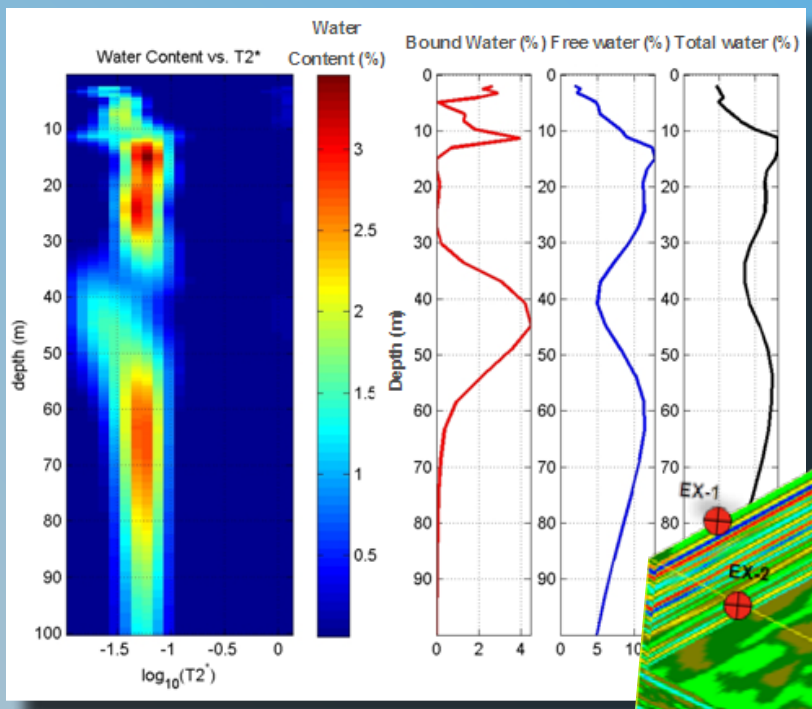
FastTIMES

December 2009
Volume 14, Number 4
www.eegs.org

Magazine for the Near-Surface Geophysical Sciences

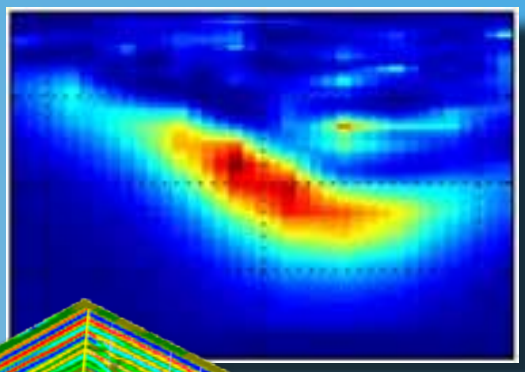
Published by the Environmental & Engineering Geophysical Society

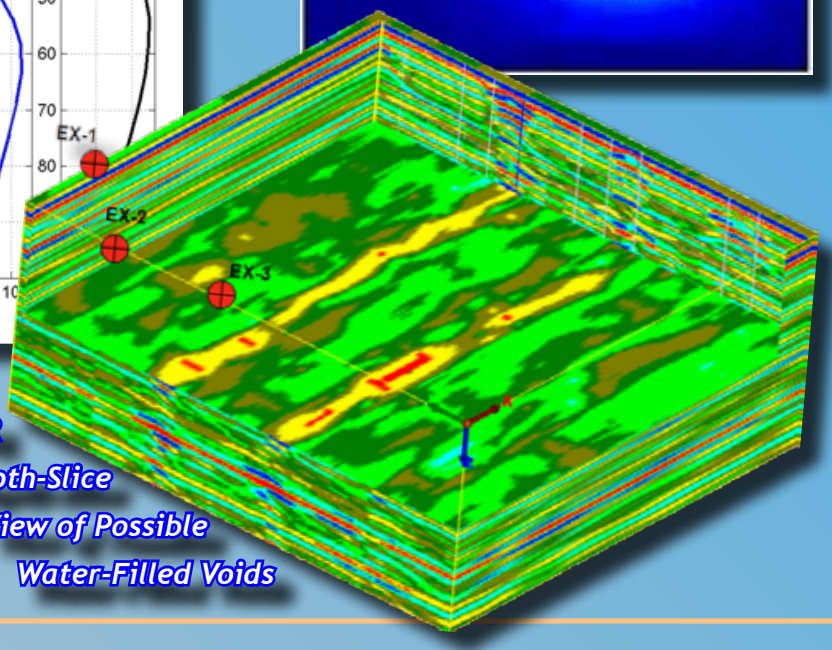
Hydro-Geological Geophysics



Low-Permeability Zone around 40m Separating Two Productive Aquifers

Relative Hydraulic Permeability





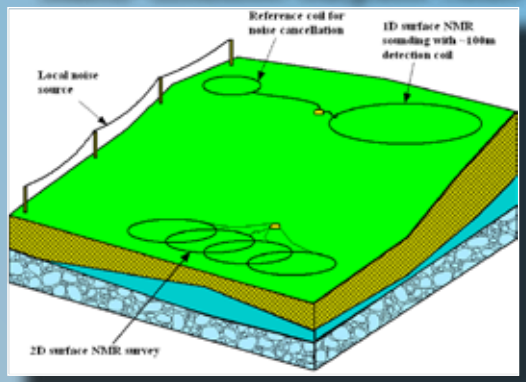
GPR Depth-Slice View of Possible Water-Filled Voids

Also in this issue . . .

- Follow FastTIMES on Twitter
- Dr. Roger Young Memorial
- New Membership Choices
- Invitation to SAGEEP 2010, Keystone
- Special Issue: Environmental Geophysics in the Oilfield

. . . and more!

Multi-Channel Surface NMR



Park Seismic
Geotechnical Seismic Investigation

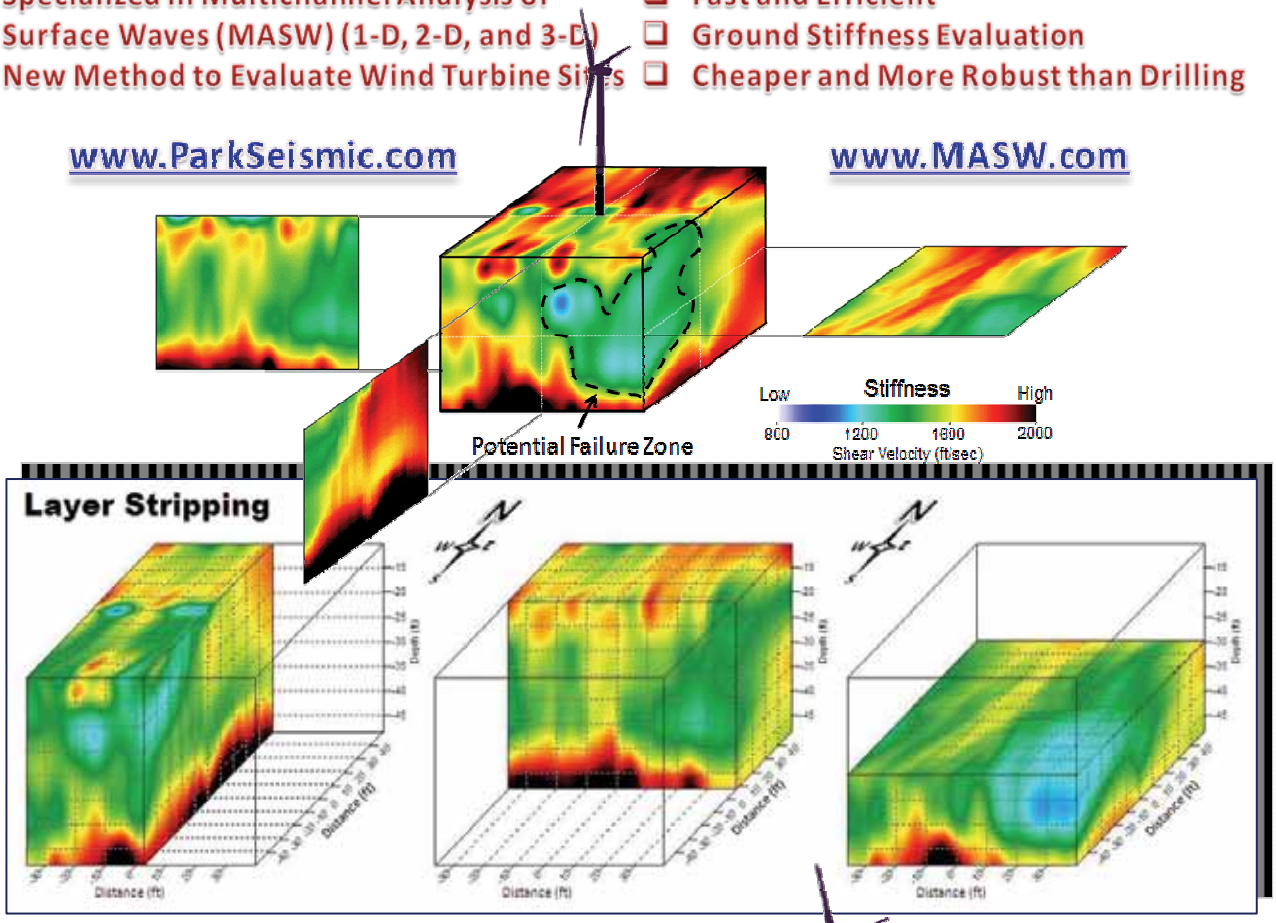
Wind-Turbine Site Seismic (MASW) Survey

Now Available

Data Analysis Services for Local Engineering Companies

- Specialized in Multichannel Analysis of Surface Waves (MASW) (1-D, 2-D, and 3-D)
- New Method to Evaluate Wind Turbine Sites
- Fast and Efficient
- Ground Stiffness Evaluation
- Cheaper and More Robust than Drilling

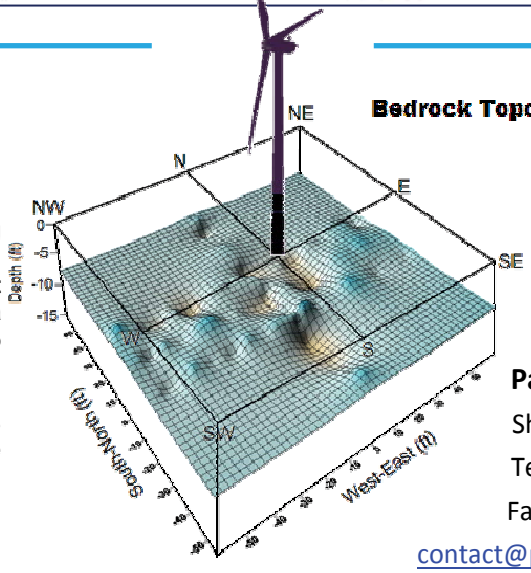
www.ParkSeismic.com www.MASW.com



Services Park Seismic Provides

Park Seismic provides a complete field survey and reporting service for seismic investigation of wind turbine sites in a flexible and prompt manner, ranging from the most basic 1-D analysis to a complete 3-D analysis depending on the site conditions and budget availability. Field surveys may be performed by a separate local engineering company according to instructions Park Seismic will provide and then subsequent data processing, interpretation and reporting will be performed at Park Seismic. Multiple-site surveys can take place in much a faster and more cost-effective manner than single-site surveys.

For more information, please contact Dr. Choon B. Park (choon@parkseismic.com, phone: 347-860-1223), or visit http://www.parkseismic.com/WindTurbine.html.



Park Seismic LLC
Shelton, CT 06484
Tel: 347-860-1223
Fax: 203-513-2056
contact@parkseismic.com
www.parkseismic.com

On the Cover

This issue features recent advances in the use of geophysics in hydro-geological engineering. **Upper right:** Coherent 2D inversion of surface NMR data to map aquifer properties. **Upper left:** Pore size distribution as a function of depth. **Center:** 3D GPR depth-slice using a 400 MHz antenna shows anomalies in the soil beneath concrete foundation, associated with voids filled with water, soil, or air. **Lower right:** Schematic drawing of a multi-channel NMR survey.

What We Want From You

The ***FastTIMES*** editorial team welcomes contributions of any subject touching upon geophysics. The suggested topic for the March 2010 issue is software applications (open source, shareware and commercial) for near surface geophysics. ***FastTIMES*** also accepts photographs and brief noncommercial descriptions of new instruments with possible environmental or engineering applications, news from geophysical or earth-science societies, conference notices, and brief reports from recent conferences. Please submit your items to a member of the ***FastTIMES*** editorial team by February 21, 2010 to ensure inclusion in the next issue.

Advertisers

Click on the entries to see the ad

Contents

Click on the entries to see the article

FastTIMES

FastTIMES (ISSN 1943-6505) is published by the Environmental and Engineering Geophysical Society (EEGS). It is available electronically (as a pdf document) from the EEGS website (*www.eegs.org*).

About EEGS

The Environmental and Engineering Geophysical Society (EEGS) is an applied scientific organization founded in 1992. Our mission:

"To promote the science of geophysics especially as it is applied to environmental and engineering problems; to foster common scientific interests of geophysicists and their colleagues in other related sciences and engineering; to maintain a high professional standing among its members; and to promote fellowship and cooperation among persons interested in the science."

We strive to accomplish our mission in many ways, including (1) holding the annual Symposium on the Application of Geophysics to Engineering and Environmental Problems (**SAGEEP**); (2) publishing the ***Journal of Environmental & Engineering Geophysics (JEEG)***, a peer-reviewed journal devoted to near-surface geophysics; (3) publishing ***FastTIMES***, a magazine for the near-surface community, and (4) maintaining relationships with other professional societies relevant to near-surface geophysics.

Joining EEGS

EEGS welcomes membership applications from individuals (including students) and businesses. Annual dues are currently $90 for an individual membership, $50 for a retired member $20 for a student membership, $50 developing world membership, and $650 to $4000 for various levels of corporate membership. All membership categories include free online access to JEEG. The membership application is available at the back of this issue, or online at *www.eegs.org*. See the back for more information.

Board of Directors

Business Office

1720 South Bellaire, Suite 110, Denver, Colorado 80222-4303; (303) 531-7517; 820-3844 fax; *staff@eegs.org*

Executive Director
Kathie A. Barstnar
staff@eegs.org

Managing Director
Jackie Jacoby
staff@eegs.org

EEGS Contributors

FastTIMES Submissions

To submit information for inclusion in ***FastTIMES***, contact a member of the editorial team:

Editor in Chief
Moe Momayez
moe.momayez@arizona.edu
(520) 626-5977

Associate Editor
Jeffrey G. Paine
jeff.paine@beg.utexas.edu
(512) 471-1260

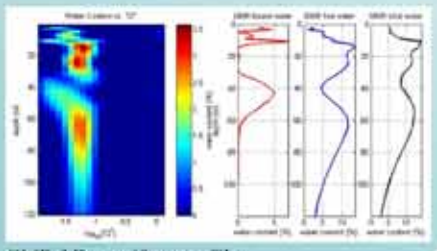
To advertise in ***FastTIMES***, contact:

Jackie Jacoby
staff@eegs.org
(303) 531-7517

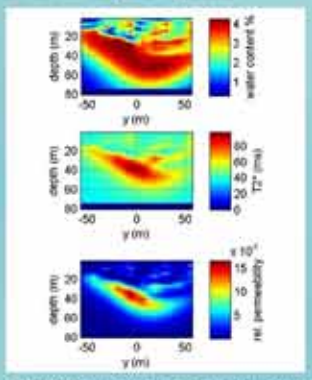
The next ***FastTIMES*** will be published in March 2010. Please send articles to a member of the editorial team by February 21. Advertisements are due to Jackie Jacoby by February 21.

Vista Clara's *GMR*

Multi-channel Surface NMR for Aquifer Imaging and Characterization



GMR 1D aquifer profile

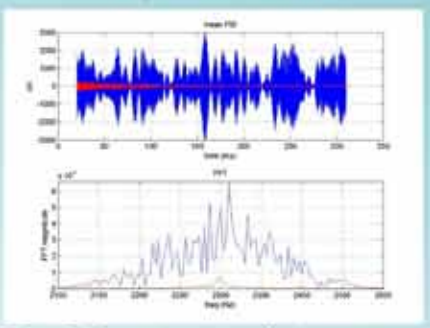


GMR 2D image of water content and relative permeability

GMR Measurements Provide:

- Direct detection and measurement of unbound groundwater
- Water content and relative hydraulic conductivity within a 1D/2D profile
- Calibrated hydraulic conductivity where local aquifer tests are available
- Depth of investigation up to 150m

*Protected by US Patent No. 7,466,128 **US and International Patents Pending.



Blue: before noise cancellation
Red: after noise cancellation
A critical GMR advantage, enables useful surface NMR surveys near cultural noise sources.

VISTACLARA INC.
21ST CENTURY GEOPHYSICS

www.Vista-Clara.com

2615 W.Casino Rd. Suite 4-JK Everett, WA 98204 USA info@Vista-Clara.com (425) 290-3626

Calendar

*Please send additions, errors, and omissions to a member of the **FastTIMES** editorial team.*

2009	
December 14–18	*2009 AGU Fall Meeting*, San Francisco, California
2010	
February 21	Deadline for submission of articles, advertisements, and contributions to the March issue of *FastTIMES*.
April 11–15	*SAGEEP 2010*: Symposium on the Application of Geophysics to Environmental and Engineering Problems, Keystone, CO
May 21	Deadline for submission of articles, advertisements, and contributions to the June issue of *FastTIMES*.
May 24–26	*Geophysics at the Beach Symposium*: Newport Beach, California
June 14–17	*ICEEG 2010*: 4th International Conference on Environmental and Engineering Geophysics, Chengdu, China
August 21	Deadline for submission of articles, advertisements, and contributions to the September issue of *FastTIMES*.
August 22-26	*ASEG/PESA 2010*: 21st International Conference & Exhibition of the Australian Society of Exploration Geophysics, Sydney, Australia
September 5–10	*IAEG 2010*: 11th Congress of the International Association for Engineering Geology and the Environment, Auckland, New Zealand
November 21	Deadline for submission of articles, advertisements, and contributions to the December issue of *FastTIMES*.

Notes from EEGS

President's Message: A Different Kind of SAGEEP This Year

Jonathan Nyquist, President (nyq@temple.edu)

The deadline for SAGEEP abstracts is just around the corner (December 18th) so I'd like to take a moment to reflect on what will be different about our annual meeting this year.

First, the requirements for SAGEEP papers have changed. There has always been a love/hate relationship expressed by SAGEEP contributors. Some academics complain that SAGEEP papers are too burdensome to write, "I can go to AGU or SEG having written no more than an abstract. If I take the trouble to write 10-page paper I am going to submit it to a journal, not a conference proceeding." Others enthuse, "SAGEEP volumes are absolutely the best source of state-of-the-art case histories!" In truth, many of these studies will never appear in journals because outside of academia there is little incentive to endure the lengthy process of peer-review and revision. Well, our current guidelines can accommodate submissions both long and short. The new "extended abstracts" can be anywhere from a few pages to a full length paper. The only limitation is that the final PDF with figures should be under 4 MB so everything fits a single CD.

Second, planning the technical sessions has been different this year. In the past, the Technical Chair has simply waited for all the papers to arrive and then sorted them into sessions. This year, the SAGEEP planning committee brainstormed to come up with exciting themes for sessions and then encouraged session chairs to invite the experts. General submissions are welcome as always. The invitation process is simply intended to encourage lively, informative sessions, and to recruit new speakers to SAGEEP.

Finally, the venue this year is not your typical hotel and meeting rooms. Keystone is a lovely resort and conference center high in the Rocky Mountains west of Denver (http://www.keystoneresort.com). Some of us old-timers are trying to recapture the memories of a wonderful SAGEEP held there in 1996. The site is beautiful, the resort offers a wide variety of restaurants and activities, and off-season rates are very affordable. Although it's springtime in the Rockies, a nearby ski area will still be open for those who want to begin or end their trip taking a run down slopes.

SAGEEP this year will be more than a meeting, it will be a destination!

Sponsorship Opportunities

There are always sponsorship opportunities available for government agencies, corporations, and individuals who wish to help support EEGS's activities. Specific opportunities include development and maintenance of an online system for serving SAGEEP papers from the EEGS web site and support for the 2010 SAGEEP conference to be held in Keystone, Colorado. Contact Jon Nyquist (nyq@temple.edu) for more information.

EEGS Announces Changes in Membership

It's time to renew your membership in EEGS – we've added options and increased benefits!

EEGS members, if you have not already received a call to renew your membership, you will – soon! There are a couple of changes of which you should be aware before renewing or joining.

Benefits - EEGS has worked hard to increase benefits without passing along big increase in dues. As a member, you receive a Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP) registration discount big enough to cover your dues. You also receive the Journal of Environmental and Engineering Geophysics (JEEG), the *FastTIMES* newsletter, and full access to the EEGS research collection, which includes online access to all back issues of JEEG, SAGEEP proceedings, and SEG extended abstracts. You get all of this for less than what many societies charge for their journals alone.

Dues Changes - EEGS has worked hard to hold the line against dues increases resulting from inflation and higher costs. Instead, EEGS leadership sought ways to offer yesterday's rates in today's tough economic climate. Therefore, you can continue your EEGS membership without any rate increase if you opt to receive the JEEG in its electronic format, rather than a printed, mailed copy. Of course, you can continue to receive the printed JEEG if you prefer. The new rate for this membership category is modestly higher reflecting the higher production and mailing costs. A most exciting addition to EEGS membership choices is the new discounted rate for members from countries in the developing world. A growing membership is essential to our society's future, so EEGS is urging those of you doing business in these countries to please encourage those you meet to take advantage of this discounted membership category, which includes full access to the EEGS research collection. And, EEGS is pleased to announce the formation of a Retired category in response to members' requests.

Descriptions of all the new membership options are outlined on EEGS' web site (*www.eegs.org*) in the membership section.

Renew Online - Last year, many of you took advantage of our new online membership renewal (or joining EEGS) option. It is quick and easy, taking only a few moments of your time. Online membership and renewal application form is available at *www.eegs.org* (click on Membership and then on Online Member Application / Renewal).

EEGS Foundation - EEGS launched a non-profit foundation (*www.eegsfoundation.org*) that we hope will enable our society to promote near-surface geophysics to other professionals, develop educational materials, fund more student activities, and meet the increasing demand for EEGS programs while lessening our dependence on membership dues. A call for donations (tax deductible*) to this charitable organization is now included with your renewal materials and can be found on the online Member Resources page of EEGS' web site (*www.eegs.org/pdf_files/eegs_foundation.pdf*).

Member get a Member - Finally, since the best way to keep dues low without sacrificing benefits is to increase membership, please make it your New Year's resolution to recruit at least one new EEGS member. If every current member recruited even one new member to EEGS, we could actually consider lowering dues next year!

*As always, seek professional advice when claiming deductions on your tax return.

From the Editor's Desk

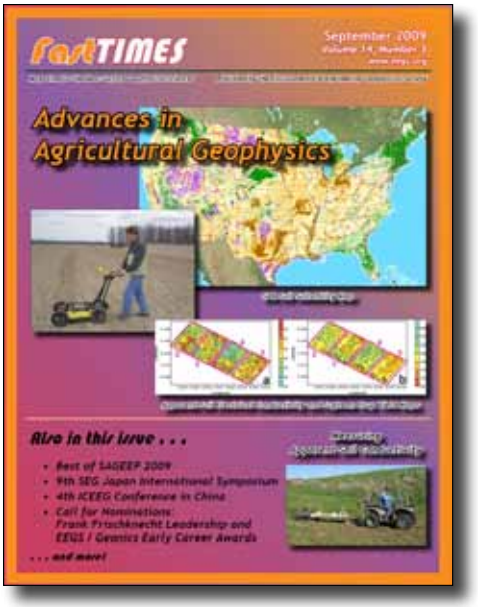
Moe Momayez (moe.momayez@arizona.edu)

2009 has been largely a year of growth and change for *FastTIMES*. Looking forward to 2010, our main goals are to broaden the *FastTIMES* audience, and to create closer ties among members of the near-surface geophysics community through web and social networking tools.

In October, the sudden and sad passing of Roger Young (*FastTIMES* Associate Editor) left a huge void in the editorial team and the geophysics community in general. On behalf of everyone at EEGS, I would like to extend our deepest sympathies to Roger's family, friends and colleagues.

FastTIMES remains the ideal outreach tool to EEGS members, members of the larger near-surface geophysical community, and the "consumer" community with an interest in problems that geophysics might help solve. Per-issue downloads continue to rise. We broke our download record twice over the past year: first in March, topping 15,000 individual downloads and then again in September with well over 25,000. To continue to build on this momentum, I would like to invite you to follow *FastTIMES* on Twitter (eegs_ft) and to share (@eegs_ft) news and information with the near-surface geophysics community.

As I sign off on this editorial page, I wish to thank you all: the authors, contributors, corporate sponsors and especially our readership for your support and enthusiasm, and look forward to our interactions in 2010. Best wishes for a happy holiday and a healthy and prosperous New Year!



From the FastTIMES Editorial Team

FastTIMES is distributed as an electronic document (pdf) to all EEGS members, is sent by web link to several related professional societies, and is available to all for download from the EEGS web site at www.eegs.org/fasttimes/latest.html. The most recent issue (September 2009, cover image at left) has been downloaded more than 25,000 times as of November, and past issues of ***FastTIMES*** continually rank among the top downloads from the EEGS web site. Your articles, advertisements, and announcements receive a wide audience, both within and outside the geophysics community.

To keep the content of ***FastTIMES*** fresh, the editorial team strongly encourages submissions from researchers, instrument makers, software designers, practitioners, researchers, and consumers of geophysics—in short, everyone with an interest in near-surface geophysics, whether you are an EEGS member or not. We welcome short research articles or descriptions of geophysical successes and challenges, summaries of recent conferences, notices of upcoming events, descriptions of new hardware or software developments, professional opportunities, problems needing solutions, and advertisements for hardware, software, or staff positions.

The ***FastTIMES*** presence on the EEGS web site has been redesigned. At www.eegs.org/fasttimes, you'll now find calls for articles, author guidelines, current and past issues, and advertising information.

Memorial: Professor Roger Adams Young

by William E. Doll, President and Chair, EEGS Foundation Board of Directors

EEGS members and the near-surface geophysics community recently lost a good friend and valued colleague, Dr. Roger Young, Associate Professor at the University of Oklahoma. On October 13 2009, Roger died peacefully in his sleep after a short illness. He was 66 years old.

Dr. Young was born in Pittsfield, Massachusetts on June 29, 1943. He attended elementary schools in New York state and Gainesville, Florida and graduated from Gainesville High School in 1961. Dr. Young received a B.S. in Geology, with High Honors, in 1965 from Wesleyan University, and his M.S. in Geophysics in 1968 from Stanford University.

Roger began his professional career in geophysics at Mobil Oil in Dallas shortly after graduation from Stanford. He married his high school sweetheart, Frances Anne Bovee, on November 3, 1968 in Topanga Canyon, California and they resided in Dallas for a short time before he was drafted into the army in January 1969. He received a direct commission after basic training and served in the U.S. Army Corp of Engineers at the U.S. Army Map Service (then TOPOCOM) and then in Vietnam. After his discharge in early 1972 he and Frances traveled for a number of months in the U.S., Mexico, and Canada before he began graduate studies at the University of Toronto. He received his Ph.D in Physics (Geophysics) in 1979 from the University of Toronto. He was a Research Geophysicist with Phillips Petroleum from 1979 to 1982 and Senior Research Geophysicist from 1982-1986. He was a Senior Research Fellow at Curtin University, Perth, Western Australia from 1986-1990. He came to OU's School of Geology and Geophysics as an Associate Professor in 1990. He held positions in, and received awards from many international geophysical societies. He was an active researcher who published numerous papers, and in recent years became best known for his work in near-surface geophysics. Many M.S. and Ph.D. students completed their degrees under his direction. He was Director of the Shell Crustal Imaging Facility for many years. In 2008, he received the Stubbeman-Drace Presidential Professorship, given to outstanding faculty selected on the basis of teaching, willingness to mentor, and dedication to research, creative activity and service. This description of the basis for awarding these Presidential Professorships summarizes Dr. Young's career at OU perfectly.

Roger served EEGS and the near-surface community faithfully for several years. He wrote a training manual and taught an associated short course for EAGE on reflection seismic methods that are widely praised within the near-surface community. He was an at-large member on the EEGS Board of Directors from 2004 to 2006, and led the selection committee for the EEGS/Geonics Early Career Award for its first two years, 2008 and 2009. He also served on the *FastTimes* Editorial Board from 2006 until his untimely death.

Roger loved camping and hiking and particularly enjoyed his field work with students and colleagues. Music, especially classical and international folk music, always gave him great pleasure. He joined Frances in International folk dancing and playing the piano was a lifelong pursuit.

Upon consultation with his family, the school of Geophysics at the University of Oklahoma has established a fund to be dispersed to Roger's wife, Frances, who was stricken earlier this year with ALS. Her subsequent care was Roger's deepest concern, and monies from the fund will help defray the

cost of home-based health care for Frances. If you would like to donate a monetary gift to this fund in honor of Dr. Young, please make the check payable to **University of Oklahoma Foundation, Inc**. and forward to the attention of **Nancy Leonard**, ConocoPhillips School of Geology and Geophysics, 710 Sarkeys Energy Center, 100 East Boyd Street, Norman, OK 73019.

Help Support EEGS!

Please Join or

Renew Your Membership

Today at www.eegs.org!

The *JEEG* Page

*The **Journal of Environmental & Engineering Geophysics (JEEG)**, published four times each year, is the EEGS peer-reviewed and Science Citation Index (SCI®)-listed journal dedicated to near-surface geophysics. It is available in print by subscription, and is one of a select group of journals available through GeoScienceWorld (www.geoscienceworld.org). **JEEG** is one of the major benefits of an EEGS membership. Information regarding preparing and submitting **JEEG** articles is available at http://jeeg.allentrack.net.*

Contents of the October/December 2009 Issue

Journal of Environmental & Engineering Geophysics
v. 14, no. 4, October/December 2009

Lightning-Induced Remanent Magnetic Anomalies in Low-Altitude Aeromagnetic Data
Les P. Beard, Jeannemarie Norton and Jacob R. Sheehan

Empirical Mode Decomposition Operator for Dewowing GPR Data
Bradley M. Battista, Adrian D. Addison and Camelia C. Knapp

Improved Hydrogeophysical Parameter Estimation from Empirical Mode Decomposition Processed Ground Penetrating Radar Data
Adrian D. Addison, Bradley M. Battista and Camelia C. Knapp

On-Site Bias Noise Correction in Multi-Frequency Slingram-type Electromagnetic Induction Measurements
Yuji Mitsuhata and Takehiko Imasato

Editor's Scratch

Dr. Janet E. Simms, ***JEEG*** Editor-in-Chief
US Army Engineer R&D Ctr.
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
(601) 634-3493; 634-3453 fax
janet.e.simms@erdc.usace.army.mil

The ***Journal of Environmental and Engineering Geophysics (JEEG)*** is the flagship publication of the Environmental and Engineering Geophysical Society (EEGS). All topics related to geophysics are viable candidates for publication in ***JEEG***, although its primary emphasis is on the theory and application of geophysical techniques for environmental, engineering, and mining applications. There is no page limit, and no page charges for the first ten journal pages of an article. The review process is relatively quick; articles are often published within a year of submission. Articles published in ***JEEG*** are available electronically through GeoScienceWorld and the SEG's Digital Library in the EEGS Research Collection. Manuscripts can be submitted online at www.eegs.org/jeeg/index.html.

EAGE's Near Surface Geophysics Journal, December 2009

*As a courtesy to the European Association of Geoscientists and Engineers (EAGE) and the readers of **FastTIMES**, we re-produce the table of contents from the August issue of EAGE's **Near Surface Geophysics** journal.*

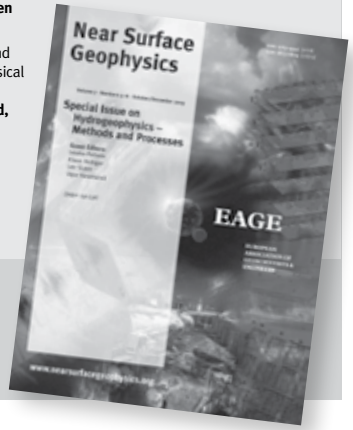
ALSO INTERESTING

Near Surface Geophysics

Volume 7 · Numbers 5–6 · October/December 2009

Content

Special Issue on Hydrogeophysics – Methods and Processes



EAGE
EUROPEAN ASSOCIATION OF GEOSCIENTISTS & ENGINEERS

__FastTIMES__ welcomes short articles on applications of geophysics to the near surface in many disciplines, including engineering and environmental problems, geology, soil science, hydrology, archaeology, and astronomy. In the articles that follow, the authors present the latest applications of geophysical techniques to address hydro-geological issues.

Surface NMR: Recent Advances in the Technology and its Application to Aquifer Characterization in the USA

David O. Walsh, Vista Clara Inc., Everett, WA (davewalsh@vista-clara.com) and Jared D. Abraham, US Geological Survey, Denver, CO (jdabraha@usgs.gov)

Introduction

Proton nuclear magnetic resonance (NMR) has been used in the Earth Sciences for the past ~50 years to study and quantify the pore-scale physical and chemical properties of water-saturated materials. The NMR measurement consists of placing the sample of materials containing water in a static magnetic field, B0, and then applying a second alternating magnetic field, B1, at a particular "resonant" frequency to stimulate the emission of a third alternating magnetic field from the water itself. The amplitude of the detected magnetic field from the groundwater is directly proportional to the volume of water present (Legchenko and Valla, 2002). Hence, NMR enables direct detection and measurement of water. This ability of direct detection and measurement is unique among established geophysical methods, and it makes the technique especially useful for hydrological investigations (Legchenko et al, 2002).

Surface NMR is a particular type of NMR measurement designed for non-invasive detection and characterization of groundwater. In surface NMR, also known as magnetic resonance sounding (MRS), the static field, B0, is the Earth's magnetic field. The resonant frequency for water in the Earth's field ranges from about 1 kHz to 3 kHz, depending on the intensity of the Earth's magnetic field. The applied alternating magnetic field, B1, is generated by routing an alternating current through a large loop of wire arranged on the surface of the Earth (Figure 1). The diameter of the loop can range from 10m to 200m depending on the intended depth of investigation. We typically use circular, square or figure-eight shaped loops (Legchenko and Valla, 2002) (Walsh, 2008). The same loop, or another nearby loop, is used to detect the very small alternating magnetic field produced by the groundwater.

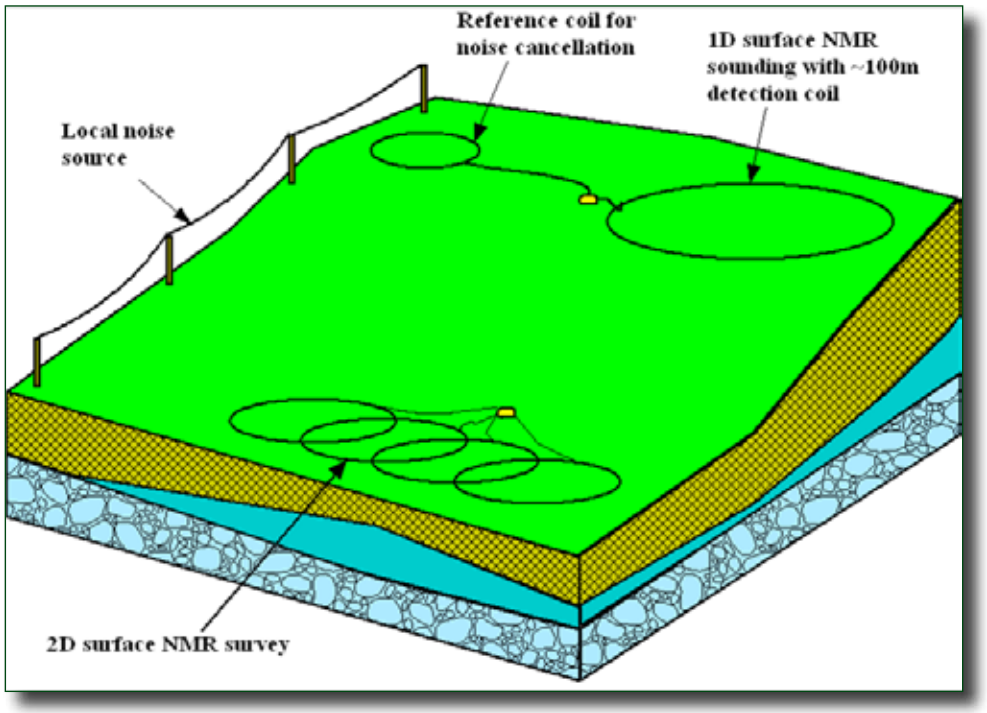


Figure 1. Multi-channel surface NMR applications include the use of reference coils to cancel local noise sources, and 2D surface NMR.

We can stimulate signals from groundwater at different depth levels by transmitting at different transmitter power levels. The relationship between transmitter output power and signal amplitude for a given subsurface location is actually not linear but sinusoidal. The received signals from groundwater at shallow depths are maximized using lower transmitted power, whereas the received signals from groundwater at greater depths are maximized using larger transmit power. The NMR measurement is repeated over a wide range of power levels and a linear inversion is performed on the entire data set to isolate the NMR signals arising from different portions of the subsurface. Once localized, the water content is estimated directly from the initial amplitude of the localized NMR signal(Walsh 2008).

The relaxation behavior (or decay rate) of the detected signal contains additional information on the pore size and its distribution, and hence provides an indication of hydraulic conductivity. The T2 relaxation rate, typically expressed in milliseconds (ms), is governed to a first order by interactions between individual water protons and the pore surfaces (Legchenko and Valla, 2002). As the pore size gets larger, the volume to surface area increases and the rate at which water protons collide with pore walls decreases. Hence, in non-magnetic geology, the exponential decay constant T2 is generally proportional to the pore volume/surface ratio, which in turn is proportional to the pore diameter (Roy et al., 2009).

Recent Technological Developments

The past 4 years have seen a rapid advance in surface NMR instrumentation, data processing methods, and field applications.

Multi-channel surface NMR

The advent of multi-channel surface NMR instrumentation, and the development of multi-channel data processing methods, have greatly enhanced the utility of the surface NMR method and improved its prospects for widespread use in hydrology (Walsh 2008). A particularly important advancement is the development of multi-channel data acquisition and processing methods for canceling noise. Typical detected NMR signal levels range from a few nanovolts (nV) to a few microvolts (μV). Noise sources such as nearby power lines, machinery and lightning can easily dominate the NMR signals of interest. Multi-channel surface NMR instruments enable the use of dedicated reference coils to record noise processes concurrently, and the use of adaptive signal processing algorithms to cancel the noise on the primary detection coil in post processing (Figure 1). Figure 2 shows an example of the level of noise cancelation that is possible, even typical, using this approach.

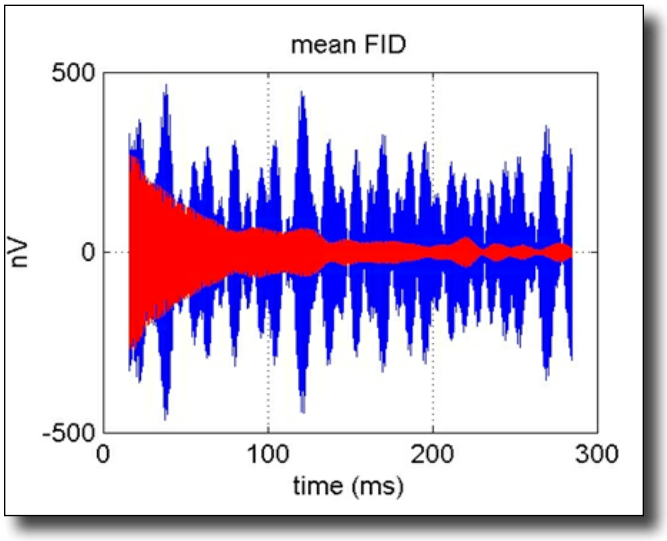


Figure 2. Example of noise cancellation using a reference coil and adaptive signal processing. Blue: the surface Free Induction Decay (FID) NMR signal before noise cancellation. Red: the same surface FID NMR signal after noise cancellation.

Multi-channel surface NMR instrumentation has also enabled time-efficient, high-resolution 2D and 3D imaging methods. A 2D surface NMR data set is acquired by laying out a series of overlapping surface

loops along a linear transect, as shown in the lower portion of Figure 1, and transmitting and receiving on various coincident and displaced combinations of loops. The entire set of data is inverted to isolate the NMR signals arising from different 2D locations in the subsurface. These 2D-isolated signals are then analyzed to develop images of NMR signal and aquifer properties in 2 dimensions. An example from a recent 2D surface NMR survey in Texas is shown in Figure 3.

Instrumentation Sensitivity and Speed

Recent advances in surface NMR technology have achieved measurement "dead-times" of less than 10ms. Until recently, the standard dead-time of commercial NMR instruments was on the order of 40ms, which prevented the detection of fast relaxing NMR signals from water in silty-clayey sediments, as well as some NMR signals from water in magnetic sediments (Legchenko and Valla, 2002)(Walsh, 2008). In addition, a new commercially available surface NMR instrument has achieved a receiver input noise density of 300 pV/rt(Hz), bringing the instrument noise level close to the resistive noise of the coil itself, which is the theoretical lower limit for detection.

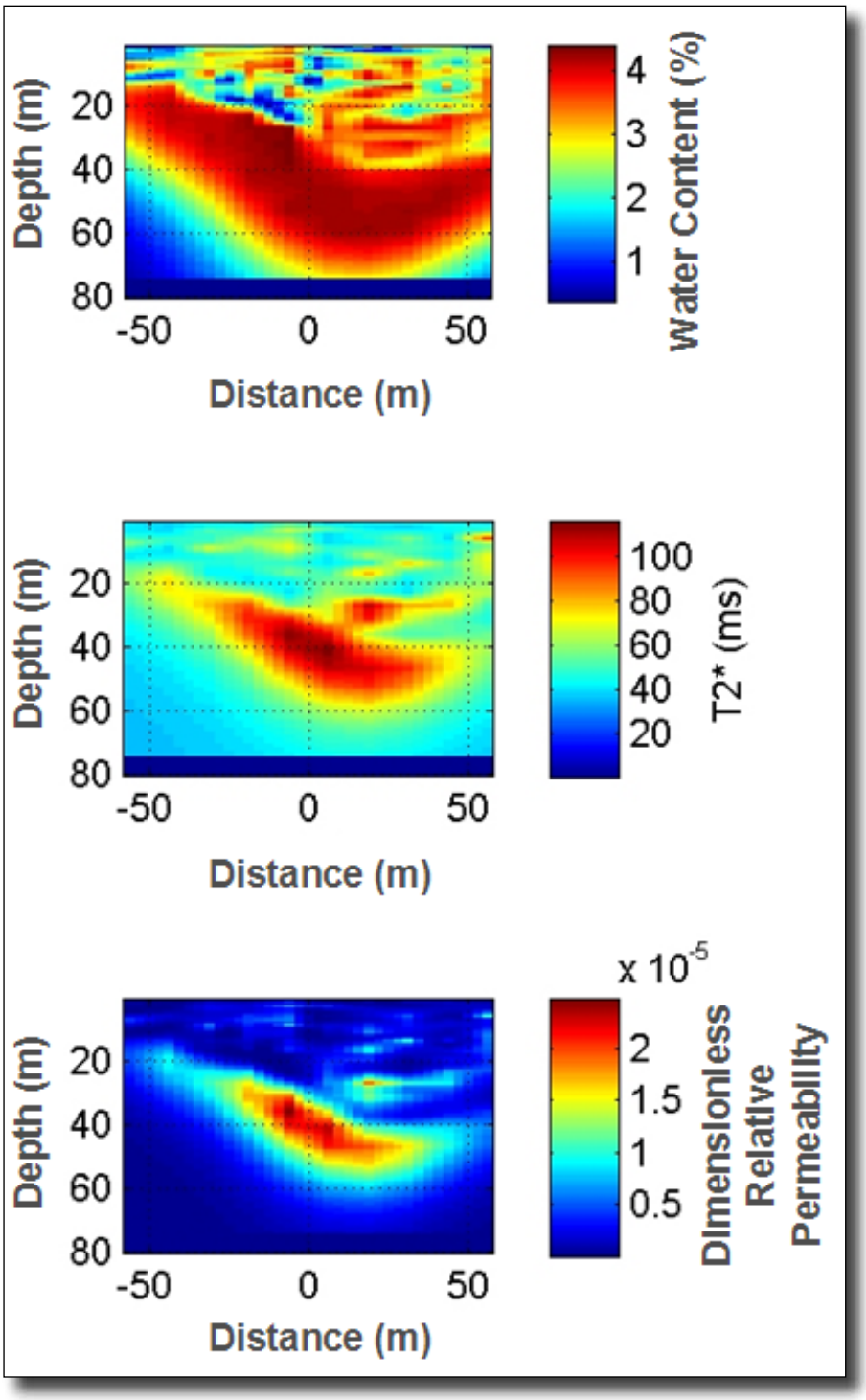


Figure 3. Coherent 2D inversion of aquifer properties under a dry riverbed, in south Texas. The red areas in the plots represent the2-D distribution of (from top to bottom) water content, movable water and a measure of the uncalibrated relative hydraulic permeability of the water in the subsurface in the riverbed (Walsh 2008).

Advances in Inversion Methods

1D and 2D inversion methods continue to improve and to extract more and better information from each NMR data set. Commercial and non-commercial surface NMR processing software packages now incorporate subsurface electrical conductivity information to compensate for field attenuation and phase shifts. Multi-exponential analysis

(similar to borehole NMR logging) provides direct information on pore-size distribution (Figure 4). Recently developed single-step, all-linear inversion methods have shown increased in spatial resolution and stability (Müller et al., 2009).

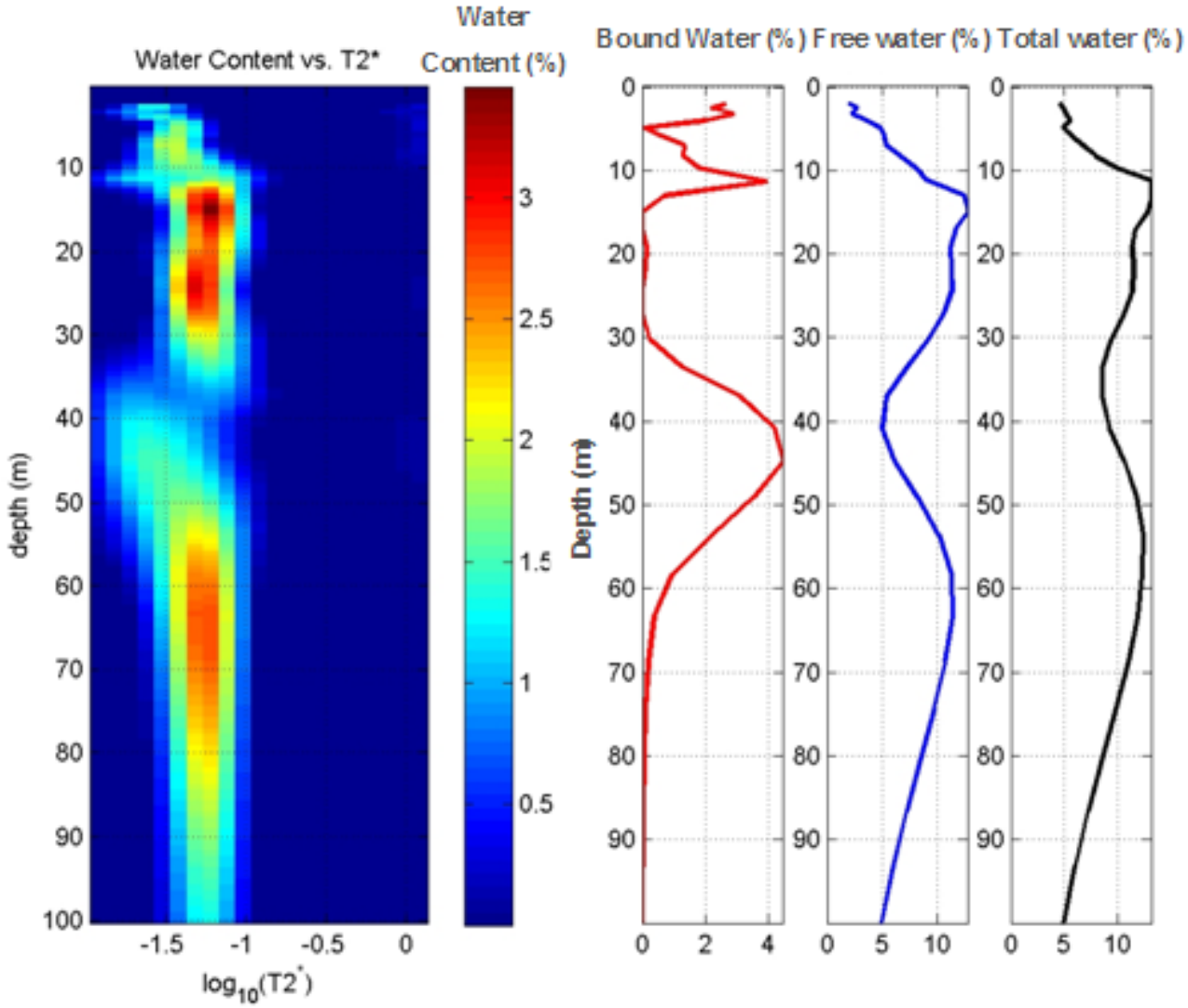


Figure 4. Multi-exponential analysis yields information on the pore size distribution vs. depth, and improved estimation of bound water, free water and total water content. This is useful for identifying zones of both high and low permeability. In this example from Nebraska, a low-permeability zone at around 40m separates productive aquifers above and below.

Advances in Pulse Sequences

Commercial surface NMR instruments now include software for measuring and estimating two different forms of NMR relaxation (T2* and T1). Most recently spin echo pulse sequences have been applied to the difficult problem of detecting water in sediments and formations with high magnetic susceptibility, and initial results are promising (Roy et al., 2009).

Advances in Pulse Sequences

NMR technique is a unique measurement environment, wherein the substance under investigation can be manipulated by the user at the atomic level, using a variety of means to illuminate the substances makeup. As in previous uses of NMR (e.g. chemistry and medical Magnetic Resonance Imaging) we can expect advancements in new ways of exploiting this phenomenon to extract hydrologically relevant information, and to develop new and better field techniques for acquiring data.

Trends for Application to Aquifer Characterization in the USA

In 2007, the U.S. Geological Survey, in cooperation with the Central Platte Natural Resources District, central Nebraska, USA, and the Nebraska Environmental Trust, initiated a four year study to test the applicability of the surface NMR or Magnetic Resonance Sounding (MRS) technique to gather information on aquifer characteristics for sub-regional groundwater models. A primary goal of the study is to calibrate the MRS systems, thus providing an effective low cost alternative to aquifer tests. It is envisioned that NMR will generate large data sets of aquifer properties in a more efficient manner than expensive and time intensive aquifer pump tests.

The research underway in Dawson County near Lexington, Nebraska (Figure 5) is a first attempt to apply the NMR technique to directly support the development of groundwater models in the high plains aquifer. The hydrological goal is to characterize the hydrogeology of the Quaternary alluvial and underlying Tertiary Ogallala Group aquifers that occur within the Platte River Valley.

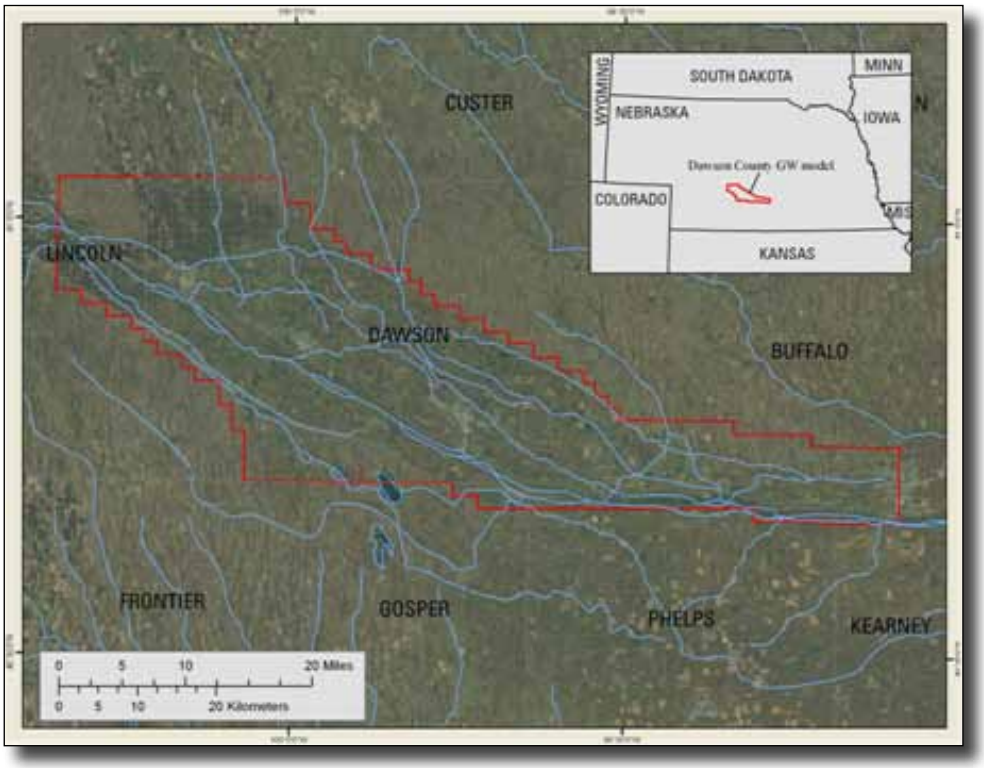


Figure 5. Location of the study area and the Dawson County, Nebraska Groundwater model in central Nebraska.

Complementary data used to evaluate and to calibrate the NMR were derived from constant discharge aquifer tests, borehole flow meter tests, lithologic descriptions, borehole geophysics, and time-domain electromagnetic soundings (Abraham et al., 2008). The NMR-derived hydraulic conductivity data were compared to hydraulic conductivity data from a constant discharge pumping tests of the alluvial and Ogallala Group aquifers. The NMR-derived hydraulic conductivity data were also compared well to conductivity estimates based on data from a borehole flow meter test (Anderson et al., 2009) (Figure 6). Further research is under way to beter understand the relationships between the borehole flow meter tests and the surface NMR This research, to be released as a USGS Scientific Investigation Report in 2011, will document an integrated NMR, surface geophysical, borehole geophysical, borehole flow meter and

aquifer test approach in which the hydrostratigraphy of the Platte River alluvial aquifer and Ogallala aquifer.

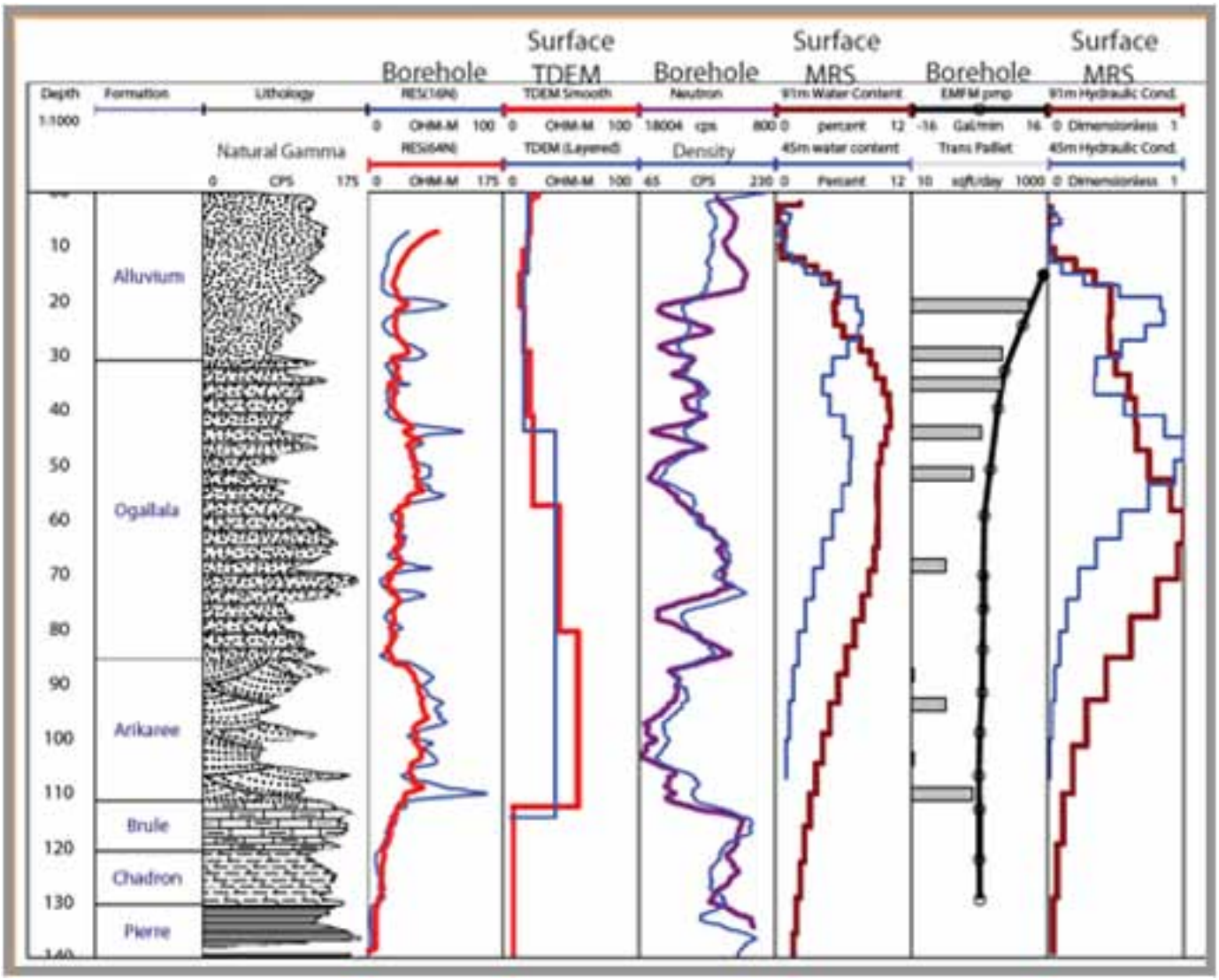


Figure 6. Plot of the results of the lithologic logs, borehole geophysics, surface Time Domain Electromagnetic (TDEM), Surface NMR of MRS, and the borehole flow meter at a test site within the Dawson Country, Nebraska Groundwater model (Abraham, et al. 2008) (Anderson et al., 2009).

References

Abraham, J.D., Kress, W.H., Cannia, J.C., Steele, G.V., Smith, B.D., and Woodward, D., 2008, Geophysics for Hydrologic Characterization, AGU Annual Fall Meeting December 14th-19th 2008, San Francisco, CA, Poster NS43B-1194

Anderson, A.J., Morin, R.H., Cannia, J.C., Williams, J.H., 2009, Geophysical Log Analysis of Selected Test Holes and Wells in the High Plans Aquifer, Central Platte River Basin, Nebraska, USGS SIR 2009-5033, http://pubs.er.usgs.gov/usgspubs/sir/sir20095033

Legchenko, A. and Valla, P., 2002, A review of the basic principles of proton magnetic resonance

sounding measurements, Journal of Applied Geophysics, 50,3-19.

Legchenko, A., Baltassat, J.M., Beauce, A., and Benard, J., 2002, Nuclear Magnetic Resonance as a Geophysical Tool for Hydrologists: Journal of Applied Geophysics; 50 21-46.

Müller-Petke, M., and Yaramanci, U., 2009 QT-Inversion-Comprehensive use of the Complete Surface-NMR Dataset, in the Proceedings 4th International Workshop on Magnetic Resonance Sounding, October 20th -23rd , 2009, Grenoble, France.

Roy, J., Legchenko, A, Menier, J., Chouteau, M., Bureau, M., Rouleau, A., 2009, MRS in spin-echo mode – 2008 tests in the Grenville, in the Proceedings 4th International Workshop on Magnetic Resonance Sounding, October 20th -23rd , 2009, Grenoble, France.

Walsh, D. O., 2008, Multichannel surface NMR surface NMR instrumentation and software for 1D/2D groundwater investigations, Journal of Applied Geophysics, vol 66, no. 3 – 4.

Don't Mess with a Geophysicist's House: A Case Study of Ground Penetrating Radar for Concrete Moisture Mapping and Void Detection in the Saturated Soil Beneath the Concrete Foundation

Mustafa Saribudak, Principal Geophysicist-Geologist, Environmental Geophysics Associates, Austin, TX(ega@pdq.net).

Site Background

The subject residence is located in the northwest part of Houston, Texas. The house is 8 years old. The homeowner replaced the carpets in the living room with wood one year after they moved in.

The wood floor started showing discoloring within 3 months right after they were installed (Figure 1).

The plumbing inspection results indicated that inspection of pipes revealed no leak at the house. A flooring company visited the living room and took some moisture readings for reconnaissance purposes. Approximate locations of the readings and values are shown in Figure 1. An engineering company was contracted to evaluate the moisture problem in the living room. However, results from the plumbing and engineering studies neither pinpoint the source of the moisture specifically nor the conditions of the concrete slab and the soil beneath it. To address the problem, the homeowner hired his own geophysical company to perform ground penetrating radar surveys in the living room.

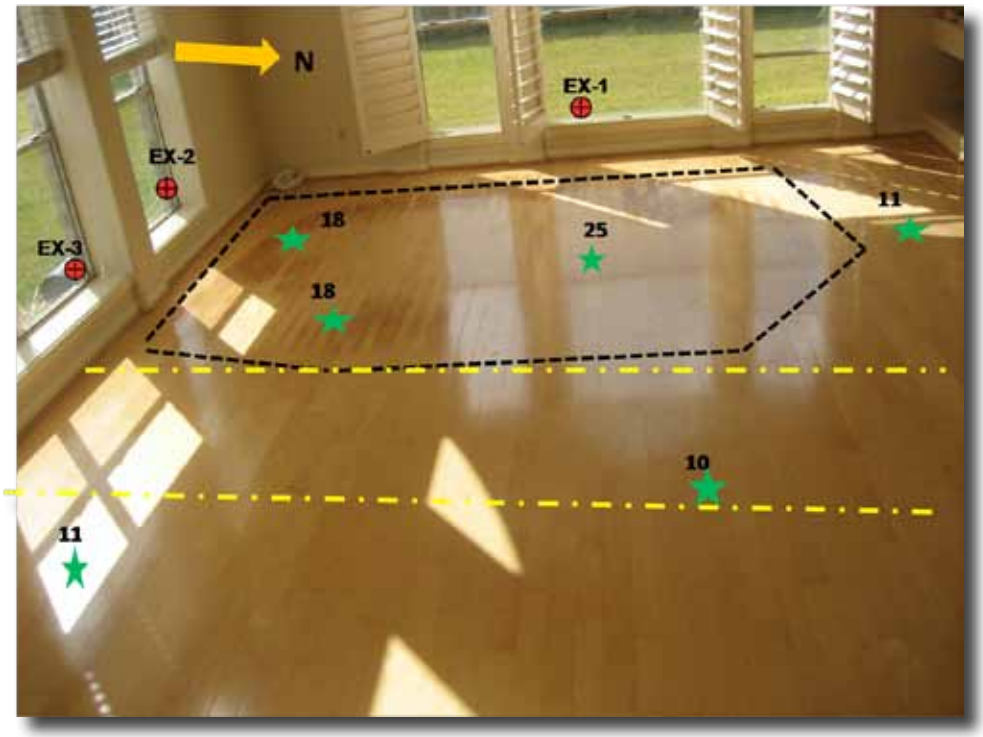


Figure 1. GPR study area showing the discolored portion of the wood floor with dashed black lines. Location of moisture readings are shown with green stars. Moisture readings 10 and 11 are background whereas 18 and 25 are high-moisture areas. Dashed-yellow lines show two post-tension cables embedded into the concrete at about 3 inch. Red circles are excavation points.

Clayey soil is present throughout the area where the subject residence is located. This type of soil expands when it gets wet, and shrinks as it dries.

Purpose of Ground Penetrating Radar (GPR) Surveys

The purpose of the GPR study was three-folded: 1) to determine whether there were water and/or sewer pipes crossing the living room; 2) to locate potential leaks and/or moisture distribution of the slab due to leaking; 3) to locate voids within the concrete foundation and/or soils underlying the concrete.

GPR Instrumentation and Survey Design

GSSI SIR-2000 GPR system was used during the surveys with antennas of 1500 and 400 MHz, whose ranges have depth penetration of up to 1 feet and 8 feet, respectively, depending on the conductivity of the concrete slab and the underlying soil. A schematic map of the living room is shown in Figure 2.

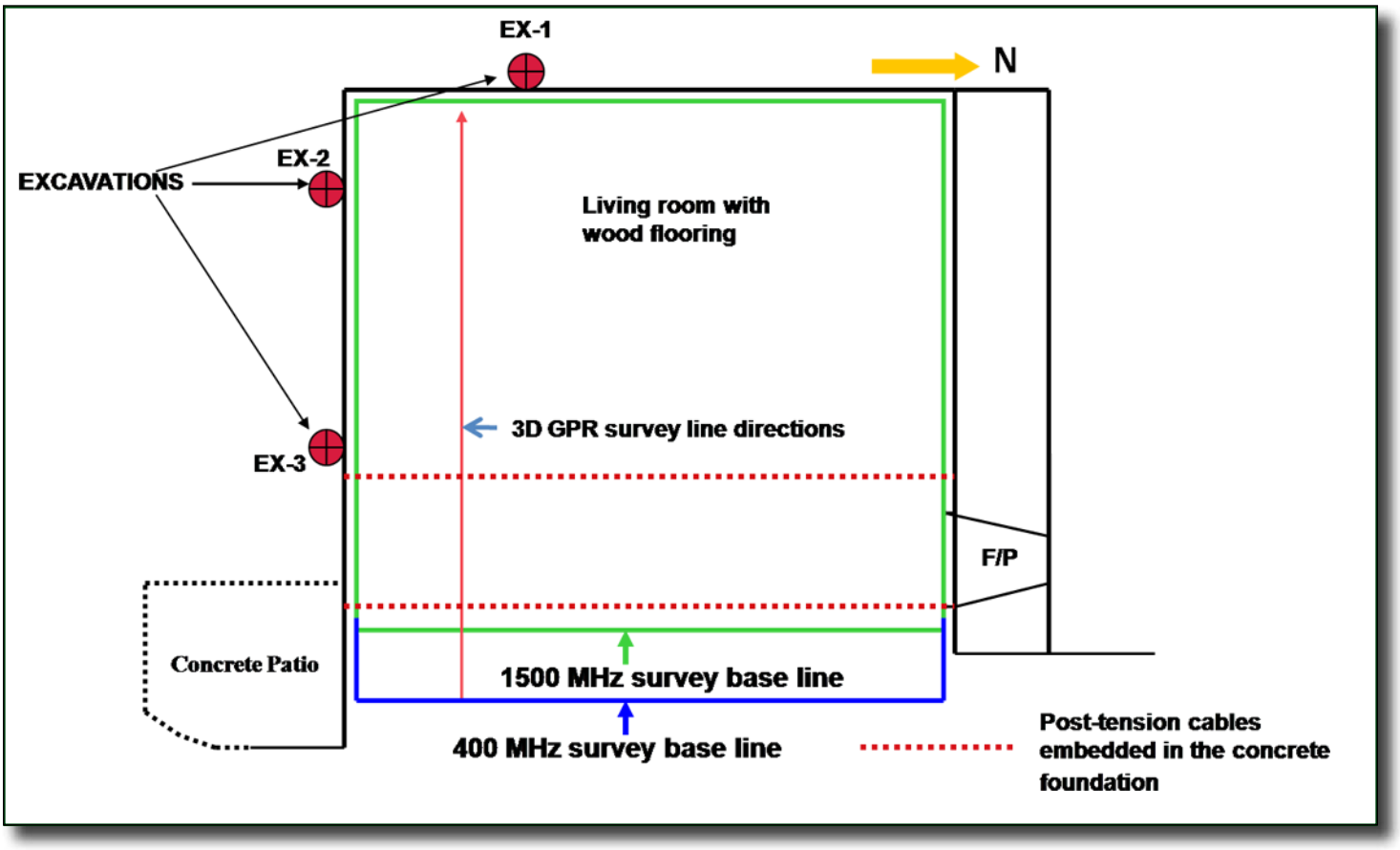


Figure 2. Schematic site map showing 3D GPR survey design.

The 1500 MHz antenna was used with a hand-held cart system to collect three-dimensional (3D) GPR data (Figure 3). 26 profiles of GPR data with six (6) inch spacing were collected.

Figure 3. Picture showing the 1500 MHz GPR survey in the living room. The GPR data was collected at every 6 inch.

The 400 MHz antenna was used with a cart system to collect 3D GPR data (Figure 4). 15 profiles of GPR data with one (1) foot spacing were collected. It should be noted that this survey's baseline (X =0, Y=0) starts 3 feet to the east of the 1500 MHz surveys

GPR is the general term applied to techniques that employ radio waves in the 1 to 1000 megahertz (MHz) frequency range, to map near-surface structures and

Figure 4. Picture showing the 400 MHz GPR survey in the living room. The GPR data was collected at every one foot.

man-made features. The GPR system consists of a transmitter and receiver antennas, and a colored display unit. Depth penetration of the radio waves is limited by the antenna chosen (larger antennas generate lower frequencies which offer greater penetration) and the conductivity of the soil.

The ability of a GPR system to work successfully depends upon two electrical properties of the subsurface, electrical conductivity and relative dielectric permittivity (i.e. dielectric constant). Dielectric constant is a dimensionless measure of the capacity of a material to store charge when an electric field is applied.

The value of the dielectric constant ranges between 1 (for air), and 81 (for water). The dielectric constant for concrete varies from about 5 when dry to 10 when saturated.

Thus, differences in dielectric constant of subsurface materials along distinct boundaries, such as moist and dry concrete and pipes embedded within the concrete slab, can cause highly significant reflections in the radar signal, which are recorded and displayed by the system.

In summary, GPR radar reflections occur when GPR waves encounter a change in velocity due to dielectric contrast. The bigger the change in concrete and/or soil properties the more signal is reflected.

Data Preparation and Processing

GPR surveys with 1500 and 400 MHz antennas were completed on August 7, 2008 and October 12, 2008, respectively. Two different baselines for the surveys were established due to different sizes of the antennas and their logistics. The direction of the profiles was from east to west. The length of the GPR profiles for the 1500 MHz survey was about 12 feet with 6 inch profile spacing. The length of the GPR profiles for the 400 MHz survey was about 15 feet with one foot profile spacing. Both surveys included the moisture free and moisture affected areas of the living room.

Upon completion of the survey, the data was transferred into a laptop computer and the x and y coordinates of each data point were determined. The data was then processed using GSSI's RADAN software.

The presentation of the 1500 and 400 MHz GPR data is in color to provide rapid visual recognition of the GPR anomalies. In the color mode the GPR data is displayed in a color-amplitude format, and a color is assigned to a specific positive or negative value of the recorded signal. In this study, red and yellow colors on the GPR profiles correspond to the highest amplitude positive pulse. Therefore, when it appears on the radar record, it means that there is a strong reflection where yellow and red colors are observed due to a high dielectric contrast. Dark blue could also represent a "strong" negative reflection and similar high dielectric contrast.

Dielectric constants of 6 and 20 were used for the concrete pad and the underlying soil, respectively, and these numbers were calibrated with known subsurface targets, i.e., the concrete thickness (6 inch) and soil depth (2 feet).

Discussion of 1500 and 400 MHz GPR Data

3D GPR results for the1500 MHz surveys are given in Figure 5, which shows a 3 inch depth-slice view of the entire study area. The map view displays two significant linear GPR anomalies shown with red and yellow colors. These anomalies trend in the north-south direction and are labeled as PTC-1 and PTC-2, whose sources are caused by ferrous materials within the concrete. In fact, a ¾ inch post-tension cable was observed on the concrete foundation outside the study area. PTC-1 anomaly appears to lose its high-amplitude strength in the middle of the study area. In other words, the integrity of the post-tension cable appears to be compromised. A very significant anomaly is also shown with light brown and yellow colors to the west of PTC-1 anomaly. This anomaly is outlined with a dashed-black line on the map (top) view of Figure 5. The geometry of this anomaly is quite correlative with the observed moisture- affected areas of the wood floor (see Figures 1 and 5). A void anomaly immediately beneath the concrete slab is also located in the 2-D section of Figure 5.

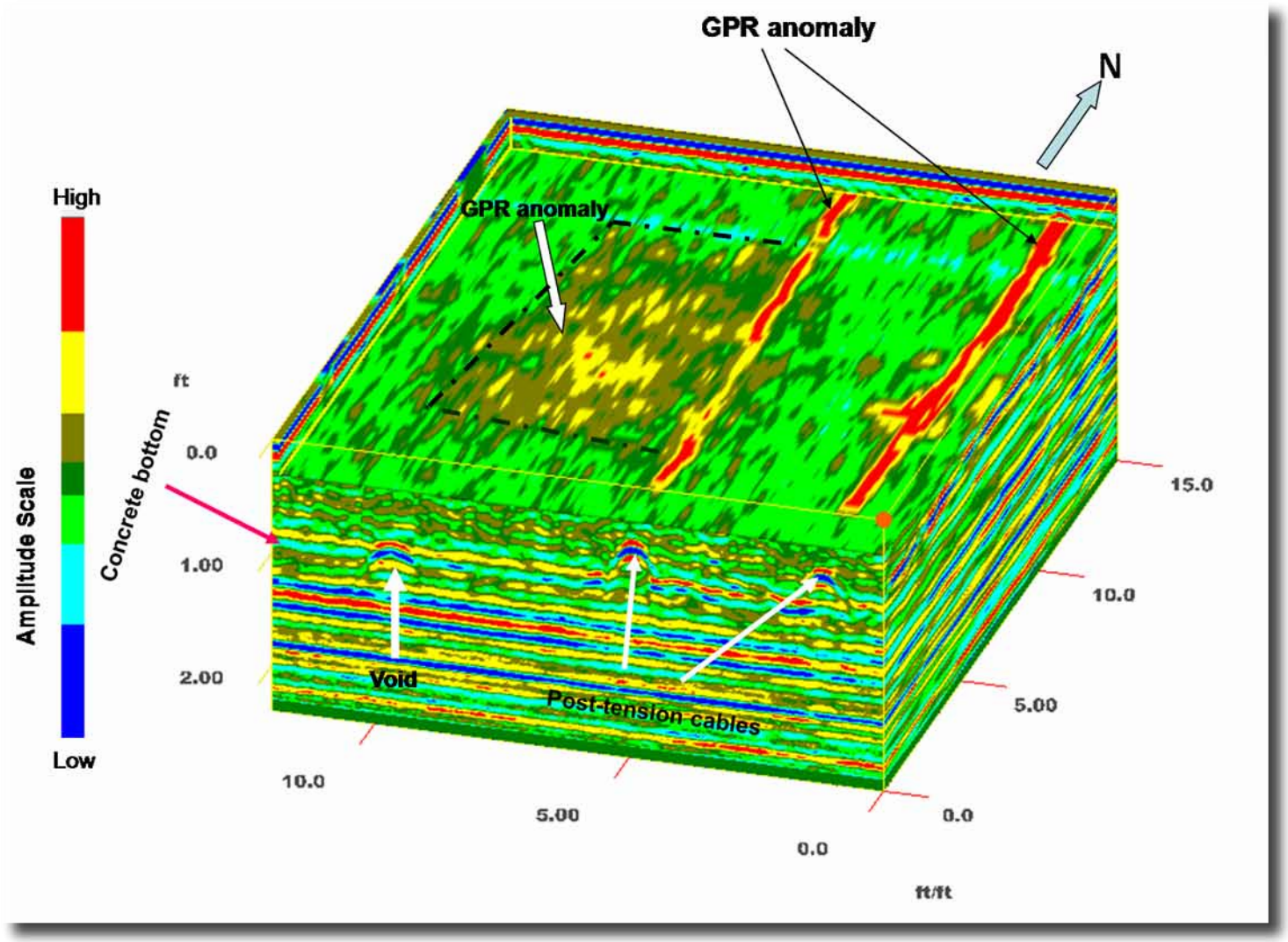


Figure 5. 3D GPR data for 1500 MHz survey showing a depth-slice view at 3 inch into the concrete foundation.

3D GPR results for the 400 MHz surveys are given in Figure 6, which shows a 2.5 foot depth-slice (top view) of the entire study area. The map view displays two linear moderate-to-high amplitude anomalies in the north-south directions. The majority of these anomalies are shown with the yellow color, which is caused by dielectric contrast (low dielectric vs. high dielectric values) within the soil underlying the concrete foundation. Source of these anomalies are not known: but they could be caused by voids filled with partly water and soil. However, there are high amplitude zones (red color) within the anomalies shown with the yellow color. The red areas are probably caused by voids filled with air. It should be noted that two linear anomalous features are approximately located beneath the post-tension cables embedded within the concrete. This correlation between the linear anomalies in the soil and the location of linear PTC anomalies within the concrete is either coincident or they are somehow related. A deeper 4-foot depth-slice does not indicate the presence of the two linear GPR anomalies or any other significant subsurface targets within the soil underlying the concrete foundation (Figure 7).

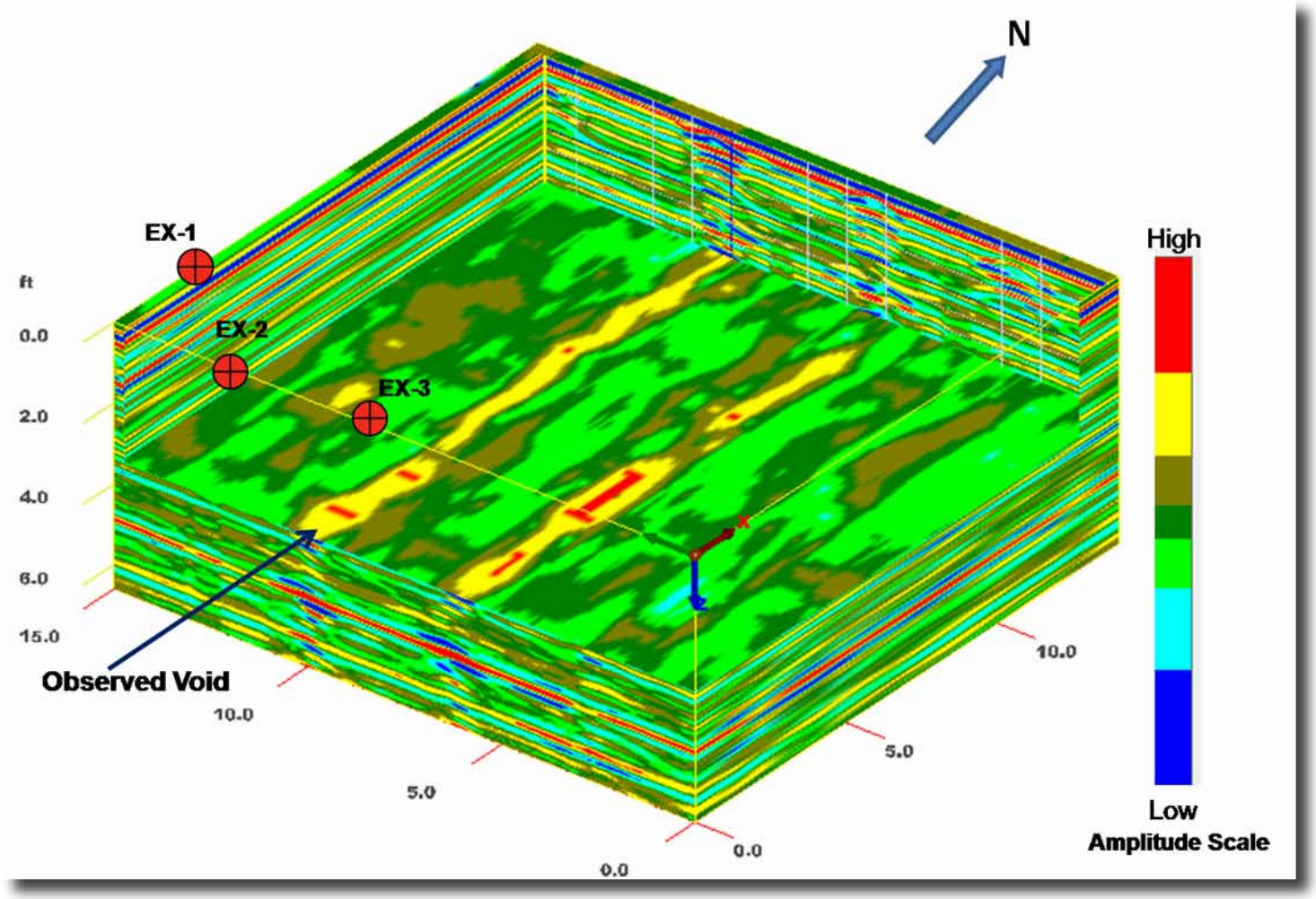


Figure 6. 3D GPR data for 400 MHz survey showing a depth-slice view at 2.5 feet. EX-1, 2 and 3 are excavation locations along the foundation.

Three locations (EX-1, EX-2 and EX-3) were excavated next to the foundation on October 8, 2008. These locations are along the foundation next to the southern and western walls of the living room (see Figures 1, 2 and 6). The EX-1 and EX-2 locations did not reveal any void or wet zone beneath the foundation; however, the EX-3 location revealed a void beneath the foundation (Figure 8). As soon as

2.5 feet depth is reached, the excavation hole was filled with ground water flowing from the soil underlying the foundation. The height of the water reached to 4 inch on October 8, 2008. A 3 feet long stick was pushed into the void with little resistance from the soil. This observation correlates well with the presence of the high-amplitude GPR void anomaly at EX-3 location. The hole was filled with dirt and covered, and the location was visited back on October 27, 2008. The water height in the hole reached one inch on this visit (Figure 9).

The fluctuations on the water height beneath the foundation could be explained by the local monthly participation (Houston: Bush Intercontinental Airport Participation Data, 2008) where the subject resi-

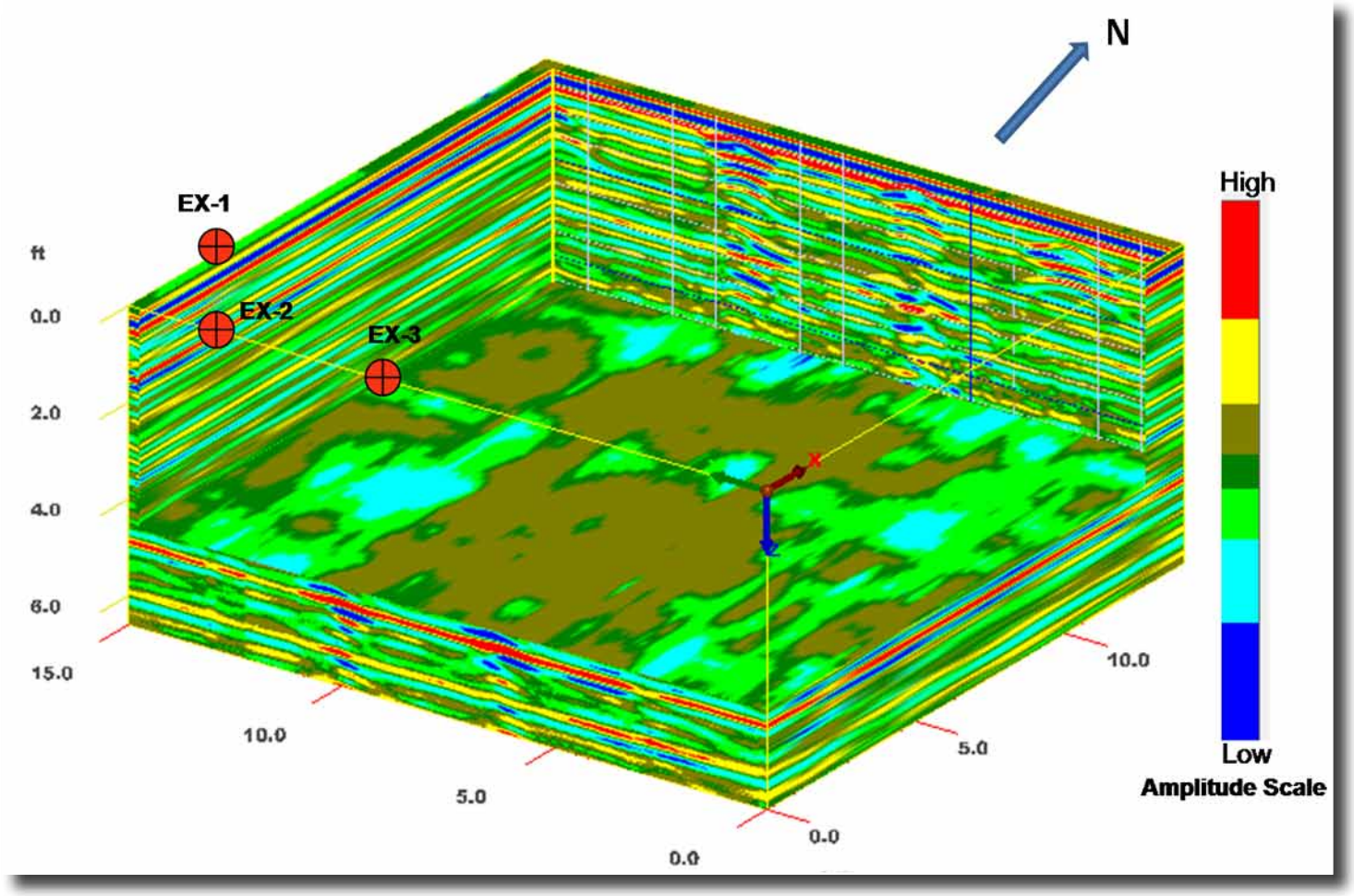


Figure 7. 3D GPR data for 400 MHz survey showing a depth-slice view at 4 feet.

dence is located nearby (Figure 10). Based on this data, the area received 12.07 inch rain during the month of September (Hurricane Ike visited Houston on September 12, 2008). The water height on the excavation was measured about 4 inch on October 8, 2008. The area received 8.67 inch rain during the month of October. The water height on the excavation was about one inch on October 27, 2008.

Conclusions

1500 MHz GPR results revealed significant anomalies within the concrete:

- A void was detected at the bottom of the concrete foundation

• Two embedded post-tension cables were located at a depth of 3";

• One of the post-tension cables did not have a strong amplitude anomaly compared to the other one. This may indicate that the integrity of the PTC is somewhat compromised;

• A low to moderate amplitude anomaly is observed to the west of the compromised PCT. The shape of this anomaly correlates well with the discolored, moisture-affected areas of the wood floor. This correlation suggests that the cause of the anomaly could be the moisture leaks through the concrete foundation from the disintegrated PTC (see Figure 5);

Figure 8. Picture showing the EX-3 excavation in the south wall of the foundation.

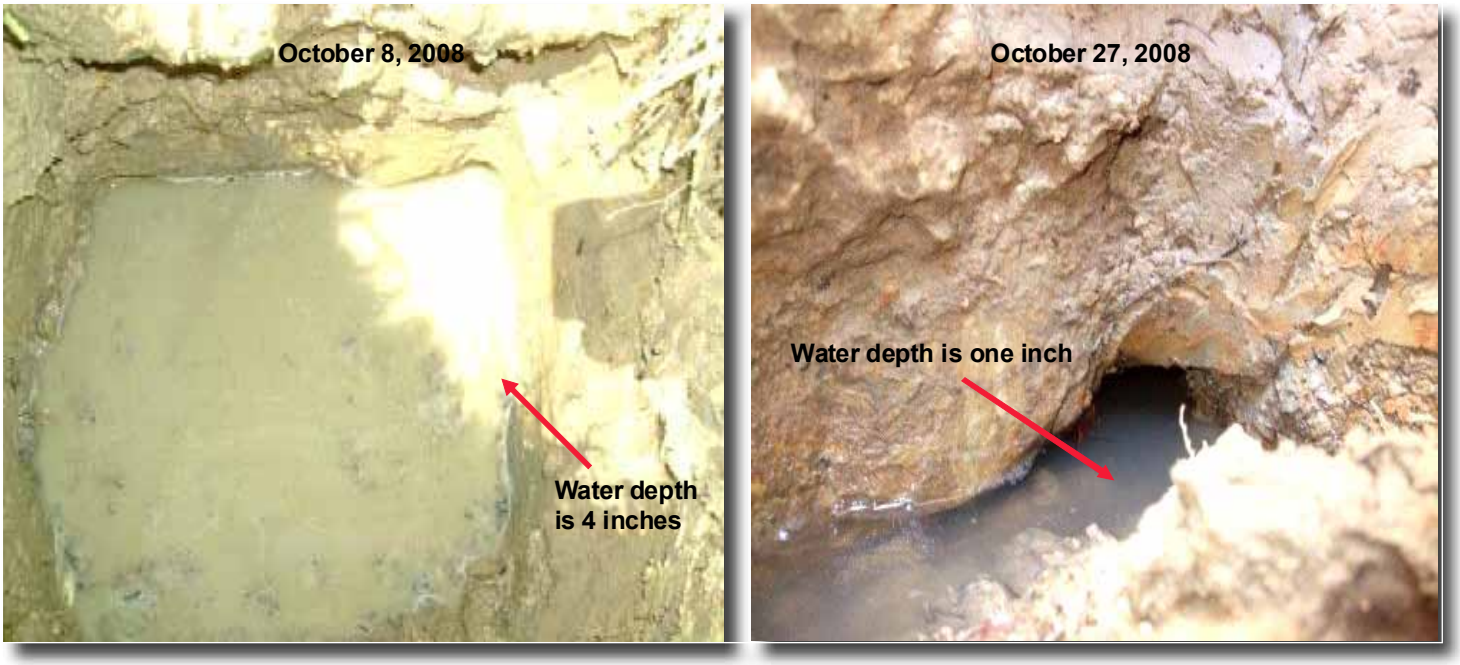


Figure 9. The void in the soil underlying the foundation at EX-3 location. Pictures are taken in October 8 and 27, 2008, respectively. Decrease in water height could be tied up to local monthly participation (see Figure 10). The top of the void is about 2 feet below the concrete pad. The material above the soil appears to be hardened clay or grade materials.

400 MHz results located significant anomalies within the soil underlying the concrete foundation:

• Two linear GPR anomalies were detected at a depth of 2.5 feet from the surface of the concrete foundation. These anomalies are mostly moderate in amplitude. However, they show areas of high amplitude as well. These anomalies trend in the north-south direction, and approximately located beneath the PTCs;

• The GPR data do not show any significant anomaly at a depth of 4 feet;

• Three locations (EX-1, EX-2 and EX-3) were excavated along the foundation outside the living room. EX-1 and EX2 locations did not reveal any wet soil or water, as expected because there were no GPR anomalies, beneath the concrete foundation; however, EX-3 excavation was chosen to be next to one of the linear GPR anomalies, and it did show a significant void beneath the foundation. The other linear anomaly was not tested because the location was covered with the concrete patio.

Visual inspection of the surface conditions next to the foundation in the vicinity of the void indicated ponding conditions, which may have resulted in (over the years), saturated soil conditions along the faulted foundation and forced the water under the slab through a created void.

A French Drainage system was installed along the foundation in order to decrease the saturated soil conditions, and the wood floor was replaced with the ceramic tile.

Houston: Bush Intercontinental Airport				
	Average Temp	**Departure**	**Precipitation**	**Departure**
January	**52.2**	**+0.4**	**4.62"**	**+0.94"**
February	**60.1**	**+4.7**	**4.00"**	**+1.02"**
March	**63.6**	**+1.3**	**2.41"**	**-0.95"**
April	**69.4**	**+0.9**	**1.46"**	**-2.14"**
May	**77.8**	**+2.0**	**4.57"**	**-0.58"**
June	**84.5**	**+3.2**	**2.06"**	**-3.29"**
July	**84.9**	**+1.3**	**1.09"**	**-2.09"**
August	**84.0**	**+0.7**	**7.45"**	**+3.62"**
September	**78.2**	**-0.7**	**12.07"**	**+7.74"**
October	**69.5**	**-0.9**	**8.67"**	**+4.17"**
November	**62.4**	**+1.5**	**2.92"**	**-1.27"**
December	**55.6**	**+1.9**	**1.68"**	**-2.01"**
ANNUAL	**71.5**	**+2.7**	**53.00"**	**+5.16"**

Figure 10. 2008 Annual Precipitation in northwest of Houston.

Acknowledgement

I thank Brian Jones of GSSI for his thorough review of the manuscript.

Coming Events

FastTIMES *highlights upcoming events of interest to the near-surface community. Send your submissions to the editors for possible inclusion in the next issue.*

Save the Dates!

The Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP) provides geophysicists, engineers, geoscientists and end-users from around the world an opportunity to meet and discuss near-surface applications of geophysics and learn about recent developments in near-surface geophysics. SAGEEP is internationally recognized as the leading conference on the practical application of shallow geophysics. Near-surface geophysics has developed into a valuable tool applied to a wide range of needs and SAGEEP is the one conference where you'll be exposed to the latest developments, equipment and software. It's also where you'll update skills... and contacts.

SAGEEP 2010 is offering exceptional educational opportunities in a quintessential mountain village setting: Keystone, Colorado. April in the Rockies can mean outdoor dining or nearby downhill skiing—but, no matter how you choose to spend your free time, epic scenery and 300 days of sunshine a year make Keystone a perfect SAGEEP 2010 location. Easy access from Denver, Colorado (DIA - Denver International Airport) via a shuttle service, its 21st century conference facilities, free WI-FI in the conference center, your choice of hotel, condo or lodge accommodations, free parking and a fantastic in-town transportation system assure attendees of a memorable and worthwhile SAGEEP experience in Keystone, Colorado.

Call for Sessions/Call for Session Chairs

SAGEEP 2010 conference planners are **seeking session chairs**. Proposed SAGEEP 2010 sessions listed below. Also being accepted are **session title suggestions**.

Call for **Session Ideas Deadline**	Aug. 14, 2009	Call for **Papers**	Sept. 14, 2009
Call for **Student Poster Abstracts**	Sept. 14, 2009	**Paper Deadline**	Dec. 18, 2009

Dam and Levee Session • Near Surface Geophysics in Government Stimulus • Military Uses of Geophysics • Rock Mechanics Session • Infrastructure • Tunneling • Hydrogeology • Urban Geophysics • Salt-Water Intrusion • Geochemistry • Energy Session • Uranium Session • Extreme Geophysics • GPR Session • Geophysical Instruments & Compliance with National Calibrations & Standards • Near-surface Geophysics on Mars

SAGEEP 2010 General Chair
Victor F. Labson, Ph.D.
e-mail: vlabson@usgs.gov

SAGEEP 2010 Technical Chair
James J. LoCoco, C.P.G.
e-mail: jim.lococo@mountsopris.com

1720 South Bellaire Street, Suite 110
Denver, CO 80222-4303
(303) 531-517
Fax: (303) 820-3844
E-mail: staff@eegs.org
Web: www.eegs.org

SAGEEP 2010
April 11-15, 2010
Keystone, Colorado USA

SAGEEP is the leading international conference on non-invasive technology for engineering and environmental site characterization. Approximately 400 professionals in the environmental and engineering geophysical community will attend this year's event. Exhibiting companies receive one full complimentary conference registration and two complimentary exhibit personnel registrations for each paid 10' x 10' booth space occupied. So, take advantage of your opportunity for quality exposure at this prestigious symposium.

Exhibitors—Space Available

Who should exhibit? Geophysical and geo-engineering service companies; developers and distributors of geo-scientific hardware and computer software; college/universities; government agencies; manufacturers and sales representatives of geophysical and geo-scientific instruments, equipment, and related supplies; publishers of scientific books and journals; research institutes; and scientific associations. Beginning in August, 2009, access the EEGS web site (www.eegs.org, then click the SAGEEP button and Exhibitor tab), for the SAGEEP 2010 Exhibitor Prospectus.

For more information or to secure your exhibit space at SAGEEP 2010, contact:
Marac Enterprises
Micki Allen, Exhibit Manager SAGEEP 2010
101-345 Renfrew Drive
Markham, Ontario, L3R 9S9, Canada
Phone: 905.474.9118
Fax: 905.474.1968
E-mail: mickiallen@marac.com

Environmental and Engineering Geophysical Society

1720 S. Bellaire Street, Ste. 110
Denver, CO 80222-4303
(303) 531-517
Fax: (303) 820-3844
E-mail: staff@eegs.org
Web: www.eegs.org

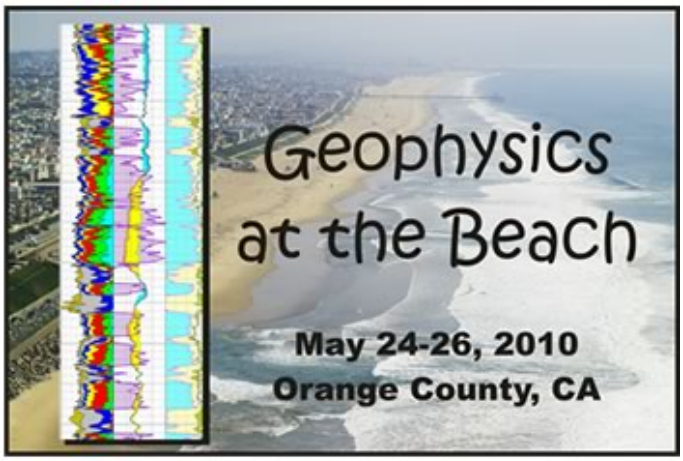
GROUNDWATER RESOURCES ASSOCIATION
of California

Geophysics at the Beach Symposium

in cooperation with Environmental & Engineering Geophysical Society

May 24 - 26, 2010
Doubletree Club Hotel Orange County Airport
and Peninsula Park, Newport Beach, California

CALL FOR ABSTRACTS
Abstract submission deadline – December 15, 2009



Groundwater will be relied upon more in the future to meet the increasing demands in a changing climate of hydrology, socio-economic pressures, decreasing surface water availability and rising surface water fees. More reliance on groundwater means an increasing need for better information on subsurface hydrogeology, water quality, and improved predictability of returns on groundwater storage projects.

Geophysics is a discipline that utilizes a suite of high resolution tools that will play an increasing role in clean and contaminant hydrogeologic investigations to obtain high quality and cost effective subsurface information to make better informed management decisions.

Who should attend: The symposium is intended for technical professionals, public agency and regulatory agency staff, university staff, responsible parties, case managers, and anyone else interested in the latest geophysical tools and technologies for application to hydrogeologic problems.

Geophysics at the Beach includes the following optional program elements:
May 24 – Basic and Advanced Borehole Geophysics Short Course
May 25 – Geophysics at the Beach Symposium
May 26 – Geophysics at the Beach Field Demonstration in the surf, sand, and grass on the Pacific Ocean

Check the GRA website for updates such as the program agenda and registration form - http://www.grac.org/geophysics.asp

Call for Abstracts

Topics for May 25th Symposium
This call for papers is for oral or poster presentation at the May 25th Symposium. This symposium will provide the opportunity to discuss many factors related to state-of-the-art geophysics practices, current research, practical application of geophysics through case studies, and discussions of the value of geophysics information, through one full day of technical sessions. Topics under consideration include the following:

Geophysics Applications for Alluvial, Fractured Rock, and Carbonate Aquifer Systems
Geophysics Applications for Water Quality Evaluation
Geophysics Applications for Groundwater Characterization and Monitoring in Urban/Suburban Environments
Applications for Monitoring Groundwater Supply, Quality, and Recharge
Quantitative Incorporation of Geophysics into Hydrogeologic Conceptual Models and Groundwater Simulation Models
Geophysics Applications for Deep Wastewater Disposal and CO2 Sequestration
Borehole Geophysics for Groundwater Evaluations
Understanding the Value of Geophysical Information
Monitoring Remedial System Performance with Geophysics
Contamination Characterization with Geophysics
High Resolution Geophysics for Site Characterization
Mapping Salt Water Intrusion with Geophysics
Other Topics Related to Surface and Borehole Geophysics

Guidelines for Submitting an Abstract for a Paper or Poster Presentation

Word 9.0 documents are preferred.
Indicate the preferred presentation method (paper or poster) and the topic of the abstract.
Abstracts must be one page in length or less, and should be titled and include all contributing authors' names and affiliations. Please identify the name of the person who will be presenting the paper or poster, and add biographical sketches of the authors as a second page. The sketches should be 50 words or less in paragraph form, and full mailing and e-mail addresses and phone and fax numbers must be included. Margins should be 1-inch top, bottom, and right side and 1¼-inch left margin. The text should be single-spaced, 10-point size, Times-Roman font, with no pagination, footers and headers. Paragraphs should be justified.
Major headings should be 12-point bold; minor headings should be 10-point italicized not bolded. There should be one blank line above and below all headings, except above major headings, which should have two blank lines.
Graphics should not be used in Abstracts.

By virtue of submitting an abstract, the submitter(s) grants GRA the right to publish any accepted abstract or the right to decline any abstract. **Please submit your abstract by email to: Mary Megarry, Groundwater Resources Association of California, mmegarry@nossaman.com no later than December 15, 2009.** The Symposium Committee will review abstracts and make final selections.

SPONSOR AND EXHIBITOR OPPORTUNITIES
If you are interested in exhibiting your organization's services or products, being an event sponsor, or giving a field demonstration of your geophysical equipment at the May 26 Field Demonstration Day, please contact Mary Megarry at mmegarry@nossaman.com or 916-446-3626.

GRA is dedicated to resource management that protects and improves groundwater through education and technical leadership.

915 L St, Ste 1000 * Sacramento, CA 95814 * Ph: 916-446-3626 * Fx: 916-442-0382 * www.grac.org

DGG 2010
70th Annual Conference of the German Geophysical Society

March 15-18, 2010, Bochum, Germany

We all would like to invite you to the 70th annual conference of the German Geophysical Society (DGG) in Bochum (*http://www.dgg2010.ruhr-uni-bochum.de/en*). It will take place at the Ruhr-University Bochum from 15th to 18th of March 2010.

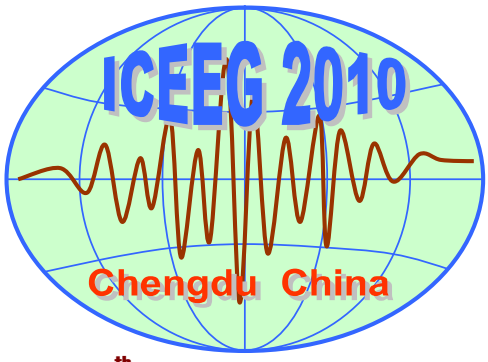
In the heart of the Ruhr Area, Bochum had its time of prosperity sparked by coal mining and the iron and steel industry. Today still evidence of that industrial period may be found everywhere throughout the city. The famous Deutsches Bergbaumuseum which is also widely known beyond Bochum treats the topic of the industrial times in the Ruhr Area. After coal mining was ceased in the 1970s, today service industries and high technology are of importance and the Ruhr-University plays an exceptional role in local urban developement. The high quality of life that the region offers between urban liveliness and rural quietness may be one reason why the Ruhr Area will host the European Capital of Culture in 2010.

In 1965, the Ruhr-University Bochum was the first German university built after World War II. With its 20 faculties gathered on one campus it evolved to one of the biggest universities in Germany with a very high reputation in research matters. The special architectural concept well integrates the campus into its surrounding nature and at the same time allows for a very close interdisciplinary cooperation and research between the faculties. These excellent conditions may be one reason for the university's numerous Collaborative Research Centres ("Sonderforschungsbereiche" SFB) funded by the German Research Foundation (DFG). In geosciences the SFB 526 "Rheology of the Earth" is of importance, where geodynamic processes from upper crust to the subduction zone and controlling material propties are examined. Geophysical aspects such as rock physics, earthquakes, geodynamics of the lithsphere as well as numeric modelling and visualization will be central topics of the conference. Also the role of geophysics for future energy supply will be focused on. A social programme and several excursions complete the conference.

Glückauf!

We are looking forward to welcoming you to Bochum at the anniversary conference of the German Geophysical Society in 2010.

Yours Wolfgang Friederich and Jörg Renner (local organizing committee).



4th International Conference on Environmental and Engineering Geophysics

June 14~17, 2010, Chengdu, China

The Near-Surface Geophysics and Geohazards

First Announcement

http://www.iceeg.cn/

Sponsoring Hosts

Chinese Geophysical Society

National Natural Science Foundation of China

China University of Geosciences (CUG)

Chengdu University of Technology

Supporters

Chengdu University of Technology

Conference Summary

Geohazard is a kind of natural hazards. In recent years, Geohazards occurred frequently in China and caused serious dangers to people's lives and property. As a branch of geophysics, near-surface geophysics is mainly applied in the detection and assessment rock-soil slopes, ground deformation, mine disasters, and water resource deterioration. The geophysical techniques are non-intrusive, cost-effective, large-scale or small-scale, and can remotely acquire three-dimensional, and even four-dimensional representations of underground media. Due to the broad application of geophysical techniques in the environmental and engineering fields, they are of great significance for the sustainable development of human society.

Having successfully convened the 1st, 2nd, and 3rd International Conference on Environmental and Engineering Geophysics in 2004, 2006, and 2008, respectively, we are once again pleased to be hosting the 4th International Conference on Environment and Engineering Geophysics in Chengdu, China, June 14-17, 2010. It is our pleasure to invite you to participate in this exciting event and to enjoy the hospitality of Wuhan.

This conference is designed to be a wonderful opportunity for all attendees to share your knowledge, experience, and friendship. We strongly believe that you will find great value in your participation in the conference and exhibits. Please do not miss this historic opportunity to present your work.

Invited speakers

Invited distinguished geophysicists and researchers from the Unite States, Canada, Europe, Australia and Asia will present their studies.

Conference topics

The entire spectrum of near-surface geophysical methods and applications.

Call for papers

This conference will offer an opportunity to all geophysicists and engineers to present recent achievements including case studies and theoretical studies in related techniques, software and instruments. The manuscript should not exceed 6 pages (including figures) with an abstract of about 300 words.

Manuscripts should be submitted via email to yechengming@cdut.edu.cn.

The deadline for the manuscripts is December 31, 2009.

Publication of Proceedings

The conference proceedings will be published by an American publisher and be delivered to the International Citation Institution.

Venue and time

The conference will be held on the campus of Chengdu University of Technology, Chengdu, China, June 14-17, 2010.

Registration

Delegate Rate: USD $200; Student Rate: USD $150; 5% off for early birds (early bird deadline is April 30, 2010). Registration includes: icebreaker, keynote session, oral and poster presentations, exhibits, conference program book, Proceedings volume, and all conference lunches and dinners. **Registration will begin on September 1, 2009. You may register via E-mail or fax.**

Hotels

Accommodations during the conference are available on the campus of Chengdu University of Technology. Hotels near the campus are also available.

Social program

Hospitality Suites: Tour of modern and antique places in the city of Chengdu which offer culture, hospitality and gastronomy in original surroundings and downtown shopping.

Language

The working languages of the conference will be English and Chinese.

Post-session trip

The post-session trip will be designed to visit ruins of Wenchuan Earthquake Park.

Ruins of Wenchuan Earthquake Park

Sponsorship Opportunities

Three levels of exhibiting sponsorship are available as follows:

GOLD: USD $2,500, including 10 m^2 exhibit space, 3 complimentary registrations, ten volumes of proceedings (5 in English, 5 in Chinese), and one page in the Conference Program & Exhibitors Directory designed to introduce your company.

SILVER: USD $1,500, including 6 m^2 exhibit space, 1 complimentary registration, 4 volumes of proceedings (2 in English, 2 in Chinese), and a half of a page in the Conference Program & Exhibitors Directory designed to introduce your company.

BRONZE: USD $800, including 1 complimentary registration, 2 volumes of proceedings (1 in English, 1 in Chinese), and one third of a page in the Conference Program & Exhibitors Directory designed to introduce your company. In addition, the icebreaker and farewell dinner during the conference are complimentary for sponsors.

The deadline for booking exhibit space is May 15, 2010. Please visit the website http://www.iceeg.cn/ or contact the organizing committee for details.

About Chengdu

Chengdu, located in southwest People's Republic of China, is the capital of Sichuan province and a sub-provincial city. Chengdu is also one of the most important economic centers, transportation and communication hubs in Southwestern China. More than four thousand years ago, the prehistorical Bronze Age culture of Jinsha established itself in this region. The fertile Chengdu Plain, on which Chengdu is located, is called *Tianfuzhi guo* in Chinese, which literally means "the country of heaven", or more often seen translated as "the Land of Abundance". It was recently named China's 4th-most livable city by China Daily.

Giant Panda, Chengdu

Organizing Committee

Honorary Chair:

Guangding Liu (Honorary Chair of China Geophysical Society)
Zhenhua He (Former President of CDUT)
Jingao Zhang (President of CUG)

Executive Chairs:

Runqiu Huang (Professor, CDUT)
Xuben Wang (Professor, CDUT)

Executive Co-Chairs:

Jianghai Xia (Senior Scientist, Kansas Geological Survey, The University of Kansas, USA)
Yaoguo Li (Associate Professor, Colorado School of Mines, USA)
Sheng Yu (PhD, Director of Geophysical Department, Natural Science Foundation of China)
Yixian Xu (Professor, CUG)

General Secretaries:

Jianguo Yan, Jing Wang
Shipeng Zhang, Jijun Jia

Technical Secretaries:

Chengming Ye, Yinhe Luo

Registration Secretaries:

Chun Lin

For more details of the conference, please visit our website http://www.iceeg.cn/, or contact:

ICEEG2010
Key Lab of Earth Exploration & Information Techniques of Ministry of Education
Chengdu University of Technology
Chengdu, Sichuan 610059
China
Phone: (011 86 28) 8407 6279 (011 86 28) 8407 9681
Fax: (011 86 28) 8407 9681
Email : yechengming@cdut.edu.cn; linchun119@163.com

ASEG/PESA
21st International Conference & Exhibition

August 22-26, 2010, Sydney, Australia

Visit the ASEG / PESA web site at http://www.aseg.org.au for more information.

ENVIRONMENTAL GEOSCIENCES

CALL FOR PAPERS

Announcing a Special Issue of Environmental Geosciences Journal
Environmental Geophysics in the Oilfield

Geophysics has long been a staple in hydrocarbon exploration. Over the last 20 years, geophysics has been increasingly employed in the shallow subsurface to better understand the environmental impacts of oil and gas exploration and production activities over the last century. Many geophysical methods, including seismic reflection, resistivity, electromagnetic induction, microgravity, and magnetics, have helped provide context for subsurface data, noninvasively focus subsequent investigations, and quantify areas and depths of impact. In recognition of the potential value of these investigations, Environmental Geosciences journal is seeking papers on this general topic for a special issue scheduled for publication in 2010. Authors interested in having a previously unpublished manuscript considered for this issue should provide a title and a few sentences describing the content to special issue editors Jeffrey G. Paine (jeff.paine@beg.utexas.edu) or Bruce D. Smith (bsmith@usgs.gov) by December 31, 2009. Manuscripts will be due by January 31, 2010.

Environmental Geosciences is a peer-reviewed journal published since 1995 by the Division of Environmental Geosciences of the American Association of Petroleum Geologists. James W. Castle is the Editor-in-Chief. Visit http://deg.aapg.org/journal.cfm for more information about the journal and instructions for authors.

Invitation to Participate in Symposium on Benchmarking Surface Wave Method

Deadline: March 31, 2010

All interested practitioners and researchers are invited to participate in a Surface Wave Benchmarking Symposium organized by the Geophysical Engineering Committee of the Geo-Institute of ASCE. The goal of the symposium is to document the state of different protocols, such as MASW, SASW and ReMi, for analyzing the surface wave data. The organizing committee invites all participants to contribute to the benchmarking exercise by analyzing a surface wave data set collected at a well-characterized site. The participants can also provide written papers for inclusion in a symposium that will be organized as part of the Geo-Risk Conference to be held in 2011. The deadline for contributing to this symposium is March 31, 2010.

Further detail and raw data collected with various methods can be downloaded from the following website: *http://saswbench.ce.ufl.edu*. Please forward any questions regarding the event to Dr. Dennis Hiltunen at *dhilt@ce.ufl.edu*.

One postdoc at the Colorado School of Mines

Induced polarization (time and frequency domains, development ofthe theory, field/lab and inversion of IP datasets) for contaminant plume investigations and permeability tomography For further details see *http://www.epa.gov/oamrtpnc/q0900194/index.htm*.The potential candidates can contact André Revil at *arevil@mines.edu* and Dale Werkema at *werkema.d@epa.gov*. The work will be performed at the Colorado School of Mines under the supervision of André Revil (dept of Geophysics, *http://www.andre-revil.com*) and co-supervision of Burke Minsley (USGS, *bminsley@usgs.gov*) and Dale Werkema (EPA). The candidate is expected to have excellent skills in numerical modeling.

Starting date: As soon as possible.

Interested in EM methods? Want to share your software, instruments, data, or ideas? Want to learn more about EM and find expertise for collaboration? Want to experiment with new applications?

Welcome to OpenEM.org!

OpenEM.org is a community resource for electromagnetic geophysics. The OpenEM virtual institute as it develops will include several continuously evolving core resources:

- a repository for community-supported open source software for EM data analysis, forward and inverse modeling and interpretation
- links to data management centers with extensive collections of unrestricted EM data sets and derived data products
- tools for requesting access to shared EM instruments both through the National Geoelectromagnetic Facility and through a clearinghouse for PI-maintained instruments that may be available for loan
- a community forum for free exchange of technical information
- Support for special interest groups (SIGs) within EM geophysics
- collaborative workgroup tools to promote multi-institutional experiment planning and execution
- hosted “webinars” on EM geophysics, to serve as a national “departmental” monthly seminar series
- academic-industry showcase of EM geophysics products and services

EM geophysics job postings, studentships, postdoctoral opportunities OpenEM is open to everyone. While it is designed primarily to serve the interests of US-based EM geophysicists, there are no restrictions on access by any individual or group no matter their geographic location. OpenEM is dedicated to free exchange of information, to establishing and promoting open standards for software interoperability, data exchange, and model definition. Our goal is to make EM geophysics accessible as widely as possible; to take it out of the specialist laboratory and into the field. The OpenEM virtual institute spans the full range of terrestrial, airborne and marine EM geophysics, including DC resistivity, induced polarization methods, passive and controlled source EM, transient/time domain EM, magnetotellurics including CSAMT, AMT and RFMT, and geomagnetic depth sounding and related methods.

Join EEGS Now!

Environmental and Engineering Geophysical Society

Membership Application

1720 South Bellaire Street | Suite 110 | Denver, CO 80222-4303
(p) 011.1.303.531.7517 | (f) 011.1.303.820.3844 | staff@eegs.org | www.eegs.org

Contact Information

Salutation	First Name	Middle Initial	Last Name	Nickname

Company/Organization	Title

Street Address	City & State

Zip	Country	Direct Phone	Mobile Phone	Fax

Email	Website

About Me: Interests & Expertise

In order to identify your areas of specific interest and expertise, please check those that apply:

Classify Association

□ Consultant □ Geophysical Contractor □ Research/Academia
□ User of Geophysical Services □ Equiment Manufacturer □ Government Agency
□ Student □ Software Manufacturer □ Other _____

Classify Interest or Focus

□ Archaeology □ Geotechnical □ Hazardous Waste □ Shallow oil & Gas
□ Engineering □ Geotechnical Infrastructure □ Humanitarian Geophysics □ UXO
□ Environmental □ Groundwater □ Mining □ Other _____

Specific Areas Involved

□ Borehole Geophysical Logging □ Electromagnetics □ Ground Penetrating Radar □ Seismic
□ Electrical Methods □ Gravity □ Magnetics □ Other_____

Professional/Scientific Societies

□ AAPG □ AWWA □ EER1 □ MGLS □ SSA
□ AEG □ AGU □ GeoInstitute □ NSG □ SPWLA
□ ASCE □ EAGE □ GSA □ SEG □ Other _____

Interested in Participating on Standing Committees?

□ Government Affairs □ Publications □ Corporate Affairs □ Student
□ Research □ Awards □ Web Page

Membership Categories

Circle the desired Membership Category amount.

	Standard (I prefer to access JEEG online and do not wish to receive a printed issue)	**Printed** (I prefer to receive a printed JEEG)
Individual*	$90	$100
NEW **Retired**	$50	N/A
Student	$20	$60
Corporate Donor	$650	$660
Corporate Associate	$2,400	$2,410
Corporate Benefactor	$4,000	$4,010

To view the qualification for the New Developing World categories, please access http://www.eegs.org and click on Membership	**Standard** (I prefer to access JEEG online and do not wish to receive a printed issue)	**Printed** (I prefer to receive a printed JEEG)
NEW **Developing World Category***	$50	$100

Category Descriptions and Newly Expanded Benefits

Individual and Developing World Category Memberships:

- Access to the **online EEGS Research Collection** resource—online access to the complete *Journal of Environmental and Engineering Geophysics* (*JEEG*) and proceedings archives of the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)
- The option of receiving a printed *JEEG* or accessing an electronic issue
- Subscription to the ***FastTIMES*** Newsletter
- **Preferential** registration **fees** for **SAGEEP**
- **Networking** and continued **communication** on issues of interest to the organization

Retired Membership:

- Includes all the benefits of the Individual Membership category. Applicants must approved by the EEGS Board of Directors. Please submit a written request for the Retired Category, which will be reviewed by the Board of Directors.

Note: This category does not include the option for a printed JEEG - if you wish to receive a printed JEEG, please sign up under Individual Membership Printed

Student Membership:

- Includes all the benefits of the Individual Membership category
- Submission must include current student ID or documentation of graduation date (applies to recent graduates for two years after graduation)

Corporate Donor Membership:

- Includes all the benefits of the Individual Membership
- Full conference registration for the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)
- A link on the EEGS Website
- Listing with corporate information in *FastTIMES*
- 10% discount on advertising in the *JEEG* and *FastTIMES*

Corporate Associate Membership:

- Includes all the benefits of the Individual Membership for two (2) people
- An exhibit booth at the Symposium on the Application of Geophysics to Engineering and Environmental Problems (SAGEEP)
- Ability to insert marketing materials in the SAGEEP delegate packets
- A link on the EEGS website
- Listing with corporate information in *FastTIMES*
- 10% discount on advertising in the *JEEG* and *FastTIMES*

Corporate Benefactor Membership:

- Includes all the benefits of Individual membership in EEGS for two (2) people
- Two exhibit booths at the Symposium on the Applications of Geophysics to Engineering and Environmental Problems (SAGEEP)
- Ability to insert marketing materials in the SAGEEP delegate packets
- A link on the EEGS website
- Listing with corporate information in *FastTIMES*
- 10% discount on advertising in the *JEEG* and *FastTIMES*

Foundation Contributions

Founders Fund

The Founders Fund has been established to support costs associated with the establishment and maintenance of the EEGS Fouindation as we solicit support from larger sponsors. These will support business office expenses, necessary travel, and similar expenses. It is expected that the operating capital for the Foundation will eventually be derived from outside sources, but the Founder's Fund will provide an operation budget to "jump start" the work. Donations of $50.00 or more are greatly apreciated. For additional information about the EEGS Foundation, visit our website at http://www.eegs.org and click on Membership, then "Foundation information". You may also access the EEGS Foundation at http://www.eegsfoundation.org.

Foundation Fund Total: _____

Student Support Endowment

This endowed fund will be used to support travel and reduced membership fees so that we can attract greater involvement from our student members. Student members are the lifeblood of our Society, and our support can lead to a lfetime of involvement and leadership in the near surface geophysics community. Donations of $50.00 or more are greatly apreciated. For additional information about the EEGS Foundation, visit our website at www.eegs.org and click on Membership, then "Foundation information". You may also access the EEGS Foundation at http://www.eegsfoundation.org.

Student Support Endowment Total: _____

Corporate Contributions

The EEGS Foundation is designed to solicit support from indivudals and corporate entities that are not currently Corporate Members (as listed above). We recognize that most of our Corporate Members are small businesses with limited resources, and that their contributions to professional socieites are distributed among several organizations. The Corporate Founder's Fund has been developed to allow our Corporate Members to support the establishment of the Foundation as we solicit support from new contributors. As such, Corpoate Founders will receive special recognition for donations exceeding $2500 that are made before May 31, 2010. These sponsors will be ackowledged in a form that may be posted at their SAGEEP booth for years to come, so that individual members can express their gratitude for the support.

Corporate Contribution Total: _____

Payment Information

Subtotals:

Membership: $ _____

Foundation Contributions: $ _____

Total: $ _____

□ Check/Money Order □ Visa □ MasterCard □ Amex □ Discover

Card Number Exp. Date

Name on Card

Signature

Make your check or money order in **US Dollars** payable to: EEGS. Checks from canadian bank accounts must be drawn on banks with US affiliations (Example: checks from Canadian Credit Suisse banks are payable through Credit Suisse new york, USA). **Checks must be drawn on US Banks.**

Payments are not tax deductible as charitable contributions although they may be deductible as a business expense. Consult your tax advisor.

Return this form with payment to: EEGS, 1720 South Bellaire Street, Suite 110, Denver, CO 80222 USA

Credit Card Payments can be faxed to EEGS at 011.1.303.820.3844

Environmental and Engineering Geophysical Society

1720 South Bellaire Street | Suite 110 | Denver, CO 80222-4303
(p) 011.1.303.531.7517 | (f) 011.1.303.820.3844 | staff@eegs.org | www.eegs.org

Membership Application
Developing World Category Qualification

If you reside in one of the countries listed below, you are eligible for EEGS's Developing World membership category rate of $50.00 (or $100.00 if you would like the printed, quarterly *Journal of Environmental & Engineering Geophysics* mailed to you—to receive a printed *JEEG* as a benefit of membership, select the Developing World Printed membership category on the membership application form):

Afghanistan
Albania
Algeria
Angola
Armenia
Azerbaijan
Bangladesh
Belize
Benin
Bhutan
Bolivia
Burkina Faso
Burundi
Cambodia
Cameroon
Cape Verde
Central African Republic
Chad
China
Comoros
Congo, Dem. Rep.
Congo, Rep.
Djibouti
Ecuador
Egypt
El Salvador
Eritrea
Ethiopia
Gambia
Georgia
Ghana
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran
Iraq
Ivory Coast
Jordan
Kenya
Kiribati
Kosovo
Kyrgyz Republic
Lao PDR
Lesotho
Liberia
Madagascar
Malawi
Maldives
Mali
Marshall Islands
Mauritania
Micronesia
Moldova
Mongolia
Morocco
Mozambique
Myanmar
Nepal
Nicaragua
Niger
Nigeria
North Korea
Pakistan
Papua New Guinea
Paraguay
Philippines
Rwanda
Samoa
Sao Tome and Principe
Senegal
Sierra Leone
Solomon Islands
Somalia
Sri Lanka
Sudan
Suriname
Swaziland
Syria
Taiwan
Tajikistan
Tanzania
Thailand
Timor-Leste
Togo
Tonga
Tunisia
Turkmenistan
Uganda
Ukraine
Uzbekistan
Vanuatu
Vietnam
West Bank and Gaza
Yemen
Zambia
Zimbabwe

EEGS Corporate Members

Corporate Benefactor

Your Company Here!

Corporate Partner

Your Company Here!

Corporate Associate

ABEM Instrument AB
www.abem.com

Advanced Geosciences, Inc.
www.agiusa.com

Allied Associates Geophysical Ltd.
www.allied-associates.co.uk

Exploration Instruments LLC
www.expins.com

Foerster Instruments Inc.
www.foerstergroup.com

GEM Advanced Magnetometers
www.gemsys.ca

Geogiga Technology Corporation
www.geogiga.com

Geomar Software Inc.
www.geomar.com

Geometrics, Inc.
www.geometrics.com

Geonics Ltd.
www.geonics.com

Geophysical Survey Systems, Inc.
www.geophysical.com

Geostuff / Wireless Seismic Inc.
www.georadar.com

GISCO
www.giscogeo.com

hydroGEOPHYSICS, Inc.
www.hydrogeophysics.com

Interpex Ltd.
www.interpex.com

MALA GeoScience
www.malags.com

Mount Sopris Instruments
www.mountsopris.com

Scintrex
www.scintrexltd.com

Sensors & Software, Inc.
www.sensoft.ca

USGS
www.usgs.gov

Zonge Engineering & Research Org., Inc.
www.zonge.com

Zonge Geosciences
www.zonge.com

Corporate Donor

Fugro Airborne Surveys
www.fugroairborne.com

Geomatrix Earth Science Ltd.
www.georentals.co.uk

Intelligent Resources, Inc.
www.rayfract.com

Northwest Geophysics
www.northwestgeophysics.com

Spotlight Geophysical Services
www.spotlightgeo.com

EEGS Store

Environmental and Engineering Geophysical Society

2009 Publications Order Form

ALL ORDERS ARE PREPAY

1720 S. Bellaire Street, Suite 110
Denver, CO 80222-4303
Phone: 303.531.7517; Fax: 303.820.3844
E-mail: staff@eegs.org; Web Site: www.eegs.org

Order Return Policy: Returns for credit must be accompanied by invoice or invoice information (invoice number, date, and purchase price). Materials must be in saleable condition. Out-of-print titles are not accepted 180 days after order. No returns will be accepted for credit that were not purchased directly from EEGS. Return shipment costs will be borne by the shipper. Returned orders carry a 10% restocking fee to cover administrative costs unless waived by EEGS.

Sold To:

Name: _____

Company: _____

Address: _____

City/State/Zip: _____

Country: _____ Phone: _____

E-mail: _____ Fax: _____

Ship To (If different from "Sold To":

Name: _____

Company: _____

Address: _____

City/State/Zip: _____

Country: _____ Phone: _____

E-mail: _____ Fax: _____

Instructions: Please complete both pages of this order form and fax or mail the form to the EEGS office listed above. Payment must accompany the form or materials will not be shipped. Faxing a copy of a check does not constitute payment and the order will be held until payment is received. Purchase orders will be held until payment is received. If you have questions regarding any of the items, please contact the EEGS Office. Thank you for your order!

SAGEEP PROCEEDINGS

			Member	Non-Member
	0026	2009 (CD-ROM)	$75	$100
	0025	2008 (CD-ROM)	$75	$100
	0023	2007 (CD-ROM)	$75	$100
	0020	2006 (CD-ROM)	$75	$100
	0018	2005 (CD-ROM)	$75	$100
	0016	2004 (CD-ROM)	$75	$100
	0015	2003 (CD-ROM)	$75	$100
	0014	2002 (CD-ROM)	$75	$100
	0013	2001 (CD-ROM)	$75	$100
	0012	1988-2000 (CD-ROM)	$150	$225
		SUBTOTAL—PROCEEDINGS ORDERED:		

SAGEEP Short Course Handbooks

	0027	NEW 2009 - Principles and Applications of Seismic Refraction Tomography (Printed Course Notes & CD-ROM) - William Doll	$125	$150
	0028	NEW 2009 - Principles and Applications of Seismic Refraction Tomography (CD-ROM including PDF format Course Notes) - William Doll	$70	$90
	0007	2002 - UXO 101 - An Introduction to Unexploded Ordnance - (Dwain Butler, Roger Young, William Veith)	$15	$25
	0009	2001 - Applications of Geophysics in Geotechnical and Environmental Engineering (HANDBOOK ONLY) - John Greenhouse	$25	$35
	0011	2001 - Applications of Geophysics in Environmental Investigations (CD-ROM ONLY) - John Greenhouse	$80	$105
	0010	2001- Applications of Geophysics in Geotechnical and Environmental Engineering (HANDBOOK) & Applications of Geophysics in Environmental Investigations (CD-ROM) - John Greenhouse	$100	$125
	0004	1998 - Global Positioning System (GPS): Theory and Practice - John D. Bossler & Dorota A. Brzezinska	$10	$15
	0003	1998 - Introduction to Environmental & Engineering Geophysics - Roelof Versteeg	$10	$15
	0002	1998 - Near Surface Seismology - Don Steeples	$10	$15
	0001	1998 - Nondestructive Testing (NDT) - Larry Olson	$10	$15
	0005	1997 - An Introduction to Near-Surface and Environmental Geophysical Methods and Applications - Roelof Versteeg	$10	$15
	0006	1996 - Introduction to Geophysical Techniques and their Applications for Engineers and Project Managers - Richard Benson & Lynn Yuhr	$10	$15

Miscellaneous Items

	0021	Geophysics Applied to Contaminant Studies: Papers Presented at SAGEEP from 1988-2006 (CD-ROM)	$50	$75
	0022	Application of Geophysical Methods to Engineering and Environmental Problems - Produced by SEGJ	$35	$45
	0019	Near Surface Geophysics - 2005 Dwain K. Butler, Ed.; Hardcover Special student rate - 71.20	$89	$139
	0024	Ultimate Periodic Chart - Produced by Mineral Information Institute	$20	$25
	0008	MATLAB Made Easy - Limited Availability	$70	$95
		SUBTOTAL—SHORT COURSE/MISC. ORDERED ITEMS:		

Publications Order Form (Page Two)

Journal of Environmental and Engineer Geophysics (JEEG) Back Issue Order Information:
Member Rate: $15
Non-Member Rate: $25

Qt.	Year	Issue
	1995	
		JEEG 0/1 - July
	1996	
		JEEG 0/2 - January
		JEEG 1/1 - April
		JEEG 1/2 - August
		JEEG 1/3 - December
	1998	
		JEEG 3/2 - June
		JEEG 3/3 - September
		JEEG 3/4 - December
	1999	
		JEEG 4/1 – March
		JEEG 4/2 - June
		JEEG 4/3 - September
		JEEG 4/4 - December
	2000	
		JEEG 5/3 - September
		JEEG 5/4 - December

Qt.	Year	Issue
	2001	
		JEEG 6/1 - March
		JEEG 6/3 - September
		JEEG 6/4 - December
	2003	
		JEEG 8/1- March
		JEEG 8/2 - June
		JEEG 8/3 - September
		JEEG 8/4 - December
	2004	
		JEEG 9/1- March
		JEEG 9/2 - June
		JEEG 9/3 - September
		JEEG 9/4 - December
	2005	
		JEEG 10/1 - March
		JEEG 10/2 - June
		JEEG 10/3 - September
		JEEG 10/4 - December

Qt.	Year	Issue
	2006	
		JEEG 11/1 - March
		JEEG 11/2 - June
		JEEG 11/3 - September
		JEEG 11/4 - December
	2007	
		JEEG 12/1 - March
		JEEG 12/2 - June
		JEEG 12/3 - September
		JEEG 12/4 - December
	2008	
		JEEG 13/1 - March
		JEEG 13/2 - June
		JEEG 13/3 - September
		JEEG 13/4 - December
	2009	
		JEEG 14/1 - March
		JEEG 14/2 - Available June
		JEEG 14/3 - Available September
		JEEG 14/4 - Available December

SUBTOTAL—JEEG ISSUES ORDERED	

SUBTOTAL - SAGEEP PROCEEDINGS ORDERED	
SUBTOTAL - SHORT COURSE / MISCELLANEOUS ITEMS ORDERED	
SUBTOTAL - JEEG ISSUES ORDERED	
CITY SALES TAX (If order will be delivered in the City of Denver—add an additional 3.5%)	
STATE SALES TAX (If order will be delivered in Colorado—add an additional 3.7%)	
SHIPPING & HANDLING (US—$10; Canada/Mexico—$20; All other countries: $45)	
GRAND TOTAL:	

Payment Information:

☐ Check #: _____ (Payable to EEGS)

☐ Purchase Order: _____
(Shipment will be made upon receipt of payment.)

☐ Visa ☐ MasterCard ☐ AMEX ☐ Discover

Three easy ways to order:
Fax to: 303.820.3844
Internet: www.eegs.org
Mail to: EEGS
1720 S. Bellaire St., #110
Denver, CO 80222-4303
Email: staff@eegs.org

Card Number: _____

Cardholder Name (Print): _____

Exp. Date: _____

Signature: _____

Environmental and Engineering Geophysical Society

2009 Merchandise Order Form

ALL ORDERS ARE PREPAY

Sold To:

Name: _____
Company: _____
Address: _____
City/State/Zip: _____
Country: _____ Phone: _____
E-mail: _____ Fax: _____

Ship To (If different from "Sold To")**:**

Name: _____
Company: _____
Address: _____
City/State/Zip: _____
Country: _____ Phone: _____
E-mail: _____ Fax: _____

Instructions: Please complete this order form and fax or mail the form to the EEGS office listed above. Payment must accompany the form or materials will not be shipped. Faxing a copy of a check does not constitute payment and the order will be held until payment is received. Purchase orders will be held until payment is received. If you have questions regarding any of the items, please contact the EEGS Office. Thank you for your order!

Merchandise Order Information:

ITEM DESCRIPTION	QTY	T-SHIRT COLOR WHITE/GRAY	MEMBER RATE	NON-MEMBER RATE	TOTAL
EEGS Mug			$10	$10	Sold Out
T-shirt (Medium)			$10	$10	Sold Out
T-shirt (Large)			$10	$10	Sold Out
T-shirt (X-Large)			$10	$10	
T-shirt (XX-Large)			$10	$10	Sold Out
EEGS Lapel Pin			$3	$3	

SUBTOTAL – MERCHANDISE ORDERED:

TOTAL ORDER:

SUBTOTAL – Merchandise Ordered:	
STATE SALES TAX: (If order will be delivered in Colorado – add 3.7000%):	
CITY SALES TAX: (If order will be delivered in the City of Denver – add an additional 3.5000%):	
SHIPPING AND HANDLING (US - $7; Canada/Mexico - $15; All other countries - $40):	
GRAND TOTAL:	

Payment Information:

☐ Check #: _____ (Payable to EEGS)

☐ Purchase Order: _____
(Shipment will be made upon receipt of payment.)

☐ Visa ☐ MasterCard ☐ AMEX ☐ Discover

Card Number: _____ Cardholder Name (Print): _____

Exp. Date: _____ Signature: _____

THANK YOU FOR YOUR ORDER!

EEGS/Forms/Merchandise Order Form/2009 Prices and details on this form are as accurate as possible, but are subject to change without notice.