December 11, 2009

Early Life on Earth: the Rock Record

Maud Walsh, School of Plant, Environmental, and Soil Sciences, LSU

Abstract:The timing and environmental setting of early life on Earth is important for understanding past and present ecosystems on our planet as well as for exploring the possibility of life on other planets. The Barberton Greenstone Belt, South Africa, has been the focus of many studies of the early Earth because of the remarkable preservation of many primary fabrics and textures in early Archean (~3.2-3.5 Ga) igneous and sedimentary rocks. Microbial mats preserved in cherts of the Barberton Greenstone Belt provide a microenvironmental context for individual fossils and a record of microbial activity in the absence of such structures.

Biography: Dr. Maud Walsh is an associate professor in the LSU School of Plant, Environmental & Soil Sciences, where her primary responsibilities are teaching and advising undergraduate students in the environmental management and plant and soil science curricula. Last year she was named the Louisiana Professor of the Year by the Carnegie Foundation for the Advancement of Teaching and the Council for Advancement and Support of Education.
Walsh's research interests include the environmental remediation and restoration and the geological record of early life and environments on Earth. She is the research translation core leader for the LSU Superfund Research Program, Health Impacts of Toxic Combustion By-products. Walsh has been involved for several years in several professional development programs for middle-school science teachers that focused on inquiry-based learning in the sciences, especially earth and environmental sciences.

November 13, 2009

New Discoveries on the Middle and Lower Continental Slope Seafloor, North Gulf of Mexico

Prof. Harry Roberts, Director Coastal Studies Institute, & Department of Oceanography and Coastal Sciences, Louisiana State University

Abstract**:** Following the movement of oil and gas exploration-production from the continental shelf to the slope in the 1970s, a wide variety of seafloor features was discovered in a deep water setting thought to be featureless mud. As part of this transition to the slope an enormous database of exploration-scale seismic and higher resolution acoustic data acquired in support of geohazards and engineering studies has now been developed. From the late 1980s to present 3D-seismic data has been

the industry standard and the increasing quality of the data has allowed its use for seafloor evaluations in place of higher frequency acoustic datasets. As it presently stands, 98% of the slope is covered by 3D-seismic surveys, with some areas having 3-4 generations of surveys. No other deep water province on earth has such complete and high quality coverage. Working with MMS support this database has been made available for seafloor studies of the northern Gulf's continental slope. Surface attribute analyses have provided the means of identifying many different types of features that are superimposed on the modern seafloor. In addition to structural features such as faults, slumps, and submarine landslides fluid-gas expulsion features are ubiquitous across the slope.

Since the mid-1980s it has been recognized that the seepage and more rapid venting of hydrocarbons and other fluids to the modern seafloor has had a great impact on shaping seafloor geology and benthic biology. At this time researchers started using manned submersibles and to a lesser extent ROVs to study the seafloor both through observation and sampling. Most work was confined to depths less than 1000m because of available vehicles. During this era discoveries were made on the upper slope that caused our impression of the modern seafloor to change. Lush biological communities were found living on hydrocarbons and their by-products. Reef-like mounds of limestone created as by-products of microbial oxidation of hydrocarbons were found at many seep sites and gas hydrates were found outcropping like rocks at many locations. However, middle and lower slope settings were unknowns largely because of the lack of available technology to observe and sample in water depths below 1000m.

In 2006 and 2007 a project was funded by MMS and NOAA which utilized the deep-diving submersible Alvin and ROV Jason to study the middle and lower continental slope from water depths of 1000m to beyond the Sigsbee Escarpment at approximately 2800m. This study and one that is on-going (using Jason)and focused on deep water corals added greatly to our knowledge of the modern seafloor at these depths. Recent discoveries indicate that hydrocarbon seepage sustains chemosynthetic communities over the full depth range of the slope and that the species compositions of the communities are different than in shallow water. Gas hydrate outcrops are a part of the surface geology at many fluid-gas expulsion sites on the middle and lower slope. Deep water corals use the seep-related carbonates as their common substrate and are thereby associated with sites of hydrocarbon seepage and venting. Large brine seeps occur on the lower slope and a sizeable brine lake was discovered in Alaminos Canyon with abundant barite deposits in and around the lake. Methane bubbling through the lake was found to supersaturate the 2300m-water column all the way to the sea surface, suggesting that methane may be contributed to the atmosphere from this source and perhaps others like it. This year the first sizeable coral "reef" mounds were found in deep water. One coral variety, Lophelia, was found to construct large mounds rising10s of meters above the surrounding seafloor. As underwater research continues, we can look forward to many more discoveries that shape our understanding of deep water seafloor geology and biology.

Biography: Harry H. Roberts is the former director of Coastal Studies Institute (for 10 years) at LSU, an emeritus member of the Department of Oceanography and Coastal Sciences (School of the Coast and Environment), and a Boyd Professor. He has had a career in marine geology that spans more than 40 years and has worked in many foreign countries as well as in the United States. Recently, his research has focused on three themes: (a) modern deltaic sedimentation and processes, (b) shelf-edge deltas,

and (c) surficial geology of the northern Gulf's continental slope. The latter research thrust has concentrated on building an understanding of the impacts of fluid and gas expulsion on the surficial geology and biology of the slope.

October 9, 2009

Seismic Monitoring of a Distressed Earthen Levee: West bank, Louisiana, USA

Prof. Juan Lorenzo, Department of Geology and Geophysics, Louisiana State University

Abstract**:** A growing societal need exists for scientific involvement in the study of coastal protection systems, that can be addressed by near-surface seismic methods. Both deep- and near-surface hydrogeologic processes can contribute to the structural failure of artificial earthen levees. Recently, seismic geophysical methods have attempted to develop a proxy for engineering shear strength, by mapping changes in the transmission velocity of shear wave through artificial levees. High fluid content may indicate both weak, under-compacted materials and/or organic-rich sediments. In the absence of electromagnetic methods Vp/Vs ratios can be used as good indicators of variations in the fluid (water, and air or gas) saturation. Cone penetration borehole tests measure the resistance of the soil to penetration of the cone tip and its frictional sliding that can be correlated to sediment types and seismic physical properties. A distressed section of an artificial earthen levee, suitable for seismic investigation, lies ~15 km S of the city of New Orleans, Louisiana, USA. Open cracks, 10 cm wide, 30 cm deep and up to 100 m in length exist along the crest at two sites. Between September 2007 and February 2008 we collect both seismic reflection and refraction horizontally (SH) polarized shear and compressional wave (P) data in pseudo-walkaway tests for the upper 100 m of the subsurface along the protected (west) side of the earthen levee within 30 m of its crest. One profile lies parallel adjacent to the damaged levee crest and, for reference, two profiles lie across from undamaged portions of the levee. In the first 30 m (~100 feet) of sediment below the lower delta plain of the Greater New Orleans area, a complex and dynamic interaction of freshwater and marine sedimentary environments has juxtaposed a diverse set of facies . We combine of Vp and Vs velocity maps, sedimentary environment interpretations, and cone-penetrometer-derived sediment/soil and laboratory-derived physical properties at one collinear engineering test site to locate zones of high fluid concentration, and perhaps seepage, artificial levee composition, and intrinsic soil shear strength as a function of lithological composition and fluid composition. Predicted shear modulus minima correlate with zones of high estimated saturation porosity (80%) high organic content and undercompacted clay-rich sediments. We interpret that despite nominal full soil saturation, small in-situ intergranular , free gas maintains Vp/Vs ratios low. However, these ratios reach > 16 within saturated an gas-free sands within an underlying sand rich buried delta lobe (2000 -4000 yr) at about 5 m depth below the shallow depths (~ 5m), under the distressed portion of the earthen levee.

Biography**:** Juan Lorenzo holds a Bachelor's degree in Geology from the University of Barcelona and Masters and PhD degrees in Marine Seismology from Columbia University. He had been with the LSU Department of Geology and Geophysics since 1993. Recent publications related to his presentation include the following:

Lorenzo, J.M., Saanumi, A, Westbrook, C., Egnew, S, Bentley, S. Vera, E., 2006. Extensive testing of sled-mounted geophone arrays for near-surface (0-4m) layers in floodplain sedimentary facies: Atchafalaya Basin, Indian Bayou, Louisiana. Proceedings of the Society Exploration Geophysicists Meeting, New Orleans Oct 1-6, 2006.

Westbrook, C.C., Lorenzo, J.M., Saanum, A., Zapata, R., Egnew, S., 2005. Shear Seismic Anisotropy Within a Relay Ramp Structure, Baton Rouge Fault System, Louisiana EOS Trans. American Geophysical Union, 86(18) Joint Assem., Suppl. Abstract NS41B-03, 23-27 May 2005, Spring Meeting, New Orleans.

Saanumi, A., Lorenzo, J.M., Bart, P.J., Tomkin, J. 2005. Seismic Reflectivity Analysis of Regional Unconformities on Ross Sea Continental Shelf: A Geophysical Fingerprint for Antarctic Ice Sheet Grounding Surfaces, EOS Trans. American Geophysical Union, 86(18) Jt. Assem. Suppl. Abstract C43A-08, 23-27 May 2005, Spring Meeting, New Orleans.

Lorenzo, J.M., 2004. Seismic testing of shallow Quaternary fluvial facies. /In /Cultural Resources Investigation of Public Access Lands in the Atchafalaya Basin Floodway, Indian Bayou North Project Area, St. Landry Parish, Louisiana. P. 6-1-6-18 Ch. 6 /Eds./ Weinstein, R., Wells, D., U.S. Army Corps of Engineers New Orleans District Draft Report, 228 pp.

Lorenzo, J.M., Cazes, C., Westbrook, C., Lowrie, A., and Van Heerden, I., 2004. Relation between Holocene and Tertiary normal faults: A comparison of shallow seismic and gravity data with deep well data across the Baton Rouge fault system, northern Gulf of Mexico coast, Louisiana, USA.: Transactions-Gulf Coast Association of Geological Societies, v. 54th Annual Convention, p. 369-370.

September 11, 2009

Are controlled river diversions an effective tool for restoring coastal Louisiana marshes?

Christopher M. Swarzenski, Louisiana Water Science Center, U.S. Geological Survey

Abstract: Controlled diversions of Mississippi River water are integral to all restoration plans for coastal Louisiana wetlands. Success at nourishing and building marsh is assumed but rarely tested critically. Two important changes in the deltaic landscape provide reasons to proceed cautiously. Water-quality of the Mississippi River has changed markedly since the turn of the century, when the river last flowed unencumbered into marshes, and is now characterized by large amounts of nutrients and herbicides. Over the same time interval, marsh soils have increasingly come to rely on organic matter to fill the volume required to maintain marsh elevation above sea-level. Results from the two largest currently functioning river diversions in coastal Louisiana show disproportionately high and unexplained rates of marsh loss associated with the influx of river water, rather than marsh building or even marsh

nourishment. This negative response needs to be properly understood before diversions can become a cornerstone of coastal restoration plans. In addition to their cost, controlled river diversions, once implemented, may have an outcome that won't be known for many years, and which, if not as envisioned, may not be easily reversed.

Biography: Dr. Christopher M. Swarzenski received a M.S. in Marine Sciences from the Department of Marine Science at Louisiana State University in 1989 and a Ph.D in Ecological Sciences from Old Dominion University in 1992 on floating marshes in coastal Louisiana. He currently works for the United States Geological Survey, Louisiana Water Science Center, in Baton Rouge on all issues related to coastal Louisiana. His research interests include marsh soils in general and factors contributing to their stability, peat-based coastal ecosystem and restoration of the Louisiana coastal wetlands. He also works on understanding the inflow and distribution of river water into the Mississippi River Delta Plain. His efforts in recent decades have had as much success as the professional baseball franchise in Baltimore, the Orioles.

May 8, 2009

Influence of Facies, Fractures and Weathering on the Hydraulic Properties of the Monroe Gas Rock and Impacts on the Sparta Aquifer

Douglas A. Carlson, Louisiana Geological Survey

Abstract**:** Although the Monroe Gas Rock (MGR) has been the studied for almost ninety years this study is the first to consider in detail the hydraulic properties of this unit. This study includes examination of approximately 3,500 well test results for permeability values and 35 geophysical logs shows that the fractures/faults, facies and weathered zones influence the hydraulic properties of the MGR. The fracutures/faults may also influence the fluid chemistry of units above the MGR. Earlier studies and have noted the presence of three facies within the MGR (in descending order the upper packstone, the middle sandy-silty wackstone, and the lower grainstone). These facies appear to yield for core samples different average porosities from. However, the examination of geophysical logs in this study reveals a fourth zone at the top of the MGR of somewhat greater and more variable porosity. This is possibly a weathered zone that lies below the erosional unconformity that defines the top the unit. The influence of facies not only impacts porosity but also impacts permeability and the spatial distribution of permeability values. Previous studies identified a facies change near the northwest-north edge of the MGR which acts as a flow boundary for the Monroe Gas Field. This is corroborated by this study's well test results, which show a general cluster of lower permeability values (1 standard deviation below geometric mean) in this region. Similarly, the higher permeability values (1 standard deviation above geometric mean) are not randomly scattered, but generally fall along lines trending approximately east-west. These lines have orientations that appear to be similar to known faults in northern Louisiana. In summary, the porosity and permeability of the MGR is typical of a carbonate rock where facies, fractures, and a weathered zone influences hydraulic properties. Lastly, fracture system may act as a

conduit for fluids between MGR, and Sparta Formation and Wilcox Group that are above it. This is revealed by natural gas being present in groundwater aquifers above the MGR as indicated by 39 wells in the Sparta that were perforated for natural gas. The interaction between the MGR and Sparta may explain why the transition zone ahead of the saline front within the Sparta is larger over the MGR than further south.

Paper co-authors: Thomas Van Biersel, Louisiana Geological Survey

Biography**:** Prof. Carlson holds a B.S. degree in Geology and Geophysics from the University of Minnesota, a M.S. in Geophysics from the New Mexico Institute of Mining and Technology, and a Ph.D. in Geosciences from the University of Wisconsin at Milwaukee. Prior to working at the Louisiana Geological Survey (LGS), Douglas was a college instructor/lecturer teaching classes in environmental geology, physical geology and physical hydrogeology at the University of Wisconsin- Milwaukee. He also taught physics and astronomy at Ball State University, and physics and geophysics at the University of Wisconsin at Stout. Since 2002, he has been involved at the LGS in research projects focusing on water quality, and hydraulic properties of aquifers, using a variety of hydraulic testing, analytical and geophysical techniques both surface and down hole. Over the past several years his research has focused on groundwater resources in northern Louisiana.

April 17, 2009

Animals in Karst
Carol Wicks, Louisiana State University

Abstract**:** Predicting the response of karstic basins to recharge events involves two components: understanding and predicting the spatially and temporally variable recharge to the basins and understanding and predicting how water and solutes are transported through the basins. Recharge to karstic basins occurs through seepage through the unsaturated zone (a distributed source), through seepage through the bottoms of losing streams (a line source), and through swallets where stream flow directly into cave systems. The rates at which recharge occurs thought these mechanisms is poorly known. Temporally, these rates likely vary with soil moisture and soil properties, vegetation status, rainfall intensity, and slope. Spatially, each karstic basin will have different recharge mechanisms occurring at different times and in different locations. For instance, in many karstic basins in Missouri, there are few swallet holes and many streams that lose water via seepage. In Kentucky, there are many swallet holes. Thus recharge is temporally and spatially non-uniform. However understanding recharge to karstic basins is an important step in being able to predict groundwater flow through these basins. The Karst Research Group has instrumented a losing stream reach with temperature dataloggers and

using the technique of Constantz and others, we are determining rates of water infiltration out of the bottom of the streambed. In the instrumented basin, there are no swallet holes proper, only losing reaches and seepage through the unsaturated zone. Using detailed soil maps and soil properties, we are calculating rates of infiltration from the unsaturated zone. We are comparing the combined rates of recharge (infiltration) to the measured discharge from the basin, thus, we are trying to balance the water budget for the basin. Once water has recharged the basin, flow of water occurs through intergranular pores (primary or matrix porpsity), fractures, and conduits. In the instrumented basin, primary porosity is very low, however the basin is fractured and riddled with conduits. Several approaches are being used by the Karst research group to model flow of water through such systems. We use a pipe-flow model that does not accurately account for the small fractures but very accurately accounts for the conduits. We use lumped system models that derive characteristic response functions, however that derivation is dependent on understanding the temporal and spatial distribution of recharge. The new field of wavelets holds promise for deriving characteristic functions of the basins and we are also pursuing that field. Overall, the goal is to predict flow and transport and the Karst Research Group will use which tool which works best for a given basin.

Biography**:** Prof. Carol Wicks has been in the Dept. of Geology and Geophysics at LSU since 2009. Prior to LSU Carol was at the University of Missouri-Columbia and the U.S. Geological Survey's Water Resources Division in Reston, VA. She holds a Ph.D. and M.S. from the University of Virginia in Environmental Sciences and a M.S. in Chemical Engineering; and a B.S. from Clarkson University in Chemical Engineering. Carol's primary research interest is understanding the linkages between hydrology and biology of karst systems. Hydrogeologic topics including determining spatial and temporal changes in the rates and mechanisms of recharge to karst basins and predicting the response of the basins to recharge events. In addition, she is also interested in understanding disturbances to the habitat of the Southern and Ozark cavefishes and understanding disturbances to the habitat of the stream gravels along cave streams.

March 13, 2009

The Tuscaloosa Trend of South Louisiana

Bill R. Hise

Abstract**:** The Tuscaloosa Trend of South Louisiana was discovered in 1975 by the Chevron Alma Plantation No. 1 Well. This well was drilled to over 20,000 feet and produced at an initial gas rate of ± 20 MMCF / Day. This well marked the opening of the False River Field and the Tuscaloosa Trend. Since that time, some 300 wells have been drilled in the Trend resulting in approximately 200 producers that are located in some 20 fields. Cumulative production to date from the Tuscaloosa Trend is over 2.9 trillion cubic feet of gas and 150 million Bbls of condensate. Individual well producing rates have been very prolific with the maximum reported producing rate from a single well of 80 MMCF / Day.

The Tuscaloosa Trend is approximately 30 miles wide and 200 miles long and extends from the Texas State line on the west to just east of Lake Ponchartrain at the Rigolets on the east side. The objective Tuscaloosa sandstones are of Upper Cretaceous age, and are overlain by the Eutaw Shale and the Austin Chalk. The discovery of the Tuscaloosa Trend is a classic example of the expertise and ingenuity of geological professionals coupled with the willingness of oil and gas companies to invest risk capital, which resulted in a significant gas discovery. Geologists reasoned that the erosion of a large area of the Monroe uplift would provide a source of Upper Cretaceous clastics. These eroded sediments were visualized to have been transported southward across the shelf and deposited in an embayment formed by the Lower Cretaceous bank edge. Exploratory wells drilled by Exxon and Chevron in the late 1960's proved that Tuscaloosa sandstones were present south of the bank edge and also proved the existence of down-to-the-south faults, which expanded the Tuscaloosa interval. After additional seismic confirmed the existence of a "wedge" between the chalk and the more steeply dipping Lower Cretaceous, Chevron drilled the Bain No. 1 in 1973 in Avoyelles Parish. Although no accumulation was found by this well, the Bain Well penetrated some 60 feet of Tuscaloosa sandstone in the wedge interval which led directly to the drilling of the Chevron Alma Plantation No. 1 Well.

A total of some 25 operators and 20 different drilling contractors have been historically active in the Trend. Now that the Tuscaloosa Trend has reached maturity, the current activity is by 3 operators and 2 drilling contractors. Wells in the Tuscaloosa Trend are deep, high pressure and high temperature. This challenging drilling environment naturally leads to relatively high incidents of gas kicks, lost returns, twist-offs, stuck pipe, and blowouts. In addition, the presence of H_2S and CO_2 in the gas produced creates problems for the tubing and casing in the wells and the surface production equipment. This sour gas composition also gives rise to the necessity for sophisticated processing at the surface to make the gas marketable.

The oil and gas activity in the Tuscaloosa Trend of South Louisiana has had a very positive impact on most of the companies that have operated there. This activity also has benefited the land owners in the Trend, many of which have received lease bonus and rental payments and substantial royalty payments. There has been a substantial benefit to the Parishes involved in the form of ad valorem taxes, the State of Louisiana in the form of bonus, rental, royalty, and severance tax payments, and the overall economy of the region.

Paper Co-author**:** Ann Warren Hise

Biography**:** Bill R. Hise holds Bachelor of Science and Master of Science degrees in Petroleum Engineering from the University of Oklahoma. He was employed for ten years by Shell Oil Company and held positions with that company of Field Operations Engineer, Reservoir Engineer, Division Reservoir Engineer, and Research Engineer. During this time, he was based in south Louisiana and Texas. Hise served as a Professor of Petroleum Engineering at Louisiana State University in Baton Rouge, Louisiana from 1964 to 1980. During that tenure, he taught courses in drilling, production, oil property evaluation, computer programming and subsurface geology. While at LSU, he organized and developed the Petroleum Industry Blowout Prevention Training Center, which offers training and conducts research in the field of blowout prevention and well pressure control. After leaving LSU, Hise has remained in Baton Rouge as a principal in The Hise Company specializing in general reservoir engineering work, unitization

and regulatory practice, drilling practices, and litigation. He has testified as an expert witness in Petroleum Engineering in State and Federal Courts and before Oil and Gas Commissions in Louisiana, Oklahoma, and Tennessee. The landowner clients of The Hise Company have been primarily in the Tuscaloosa Trend of south Louisiana. For the past 12 years, Hise has been the Operations Manager for Pennington Oil & Gas Interests under a consulting contract between The Hise Company and Pennington. During that time Pennington has successfully drilled and completed 12 high pressure gas wells in the Tuscaloosa Trend and is currently drilling their 13th well in the Trend at a location in the Judge Digby Field, to a proposed total depth of ± 22,000'. He is a Registered Professional Engineer in Petroleum Engineering in the State of Louisiana and a member of the Society of Petroleum Engineers.

February 13, 2009

Investigation of the LSU Campus Mounds (16EBR6) Using Surface Geophysical Methods and Down Core Techniques

Brooks Ellwood, Louisiana State University

Abstract: The LSU campus mounds (16EBR6) have not been extensively studied, but previous work has shown that the mounds are Archaic (5,677 B.P.) in age. It has been suggested that each mound was built during a single construction phase (Homburg, 1991) and assumed that they were built at separate times. Age assignment is based on 3 dates using the 14C method, producing a calibrated mean age of 5,677 B.P., falling within the age range for other mounds in Louisiana (Gibson and Shenkel, 1984; Homburg, 1991). The only excavations known to have been performed on the mounds were those by Homburg (1991), where he excavated five sites located around the base of the mounds, collected and analyzed sediment cores, and conducted a proton magnetometer survey that did not utilize a differential magnetometer, resulting only in total field data. The 2008 work to be reported involved the acquisition of several geophysical data sets, including electrical resistivity profiles, magnetic Cesium vapor gradiometer, and GPR experiments performed on the LSU Campus Mounds, with the goal of evaluating, in greater detail than previously, the subsurface characteristics of the mounds. In addition to the surface surveys, five, small, 1" diameter, 2.5-3 m long cores were collected from the mounds, to evaluate the sedimentary character within the mounds. The lithology of collected cores was described and the magnetic susceptibility of selected cores was measured in the Rock Magnetism laboratory at LSU. The results of all this work will be discussed. This talk is a synthesis of the work performed as the laboratory component of the GEOL 4019 Geoarchaeology class taught at LSU in the Spring, 2008.

Biography: Prof. Brooks Ellwood is the Robey Clark Distinguished Professor in the Department of Geology and Geophysics at Louisiana State University in Baton Rouge, Louisiana. He holds a B.S. from Florida State University, and a M.S. and a Ph.D. from the University of Rhode Island. He specialize in geophysics, rock magnetism, stratigraphy and geoarcheology, and has worked in Europe, Africa, Asia

and North America. Brooks has over of 30 years research and teaching experience in academia. He has been at LSU for the past ten years and has over 100 publications in various books, conference proceedings, journals, and others.

January 16, 2009

A Test Comparison of Dipmeter Strikes and Lineament Orientations in North-Central Louisiana

Richard McCulloh, Louisiana Geological Survey

Abstract**:** An ongoing program in the Water and Environmental Section of the Louisiana Geological Survey seeks to gather and sort deep-subsurface dipmeter records into two databases, one for depositional interpretation and the other for structural interpretation. For this purpose, dip angles of 20° or greater magnitude are treated as reflecting structural influence, and those less than 20° are treated as depositional in origin. In connection with this effort, we selected a test area in north-central Louisiana for comparison of the resultant strikes of the "structural" dipmeter entries (predominantly from 6,000+-ft depths) with the orientations of interpreted straight hydrographic segments or surface drainage lineaments. The Monroe South 30 x 60 minute quadrangle includes the greater part of the largest known array of surface drainage lineaments in the state; its western half was the area chosen for focus. The bedrock geologic units exposed there comprise Eocene formations of the Claiborne Group (Cane River, Sparta, Cook Mountain, and Cockfield). We examined the sixteen 7.5-minute topographic quadrangle sheets covering this area for straight drainage-course trends, interpreted them at 1:24,000 scale using a length cutoff of 300 m, and summed their measured orientations as a simple (nonlength-weighted) count for each 7.5-minute quadrangle and for all the quadrangles combined. This exercise resulted in an average of ~89 interpreted surface lineaments (range 63-119) per individual 7.5-minute quadrangle, and a collective total of 1,422 lineaments for all 16 quadrangles. Rose plots of unaveraged counts prepared in 10° frequency classes for each 7.5-minute quadrangle and for the combined total data set show a very strong trend oriented NW-SE, a strong though weaker trend oriented NE-SW, and much weaker though discernible trends oriented ~N-S and ~E-W. These drainage-course trends show no statistically significant difference from the examined dipmeter subpopulation, except for the NW quadrant when the quadrants are considered separately. The first portion of the presentation will provide some background on the history of drainage-lineament investigations in Louisiana to put the second portion, which treats the exercise described above, in context.

Paper co-authors: Douglas Carlson, Louisiana Geological Survey

Biography**:** Richard P. McCulloh holds a B.S. degree in geology from Oklahoma State University and an M.A. degree in geology from the University of Texas at Austin. He joined the Louisiana Geological Survey

(LGS) in Baton Rouge after working for two years as a geologist for Conoco Minerals Inc. in the south Texas uranium district. Since joining LGS he has been involved in investigations of geopressured-geothermal potential; assessment of sedimentary uranium potential; stratigraphic configurations associated with Miocene growth faults; delineation of shale-filled channels in the Wilcox Group; surface and shallow-subsurface geology of emergent salt domes in coastal Louisiana; structural geomorphology as reflected in stream nets and alluvial courses; and surface geology at 1:24,000, 1:100,000, 1:250,000, and 1:500,000 scales.