ALABAMA BOARD OF LICENSURE FOR PROFESSIONAL GEOLOGISTS

THE ALABAMA GEOLOGIST

WINTER 2011 EDITION

ELECTRONIC VERSION

Dorothy Malaier Honored by ABLPG

Dorothy S. Malaier was presented a plaque from the Alabama Board of Licensure for Professional Geologists in appreciation of her service on the Board (from June 14, 2001 to November 30, 2010). Prior to her Board term expiring, Ms. Malaier served as Chairperson of the Board. [Picture R to L: Dorothy Malaier and Keith Warren, Executive Secretary of the Board].

CONTINUING EDUCATION UPDATE & GUIDELINE CHANGES

The Board has noticed a disturbing decrease in the number of CEU activities available to members. Economic conditions have most certainly had an impact on the number of events being conducted and sponsored. In an effort to assist members with obtaining the required CEU credits, the Board has taken the following steps:

1.. Beginning in November, the ABLPG will be sending e-mail notifications of upcoming CEU opportunities to current PG's with valid e-mail addresses. If your e-mail address is not current, please contact the Board office to make necessary corrections. Please check the Board's website under "Continuing Education Opportunities and Information" for links and other information about upcoming events. If you are aware of a CEU event that is not posted, please contact the Board with the information so it can be posted.

2. The Board has also formed a committee to organize periodic CEU seminars. The initial concept is for a series of presentations and discussions on a variety of topics. The first event and agenda will be announced in January 2012. If *you* have any suggestions for topics, or would like to participate, please contact the Board office, who will forward to the appropriate Board member.

3. Limitations on Category 4 CEU activities (4a) regulatory and safety related training, (4b) internet seminars and courses and (4c) in-house educational activities have been removed. There are now no restrictions on the number of hours that can be claimed in any of these categories, either combined or separate. Please see the revised CEU Guidelines posted on the website.

WWW.ALGEOBD.ALABAMA.GOV

BOARD MEETINGS

10:00 a.m. - Thursdays
Board Conference Room
2777 Zelda Road, Montgomery AL 36106
www.algeobd.alabama.gov

2012 MEETINGS

JANUARY 19TH
APRIL 12TH
JULY 19TH
OCTOBER 11TH

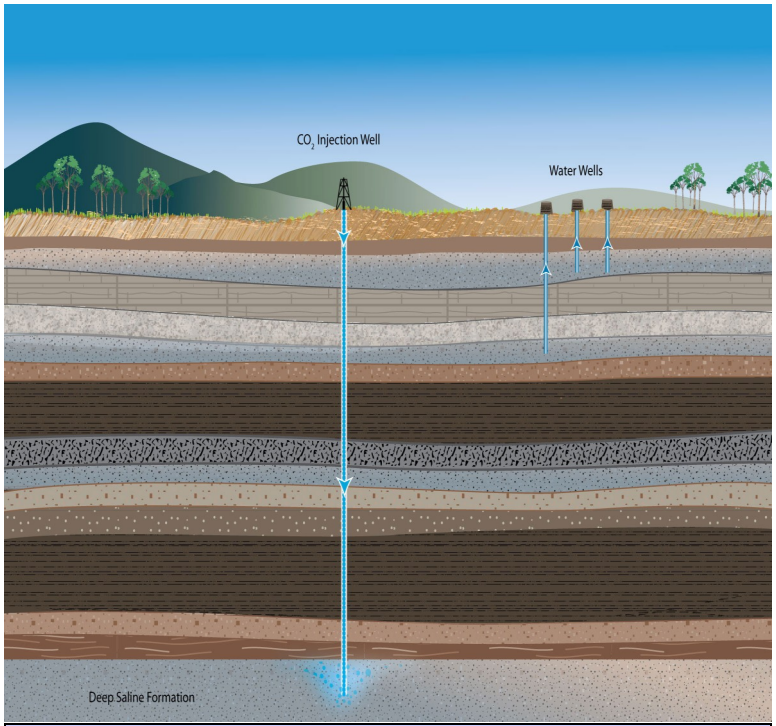
The Carbon Conundrum: New Technology & Geoscience Jobs

By: Dr. Richard Esposito

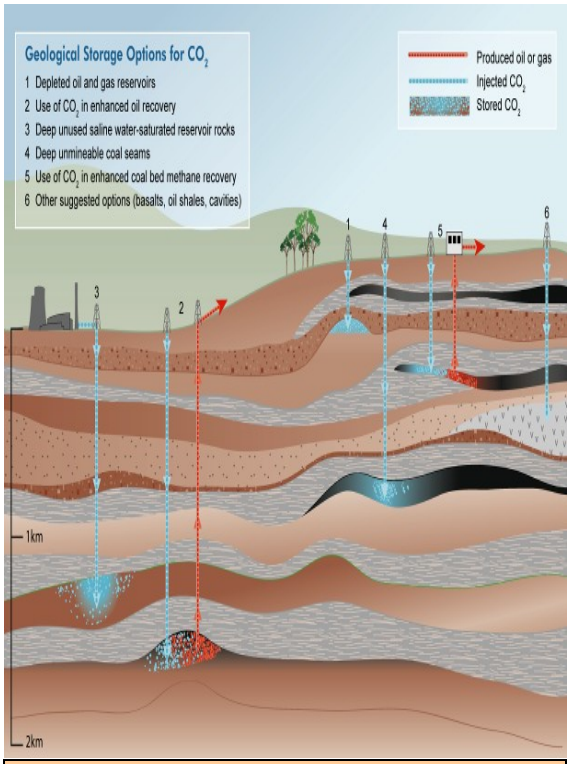
Due to ongoing discussions regarding climate legislation in Washington D.C. and the potential for carbon dioxide (CO_2) regulation by the Environmental Protection Agency (EPA), a vanguard of technologies are being evaluated ranging from increasing efficiency to repowering with low-carbon fossil fuels. One promising technology that helps sustain the future of fossil-fuels is of key interest to geologists and actually puts CO_2 into the ground.

Carbon Capture and Storage (CCS) is the technology that involves the separation of CO_2 from flue gas, compression into a liquid state, pipeline transportation, and injection into geologic formations. The Earth has sequestered over hundreds of millions of years, trillions of tons of CO_2 in the form of oil, coal, and natural gas. CCS technology looks to re-sequester CO_2 that is produced as a byproduct from the combustion of fossil-fuels for power that would otherwise be emitted into the Earth's carbon cycle. This technology could facilitate the continued development of the huge United States coal resource base (over 200 years), help provide domestic energy security, and allow for the continued environmental compliance and use of existing depreciated power plant infrastructure.

If this technology develops, it will present significant career opportunity for geoscientists in the power and environmental consulting sectors in the disciplines of geophysics, stratigraphy, geochemistry, petrology, and reservoir modeling. At present, an unprecedented research & development effort to understand the technical feasibility, deployment costs, and evaluation of potential risk of CCS is playing out both in the United States and internationally. These efforts are focused at providing industry the knowledge to make investment decisions for wide-spread commercial-scale deployment of CCS by the year 2020.



Deep saline formations with multiple low permeability seal will be the primary geologic sink suitable to store commercial volumes of carbon dioxide in the southeast region (illustration above).



Diverse geologic sinks are available for geologic storage of carbon dioxide (illustration above: Intergovernmental Panel on Climate Change (IPCC) special report 2007).

The most promising geologic formations for carbon sequestration are deep (> 2,500 feet) saline sandstone reservoirs, unmineable coal seams, and depleted oil and gas fields. The foundation of geologic sequestration is to select a formation that has high permeability for injection, porosity for storage, and contains cap rocks (low permeable seals) to keep buoyant CO_2 permanently trapped in formations. In the case of coal, CO_2 is actually adsorbed into the coal matrix. In saline sandstone formations, most injected CO_2 will be trapped in dead-end pore space (residual trapping) and trapped beneath cap rocks (stratigraphic trapping). Stratigraphic trapping is very similar to groundwater confinement in Underground Sources of Drinking Water (USDW) aquifer systems, as well as the basic premise of how oil and gas deposits accumulated through trapping in subsurface geologic formations. Natural gas is also stored in geologic formations and extracted as needed. Different from natural gas storage, over time the injected CO_2 will dissolve into formation fluids such as brine (solution trapping) and eventually mineralize to form new mineral phases.

The Carbon Conundrum (Continued from Page 2):

The role of a geologist will first be to lead site selection through site characterization using tools borrowed from the oil and gas industry, such as surface and down-hole geophysics, petrology, and stratigraphy. After this, geologists will use these data to create reservoir models that will help predict the fate and transport of the CO_2 injected into these formations. Other tasks in play for geoscientists will include Underground Injection Control (UIC) permitting, site operations, and the use and interpretation for results from technologies to monitor and verify the location of injected CO_2 (including shallow groundwater quality, deep fluid and gas samples, seismic profiling, pressure gradients, and isotopic tracers.) The EPA is proposing new federal requirements under the Safe Drinking Water Act (SDWA) for the purpose of ensuring the protection of underground sources of drinking water from long-term underground geologic sequestration (Federal Register/ VOl. 73, No. 144/Friday, July 25, 2008/ Proposed Rules).

A quick look at the United States shows that the southeast region possesses the largest storage capacity of any region and with diverse sink locations. Extensive saline sandstone formations such as the Tuscaloosa, Paluxy, Eutaw, and Washita-Fredericksburg, just to name a few, are in play to provide huge storage capacity in the Mississippi-Alabama-Florida (M-A-F) Gulf Coast. These formations are all capped by low-permeable seals that provide excellent storage safety from overlying USDW's. Many of these formations are well assessed as they have already been developed for natural gas and oil throughout the M-A-F Gulf Coast.

The United State Department of Energy (DOE) has put together a very aggressive research program and has provided funding for the near-term deployment of CCS. Beyond Technology, the DOE has identified a qualified geosciences work force as a potential barrier to the wide-spread commercial deployment of carbon capture and storage. They have recently awarded over forty Geologic Sequestration and Training Research grants throughout the United States for the development of expertise in the discipline. In Alabama, the University of Alabama the University of Alabama at Birmingham, and Tuskegee have received awards. Information on this program can be found at *www.grants.gov/search/search.do?*

Another DOE effort to help train a future workforce in CCS technologies is the Research Experience in Carbon Sequestration (RECS) program. www.RECSCO2.org.

Southern Company recently hosted the 2011 RECS program, funded by the Department in Birmingham, Alabama. Thirty students from around the world were accepted to participate in this 10 day workshop to learn about CCS from experts in industry, the research community, NGOs, and governmental agencies. To exhibit the most recent breakthroughs in applied CCS technology, Southern Company hosted tours to locations including Gorgas Steam Plant, the National Carbon Capture Center, Barry Steam Plant, and sequestration laboratories facilities located at the University of Alabama at Birmingham. At these locations, students listened to presentations, participated in hands-on exercises, and got to see first-hand the many projects that both Southern Company and other electric utilities are conducting in the ongoing technology development of CCS.

Several DOE funded CO_2 pilot injection projects have already been performed with others scheduled for the near-term future in the southeast. In 2008 a pilot injection of 3,000 tons was performed into the Tuscaloosa Formation (saline sandstone) at 9,500 feet in southeast Mississippi at the Mississippi Power Plant Daniel.

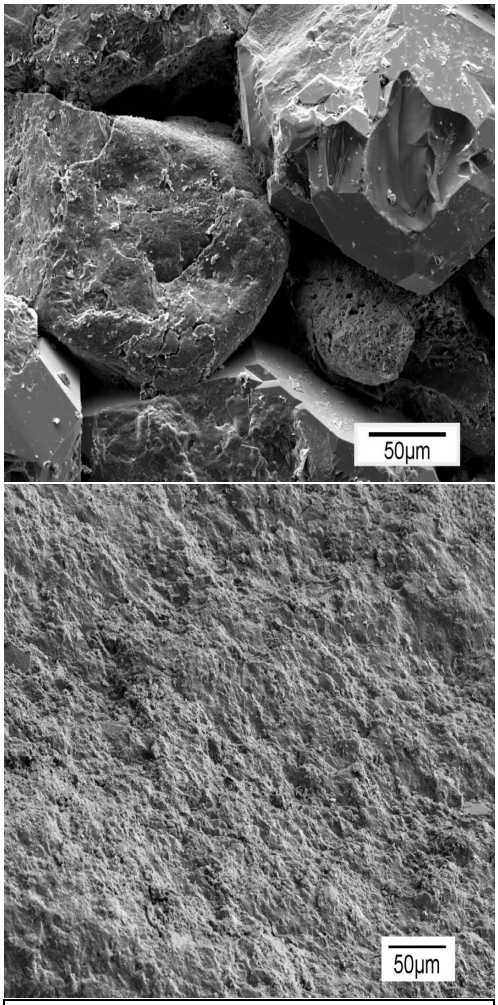
The Tuscaloosa Formation at 8,500 below ground surface in south Mississippi contains porous sandstone reservoirs (cores on left) capped by low permeability shale and mudstone seals (cores on right).

The Carbon Conundrum (Continued from Page 3):

In 2009, an injection of 1 million tons was performed in the Cranfield Oil Field, also in the Tuscaloosa Formation (owned and operated by Denbury Onshore), in southwest Mississippi that was associated with enhanced oil recovery. In 2010 two coal seam pilot injections were performed, one in the Black Warrior Basin of Alabama, lead by the Geological Survey of Alabama (GSA), and one in West Virginia, lead by Virginia Tech. Both coal seam projects were associated with evaluating enhanced coal-bed methane recovery. Since CO_2 has greater affinities to adsorb onto coal than methane, injected CO_2 can desorb and displace methane within coal seams, allowing for coalbed methane recovery. In 2010 an injection of 7,500 tons was also performed at the Citronelle Oil Field in southwest Alabama to evaluate the field's enhanced oil recovery viability and geologic sequestration capacity.

All of these injection projects support a project already capturing CO_2 from a coal-fired power plant in Alabama at Alabama Power (a Southern Company) Plant Barry. This project involves the integration of the capture operations with compression and pipeline transport of approximately 12 miles to the Citronelle Oil Field. At the Citronelle Oil Field the CO_2 will be injected into the Paluxy (a saline sandstone formation) stratigraphically located above the oil field. At 150,000 tons per year, this project will include the largest coal-fired capture plant in the world and the largest single injection of CO_2 sourced from coal in the world, along with the first CO_2 pipeline in Alabama.

Another grant program that the DOE has funded is the characterization of promising geological formations for geologic sequestration. Much of what is known of deep geology is from oil and gas exploration, especially in areas of the southeast. This knowledge can be related to the hypothesized performance of target formations undergoing geologic sequestration. Earlier this year the DOE awarded thirteen projects to advance our knowledge of deep sequestration geology opportunities throughout the United States. Some sites are slated for drilling while others will involve looking at existing geologic information supplemented with seismic surveys. In the southeast, The University of Alabama was awarded a project to drill a deep stratigraphic test well at Alabama Power (a Southern Company) Plant Gorgas located in Parrish, Alabama. The University of South Carolina was awarded a grant to study the coastal plain geology of the South Georgia Basin, that spreads over Georgia and South Carolina, which has little known geologic information in terms of sequestration potential because of limited oil and gas production.



Photomicrographs of thin-sections of a sandstone of on top showing porosity and permeability (reservoir rock) and shale seal on bottom showing low porosity and permeability.

At this point the greatest barrier to commercial-scale deployment of CCS is the high costs of capturing CO_2 from flue gas. Capitol costs for capture units are high and at present the parasitic load to power these capture plants is up to 30% of total power output from the plant. Beyond intensive R&D on geologic sequestration, a huge effort to reduce the capitol and operating costs of capture technologies is moving forward in Alabama. In 2009 the DOE selected the Power Systems Development Facility (PSDF) in Wilsonville, Alabama (a Southern Company host site adjacent to Alabama Power Plant Gaston) to develop the world's largest CO_2 capture technology testing center. This facility has been named the National Carbon Capture Center (NCCC) with a primary goal of reducing carbon capture costs. Utilities are guardedly optimistic for the wide-spread commercial-scale deployment of CCS as a means of reducing carbon emissions. To reach the goal of making a financial investment decision by 2020, an unprecedented R&D effort is being deployed. This R&D phase in CCS technology could provide a new opportunity for professional jobs in the geosciences community and provide funding for graduate research, especially if wide-spread commercial-scale deployment moves forward.

By: Dr. Richard A. Esposito, ***Principal Research Geologist, Research & Technology Manager., Southern Company***

REMINDER!

Have You Moved or Has Your E-mail Changed Recently?

Please notify Hope Paulene by e-mail or call her with updated information:
E-mail: geology@warrenandco.com OR Call: 334-420-7236

AUBURN AND ALABAMA STUDENTS TEAM WITH NATIONAL INTIATIVE TO STUDY EARTH'S INTERIOR

Posted by Wire Eagle

Despite their sometimes destructive consequences, can earthquakes actually be helpful events? The answer is a resounding "yes," according to a team of two students and two professors from the University of Alabama and Auburn University.

Students Stanton Ingram, from the University of Alabama, and James Taylor, from Auburn University, along with their professors, Andrew Goodliffe, associate professor of geological sciences at Alabama, and Lorraine Wolf, professor in the department of geology and geography at Auburn, have teamed with other researchers across the country in a National Science Foundation-sponsored project known as Earthscope.

Earthscope, a scientific initiative to study the Earth's interior, makes use of a collection of seismographs that will record earthquake waves from all over the globe. Aptly termed US Array, the seismographs will help geoscientists to study the characteristics of the deep Earth, much like a doctor can study the body's interior through medical imaging. Since 2003, 400 US Array seismic stations have been slowly marching toward Alabama from their starting point on the West Coast.

Ingram, from Birmingham, and Taylor, from Cincinnati, are both geoscience students at their respective schools. They were selected to join 10 students to help find locations for seismic stations in Alabama and the Midwest states this summer. The two students are scouting for sites in rural Alabama to host the stations, scheduled to arrive in the state during 2011. These stations will not only record local earthquakes that occur in the state, but will be sensitive enough to pick up earthquakes from afar. Seismic waves that travel through the Earth reveal information about the Earth's composition and its inner workings. Scientists will use the collected data to understand how mountains and continents form and how they are modified through time. More information about the Earthscope project is available at the website, http://www.usarray.org. Contacts: Charles Martin, Auburn University, (334) 844-9999 (marticd@auburn.edu)

CONGRATULATIONS!!!

To Our Newest PGs!

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Kristen H. Scheller-#1308
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