



2013 MORESE Colloquium

Final Program

Date: Friday, October 11, 2013
Time: 1:30 pm to 6:00 pm
Where: BSB 3.03.02 (Loeffler room)

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 16 research papers, with 15 of them from MORESE students. The content covers a diverse spectrum of contemporary topics from geology, environmental science, and civil engineering. Six graduate students from different fields of Geology, Environmental Science and Engineering will serve as a judge committee to evaluate all the presentations. Each poster consists of 5 minutes presentation and 5 minutes of judges asking questions. The judge committee will evaluate all poster presentations for one first, two second, and three third best presentations (a total of 6 awards) in terms of overall quality and professionalism. Cash awards will be given for the first place (\$250), second place (\$200), and third place (\$120).

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:

Kevin Eddy – ESE PhD student

Chad Furl – ESE PhD student

Gisella Lamas – ESE PhD student

David Prado – ESE PhD student

Chris Ray – Geology Master's student

Wentao Xia – ESE PhD student

Final Program of 2013 MORESE Colloquium

	Student	Major	Mentor	Title
Poster Session I (1:30-3:00 pm)	<i>Karem Alfaro</i>	Civil Eng.	Samer Dessouky	Mitigation of Air Emissions By Utilizing Vegetation
	<i>Diana Azouggagh</i>	Geology	Marina Suarez	Micro Sampling Carbon and Oxygen Isotope for Analysis from Limestone Caprock from Cleveland Lloyd Dinosaur Quarry in Eastern Utah
	<i>Velita Cardenas</i>	Geology	Blake Weissling	Antarctic Sea Ice/Slush Assessed by Multi-Frequency Electromagnetics: A Predictive Tool
	<i>Livier Corona</i>	Civil Eng.	Xiaofeng Liu	Gravity Currents on Slopes
	<i>Kristi Funari</i>	Geology	Yongli Gao	General Water Quality Survey of Upper Cibolo Creek During Drought Conditions
	<i>Jessica George</i>	Civil Eng.	Heather Shipley	Chemical Wastewater Treatment Processes of a Tanning Facility
	<i>Angela de Greef</i>	Civil Eng.	Jie Huang	Liquid Limit and Plastic Limit Tests
	<i>Shelby Williams</i>	Env. Sci.	Blake Weissling Steve Ackley Hongjie Xie	Image Processing of Ship-based sea ice digital photography
3:00-3:30	Coffee Break			
	<i>Ana Atilano</i>	Geology	Hongjie Xie Xin Miao	Detection of Melt Ponds through High Spatial Resolution Aerial Photos
	<i>Ana Balino</i>	Geology	Xin Miao	Extract Detailed Terrain Information From High-resolution Lidar Data
	<i>Alex Hilario</i>	Civil Eng.	Hatim Sharif	Impacts of Heat Island on Rainfall in Houston, TX

Poster Session II (3:30-5:00 pm)	<i>Christine Maher</i>	Geology	Lance Lambert	Sexual Dimorphism in the Triassic Ammonoid <i>Joannites</i>
	<i>Faviola Manzano</i>	Civil Eng.	Ruoting Pei	Bacteria cell walls are novel viscosity modifying admixtures of concrete
	<i>David Morua</i>	Civil Eng.	John Joseph	The Development of Scientific Support to Assess the Environmental Impact of Fracking-Related Activities in the Eagle Ford Shale
	<i>Andres Munoz</i>	Civil Eng.	Hatim Sharif	Flood Fatalities in the U.S.
	<i>Jose Salazar-Verdin</i>	Geology	Marina Suarez	Carbon isotope chemostratigraphy of the lower Cedar Mountain Formation, Utah
5:00-6:00pm	Award Ceremony (COS Dean George Perry) and Dinner			

Mitigation of Air Emissions By Utilizing Vegetation

*Karem Alfaro and Prof. Samer Dessouky
Department of Civil and Environmental Engineering*

As our society grows and expands, the increase used of transportation along our roadways continues to become a critical issue. The contamination resulting from the use of vehicles can be qualified as both harmful air emissions and disruptive noise pollution. With the increased focus on environmental consciousness, the use of natural environmental solutions such as vegetative barriers has become a potential solution to a growing issue.

The increasing use of vehicular transportation has led to the increased in measurable contamination. Vehicular contamination may be measured in the form of particles, vehicular emissions, or as noise, auditory contamination. The contaminants released by vehicles have resulted in the search for a means to contain the contaminants and prevent human exposure. More than 1,000 compounds have been identified in exhaust and evaporative emissions from mobile sources. The impact of fine particulate matter (PM) on public health has long been a concern. Human inhalation of ultra-fine particles has been linked to health issues. The primary sources of fine (PM 2.5) are diesel trucks. It is challenging to predict the patterns of emissions. The vehicles that provide the primary source of PM 2.5 are particular difficult to formulate a pattern for due to the unreliable vehicular activity data.

In May of 2010 the Environmental Protection Agency (EPA) released a document for their Office of Research and Development discussing the dispersion effects that vegetation has on pollutants resulting from vehicular transport. The document references an "extensive sampling" conducted during the summer of 2006 that measured air toxins, gases (CO, NO_x), and particulate matter" along a roadway in Raleigh, NC. To determine if there was any measurable drop in the contaminant levels, the study focused on two types of areas, areas of unobstructed flow and areas obstructed by 6m noise barrier and vegetation. Results from the Raleigh near-road study "found lower concentration of carbon monoxide and particle counts downwind of barriers. This data, illustrated in Figure 1, would suggest that vegetative barriers are in some way effective in countering the pollutants released by automobiles of various types. The EPA study determined that vegetative barriers are capable of having an impact on mitigating vehicular emissions, but the effectiveness is site-specific. Factors such as, local meteorology, building density/height, distance from road, and placement of pedestrian/bike paths, may play a role in the overall effectiveness of vegetative barriers.

In 2013 adapt Oakland published a document discussing the value of vegetative barriers in mitigating the effects of various sources of pollutants in the West Oakland area of California. The community is encircled by three freeways, a one million car-per-day bridge, an 80-million gallon-per-day waste treatment plant, and a 2,000-acre port, which together result in an ambient

diesel PM concentration nearly three times that of the rest of the Bay Area. The result of the increasingly dangerous environmental conditions was the proposition of dense near-road urban forestry at the edge of the industrial zone between residential areas, as well as near high traffic roads and freeways.

Vegetation in the urban setting provides a host of beneficial effects; it has been shown to improve overall community health and vitality particularly in children, the elderly, and residents of low-income housing. Urban forestry has the added benefit of increasing property values by reducing blight, and also mitigates the urban heat island effect. Greenbelts are simultaneously explored as stormwater management solutions; through infiltration they help to reduce the millions of gallons of stormwater that often overwhelms the municipal stormwater system and flows untreated into the San Francisco Bay, contaminating fisheries and endangering human and animal lives.

The documentation of the effectiveness of vegetative barriers available to adapt Oakland yielded promising but widely variable findings. The issue was that previous studies had focused more on research done in controlled environments where data could be collected consistently and results could be reproduced for verification. Simulations and wind tunnel studies have been prominent in the study of the effectiveness of vegetative air barriers.

The study of vegetation as an effective air barrier has revealed that vegetation has a measurable effect on the concentration levels of particulate matter (PM) that it is exposed to. Vegetation effects PM concentrations by means of deposition and as a barrier. Deposition is the physical capture of particulate matter on the leaves and bark of trees and plants. The naturally large surface area of vegetation, such as trees and large bushes, provide ample substance for particulate matter to be captured by. The height and density of the tree stand effects the occurrence of turbulence on the windward and leeward sides of the trees. The height of the trees also aides in forcing a portion of the wind up above the canopy. The wind that is forced upward will eventually effect ground level wind intensity, but the height will increase the linear distance before ground level winds are effected. The shear variety of vegetation types is important as well due to the various surface features, such as bark and leaves, which each species of tree has. The roughness and stickiness of plant surfaces also has a great effect on the capture of particulate matter.

The use of natural barriers is a topic of major interest and critical importance. Vegetative barriers provide the potential for a renewable method of mitigation that may be utilized as a source for recyclable content for other aspects of life. As an emissions control device, vegetative barriers can be very effective. Their density, large surface area, and height provide many of the benefits that are required to contain and control the flow of harmful vehicle emissions.

Submitted for Poster Presentation

Detection of Melt Ponds through High Spatial Resolution Aerial Photos

*Ana Atilano and Profs. Hongjie Xie and Xin Miao
Department of Geological Sciences*

Melt Ponds are melted ice and snow on top of sea ice that usually form in the warmer months. Unlike ice, melt ponds absorb heat which can significantly influence Earth's radiation balance. Detecting melt ponds manually is time consuming and strenuous but using ENVI software helps extract melt ponds efficiently.

Seven distinct images of the North Pole were used. They were taken by the Chinese Arctic Exploration in 2010. The remote sensing software ENVI was used to classify the images.

In ENVI, each image is interpreted in four different classifications; Parallelepiped Distance, Minimal Distance, Maximum Likelihood, and Mahalanobis Distance. Parallelepiped classification is based upon a standard deviation threshold from the mean of each selected class. The Minimum Distance classification uses the mean vectors of each ROI and calculates the Euclidean distance from each unknown pixel to the mean vector for each class. Maximum Likelihood classification assumes that the statistics for each class in each band are normally distributed and calculates the probability that a given pixel belongs to a specific class. The Mahalanobis Distance classification is a direction sensitive distance classifier that uses statistics for each class. For every image, a total of four Region of Interest (ROI) were used: Seawater represented in the color red, Ice/Snow in green, Submerged Ice/ Melt Pond in blue, and Shadow in yellow. Each ROI required 20 pixels to represent its region; they were manually picked.

Results showed a range of interpretation depending on classification and image content. Out of the four classifications used, Parallelepiped was the least effective. Three out of the four images did not detect the shadow ROI at all and there were black voids in all images. Black voids represent pixels that fit neither ROIs. An explanation for this situation is because this classification classifies the pixels based upon a standard deviation threshold from the mean of each selected class. If a pixel value lies above the low threshold and below the high threshold for all n bands being classified, it is assigned to that class. If the pixel value falls in multiple classes, ENVI assigns the pixel to the last class matched. Areas that do not fall within any of the parallelepiped classifications are designated as unclassified. The best classification out of the

four was Maximum Likelihood. It had the best representation of all ROIs' for all the images. This is because this classification assumes that the statistics for each class in each band are normally distributed and calculates the probability that a given pixel belongs to a specific class. The equation used is the following:

$$P(\omega_i) = \frac{1}{|\Sigma_i|} \exp\left(-\frac{1}{2}(x - \mu_i)^T \Sigma_i^{-1} (x - \mu_i)\right)$$

Where “i” represents class, x represents n-dimensional data (where n is the number of bands), $p(\omega_i)$ represents probability that class (ω_i) occurs in the image and is assumed the same for all classes, $|\Sigma_i|$ represents determinant of the covariance matrix of the data in class (ω_i), Σ_i^{-1} represents its inverse matrix, and μ_i represents mean vector. Although the ROIs were interpreted, there was a common problem between the images, specifically if the images that have plenty of shadows. The ROI for shadow will overlook submerged ice/ melt pond. This was very common in the Mahalanobis Distance classification. Unlike Maximum Likelihood, Mahalanobis Distance classification assumes all class co-variances are equal and all pixels are classified to the closest ROI class unless the distance threshold is specified. When comparing Mahalanobis Distance to Parallelepiped classification, Mahalanobis is better at classifying because there are no black voids in the images.

In the end, ENVI software can help identify melt ponds in an effective way by using the ROIs listed, manually selecting a set of 20 pixels to represent an ROI, and using the Maximum Likelihood classification.

Submitted for Poster Presentation

Micro Sampling Carbon and Oxygen Isotope for Analysis from Limestone Caprock from Cleveland Lloyd Dinosaur Quarry in Eastern Utah

*Diana Azouggagh and Prof. Marina Suarez
Department of Geological Sciences*

Cleveland Lloyd Dinosaur Quarry (CLDQ) is a world renown historical paleontological site that was declared a National Natural Landmark in 1966. The site is located 32 miles south of Price, Utah in the northwest region of the San Rafael Swell. CLDQ is in the Brushy Basin Member of the Morrison Formation, and was dated to approximately 147 mya. The site is the home of the densest concentration of Jurassic dinosaur bones ever found. There has been an estimated 10-12,000 dinosaur bones removed from the quarry area, with 46 of the animals found being *Allosaurus fragilis*. However, mystery lies in many aspects of CLDQ including the accumulation of these well preserved and disarticulated skeletal remains. The two hypotheses, one suggesting the location was a predator trap produced by either a mud bog or a spring and the other conveying attritional drought accumulation, were considered. We tested the drought hypotheses by analyzing carbonates deposited in and around CLDQ. If the drought hypothesis was correct we expected to find positive trends in Carbon and Oxygen isotopes. Our results for Carbon ranged from -10.79‰ to -8.20‰ and for Oxygen -5.79‰ to -4.50‰. A positive trend was not apparent with our $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values, showing our results did not support drought accumulation.

Submitted for poster presentation

Extract Detailed Terrain Information From High-resolution Lidar Data

*Ana Balino and Prof. Xin Miao
Department of Geological Sciences*

Lidar is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. Lidar offers an alternative to in situ field surveying and photogrammetric mapping techniques for the collection of elevation data. Lidar technology can be used to provide elevation data that is accurate, timely, and increasingly affordable in inhospitable terrain, with applications in archaeology, geography, geology, geomorphology, seismology, forestry, remote sensing, atmospheric physics, and contour mapping. Lidar uses ultraviolet, visible, or near infrared light to image objects and can be used with a wide range of targets. A narrow laser beam can be used to map physical features with very high resolution. Lidar range information into a set of latitude, longitude, and altitude coordinates for each Lidar return. If we wanted information about a sinkhole then we would be interested in the first and last returns .

POSTER Presentation

Antarctic Sea Ice/Slush Assessed by Multi-Frequency Electromagnetics: A Predictive Tool

*Velita Cardenas and Prof. Blake Weissling
Department of Geological Sciences*

During the ODEN South Ocean Expedition 2010-11 across the Amundsen Sea, sea ice thickness was assessed in multiple transects across the Antarctic sea ice using multi-frequency electromagnetic induction sounding. Despite initial instrument calibration for all frequencies to a common ice thickness, based on a 2-layer conductivity model, subsequent analysis of the data set for each frequency showed an ice thickness divergence most frequently in areas of seawater flooded ice, interposed between base of the snow layer and the top of the ice – most commonly referred to as the slush layer. The slush layer occurs when excessive snow on the sea ice pushes the top ice surface below sea level, due to buoyancy principles. The purpose of this study is to assess the potential for multi-frequency EM to predict the presence and possible depth of the flooded slush layer using multi variant regression models. Having the means to remotely sense sea ice slush layer and negative ice freeboard has significant implications in current satellite based efforts to measure sea ice elevation for the estimation of sea ice mass and change – a key element of global climate forcing models.

Submitted for Poster Presentation

Gravity Currents on Slopes

*Livier Corona and Prof. Xiaofeng Liu
Department of Civil and Environmental Engineering*

Introduction

A gravity current or density current is the flow of a fluid within another fluid caused by the different density between them. Both fluids have different specific weights with a driving force that is caused by dissolved, suspended material or by temperature differences. These gravity currents are mostly horizontal; they can occur as top or bottom boundary currents, or as intrusions at some intermediate level. For the majority of time the fluids can be mixed. Therefore, the results of the mixing fluids play an important role in the dynamics of the flow. The gravity of the currents is very important in many different scientific disciplines and they are caused by natural situations and also can be created in laboratory experiments. Some of the examples of gravity currents are salt water edges in river estuaries, sand storms, rivers plumes into oceans and snow avalanches. In this experiment we will see the comparison of the dynamics of density currents on different slopes. The velocity of the fluids was measured with an ADV (Acoustic Doppler Velocimeter). The effects of different slopes on the density currents were analyzed by graphs and formulas.

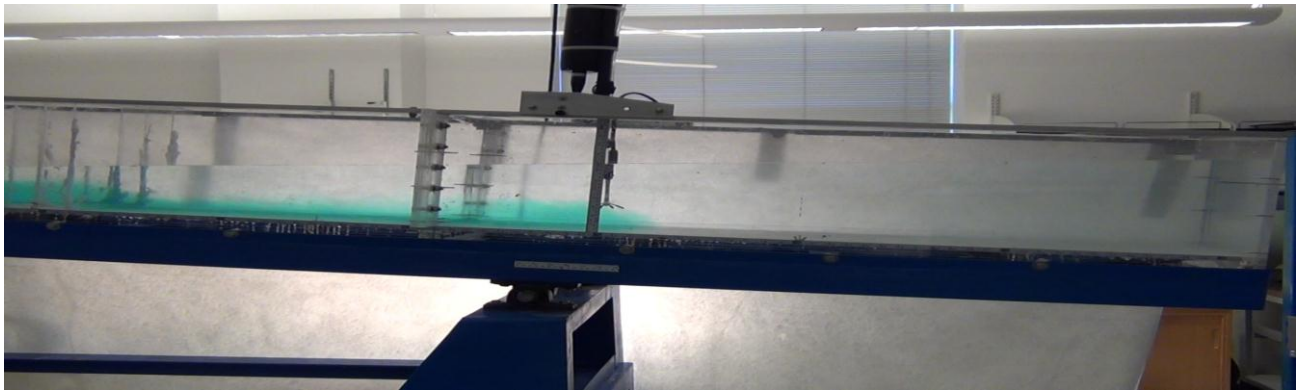


Figure 1. Density current from lab.

Methodology

The experiment consists of having two different fluids with different density. One of the fluids is fresh water dissolved with salt; this is the fluid with a density of 1.005; the other fluid is fresh water with a density of 1.000. In a 12' tilting flume, the salty water and the fresh water are deposited in separate areas. They are separated by a gate located at $\frac{1}{2}$ of the flume. To distinguish the fluids I applied a colored dye to the salty water before adding the fluids to the flume. As mentioned before an ADV is installed at a position on the left of the gate where the salty water can reach the ADV this is in order to measure the flow velocity of the fluids. I also used high speed video cameras to get the development of currents. The experiment was conducted for both density currents flowing up and down the slope with a slope range from -6

degrees to 6 degrees. The slopes and cases are shown below, each case was done two or three times each and the results were based on the average.

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Slope	0	-2	-4	-6	2	4	6

Table 1. Experimental cases and their slopes

For each of the presented cases the velocity of the current was recorded in addition to the distance the fluid travelled and the time elapsed.

Results

All the results of the experiment were based on comparison of the negative and positive velocity of the fluids in different slopes. The velocity-time graphs demonstrated that the fluid takes the longest period to travel over the tilting flume when the slope increases. The parameters of the experiment are shown below.

Channel length (ft)	Channel With (ft)	Water Depth	Channel Bottom	Kinematic Viscosity (m ² /s)	Specific Weight salty water	Grashof number (Gr)	Reduced gravity g'	Velocity Scale Ub (m/s)	Reynolds Number (Re)
12	1	varies	Slope (degrees) from -6 to 6	1.00E-06	1.005	1.02E+08	0.049	0.050508	0.049

Table 2. Parameters of the numerical models

We can conclude that it is very important to consider how different slopes can affect the velocity of fluids, and how the results vary depending on the negative or positive slopes, that changes the velocity in which one moves faster than the other.

Submitted for Poster Presentation

General Water Quality Survey of Upper Cibolo Creek During Drought Conditions

*Kristi Funari and Prof. Yongli Gao
Department of Geological Sciences*

The Edwards Aquifer is the primary source of water for residents in the San Antonio area. When investigating possible sources of contamination it is important to understand the water quality of streams prior to infiltration into the aquifer. Cibolo Creek is a disappearing and reappearing stream in Kendall County, Texas that crosses the Edwards recharge zone producing complex surface water-groundwater interactions. The purpose of this project is to gain a better understanding of these interactions and to identify future sampling sites by analyzing natural environmental and isotopic tracers. Water conditions were generally stagnant to low flow along much of the creek, and a number of sites monitored in previous studies were dry. The area downstream of the water treatment facility appeared to have the greatest amount of flow. Field measurements were taken using a YSI conductivity meter and a pH meter. Water samples were collected according to EPA standards to measure stable isotopes on a Picarro Cavity Ringdown Spectrometer. Preliminary data show conductivity increased from a value of 0.245 mS/cm upstream to a value of 0.945 mS/cm downstream. $\delta^{18}\text{O}$ and δD appears to become lighter while travelling downstream with an initial upstream measurement of 0.82 ‰ for $\delta^{18}\text{O}$ and 0.21 ‰ for δD , and a downstream measurement of -3.05‰ for $\delta^{18}\text{O}$ and -16.25 ‰ for δD . The current hypothesis is that this apparent trend occurs because of discharge from the waste water treatment plant located adjacent to the Cibolo Creek Nature Center in Boerne, Tx. Alkalinity and conductivity measurements show poor correlation suggesting CaC may not be the only major dissolved constituent. Future experiments will include measurements of major cations on an Inductively Coupled Plasma Spectrometer (ICP) to help distinguish source of water. The upstream sections of Cibolo Creek appear to be spring fed. Considerable evaporation takes place in stagnant sites and flow increases near the waste water treatment plant. Future sampling should include water from the treatment plant and in locations that experience the least amount of evaporation.

Submitted for Poster Presentation

Chemical Wastewater Treatment Processes of a Tanning Facility

*Jessica George and Prof. Heather 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, aeration and reverse osmosis. 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. Additionally, the wastewater streams were subjected to the alternative method of a modified home reverse osmosis system to determine the effectiveness of such a system. The success, efficiency and cost effectiveness of the reverse osmosis system was examined via traditional methods. Having tested four different methods for wastewater treatment, the use of polymers as coagulants was deemed the most successful at removal of chromium and improvement in clarity as a conventional method. However, as an alternative method, the reverse osmosis system proved most successful by and far due to the pristine quality of water produced--albeit the least efficient and most expensive choice.

Submitted for Oral Presentation

Liquid Limit and Plastic Limit Tests

*Angela de Greef and Prof. Jie Huang
Department of Civil and Environmental Engineering*

Liquid Limit Test:

The liquid limit is defined as the minimum moisture content at which a soil will behave like a liquid if there is any addition of moisture. Soil consistency describes the degree and kind of cohesion and adhesion between the soil particles as related to the resistance of the soil to deform or rupture. Since the consistency varies with moisture content, the consistency can be described as dry, moist, or wet consistency.

For the liquid limit test of a soil, engineers would use the following: a dry soil sample that passes through a No. 40 sieve, Casagrande liquid limit device, grooving tool, moisture cans, porcelain evaporating dish, spatula, oven, balance sensitive to 0.01 grams, plastic squeeze bottle and paper towels.

Soil was placed into the metal cup portion of the device and a groove was made down its center with a standardized tool. The cup was repeatedly dropped onto a hard rubber surface, during which the groove closed up gradually as a result of the impact. The number of blows for the groove to close was recorded. The test is normally run at several moisture contents, and the moisture content which requires 25 blows to close the groove is interpolated from the test results. The moisture content at which it takes 25 drops of the cup to cause the groove to close over a distance of 0.5 inches is defined as the liquid limit.

The liquid limit is primarily used by civil and geotechnical engineers to determine and classify physical properties of a soil as well as compressibility, permeability, compaction, shrink/swell potential and shear strength.

Plastic Limit Test:

The plastic limit of a soil is the moisture content, expressed as a percentage of the weight of the oven-dry soil, at the boundary between the plastic and semisolid states of consistency. It is the moisture content at which a soil will just begin to crumble when rolled into a thread $\frac{1}{8}$ inch in diameter using a ground glass plate.

The equipment used includes: a dry soil sample that passes through a No. 40 sieve, porcelain evaporating dish, spatula, plastic squeeze bottle with water, moisture can, ground glass plate, balance sensitive to 0.01 grams and oven.

Soil was placed in the porcelain dish, squeezed and rolled into an ellipsoidal shaped mass. The soil was rolled between the fingers, or palm of hand, and the ground glass into a thread of uniform diameter throughout its length.

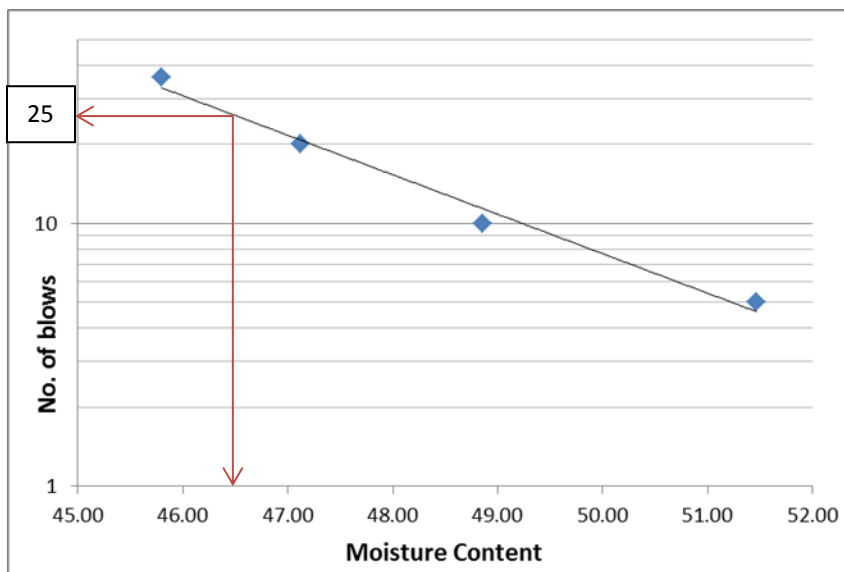
When the diameter of the thread became $\frac{1}{8}$ inch, the thread was broken into several pieces. The pieces were squeezed together between the thumbs and fingers into a uniform mass roughly ellipsoidal in shape, and rerolled. This procedure was repeated until the soil could no longer be rolled into a thread, meaning the plastic limit has been reached. A sample of the soil was immediately taken to determine its moisture content. The soil sample was placed in a can,

weighed and left to oven-dry, uncovered, for 24 hours. Afterwards, the sample was reweighed to obtain the Plastic Limit.

LIQUID LIMIT TEST					
Can No.	Can wt (g)	Can + wet soil (g)	Can + dry soil (g)	Moisture Content	No. of Blows
1	14.19	45.15	34.63	51.47	5
2	11.21	39.91	30.49	48.86	10
3	15.39	45.05	35.55	47.12	20
4	14.34	50.76	39.32	45.80	36

PLASTIC LIMIT TEST	
FINAL	
Can No.	5
Mass of can, W1 (g)	30.66
Mass of can + moist soil W2 (g)	47.28
Mass of can + dry soil W3 (g)	43.8
$PL = \frac{W_2 - W_3}{W_3 - W_1} \times 100$	26.48

PL	26.48
LL	46.5
PI	20.02



Submitted for Poster Presentation

Impacts of Heat Island on Rainfall in Houston, TX

*Alex Hilario and Prof. Hatim Sharif
Department of Civil and Environmental Engineering*

There is more evidence that shows how heat island effects influence the precipitation in coastal areas. The increase in precipitation of certain areas will change or decrease precipitation in other areas. This destroys the natural balance in the precipitation or rainfall for that area. These heat islands are created by the growth or urbanization that escalate in these areas. Houston, Texas, is one U.S. coastal city that has experienced rapid growth and has become an urbanized town. Our research focuses in the change in precipitation in the city of Houston, Texas; and it includes data recorded during the last thirty years.

This paper presents data using Hydro Desktop, which is software that allows you to find and analyze hydrologic and climate data registered with the CUAHSI Hydrologic Information System. The CUAHSI Hydrologic Information System is an Internet-based system that allows one to share hydrologic data. It allows for servers to share and publish their hydrologic information, which is available for publication.

Poster Presentation

Sexual Dimorphism in the Triassic Ammonoid *Joannites*

Christine Maher and Prof. Lance Lambert
Department of Geological Sciences

The purpose of this research was to determine whether variation in a group of Late Triassic ammonoids of the genus *Joannites* display evidence of sexual dimorphism or two different species. Sexual dimorphism in ammonoids is assumed to be related to the dimorphism in modern cephalopods, where the female is often larger and wider than the male. The suture patterns of ammonoids are used to understand their evolutionary history and provides the basis for taxonomy. To test the variation in these specimens, measurements of the maximum height, maximum width, diameter, chamber, and umbilicus were taken from each specimen. The values and ratios were then compared on graphs. Suture lines were also drawn from representative specimens to study their variation. Based on the graphical analysis, two groups of ammonoids stood out as end members. One group displayed wider width and shorter heights, while the other group displayed taller heights and smaller widths. The two groups also showed different suture patterns that were very similar in lobe elements, but had different orientations with respect to the ventral lobe. The results of this research show strong evidence that two distinct groups of *Joannites* are different in size and suture patterns. This evidence supports the hypothesis that these Late Triassic ammonoids display sexual dimorphism.

Submitted for Poster Presentation

Bacteria cell walls are novel viscosity modifying admixtures of concrete

Faviola Manzano and Prof. Ruoting Pei
Department of Civil and Environmental Engineering

Abstract

Viscosity modifying admixtures (VMAs) are widely used in the construction industry to enhance the stability and cohesion of fresh concrete and ensure high resistance to water dilution and bleeding in concrete-based systems. Commonly used VMAs such as diutan gum are costly. The major component of the bacteria cell wall, peptidoglycan, has a chemical structure similar to a common polysaccharide VMA such as diutan gum and bacteria cell walls are cost effective. Thus bacteria cell walls as VMAs were studied for possible application in the construction industry. Bacteria cell walls were incorporated in cement mixes and viscosity tests were performed on the cement paste (W/C 0.4). A bacterial cell wall concentration of .375% by weight of water was used on all cement mixes. To address the relationship of molecular weight of the bacteria cell wall and how it affects the VMA properties, the bacteria cell walls of different molecular weights were incorporated into the cement paste and viscosity was measured. With bacterial cell walls being a cost effective material, these results demonstrated the feasibility of applying bacterial cell walls as a new VMA in the construction industry.

Method

- *Bacillus subtilis* was cultured in nutrient broth.
- Media was centrifuged at 2500 rpm for 15 min to collect bacteria.
- Bacteria was ground in a mortar for 15 min with equal volume of alumina and then suspended in saline solution and centrifuged at 2730 rpm for 20 min.
- Pellets were removed and centrifuged again at 10,900 rpm for 20 min.
- Bacteria cell wall was weighed and mixed into deionized water before mixing into cement.
- Hydrolyzing and sonication was done on bacteria cell walls in some instances to change the molecular weight, these times varied for each.
- Cement paste was placed into cylinder and viscosity measurements were taken using a viscometer.
- Measurements of apparent viscosity and shear stress were taken every 15 seconds when increasing and decreasing shear rates from 10.9 s^{-1} to 68 s^{-1} .

Results

The apparent viscosity of the cement paste was found to decrease with an increase in shear rate, which is characteristics of the shear thinning behavior of VMA modified cement. The viscosity of the cement sample that contained both superplasticizer and the BCW was higher than the cement sample with just superplasticizer alone. This indicates that BCW may be substituted as a cost effective VMA. To study whether the molecular weight of BCW affect the viscosity, BCW were pretreated with lysozyme and STET buffer and then sonicated for 60 mins. A decrease and increase in hydrolyzed time showed a relationship between molecular weight and viscosity.

Sonicated times also change properties in the BCW and had an effect on viscosity.

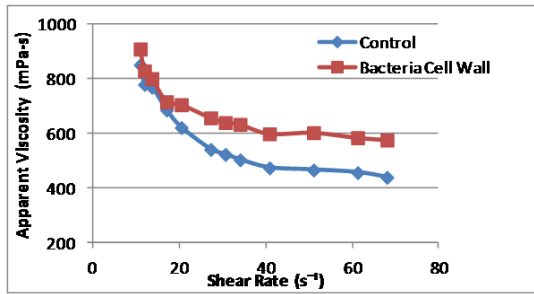


Figure 1

Figure 1

Cement samples with a W/C of 0.4 and a superplasticizer concentration (by weight of cement) of 0.25%. Control contains no BCW, second sample contains a concentration of BCW of 0.375% by weight of water. Data shows that by adding BCW to a cement mix it is possible to increase the viscosity. Data also shows the apparent viscosity of the cement decreases as shear rate increase, which is indicative of the shear thinning property of VMAs.

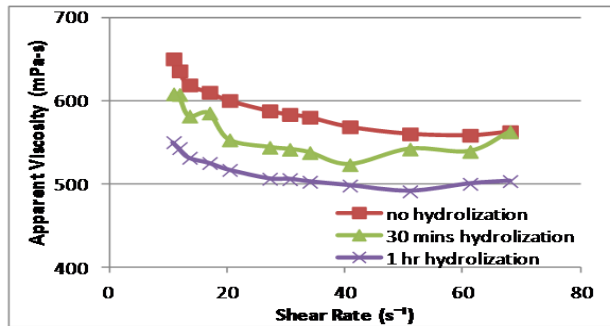


Figure 2

Figure 2

Cement samples with W/C of 0.4, superplasticizer concentration of 0.75% by weight of cement, BCW concentration of 0.375% by weight of water, sonification time of 30 minutes. As the hydrolyzed time increases the molecular weight of the BCW decreases and so the viscosity of the cement decreases. The data suggest that lowering the molecular weight of the BCW is associated with decreasing viscosity of cement paste.

Conclusion

From the research completed and data collected it may be possible to use bacteria cell walls extracted from *bacillus subtilis*. The bacteria cell walls alter the viscosity of the cement. There is an increase in viscosity when bacteria cell walls are incorporated into the cement paste. Cement with bacteria cell wall also show a shear thinning characteristic. The molecular weight of the bacteria cell wall has an effect on the viscosity. By decreasing the molecular weight, the viscosity of the cement also decreases. The sonification time also can increase or decrease the viscosity of the cement. As sonification time increase the viscosity decreases. Throughout this process however properties of shear thinning VMA's are still present.

Submitted for Poster Presentation

The Development of Scientific Support to Assess the Environmental Impact of Fracking-Related Activities in the Eagle Ford Shale

*David Morua and Prof. John Joseph
Department of Civil and Environmental Engineering*

Introduction

In South Texas, mining of the Eagle Ford Shale has provided some individuals and communities with a much needed economic boost during these tough financial times. However, the impact of the mining activities on the health of residents and the local environment is unclear. The purpose of this research is to help provide concerned residents of such communities in South Texas the scientific support they need to understand the health and environmental effects. Those residents, in turn, may incorporate such understanding to help form a response to the mining activities.

Methodology

The research at this early stage focused on preparing for community outreach to gain a first hand understanding of environmental concerns in areas where there is significant production activity. Journalists and other experts were contacted to gain a better perspective of the type activity in the area and express any setbacks that may be encountered in furthering our study. In analyzing the data gathered, a map was generated through geographic information system (GIS) software to examine patterns of significant environmental concerns to drilling activity and evaluate whether there may a correlation between both.

GRASS (Geographic Resources Analysis Support System) was selected as the GIS software because it is well-established, open source, and freely available, and would thereby allow residents to document locations and other characteristics of the concerns they may have without the need for expensive proprietary GIS software.

Results

The preliminary research revealed Karnes County to be an area of particularly intense activity, and where resident concerns had surfaced in the media. A detailed map of the county was prepared in GRASS, showing some electronically available mining activity data, but with a view towards more revealing documentation through site visits and the participation of residents. The interviews with journalists and other experts in San Antonio indicate, however, that residents may tend not to talk openly about environmental issues. Although there is always some concern with this much activity, citizens are often not aware of how to handle all the activity in their community, especially noticing significant environmental effects. Many of the communities are not very organized to manage the effects of the “boom” and as a result there is not much accountability on any possible environmental effects.

The relatively sparse, rural populations may make the formulation of a communal response more difficult still. Interviews and research also suggests that gaining sufficient data in such a rural area may be challenging because much of the activity is taking place in ranches where not many people are aware of much of the need for data collection. Companies doing the drilling are also not publicly stating what they are doing in the area so there is much speculation to how much damage, if any, is being done to the environment.

We have become informed of meetings in one locality that will likely serve as a springboard to making contact with concerned residents.

Conclusions

Further study and awareness is needed to address the environmental concerns in the area. While there are many challenges to achieving the goal of this project, we have evidence that there are residents who are concerned about the potential health and environmental impacts of the mining activities. The first challenge is to develop a working relationship with such residents. Subsequent challenges are to become surmountable only through the insights, creativity, and energetic participation of such residents.

Flood Fatalities in the U.S.

*Andres Munoz and Prof. Hatim Sharif
Department of Civil and Environmental Engineering*

It is widely believed that Texas has the highest flood fatality risk, since it leads the nation in total number of fatalities. To verify that, this study examined characteristics of flood fatalities from all 48 conterminous states as well as the District of Columbia between 1959 and 2011. The data come from the National Climatic Data Center (NCDC) Storm Data monthly publications (a total of 636 issues). We estimate the flood fatality risk through normalization by the population for each state, as well as a national normalization. Using these definitions of flood fatality risk as basis for ranking, it was found that South Dakota was ranked first with 68 fatalities per 10,000,000 people. It was also found that Texas was ranked 6th having a total of 11 fatalities per 10,000,000 people. We can also see a decreasing trend in normalized flood fatalities on a national scale as well as the state level, for the majority of states, especially Texas. From this evaluation we could see that, densely populated, Texas having the highest number of fatalities by a large margin drops in flood fatality risk ranking. Similarly, South Dakota having the highest fatality rate per 10,000,000 people ranks fourth in total number of fatalities. The significant decreasing trend in flood risk in Texas is probably due to the aggressive outreach programs in that state such as the “Turn Around Don’t Drown” campaign.

Submitted for Poster Presentation.

Carbon isotope chemostratigraphy of the lower Cedar Mountain Formation, Utah

*Jose Salazar-Verdin and Prof. Marina Suarez
Department of Geological Sciences*

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, particularly the Yellow Cat Member, 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. A total of 96 samples were 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. Values are expected to show significant excursions to match with previous data which suggested the Yellow Cat Member is Barremian. With supporting data we expect to establish a more accurate chronostratigraphy.

Submitted for Poster presentation

Image Processing of Ship-based sea ice digital photography

*Shelby Williams, Profs. Blake Weissling, Stephen Ackley and Hongjie Xie
Department of Geological Sciences*

A digital camera called the EISCAM, constructed at UTSA, was used on a 2 month ship expedition, SIPEX2, which traversed the sea ice zone of East Antarctica in Sept-Oct 2012. Photographic images of the sea ice adjacent to the vessel were taken every few seconds. Our work consists of relating the ship position to the distance from the outer sea ice edge and to measure sea ice parameters that are related to wave penetration and attenuation as waves traverse further into the pack ice. First steps involved selecting images for processing and subjecting them to an orthorectification procedure so that true areas could be measured from an oblique image. These orthorectified images are then used to calculate two sea ice parameters, the ice concentration (percentage of ice cover) and the sea ice floe areas, to be used in constructing floe size distributions. The sea ice data will be used in the construction of a theoretical prediction model for wave penetration and attenuation. Field measurements of the wave changes with distance taken at the same time will be compared as validation of the theoretical model prediction.