CH-3 ranges from 1420 ± 58 yr BP to -12 ± 9 yr BP. The age of CH4 ranges from 790 ± 22 yr BP to 247 ± 20 yr BP. The amount of strontium present in CH-4 and CH-3 fluctuates throughout the sample, which may indicate drought and wet oscillations. Prolonged droughts may have had a significant impact on the Mayan civilization.