



2012 MORESE Colloquium

Final Program

Date: Tuesday, October 2, 2012
Time: 1:30 pm to 6:30 pm
Where: BSB 3.03.02

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 18 research papers, including 8 oral and 10 poster presentations. The content covers a diverse spectrum of contemporary topics from geology, environmental science, and civil engineering. Eight graduate students from different fields of Geology, Environmental Science and Engineering will serve as a judge committee to evaluate all the presentations. Each talk will be 20 minutes maximum including questions/answers; each poster consists of 5 minutes presentation with 5 minutes of judges asking questions, maximum 10 minutes. For each category (talk and posters) they 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) talks and posters.

Refreshments and dinner will be provided by the College of Science. The MORESE management would like to thank Dean George Perry for supporting this event.

Judge Committee:

Peter Anderson – Geology Masters student (for talk)

Stephani Williams – Geology Masters student (for poster)

Chad Furl – ESE PhD student (for talk)

David Prado – ESE PhD student (for poster)

Mohamad Sadat – ESE PhD student (for poster)

Newfel Mazari – ESE PhD student (for talk)

Tanzina Rahman – ESE PhD student (for talk)

Tuan Le – ESE PhD student (for poster)

Final Program of 2012 MORESE Colloquium

	Student	Major	Mentor	Title
1:30-1:50pm	Nicholas Vasquez	Civil Eng.	Drew Johnson	Soil erodability testing
1:50-2:10pm	Velita Cardenas	Geology	Judy Haschenburger	An Evaluation of Shields' Experiment on Sediment Entrainment
2:10-2:30pm	Debbie Duran	Geology	Xiaofeng Liu	Flood control for the City of San Antonio
2:30-2:50pm	Ashli Green	Env. Sci.	Jyotsna Sharma	Analyzing the Composition of the Marine Nematode Community in the Post-Deepwater Horizon Environment
2:50-3:40	Poster Session 1 and Coffee Break			
3:40-4:00pm	Marcus Garcia	Civil Eng.	Xiaofeng Liu	Comparison of BMP practices in San Antonio and Austin
4:00-4:20pm	Marvin Lopez	Geology	Lance Lambert	Oxygen Isotopes in Conodont Phosphate: Paleocological or Diagenetic Signal?
4:20-4:40pm	Andres Munoz	Civil Eng.	Hatim Sharif	Flood fatalities in the U.S.
4:40-5:00pm	Johanna Torres	Geology	Hongjie Xie	Analysis of Lake Buchanan's Temperature Variation Using MODIS and In-Situ Data
5:00-5:40pm	Poster Session 2 and Judge Meeting for Ranks			
5:40-6:30pm	Award Ceremony and Dinner			
Posters				

	Christian Baker	Geology	Stephen Ackley	Albedo of Sea Ice derived from Airborne Imagery in the Bellingshausen Sea Antarctica
	Ana Balino	Civil Eng.	Ruoting Pei	Viscosity Modifying Agent
	Louis Faust	Civil Eng.	Heather Shipley	Visualization and CFD: Simulating Dissolved Oxygen Content in Rivers
	Jessica George	Civil Eng.	Heather Shipley	Chemical Wastewater Treatment Processes of a Tanning Facility
	Josues Gonzalez	Elec. Eng.	Drew Johnson	A DAQ System for the Environmental Engineering Laboratories
	Phillip Gutierrez	Civil Eng.	Jie Huang	Effects of Seismic Loads in Soil Arching Conditions
	Alex Hilario	Civil Eng.	Hatim Sharif	Comparison of Fatalities Caused by Flooding During the Last Fifty Years
	Naiomi Patterson	Geology	Stuart Birnbaum	Growth and attachment of <i>Desulfovibrio desulfuricans</i> on gypsum with implications for a Mars analog
	Jose Salazar-Verdin	Geology	Marina Suarez	Carbon isotope chemostratigraphy of lower Cedar Mountain Formation, Utah
	Mark Santos	Civil Eng.	Jie Huang	Laboratory Analysis of MSE Wall Experiencing Uplift

Albedo of sea ice derived from airborne imagery in the Bellingshausen Sea of Antarctica

Christian Baker and Stephen Ackley,
Department of Geological Sciences

Of all the roles sea-ice in Polar Regions play, perhaps the most important is the one it plays in our planet's overall radiation budget. Sea-ice melts and reforms with the changing of the seasons, resulting in a constant fluctuation in both the physical areas of snow-covered ice and the open water surrounding it. As ice thickness and snow thickness increase, the amount of radiation reflected increases, creating a positive feedback loop; as less heat is retained by the region, temperature lowers, which promotes the formation of more ice, which in turn reflects even more radiation, lowering the temperature even more. As ice thickness and snow thickness decrease, an opposite positive feedback system is established; ice melts, creating more surface area of water, which absorbs more radiation, causing the temperature of the water to rise, causing more ice to melt, creating even more surface area of water. Either system has potentially serious implications for the future regional environment, as well as the overall future climate of our planet. Understanding the change in area-weighted albedo of the region over time gives us valuable insight into possible climate behavior in the future. The research and data from this project helps fill the gap of understanding of area-weighted albedo for ice-floes in the Bellingshausen Sea, Antarctica in October 2009.

The particular data used for this project is stored in GeoTIFF format and came from NASA's 2009 IceBridge mission, which collected extensive imagery data over Greenland and Antarctica using the Digital Mapping System (DMS), available online at the National Snow and Ice Data Center (NDISC).

To analyze the imagery, we employed a combination of GIS software; ArcGIS was used to visualize the images from far away and see how they all fit together. This was particularly important at the beginning of the project to become familiar with the data set and sea-ice phenomena, and again near the end where zones could be generally be defined by their compositions. A Python script was created to convert the larger raw files (.tiff) into smaller layer files (.lyr), in order to load smoothly into ArcGIS. This technique solved a "freeze-up" problem with ArcGIS, and provided an extra benefit by removing the black (data-empty) borders off of each individual image. Removing the black borders also cleaned up most of the image-overlap produced when the photos were taken closely together.

While ArcGIS was a helpful tool for visual reasons, the bulk of the work was done using ENVI + IDL. The analysis process for each image followed the same basic structure. The first step, after loading the appropriate bands into the program, was to acquire the coverage area in pixels by creating a region of interest (ROI) by means of band threshold, and record it. Afterwards, a density slice was performed in order to establish three classifications: young ice, old ice, and open water. The specific classification ranges for each class varied slightly from image to image, but generally fell in the (0 - ~75) range for open water, (~75 - ~150) for young ice, and (~150 - 255) for old ice. Because each image was different, due to varying illumination (sun angle and cloud cover), it was necessary to tweak the classification ranges with each image to make the extracted data match the visual phenomena happening on the ground. Once the appropriate ranges had been established, another Band Threshold to ROI was performed on each

class range to calculate the exact area in pixels that that particular class occupies, which was then recorded. The density slice ranges, based on Allison et al, 1993, corresponded to albedos of 0.07 for open water, 0.25 for young ice, and 0.77 for snow covered ice. Finally, before loading up another image, a general note was recorded about what the ice conditions of the image were (e.g. “Pancakes” or “Leads”, were quite common, and often a series of consecutive images would contain the same keywords). These notes were used to define zones for characterizing area-averaged albedos.

We found that of the 722 images analyzed so far, three distinct provinces of areal-averaged albedo were found. In the ice edge or northern-most region, where ice divergence was high, the albedo was generally lower than the mid-pack, which consisted of the most snow-covered pack of high ice concentration. The southern-most region, near the coast however, also had low albedo, primarily due to new ice formation too young to have accumulated a high albedo snow cover. The near-coastal regions are regions of continuous new ice formation as winds from the Antarctic continent continuously blow away from the coast, exposing open water to cold temperatures. So, while the outer edge and near-coastal region both have lower albedo, they are of quite different origins, ice melting and breaking apart in the north and continuous new ice formation in the south, leading to a more complex interaction of radiation and ice properties than initially posed, as both ice melting and ice formation can take place simultaneously in the same general region.

Submitted for Poster Presentation

Viscosity Modifying Agent

Ana K. Balino and Ruoting Pei
Civil Engineering Department

Viscosity modifying admixtures (VMA) are water-soluble polymers that enlarge the viscosity of mixing water and improve the ability of cement paste to hold on to its constituents in suspension. Cement paste serves as the starting point for the workability properties of self-compacting concrete and these properties could be assessed by self consolidating cementations materials. From a rheological point of view, the use of a VMA along with enough super plasticizers substance enables to guarantee high deformability and stability.

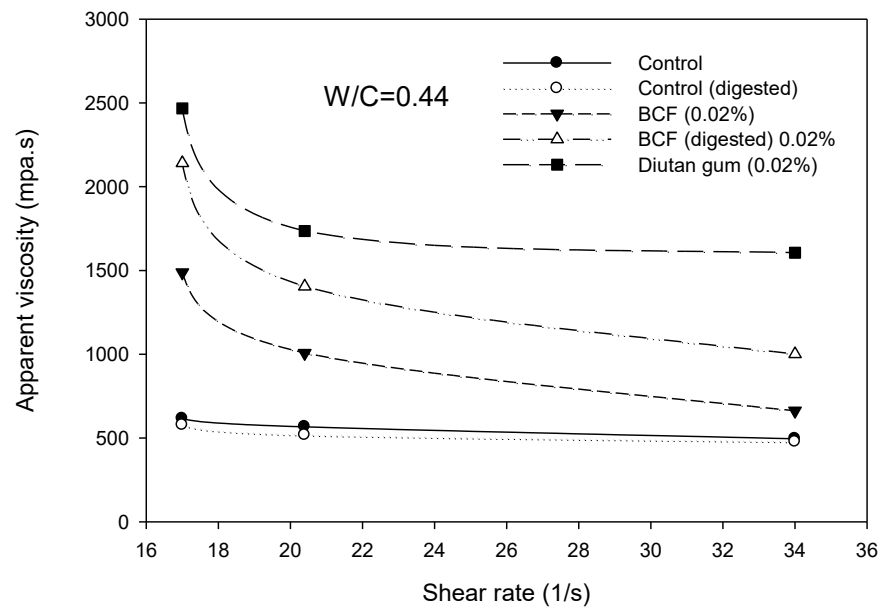
In this research, role of VMA on the strength of concrete have been investigated. The paste measurements were conducted on observed test. This paper reports test results leading to the suggestion of suitable water/cement ratio, and amount of viscosity modifying admixtures that can be used to accomplish enough viscosity which leads to stable cement paste. It is proved that the properties of cement paste are mostly affected by the water/cement ratio, BCF, and other factors.

Before tests were conducted on viscosity, there was a preparation of heat-killed cells and bacterial cell fraction of *Bacillus subtilis*. After killed of bacteria, BCF (bacteria cell fractions) also called pellet. It all started with *Bacillus subtilis*.

First day, *Bacillus subtilis* cells were cultured in nutrient broth at 37C, collected during exponential growth phase, autoclaved at 120C for 30m, centrifuged and re-suspended in physiological saline solution (8.5g/L NaCl) before being stored at -20C. Second day, briefly, frozen *Bacillus subtilis* cells were put in a mortar and ground for 15 minutes with an equal volume of alumina. Disrupted cells were collected by adding physiological saline solution. The suspension was centrifuged at 2500rpm using Eppendorf 5804R fixed angle centrifuge rotor at 4C for 20 min, to eliminate alumina and unbroken cells. The supernatant will then be centrifuged at 10000rpm using the same rotor at 4C for 20 minutes, to separate the two fractions: supernatant and pellet (BCF, which contains cytoplasm membranes and cell wall). Pellet was re-suspended in physiological saline solution to a concentration of 0.1mg wet weight/mL and was stored at 20C until further analyses.

After a collection of the necessary BCF need to begin test, started creating the solution for viscosity test. Solution created contains 8g of water, 20g of cement, sp, and .3g of BCF. Two different sp were been used one of .05 and the other of .15, there was also control solution made which did not include BCF. This experiment was to focus on how the BCF affect viscosity results. As the results were gathering at different ramps per minute, conclusions were made that there was little increase like 5% by changing the sp, and 10% by adding BCF. There was also the analysis that as the rpm increase the results decrease.

Example of Results Analyze



Prefer Poster

An Evaluation of Shields' Experiment on Sediment Entrainment

V. Cardenas and J. Haschenburger
Department of Geological Sciences

Examining the condition under which sediment motion is initiated is an integral part of understanding sediment fluxes in rivers and their effective management. The purpose of this study was to evaluate how Shields conducted his experiments to better understand his entrainment function for fine gravel. A grain size distribution with a median diameter of 2.5mm was created by mechanically sieving sediment to match one of Shields' distributions. Flume experiments were conducted on this sediment mixture by subjecting it to different flow rates and slopes. Observations of flow depth and water temperature were recorded and, using other known variables, Shields' entrainment function was calculated. Results of the experimental runs will be discussed in relation to how incipient motion is defined and how the flow rate is changed during runs.

Flood Control for the City of San Antonio

Debbie Jennifer Duran, Department of Geological Sciences
Xiaofeng Liu, Civil Engineering Department

The San Antonio River Watershed is a highly populated area that is prone to inundation. Flooding has played a major role causing death for many and considerable damage which has amounted to thousands of dollars. San Antonio has become a tourist attraction for numerous tourists from all around the world visiting The Riverwalk, The Alamo, missions, and countless of other beautification attractions. It is also the home for millions of people, being the 7th most populated city in the United States. Due to all these reasons and more, flood control in the city of San Antonio has become a vital necessity to maintain in our city.

In order to continue to sustain a moderate amount of water in our San Antonio River, the San Antonio River Authority along with other corporations have helped construct The Olmos Dam, The San Antonio River Tunnel, The San Pedro Creek Tunnel and six major flood gates around our City. Recently new developments were underway in efforts to apply modern, environmentally sensitive and aesthetic construction methodologies to enhance the flood carrying capacity of the river, meanwhile bringing recreational amenities and improvements; such project is known as The San Antonio River Improvements Project which focuses on renovating a 13 mile portion of the San Antonio River. In 2007, the Bexar County Commissioners' Court established The Bexar County Flood Control Program. It is a \$500 million investment over a 10 year period to build approximately 50 flood control projects across our community. All these flood control projects collaborate with one another to prevent waters from rising and inundating the city millions call home. Through literature review we have found San Antonio's flooding history and helped synthesize the past, current, and recent flood control practices in our City.

Overall the City of San Antonio has learned from our past floods to continue to create new flood control projects. As San Antonio continues to grow, one of the main objectives is to be able to prevent and control future flooding by abundant amounts of rainfall with new flood control projects effectively throughout the city. With the help of the San Antonio River Authority and its affiliations, we can continue to enjoy our historic, tourist-attracting, beautiful City of San Antonio, which we call home.

For talk

Visualization and CFD: Simulating Dissolved Oxygen Content in Rivers

Louis Faust and Heather Shipley
Dept. of Civil and Environmental Engineering

Visualization is the process of visually representing large data sets so they may be more quickly and easily understood. It is a useful tool in both education and research as it allows complex systems and their normally unseeable components to come to life and areas of interest to be discerned readily. Computational Fluid Dynamics (CFD) uses the processing power of computers to perform numerical methods in order to solve problems involving fluid flow. In this research, the goal was to visualize the effect of wastewater discharge on a flowing river and to evaluate CFD and visualization packages for accuracy and ease of use.

The building of a virtual river, represented as a meandering channel and referred to as the “mesh”, was accomplished using the opensource CFD software package OpenFOAM. OpenFOAM was also used to solve for the fluid flow and the advection-diffusion of dissolved oxygen (DO) and biological oxygen demand (BOD) from the wastewater stream to the river. Incorporation of the Streeter-Phelps equation in the solvers allowed for the analysis of DO and BOD as a function of time and distance. ParaView software was used as the visualization engine for the data sets.

The final model yielded data sets which agreed within 5% error with results obtained performing calculations by hand. The final visualization is a good picture of how water quality is affected by discharge and allows for students and researchers to see somewhat quickly the effects of different variables on mixing. These results demonstrate OpenFOAM and ParaView as effective CFD and visualization software packages. Ease of use was the biggest challenge in this research as these programs (OpenFOAM especially) are not intuitive or easy to operate without thorough training or a strong background in mathematics and programming.

Submitted for Poster Presentation

Comparison of BMP Practices in San Antonio and Austin

Marcus Garcia and Xiaofeng Liu
Dept. of Civil and Environmental Engineering

Best Management Practice (BMPs) is used for reducing storm-water pollution. As fresh water becomes scarcer, the protection of the fresh water is very important. With the advent of the Clean Water Act and the EPA's Storm-water BMPs program pollution discharge in waterways can now be controlled, therefore protecting fresh water. The Texas Commission on Environmental Quality (TCEQ) uses BMPs over Edwards Aquifer. Likewise, both San Antonio and Austin use BMPs to control pollution in water stream. Austin's BMPs system is largely dependent on Watershed Protection Department. San Antonio BMPs process relies on multiple sources therefore making it less reliable.

There are advantages for relying on one department for BMPs process that will improve the implementations and reliability of the BMPs. Therefore the research presented will compare San Antonio BMPs process to Austin BMPs process. This study will also explore how San Antonio can improve the BMPs by consolidating the responsibilities and by using the EPAs Storm Water Management Model software to model the use of BMPs and Low Impact Development on a site development. Future consecrations can include using EPA software to compare the difference in water runoff when use of LID and BMPs to no controls of storm water, as well as to compare different BMP design options.

Prefer talk

Chemical Wastewater Treatment Processes of a Tanning Facility

Jessica S. George and Heather J. Shipley
Department of Civil and Environmental Engineering

The process of leather tanning produces harmful chemical and organic pollutants. In order to meet regulatory standards, this study explored chemical treatment methods to successfully and efficiently reduce the concentrations of harmful pollutants in the wastewater. Multiple wastewater streams representative of various stages in the tanning and wastewater treatment processes were initially characterized and subsequently treated through means of chemical coagulation, adsorption and aeration. No two wastewater streams were alike, meaning every stage in the tanning and wastewater treatment processes are physically and chemically dissimilar. Through a series of jar test experiments, use of multiple industry-grade polymers as chemical coagulants greatly reduced chromium concentrations and turbidity levels. The wastewater streams were also subjected to adsorption experiments to see chromium removal efficiency of metal oxide nanoparticles and activated carbon at varying concentrations over a 24hr period. Though poor adsorption of chromium occurred by both the nanoparticles and activated carbon, the activated carbon was successful in reducing nitrogen levels. Aeration experiments using a stir plate at 350rpm monitored with a DO probe conducted for up to 48hrs to determine effectiveness on polymer-treated wastewater streams. COD, nitrogen and turbidity improved the most given a sufficient amount of time (≥ 24 hrs). Aeration however provided no significant improvement for BOD₅, incidentally increasing with time. Having tested three different methods for wastewater treatment, the use of polymers as coagulants was deemed the most successful at removal of chromium and improvement in clarity, albeit the most expensive choice.

Submitted for Poster Presentation

A DAQ System for the Environmental Engineering Laboratories

Josues Gonzalez, Miguel Alvarez, Drew W. Johnson
Department of Civil and Environmental Engineering

A data acquisition (DAQ) system was developed to be used in various applications in environmental engineering laboratories, the system's hardware uses the open source Arduino platform, and several software applications were developed for the system using the Lab VIEW development system. A functionality of the system is its capability to extract data via serial port communication; this functionality was used to record the change in volume of a liquid in a beaker over a period of time from a Setra scale and with a sampling rate specified by the user. The Setra scale outputs the weight measurement in decimal, a Lab VIEW program receives this information, records it, and makes an excel spreadsheet for further analysis by the human operator. Another application that was developed with the system was a control system for a infusion pump. The infusion pump was controlled with transistor to transistor logic (TTL). The purpose of the control was to inject or withdraw from the syringe until a specified pressure is reached. The pressure from the syringe is measured with a transducer, a transducer transforms mechanical pressure into voltage which is processed by the system and transformed back into mechanical pressure to be displayed in a Lab VIEW application. The DAQ system is a versatile system capable of functionalities only limited by the software developed for it, it is easy to replicate and expand up on for used in other types of laboratories.

Submitted for Poster Presentation

Analyzing the Composition of the Marine Nematode Community in the Post-Deepwater Horizon Environment

Ashli Green, Environmental Science,
Jyotsna Sharma, Department of Biology

Nematodes are the most abundant metazoans in marine sediments from intertidal zones to the darkest depths of the sea. They have been shown to be important bioindicators of anthropogenic disturbances such as: oil spills, radiation leakage, and large amounts of total suspended solids. Nematodes are primary consumers and are good bioindicators because most pollutants are highly concentrated in the sediments, therefore the nematodes are continually exposed due to their association with sediments, and are more likely to exhibit effects due to the contamination. On April 20, 2012 a major British Petroleum's Macondo Well (also known as "Deepwater Horizon") had a blowout spill releasing an estimated 52,000 barrels of crude oil per day into the Gulf of Mexico (GOM) about 40 miles off the southeast coast of Louisiana. This was among one of the worst oil spills in history because after the explosion, Deepwater Horizon burned for more than a day before sinking and spilling about 4.9 million barrels of crude oil into the Gulf waters until the leak was stopped by capping the gushing wellhead on July 15, 2010. The aim of the present study was to 1) determine how the composition of the nematode community in intertidal sediments was impacted by this major ecological disaster 2) examine the vertical distribution of the nematode fauna in intertidal sediments and 3) study the trophic groups to determine the functional role of nematodes.

Core samples were collected from five intertidal sites along coast of north GOM. Samples were taken from Shell Fish Lab, Cadillac Ave., Ryan Court, Bay Front Park, and Bellaire Blvd on the dates 3/28/11, 9/25/11 and 11/16/11. With the exception of March, 2011, two separate core samples (500cc) were collected at each location and preserved in DESS. The cores were subdivided to determine the vertical distribution of nematodes: 0-3cm, and 3- 10cm. Nematodes were extracted by decantation and flotation from each core by using a 45 μ m sieve. A subsample of 100 nematodes were sorted by hand and transferred to anhydrous glycerin by the method of Seinhorst (1959) into a watch glass. This procedure facilitates identification of nematodes as it alters the refractive index of the thick nematode cuticle so internal structures can be observed. The nematodes were then placed in a desiccator for about a week and transferred onto slides for examination under a microscope. They were identified to genus based on their morphology using standard taxonomic keys. After identifying nematodes the data was tabulated onto an excel spreadsheet. Nematodes were classified into feeding groups based on their buccal morphology (Wieser, 1953).

A total of 70 nematode genera were identified from March, 2011 to November, 2011. The lowest number of genera was found in March, and continued to increase in later months. The most commonly found genera from these dates were *Axonolaimus* (78%), *Theristus* (49 %), *Oncholaimus* (38%), and *Enoploides* (13%). March 2011 samples collected less than a year after the oil spill are distinct from the others. The nematode fauna at Ryan Court, Shell Fish Lab and Bayfront Park in September and November had 70% similarity in composition of genera. The most commonly found genus in all the samples from these dates was *Theristus*, a selective

deposit feeder than can ingest particles such as diatoms and bacteria. *Axonolaimus*, also a deposit feeder, was found in three locations, Bellaire Blvd, Cadillac Ave, and Bay Front Park, but was completely absent from the other two locations. No significant difference was noted in the vertical distribution of nematodes, however, when *Enoploides*, *Metoncholaimus*, *Oncholaimus* predominated in the upper 3cm layer, the smaller nematode genera are more abundant in the lower sediments.

The results shed light on the nematode's role in recovery of biota in the Gulf waters. These microorganisms are at the bottom of the food chain and affect the ecosystem around them in many ways. It is important to see how the nematode community continues to respond rapidly to disturbance and enrichment. The data presented here are an important baseline for future studies to see if or how the nematode population change in the future. It also adds to an understanding of how nematodes contribute to the Gulf of Mexico's ecology as it heal from this disaster.

Effects of Seismic Loads in Soil Arching Conditions

Phillip Gutierrez and Jie Huang
Department of Civil and Environmental Engineering

The effects of soil arching under seismic load are an under-studied aspect of geotechnical engineering. Soil Arching is a universal phenomenon in a soil mass above tunnels, underground trenches and retaining walls. This experiment will be implemented in order to track individual soil particle movement during soil arching conditions under seismic loads. Various soil arching theories have been created from lab tests under static conditions, but the use of dynamic loads in these tests has not been examined. This study involved the use of a shaker table with variable settings, a tank with dimensions 2 in. x 42 in. x 28 in. to hold the “soil particles”, and the “soil particles” which are represented by aluminum bars. By creating a small scale model of these conditions, more accurate observations can be made about this scenario. With the use of precise photography, the aluminum bars can be tracked through their movement and displacement can be measured. With the understanding of soil movement during these conditions, critical properties, such as the size of the soil arching zone and the equal displacement plane, can be more accurately estimated.

The experiment began with the acquisition of aluminum bars from another university which will represent the soil particles in the ground. These bars are ideal for representing actual soil particles because the specific gravity of aluminum is similar to that of soil and they were in three different size diameters, $\frac{1}{4}$ ”, $\frac{1}{2}$ ” and 1”. Also, the bars can create a plane-strain condition, meaning it can generate soil arching in a two dimensional condition. The bars were marked in the center for accurate tracking and crosshairs were also marked through the center to be able to observe any rotation in the particle. After an individual ID number was given to each $\frac{1}{2}$ ” and 1” diameter bar, all bars mixed proportionate to weight and placed in the containment tank at a height of 7 inches. The tank was built with an adjustable trap door at the bottom that is lowered to create soil arching conditions. A geotextile sheet is placed below the bars and above the trapdoor in order to mimic flexible support. Attached to the shake table with bolts, the container was ready for the seismic loads that can be inputted into the machines software. In order to track the movement of the bars, a Nikon D7000 camera was bought in order to get the best picture quality and capture multiple frames per second. Placed at a distance of three feet away from the container, the camera will take a picture before and after. These photos will be compared to quantify displacement. Also, photos will also be taken during movement in order to give a general path of soil particles. The shake table was set with the initial parameters of an amplitude, or total displacement, of one-half inches, a frequency of two hertz, and duration of 50 cycles.

After setting up the initial test during the summer, the project will study the effects of different variables on the soil arching zone and the equal displacement plane. The soil arching zone is the area of soil mass that has shifted. If fiber optic cables or other underground utilities are in this zone, they could be damaged because of soil movement in this zone. The equal displacement plane is the elevation in the soil mass where there is no vertical displacement. If the equal displacement plane is above the surface of the soil, displacement of the surface soil will cause large elevation differences at the surface which will cause problems for any structure near this area. In the future, the model will be under different amplitudes, frequencies, durations, soil

height, and proportions in order to determine a better estimation of the soil arching effects for seismic conditions.

Submitted for Poster Presentation

Comparison of Fatalities Caused by Flooding During the Last Fifty Years

Alex Hilario and Hatim Sharif
Department of Civil & Environmental Engineering

This research makes a comparison of fatalities that occurred during the last fifty years in the states of Arizona, Indiana, Georgia, Massachusetts, Iowa, Michigan, Illinois, Kansas, Minnesota, and Nevada. The research covers deaths that happened within the different counties of each state.

The data used to develop this research was the storm data collected or developed by National Climatic Data Center (NCDC) which is the world's largest active archive of weather data. NCDC provides data requests from all over the world and produces a number of publications about climate. The NCDC operates two centers: one is located in Asheville, North Carolina, which is the World Data Center for Meteorology and the other is the World Data Center for Paleoclimatology located in Boulder, Colorado.

The NCDC storm data was used to develop this research. This data provided information such as the date of the event, the location of the event, and a description of each individual event when available. The research was done by carefully analyzing each individual case where flooding was present. The data collected starts in January of 1959 and ends in December of 2009.

The general results show that there is an increase in casualties caused by flooding. The gender of the casualties are predominantly male but also female casualties are present. Even though the age group varies, the predominant age ranges from adults (18-69) to youngsters (2-10). A large number of casualties occur when the victims are inside a vehicle.

In conclusion, this research clearly shows that the number of fatalities caused by flooding in the different states is steadily increasing. It is a challenge for future engineers to continue to collect accurate data so that we can develop ways to prevent or decrease fatalities due to flood in the future.

Poster Presentation

Oxygen Isotopes in Conodont Phosphate: Paleoecological or Diagenetic Signal?

Marvin Lopez and Lance Lambert
Department of Geological Sciences

Conodonts were very small, eel – like animals ranging from the late Cambrian Period to the Triassic Period. They are extensively used in correlating and dating strata. While the actual animal was mostly made out of soft tissue, their strong teeth are often preserved, which are called “elements”. Research results show that oxygen isotope ratios derived from conodont phosphate vary for different time periods in the geologic record. A compelling question is whether these isotope ratios represent true paleoecological signals of the Paleozoic oceans when the conodonts lived, or whether they reflect the later diagenetic history, after the sediments turn into rock.

My MORESE project will help test which history is recorded in the oxygen isotope data. The Chappel limestone in Central Texas is known to have a unique, long-range lag deposit from the Ordovician Period up to the Mississippian Period. Conodonts will be sorted by taxonomic assignment and by chronologic order. Then they will be run for oxygen isotope analysis. If the signal is the same for Ordovician, Silurian, Devonian, and Mississippian conodonts, we know the isotope record is diagenetic. If the conodont groupings have differing isotope signals according to their age and their species group, we know that the oxygen isotope record of conodonts reflects their paleoecology.

Flood Fatalities in the U.S.

Andres Munoz and Hatim Sharif
Department of Civil & Environmental Engineering

From 1959 to 2011 Texas is believed to have the highest flood fatality risk, since it leads the nation in total number of fatalities. This study examined characteristics of flood fatalities from multiple states. The source of data came from the National Climatic Data Center (NCDC) *Storm Data* monthly publications. We found that flood fatalities in Texas, after normalization by population, are lower than 6 other states. We also see a decreasing trend in flood fatalities for Texas. However Texas leads the nation in the number of flood fatalities per unit depth of average rainfall. Ninety percent of fatality causing events in Texas resulted in less than six fatalities. The nature of storms and terrain, such as low water crossings, may be behind the characteristics of fatalities in Texas.

Submitted for Oral Presentation.

Growth and attachment of *Desulfovibrio desulfuricans* on gypsum with implications for a Mars analog

Naiomi Patterson and Stuart J. Birnbaum
Department of Geological Sciences

The Mars rover Curiosity, tasked with determining if Mars could have supported microbial life, discovered an outcrop containing bedded gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) suggesting the question "Can sulfate reducing bacteria (SRB) – specifically *Desulfovibrio desulfuricans* – use solid gypsum as their terminal electron acceptor and can an analog for SRB on Mars be developed in the laboratory?" The research approach includes (1) using a modified growth medium with gypsum substituted for soluble sulfate to determine the rate and effects of abiotic dissolution of gypsum crystals; (2) repeating this experiment in the presence of SRB to determine the biological effects on gypsum dissolution; and (3) using scanning electron microscopy (SEM) to determine whether microbial activity yields a diagnostic signature to help recognize evidence of former microbial activity preserved in Martian samples in the future.

Here we report findings of a preliminary study using the SEM to compare gypsum crystals immersed in sulfate-free media without SRB, to gypsum crystals in the same media inoculated with SRB. Samples were prepared and treated identically except one was inoculated with SRB; all samples were incubated for 96 hours minimum at 30°C. The sample without cells showed clean crystal surfaces and minimal dissolution. The sample with cells showed (1) evidence of corrosion pits, (2) a biofilm coating crystals, and (3) subspherical bodies ~1 μm in size interpreted to be desiccated cells. These results suggest (1) that SRB grow using solid gypsum as their terminal electron acceptor; and (2) SRB attach to gypsum crystals producing signatures indicating their presence and activity.

Submitted for Poster Presentation

Analysis of Lake Buchanan's Temperature Variation Using MODIS and In-Situ Data

Johanna Torres, Anthony Arricale, Hongjie Xie
Department of Geological Sciences

1. Introduction

Numerous studies have explored alternative applications of Aqua and Terra satellites and the data from the Moderate Resolution Imaging Spectrometer (MODIS) onboard. The Aqua and Terra satellites are part of NASA's Earth Observing System mission. The mission's purpose was to better understand climate change by making connections between changes in Earth's atmosphere, land, snow, ice, ocean and energy balance. For this study the goal is to assess the validity of surface water temperatures (SWT) from the Moderate Resolution Imaging Spectrometer (MODIS) data aboard the Terra and Aqua Satellites for Lake Buchanan. The images would be assessed and compared against in-situ data provided from the Lower Colorado River Authority (LCRA). If it is found to be valid, satellite data can be used to monitor lakes where it is not possible to collect in-situ data. Gathering information on water temperature is important because it has effects on water chemistry and biological processes as well as providing overall insight to climate change.

2. Data Used and Methodology

2.1 MODIS

The Aqua and Terra satellites are both equipped with a Moderate Resolution Imaging Spectroradiometer which retrieves Land Surface Temperature and Emissivity (LST) data at 1 km pixels scale. The satellites are in a sun-synchronous orbit, which means that the satellites cross the same point over the Earth's surface at the same time every day. Terra travels from north to south and during its day circulation it always crosses the equator around that locations local time of 10:30 am while at night it will always cross at 10:30 pm local time. Aqua on the other hand travels from south to north and passes over the equator at the local times of 1:30 am and 1:30 pm.

The data for Lake Buchanan's LST, in this case Surface Water Temperature (SWT) was ordered from the Oak Ridge National Laboratory Distributed Active Archive Center. The data included a total of 452 daytime images, 452 nighttime images from the Aqua satellite and 559 daytime, 558 nighttime images from Terra. The images are 8-day average temperature images from the period between July 2002 to April 2012 for Aqua and March 2002 to April 2012 for Terra. There was a total of 410 cloud free nighttime images and 403 daytime cloud free images for Aqua while there was a total of 546 cloud free daytime images and 513 cloud free nighttime images for Terra.

2.2 In-Situ Data

The LCRA provided daily flow rate, daily rainfall at the Colorado River at Bend. Daily air temperature data was provided from one upstream site and three downstream sites. They also provided instantaneous water temperatures that are sampled manually during the day. The water

temperatures were taken at a depth of 0.3 meters and are taken once every two months at 5 sites at Buchanan Lake. Because the water temperatures are taken during the day, the data sets were compared to the daytime Aqua and Terra monthly averages calculated in Excel for every month that there was a temperature provided by the LCRA.

3. Results/Conclusion

The data sets being compared are the monthly SWT from MODIS and the manual readings that were taken on site at the four different locations at the lake. Data sets were provided for 5 locations but the location at the confluence of Council and Morgan Creeks had insufficient data. The following figures 1 and 2 are graphical representations of the in-situ data at the Rocky Point location compared to Aqua and Terra monthly averages, respectively. Although this site had the most similar trends between the in-situ and satellite data, it can still be seen that the satellite data shows an overall increase of SWT while the in-situ data shows an overall decrease. The others sites had the same results. Many factors that are possible contributors to these results are the fact that the in-situ temperatures are below the surface, at a depth of 0.3 meters. Something else to consider is that there is only one temperature given for once every two months in the in-situ data set and the MODIS information being used are monthly averages for the given month. Other results included visual representations made on ArcMap 10 of the temperature distribution of Lake Buchanan over the period of 10 years. The images show that the warmest part of the Lake is near the center, around Rocky Point. Further investigations that will be looked into are the similarities of the trends between the MODIS data and air temperatures recorded near Lake Buchanan, as well as studying the inflow vs outflow of the reservoir.

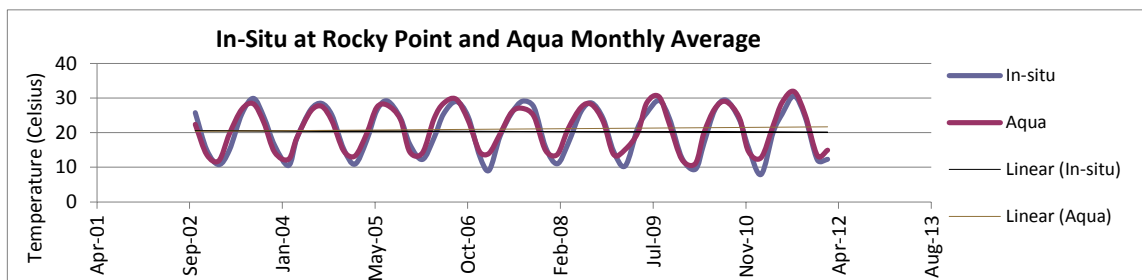


Figure 1. This graph shows the linear trends of the Aqua satellite data and the in-situ data at Rocky Point

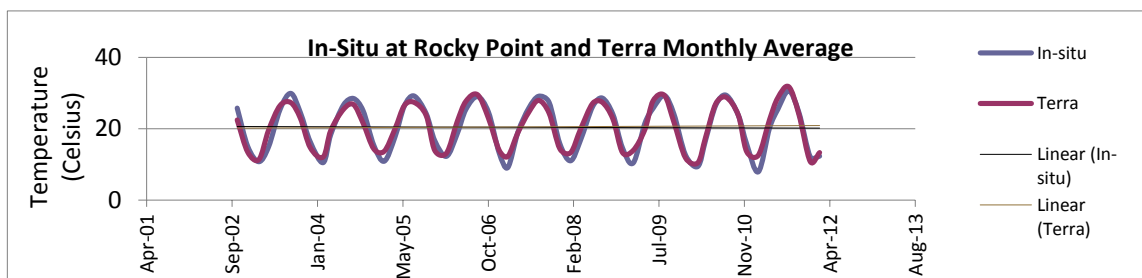


Figure 2. This graph shows the linear trends of the Terra satellite data and the in-situ data at Rocky Point

Carbon isotope chemostratigraphy of lower Cedar Mountain Formation, Utah

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The Cedar Mountain Formation in Utah is important to improve our understanding of the Early Cretaceous continental climate. Recent discoveries also make this formation important to understanding the evolution of dinosaurs in the Early Cretaceous. The age of these rocks is still unclear and more studies need to be done to establish a more accurate chronostratigraphy. Vertebrate paleontologists argue that this section is no older than Barremian(130-125 Ma) while ostracode and pollen biostratigraphers suggest dates as old as Berriasian(145-140). By using organic carbon isotope chemostratigraphy we expect to improve stratigraphic context. In 2007, 57 samples were collected, and this summer prepared by crushing into a fine powder, decarbonated using 3M HCl. The samples were then weighed and analyzed on a Delta + XP IRMS connected to a Costech Element Analyzer and reported relative to VPDB. The $\delta^{13}\text{C}_{\text{org}}$ values average 26.5‰ and range from -28.8‰ to -24.3‰. Previous data (U-Pb dates from a carbonate sample of 119Ma and preliminary paleomagnetic signatures) suggested we could expect to see the global C3 negative isotope excursion followed by a positive excursion. While the curve does vary by about 2‰, no significant excursions are recognized and we therefore conclude the age to be Barremian which in other carbon isotope curves show smaller variations. Additional magnetostratigraphic data may clarify this conclusion as will continued stratigraphic research in near localities.

Submitted for Poster presentation

Laboratory Analysis of MSE Wall Experiencing Uplift

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Mechanically stabilized earth (MSE) walls have been used widely in a multitude of applications, largely to retain soil mass or support a diverse array of superstructures. Today, the annual construction of MSE walls has exceeded the amount of any other earth retaining wall constructed, largely due to the financial and time frame advantages that this system employs. The MSE wall design is based on limit equilibrium (LE) analysis to ensure the external and internal stabilities and the deformation is estimated empirically. In recent years MSE walls have been increasingly built over soft, loose or expansive subgrades, which have been deemed unsuitable for MSE walls. Under conditions as such, MSE walls may experience upward or downward movements that are not considered within wall design. Our research lies within the exploration of the effects that the upward and downward movement have on geogrid tension, lateral earth pressure, as well as the amount of deflection the MSE wall experiences.

Our study was conducted on a self constructed MSE wall model having the dimensions of 3x4x2 (HxLxW) respectively. Multiple analyses were run with two or three layers of punch-drawn geogrid. Poorly graded blast sand was used as our backfill and was compacted to 90% relative compaction. Strain gauges, dial gauges and pressure cells were installed at specific positions to monitor the parameters through a ten channel data logger. During the tests, the leveling pad of the MSE wall was lifted by a hydraulic jack to increments of .25-.5 inches each time. Readings from the instruments were acquired for each uplift and recorded. The ultimate uplift was limited to two inches and was considered an extreme condition. The data obtained was plotted and analyzed as a function of upward movement.

Based on our study it can be concluded that the upward movement has a considerable influence on the strain in the geogrid and the lateral pressure on the MSE wall. After further interpretation of our data, it is highly recommended that the possibility of upward movement of MSE walls should be taken into account within MSE wall design.

For poster

Soil Erodability Testing

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Determining erosion susceptibility of soil is important to mitigate soil losses at rivers and streams and control landslides. The research that was done in the summer was to develop a soil erosion test using a water mixing (agitator) apparatus where water overlying a soil sample was mixed with a paddle at different RPMs and amount of soil suspended was measured by weighing after drying. No standardized technique has been adopted for doing these types of tests and this method may be a low cost alternative to other methods that rely upon testing soil samples in hydraulic flumes which can be very expensive (\$1000 per test).

Apparatus necessary for our new testing procedure includes compacted soil cylinders, agitator with a flat paddle, and a peristaltic pump and oven. Once a cylinder is compacted to 20 cm it is then cut into a 15 cm cylinder and water is placed on the surface of the soil and allowed to sit for 24 hours. The agitator/paddle is inserted 5 cm above the soil sample and turned on to a specific rpm. The agitator is run for 5 minutes to create shear stress on the soil with water. Once the 5 minutes is over, a pump is used remove 100 ml of the suspended solids that are in the water. The 100 mL is put into an oven at a temperature of 100 degree Celsius so the water can evaporate, but keeping the solids in the cup. Based upon the amount of solids remaining after evaporation, the erosion rate can be calculated.

The results so far have been reproducible with higher rpm (shear stress) resulting in higher erosion rates, allowing for comparisons between different types of soils. This is going to be an ongoing project and hopefully one day The University of Texas at San Antonio will have produced a standardized test that allows easy comparisons or erodability between soils.

Submitted for Oral Presentation