



The Environmental
and Engineering
Geophysical Society

Fast TIMES

The EEGS Newsletter

February, 2000

President's Message



Phil Sirles
President, EEGS

In This Issue

- President's Message
- From the Editor
- EEGS Board of Directors
- Letters To The Editor
- Corporate Profile
- Corporate Members
- Geophysical Applications
- Announcements
- EEGS Membership
- Certificate to be offered
- Calendar of Events
- Advertisers Index

“Webcentric”! Did I hear you say - webcentric? Sure, OK. But for EEGS, what does webcentric mean? Over the last few years all of us have been touched more and more by the omnipresence of the world-wide web. Therefore, as a society we intend to touch you, more and more with the use of the www.eegs.org site. Currently, several plans are underway to make the site more attractive, more productive, and more interactive for use by members as well as nonmembers. Already, we see the SAGEEP website making the process of registration as well as participation easier for the symposium. As e-commerce creeps into our lives, it will surely increase the opportunities for members to utilize our society's website for purchase of educational materials and products, distribution of newsletters and journals, and general exchange of information regarding the health and status of the association.

Maybe like many of you I feel we are becoming inundated with “dot.com this” and “dot.com that”; and, I state this to a very high-tech audience – it can be oversold. Yes, I admit the EEGS website will allow for more simplified processes and easier communication, distribution of revenue-generating materials and other association information (e.g., Board meeting minutes). Clearly, the web will become a way of life for all of us and EEGS as well – that seems inevitable! However, I stopped for a just moment the other day to look-up in Webster's what, by definition, we stand for; that is, a “society”. Although somewhat long, I believe its definition is worth presenting here (to make my point of course): “Society: a group of persons united for the promotion of a common aim, typically literary, scientific, political, religious, benevolent or convivial; an association of individuals, as a nation, organized for mutual profit and protection; persons from any region or any period of time viewed in regard to manners, customs, or standard of living; human beings collectively, seen as having characteristics in common; those who recognize each other as associates, friends, and acquaintances; the leisured, wealthy, or fashionable section of any community, its manner of living, and its influence; the relation of men to one another when in association, companionship, fellowship, and company.

Except for the “...leisured, wealthy, or fashionable...” part of the definition, I found it very apropos and enlightening; particularly, with respect to the “web society” forming all around us. Don't take me wrong, I am actively participating (probably more than most) in the “webolution”, mostly because I do not want to be passed by. But, I find being webcentric very impersonal. When alone, I find it very useful, many times fun, but often... just boring! As a member of the Environmental and Engineering Geophysical “SOCIETY”, surely I too will find the web useful – as a *tool*. Certainly, if we become a scientific society networked by the web, I fear a certain downfall. Should you read this prior to SAGEEP '2000 in Washington DC (February 20-24), maybe you ought to come. Come to this Society's ultimate purpose: recall, “...a group of persons united for the promotion of a common aim, typically literary, scientific, [and]... the relation of men [women] to one another when in association, companionship, fellowship and company”. My opinion, for what it's worth, is that a function like SAGEEP – *IS THE SOCIETY!* It is our chance to come together as geoscientists, engineers and practitioners to be with- and be around- our peers! SAGEEP has always been the main-stay of EEGS, both socially and financially. In fact, the ultimate foundation for EEGS arose out of SAGEEP – not the other way around! There is a not-so-subtle message there! Thus, I do not plan to

continues on following page...

attend a webcentric annual convention this year. Instead, I will attend the premier conference of a society that promotes "...a common aim..."; which is, the mission statement of this society (look for it elsewhere in this newsletter)!

I want to thank EVERYONE involved with SAGEEP '2000! Try me if you will – but... I believe this will be the best attended, most entertaining and scientifically stimulating SAGEEP in the history of EEGS! The group responsible for putting the conference together is to be commended (PLEASE - take a minute to look for the list of the contributing individuals to SAGEEP 2000 in this newsletter): Jeff Wynn (General Chair) and Bakr Ibrahim (Technical Program Chair) and ALL of the Planning Committee members have worked so well together. Also, Mark and Lynn Cramer (with Expomasters) you continue to amaze me with your concerned and concerted efforts to the SAGEEP. My pre-meeting compliments - you ALL have done a marvelous job this past year! Come to DC this February and test me; then, tell me if I'm wrong!

As I conclude my term and write my lame duck President's message, I leave with these final thoughts. This is my chance to thank the Board members and Officers for their active participation in this year's issues. Some issues have been frustrating, but most have been stimulating and... invigorating, to say the least! I encourage you to stay tuned as John Nicholl, your next President, will inform the EEGS membership of the exciting changes that will take place over the next few months. Additionally, my extended thanks goes to the professionals at The Resource Center for Associations. Your commitment to managing EEGS, assisting its members, and helping the Board do their work this year (especially me!) was nothing shy of superb. To my cohorts at MicroGeophysics: THANK YOU. Thank you for the time, resources and patience provided to me this past year. Certainly, I could not have been as effective this past year as President without the time commitment! I do not take it for granted, and I very much appreciate your support.

Finally, to YOU – the EEGS member: Thanks for the outpouring of emotion I received after asking "Do you Care?" (November issue *Fast Times*). It was fun and exhilarating to see that so many members DO care! As I went through the e-mails and faxes, and got your phone calls as they literally poured in – I was impressed and touched! THANK ALL OF YOU! It was very nice to learn, see, and feel just how much you do care about EEGS! Its health and welfare will most certainly depend on all of you folks that, like me, *DO CARE!* Be proactive in EEGS — IT IS WORTH IT.

Have a terrific year! See you at SAGEEP, and if I don't catch you "*associating*" at OUR symposium in DC – I guess I'll catch you 'webcentrics' in the chat rooms?!



From the Editor

Ronald Kaufmann

As you read this February issue of *Fast Times*, you will probably be in-between your hectic and busy field work schedule. Many EEGS members have told me that their workload has increased dramatically in the past few months. This comes with rewards, but also, unfortunately, reduces the amount of submissions to this newsletter. Therefore, I again am asking you to take just a small amount of time to submit a letter or article for the next issue. Let's hear what has been keeping all of you so busy.

What Every Geophysicist Should Know About Quality Control

Quality Control is a term that has become overused and annoyingly prevalent in today's society. As geophysicists, we too are seeing quality control becoming increasingly emphasized by project managers. What exactly is quality control applied to geophysical investigations and how should it be used? I recently asked these questions to Rich Hopkins (MARRICH Inc.), who teaches quality control procedures to geophysicists around the country (most recently at SAGEEP 2000). Your editor conducted the interview with Mr. Hopkins on an airplane and dutifully recorded the information on a quality-engineered airsick bag.

Editor: What is the main goal of a Quality Assurance Program?

Hopkins: *The main goal of any Quality Assurance program related to geophysics is to ensure that quality data will be obtained to meet the client's objectives.*

The EEGS Newsletter is published quarterly by the Environmental and Engineering Geophysical Society (EEGS). Subscription is by membership in the Society.

The newsletter encourages letters, announcements, and other items of general interest to geophysicists involved in applications to engineering.

Submissions should be via e-mail or on IBM formatted 3.5 inch disk. Graphic files can be accepted in any standard format including TIFF, GIF, JPEG, PCX, BMP, OR WMF. The editor reserves the right to edit or reject all submissions. Opinions expressed in the newsletter do not necessarily represent those of EEGS or its officers.

Editor: Ronald Kaufmann

Technos, Inc.
3333 NW 21st Street
Miami, FL 33142
Phone: 305-634-4507 FAX: 305-635-4109
<kaufmannrd@worldnet.att.net>

Advertising: Michael P. Thompson

EEGS
10200 W 44th Ave Ste 304
Wheat Ridge CO 80033-2840
303-422-7905 FAX 3-3-422-8894
<mthompson@resourcenter.com>

EEGS Board of Directors

The following are the current members of the EEGS Board of Directors. Email addresses are included to facilitate communication between you and the Board.

Officers

Past President Dick Wold
<rwold@mail.geometrics.com>

President Phil Sirls
<microgeo@aol.com>

1st Vice President John Nicholl
<john_nicholl@urscorp.com>

2nd Vice President John Jansen
<Jjansen@reukert-mielke.com>

Secretary/Treasurer Micki Allen
<mickia@compuserve.com>

Board Members at Large

Ron Bell <enwservice@aol.com>

Pete Haeni <phaeni@usgs.gov>

*Mike Powers <mhpowers@usgs.gov>

*Barbara Luke <bluke@ce.unlv.edu>

*Niels Christensen <geofnbc@aau.dk>

[* indicates new to the Board of Directors as of SAGEEP '99]

Editor: What is the difference between Quality Control and Quality Assurance?

Hopkins: A Quality Assurance program ensures that quality control procedures are being performed and meet the stated criteria. Quality control is the specific task performed by the geophysicist acquiring the data, and designed to test the repeatability or accuracy of the data.

Editor: What kinds of data need to be quality controlled?

Hopkins: All data need some measure of quality control. The data need to be documented so that someone else could reacquire the data in exactly the same manner. Remember, bad data not only includes erroneous data, but also undocumented data.

Editor: How much QC is enough QC?

Hopkins: Well, it really depends on how accountable and responsible the client is willing to be. The project budget usually dictates how much time can be allotted to performing quality control tasks.

Editor: Is there anything else important to understanding quality control?

Hopkins: Quality control is not meant to replace experience. It only documents and assures that "good" data are being collected.



Letters To The Editor

SAGEEP Hotels too Expensive!

Regarding "Book Early for SAGEEP 2000" (November, 1999 *FastTimes*), I believe that there should be other alternatives to the problem than blaming it on your members. Are there not any convention halls that don't require hotel rooms be booked too? For example, I wonder if in Toronto the International Centre would be a place to try.

I find the SAGEEP meeting to be very useful. Last time I went was in Chicago. Oakland was too far. I'm sorry but because of scheduling, if I decide to go to this year's convention, not only will I book late, but I will stay at the cheapest hotel possible. I won't feel guilty about it either because, call me crazy, I try to save my money for other things, like airfare to a SAGEEP meeting. Regardless, I understand your frustration, and I'd be happy to research alternative actions if you have a meeting in Toronto.

-Joe Mihelcic

An Open Letter to EEGS Members

For last three years, I have served on the EEGS Board of Directors. I recently agreed to run for another three-year term on the board, but as of this writing, I do not know if I have been re-elected. So, I am writing from the perspective of a person who has served his time and is about to be released, but may be recalled to activity duty.

I question the significance of EEGS as a professional scientific society. I wonder if geophysics as a profession or an industry has a future. If it does, where is it going? What good is geophysics anyway? Would the mission of the society be as well, if not better, served through another professional society such as the SEG, ASCE, AEG, or the NGWA? What is – or perhaps more importantly "should be" – the *mission* of the society? Why is it that only a few dedicated individuals give anything back to the profession or industry that provides their livelihood?

Perhaps it is far too revealing that I am able to address with the clarity and certainty all of the above questions but one. If asked, I will confidently tell you that EEGS makes a difference in the working as well as private lives of its members. It does so by simply fulfilling its mission to educate. As EEGS strives to provide relevant information on practical subsurface imaging solutions for environmental and engineering site characterization, the quality of work is improved, more successes occur, and clients are better served and satisfied. Ultimately, this precipitates an increased utilization of geophysical methods resulting in an expanding market for personnel, equipment, and related services. No other geophysics oriented society comes close to doing as good a job with such limited resources simply because no other society does as much nor works as hard to educate its clients and its membership in the matters of shallow geophysics. The future of the industry is, in fact, limitless when you consider all of the needs of an expanding world economy and population. The key is to make our collective customer base knowledgeable about the technology as well as the geophysical technologists knowledgeable about the latest innovation and development. This is done through education, which simply put, is the mission of EEGS.

continues on following page...



Submit your correspondence to:
Ronald Kaufmann, EEGS Editor
c/o Technos, Inc.
3333 NW 21st Street
Miami, FL 33142
Phone: 305-634-4507
FAX: 305-635-4109
<kaufmannrd@worldnet.att.net>

I am not able to tell you, however, why only a few dedicated individuals accept the challenge of service to profession. If asked why I have, I will point out my professional and personal growth through work on the board and in various other capacities with EEGS. I will tell you that there are many EEGS related tasks that need to be done, all that is needed is people to do them. I will even speak to you regarding my personal struggles managing work, family, and volunteer activities. But I am not able to tell you why it is that only a few are willing to volunteer 1 or 2 hours a week or month in order to help EEGS fulfill its mission.

Fourteen years ago, I accepted an invitation join an ad hoc committee of Denver area geophysicists to plan and produce the first SAGEEP. The objective of that first conference was to educate. That initial effort ultimately flowered into EEGS with its well respected peer reviewed professional journal, a newsletter, a web page, 13 years of SAGEEP Proceedings, and a CD ROM Short Course on Environmental Geophysics as well as other publications, short courses, and opportunities for professional improvement. Arguably, this is a remarkable accomplishment for a profession in an industry that some claim to be stagnant if not clearly on the wane. What makes it even more remarkable is that it was accomplished, by and large, by volunteers who believed that giving back to their profession through service to others was a worthwhile endeavor.

As of this writing, I believe the most important goal of the board is to increase member involvement in the society. I am not certain how to best do this and, therefore, need your assistance. Please take a few moments to Email your thoughts, ideas, suggestions, criticisms, perceptions, etc. to me at rsbell@enwservices.com. Tell me what you think. Thanks in advance.

-Ronald S. Bell

Corporate Profile

Dualem Inc.

Dualem Inc. was founded in 1998 to provide geometric EM instruments for near-surface geophysical applications. Dualem is also the name coined to describe the instruments, and the coil system they utilize. Dualem specializes in geometric EM systems, wherein the separation and orientation of the transmitter and receiver govern the response of a geological feature. The



Dualem Inc.

Geo-Conductivity Meters

Dualem-2 and Dualem-4 Dual-Depth EM Systems

www.dualem.com
mail@dualem.com

☎ 1 905 876 0201
☎ 1 905 876 2753

Corporate Members

Geometrics

2190 Fortune Drive
San Jose CA 95131 U.S.A.
Rob Huggins

Geonics Limited

8-1745 Meyerside Drive
Mississauga ON L5T 1C6 Canada
Simon Boniwell

Geophex Ltd.

605 Mercury Street
Raleigh NC 27603-2343 U.S.A.
I. J. Won

Interpex Limited

715 14th Street
PO Box 839
Golden CO 80401 U.S.A.
Christo Slee

MALÅ GeoScience USA Inc.

400 Harvey Road
Manchester NH 03103 U.S.A.
Thomas Fenner

Mount Sopris Instruments

17301 West Colfax, Suite 255
Golden CO 80401 U.S.A.
James LoCoco

Dualem system consists of a horizontal (Z-axis) transmitter, a horizontal co-planar receiver, and a perpendicular (X-axis) receiver. Each receiver combines with the transmitter to form a geometry with a unique depth of exploration at low-induction-number, and a distinctive profile for objects with high induction, such as steel drums. The horizontal transmitter and receiver form the horizontal co-planar geometry, which has depth of exploration 1.5 times the transmitter-receiver separation. The horizontal transmitter and perpendicular receiver form the perpendicular geometry, which has a depth of exploration 0.6 times the transmitter-receiver separation, and superior metal-detection capability.

Dualem has developed two commercial instruments. The Dualem-2 has 2-m separation between its transmitter and receivers, and the Dualem-4 has 4-m separation. For mapping soils, or sites where there are obstructions and/or electrical noise, the Dualem-2 is a good choice. Its compact size is convenient to maneuver around obstacles, and it is less susceptible than larger systems to external noise. With 4-m separation, the Dualem-4 is effective for mapping geological layering to about 6 m. Applications for the Dualem-4 include the mapping of soil thickness, and contamination in soil and shallow groundwater. For buried metal, the Dualem-4 can detect a single steel drum at depths to 4 m. These qualities make the Dualem-4 a good choice for the characterization of a variety of sites. Both the Dualem-2 and Dualem-4 have a streamlined shape that, with the balanced harness supplied with the instruments, makes them relatively comfortable to carry on the hip. Their shape and harness also enables the instruments to be slung at shin height for maximum signal and penetration, where terrain and obstacles permit.

Rick Taylor is responsible for marketing and sales at Dualem, and provides routine customer support. Rick has engineering degrees in geophysics and mining; and since 1984, he has developed applications for geophysical EM, and supported the users of various EM systems and surveys. Dualem draws on the technical expertise of several people with unique knowledge and experience. These include Scott Holladay, who holds a doctorate in EM geophysics and is a leader in EM system development, and James Lee who, with degrees in electronic engineering and geophysics, has designed several widely used EM systems. In geophysical EM, several companies specialize in time-domain and multi-frequency instruments, and are energetically developing these technologies. Although geometric EM has been popular since Doll introduced the induction logger in 1949, in recent years there has been little development of in this area. The practical and versatile nature of geometric EM has led to its widespread use for a variety of applications. Dualem believes that innovations, such as the Dualem coil system, will reinvigorate geometric EM as a technology for the next generation of geophysicists and engineers.

Geophysical Applications

NEHRP Soil Classifications in the New Madrid Seismic Zone Using SH-Wave Refraction/Reflection Methods

Steve Wood, Ed Woolery, and Ron Street*

Department of Geological Sciences/Kentucky Geological Survey

University of Kentucky

Lexington, KY 40506-0053

(*M.S. Student in Dept. of Geological Sciences)

Introduction

Most building codes in the central United States now require consideration of seismic loads. The codes generally adhere to the *National Earthquake Hazards Reduction Program's (NEHRP) Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*. This guidance states that short- and 1-second spectral response accelerations require adjustment for site conditions if the recommended spectral response accelerations are greater than 0.15 g or 0.04 g, respectively. Typically, these conditions are exceeded in the Upper Mississippi Embayment, because of the presence of the New Madrid Seismic Zone (NMSZ) (Fig. 1).



Figure 1. The study area in relation to the Mississippi Embayment and New Madrid Seismic Zone. The poorly consolidated sediments are in excess of 1 km in some parts of the study area.

| Soil Type | General Description | Ave. V_s (m/s) |
|----------------|---|---------------------------|
| A | Hard rock | >1725 |
| B | Rock | 761-1725 |
| C | Long and/or stiffest soils mudst., gravels | 305-760 |
| D | Earthy soils and/or silts/clay, silt/clay, sand & gravel | 181-305 |
| E ₁ | Small thickness (<10 ft); soft-to-medium clay; $V_s < 181$ m/s | <181 |
| E ₂ | Large thickness (>10 ft); soft-to-medium clay; $V_s < 181$ m/s | <181 |
| F | Soils unsuitable for lateral movement | Site specific modeling |

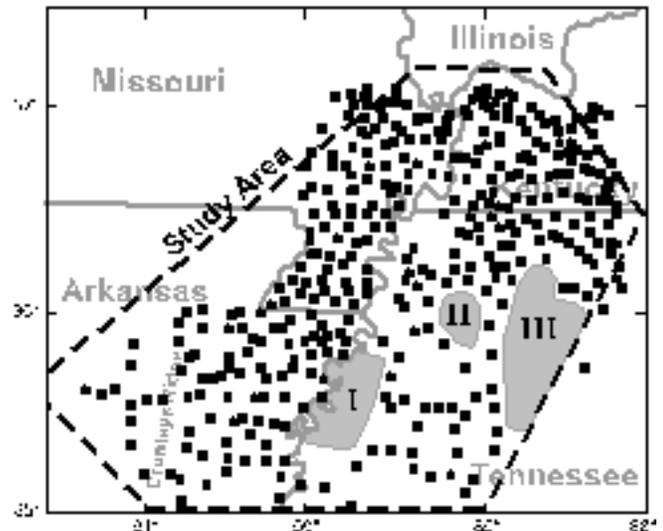
Sites in this region are usually on thick deposits of loose to poorly consolidated, water-saturated sediment that characteristically have low to moderate shear-wave velocities. The shear-wave velocities and damping, as well as the thickness of the soil/sediment bedrock overburden, strongly influence the ground motions from New Madrid design earthquakes. Effects include the amplification, deamplification, frequency modulation, and increase in the ground-motion duration. Damage estimates from past earthquakes (e.g. 1989 Loma Prieta), however, have found ground-motion amplification to be the major contributor to property loss. NEHRP has sought to characterize amplification effects by establishing six soil categories based on the time-averaged shear-wave velocities, v_s , in the upper 30m of the site profile (Table 1). The cost-effective and noninvasive nature of the SH-wave refraction/reflection method is ideally suited to the direct measurement (small strain) of this dynamic soil property on a regional scale. We have collected and classified approximately 400 SH-wave soundings in accordance with the 1997 NEHRP provisions.

Table 1. NEHRP soil classification based on shear wave velocity.

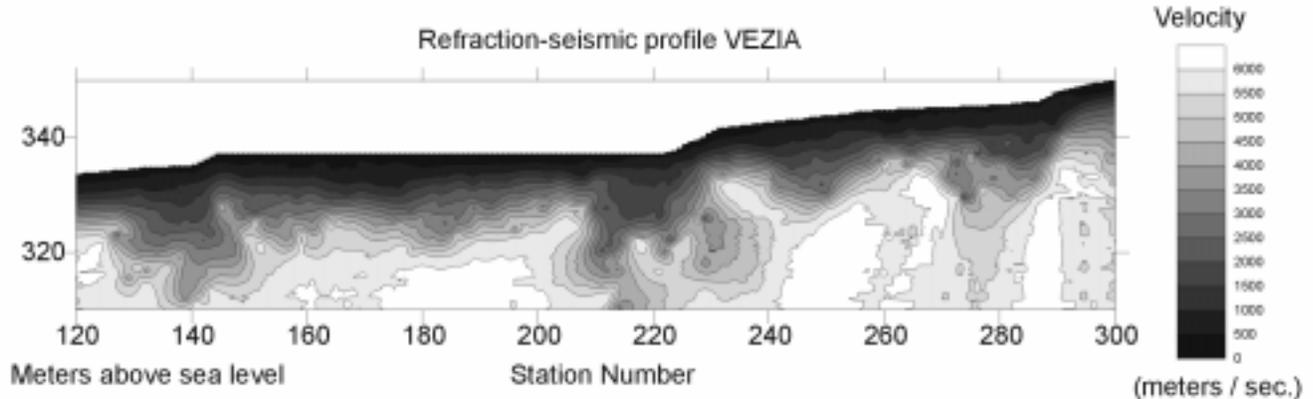
Data Acquisition, Processing, and Interpretation

Since 1990, personnel at the University of Kentucky, and more recently Rob Williams and his colleagues at the U.S. Geological Survey, have been collecting refraction/reflection shear-wave data at sites throughout the Upper Mississippi Embayment for the purpose of seismic hazard classification. Figure 2 shows the locations where UK has collected data during the past decade. The high data density in the Paducah, KY, and Memphis, TN, areas is the result of special studies.

Figure 2 (Right). Approximately 400 SH-wave soundings have been performed in the Upper Mississippi embayment since 1990. Sites predominantly fall into Site Class D. A few Site Class C sites in western Kentucky and near the edges of the embayment, as well as scattered Site Class E sites adjacent to the rivers are the exceptions. Regions I-III represent data gaps in areas yet to be investigated. Although the extreme northwestern corner of Tennessee also appears to lack data, numerous SH-wave reflection profiles exist which are not shown.



RAYFRACT - now with turning ray seismic refraction data inversion



Our Rayfract software now also implements the **Delta-t-V method** (Gebrande, H. and Miller, H. 1985). This method delivers continuous depth vs. velocity profiles for all stations. The profiles are exported into an ASCII file which may be processed conveniently with third-party scientific data plotting software to produce **color-coded station number vs. depth velocity contour maps**. The method handles real life geological settings such as vertical velocity gradients / velocity inversions / pinching out layers and outcrops gracefully. The time consuming and artificial assignment of first breaks to refractors has been abolished. Import or specify first breaks and profile geometry, and then generate convincing velocity-depth contour maps efficiently by calibrating just four parameters with core drilling data! **First break picking has been facilitated decisively** with our new semi-automatic picking method. The price of an end user license remains unchanged at US \$ 3,300, including one year of support. We continue to offer a price reduction of 20% to academic and non-profit organizations. Ask for a trial version. Handles OBS marine data / 2D reflection-seismic lines.

Intelligent Resources. Weid 3, CH-6313 Menzingen/Switzerland.
Tel. / Fax : +41 41 755 32 74. E-mail : resources@spectraweb.ch

RAMAC™ Ground Penetrating Radar and Borehole Radar Systems

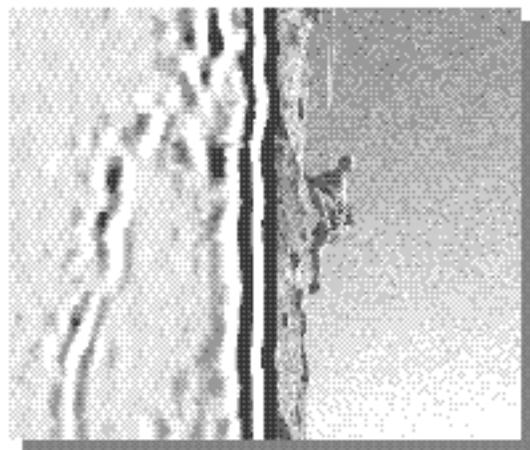
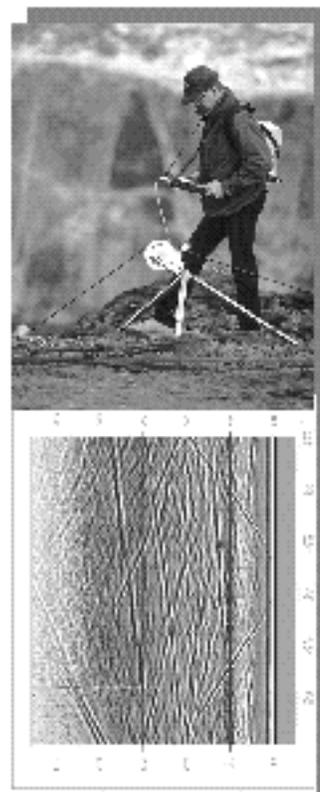
Flexible : one system for all your GPR requirements

Affordable: low operating and ownership costs

Customer Support: the best measure of total quality

T rue 16-bit digital data: RF signals digitized at receiver

Simply: the best GPR value



Let RAMAC/GPR take you to new heights...



...and new depths

MALÅ GeoScience AB
Skolgatan 11, S-930 70 Malå, Sweden
Tel: +46 953 34550; Fax: +46 953 34567
E-mail: geoscience@malags.se
Web-site: www.malags.se

MALÅ GeoScience USA, Inc.
400 Harvey Rd., Manchester, NH 03103
Tel: 1-888-USA-MALA or (603) 627-5841
Fax: 1-603-627-5874;
E-mail: sales.usa@malags.se

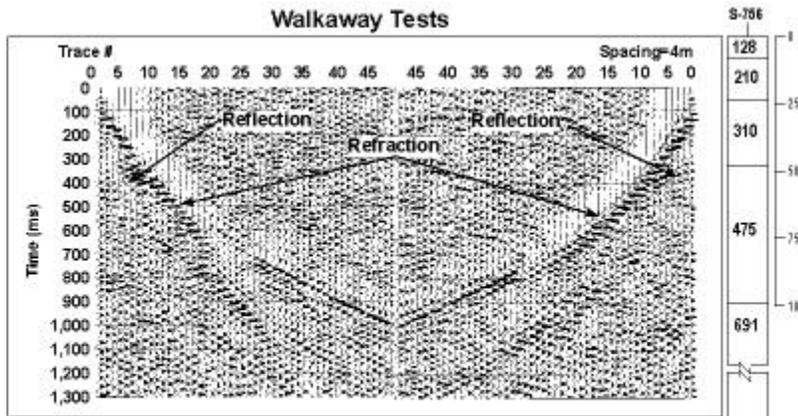


Figure 3. A reversed SH-wave walkaway test of average quality from northeastern Arkansas. The interpreted depth-velocity model (in m/s) for the site is shown at the right. The shear wave velocity of the deeper sediment (below approximately 100m) was not sampled. The 846m depth to bedrock (shaded) was determined by P-wave soundings.

Our field procedures can be traced to the early near-surface pioneering work of scientists such as Don Steeples and Rick Miller of the University of Kansas/Kansas Geological Survey, and Jim Hunter and Susan Pullan of the Canadian Geological Survey. We have applied the conventional, reversed, SH-wave walkaway technique for measuring the in situ velocities. In general, we used a seismic hammer striking a section of steel I-beam or wood in a direction perpendicular to the wave propagation and geophone spread to acquire data. Recently we have used an IVI MiniVib® seismic source for the deeper sediments. Data were recorded on 24- and 48-channel engineering seismographs, and standard signal processing was performed using a variety of software packages (i.e. VISTA® and WinSeis®). Our data interpretation has evolved during the past decade; early interpretations of the refraction/reflection data were typically done using traditional graphical methods, whereas recently acquired data are interpreted using commercial modeling software. Figure 3 shows a reversed SH-wave refraction/reflection

walkaway (average quality) acquired using a seismic hammer in northeastern Arkansas. The velocity/depth model calculated from the data is shown along the right side of the plot.

Discussion/Conclusions

Based on the weighted shear-wave velocities of the top 30m of soils, sites throughout the study area predominantly fall into *Site Class D* (180 to 360 m/s). A few *Site Class C* sites (360 to 760 m/s) in western Kentucky and near the edges of the embayment, and scattered *Site Class E* sites (<180 m/s) adjacent to the rivers are the exceptions. In the uplands of western Kentucky and western Tennessee (removed from the active flood plain), velocities were typically in the mid-200 to mid-300 m/s range, whereas in the embayment lowlands of northeastern Arkansas and southeastern Missouri, velocities were lower, ranging between 180 and the low-200 m/s.

We believe that the greatest seismic hazard emanating from the NMSZ, within the design life of new construction, is enhanced ground motion, and that this study provides the basic framework for basin-scale ground-motion discussions and analyses. Furthermore, with the exception of Memphis, the Upper Mississippi Embayment is predominantly rural and sparsely populated. Therefore, codes adhering to NEHRP provisions are sufficient for most noncritical structures. The data for this study were collected evenly over a wide geographical area; velocities were often found to change rapidly, especially in the alluvial deposits along the Mississippi River. Consequently, the results are not adequate for, and should not be applied to, site-specific design of critical structures.

There are additional limitations as well. First, although the depth to bedrock is reasonably well known, we have thus far only begun to document the deeper sediment (>100m) velocities. In order to understand the damping or amplification of the intermediate- to low-frequency (i.e. <2 Hz) ground motions that are typically of interest to structural engineers, shear-wave velocities of the entire soil/sediment column must be defined. In addition, the deeper velocities and impedance contrast at the bedrock-soil interface are required before two- and three-dimensional ground-motion effects (i.e. basin-generated surface waves, long-period dispersed surface waves, P/SV wave coupling from non-vertical incidence, etc.) can be reliably modeled.

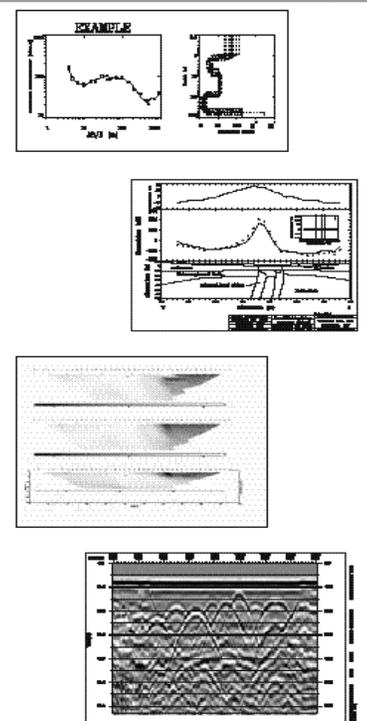
PC Based Software for the interpretation of:

- Resistivity
- Induced Polarization
- EM conductivity
- Frequency EM
- Magnetotellurics
- VLF
- Transient EM
- Gravity
- Magnetics
- Seismic Refraction
- Seismic Reflection
- Ground Penetrating Radar

www.interpex.com
info@interpex.com

INTERPEX HOUSE
P.O. BOX 839
GOLDEN, CO 80402
U.S.A.

TEL (303) 278-9124
FAX (303) 278-4007



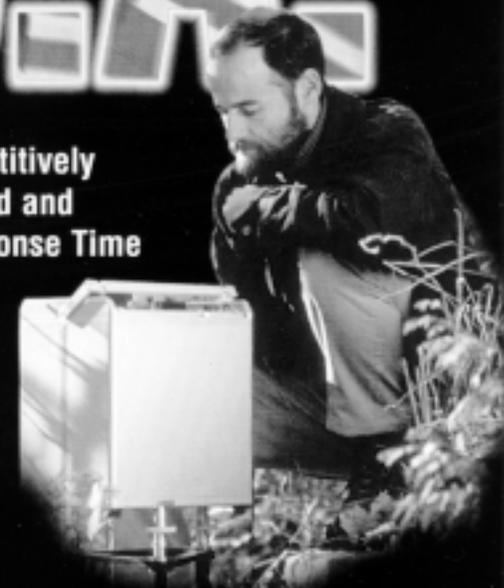


The
Largest
Geophysical
Rental Inventory in the



U.S.A.

Competitively
Priced and
Fast Response Time



- Gravity Meters
- Magnetometers
- Gradiometers
- VLF Electromagnetics
- Conductivity Meters
- GPR (Ground Penetrating Radar)
- Magnetic Susceptibility Meters
- Resistivity Meters
- IP Systems
- Spectrometers
- Borehole Logging Systems

SCINTREX

900 Woodrow Lane, Suite 100, Denton, Texas 76205 • Tel: (940) 591-7755 • Fax: (940) 591-1968 • e-mail: scintrexusa@compuserve.com

A new interactive FFT-based grid suturing technique applied to ground geophysical surveys in Greece.

A. C. Johnson (Geosoft Europe Limited), A. Sarris (Institute of Mediterranean Studies – F.O.R.T.H.)
M. E. Amza-Prein (Geosoft Europe, Germany).

Submitted to: 2nd Balkan Geophysical Congress, Istanbul, 5-9 July, 1999.

Edited version presented below.

Introduction

The utility of compiling potential field surveys is well documented and varies in scale from continental-scale projects to assess global tectonics, to local surveys of a few meters in size to evaluate environmentally or archaeologically important sites. A single survey covering the whole area of interest with uniform data quality, station spacing and data reduction parameters is a luxury that is rarely available.

What is more often the case is that areas of particular interest in any given survey lie at the margins of the data set, necessitating either further acquisition, or the stitching together of adjacent existing surveys to give the best possible coverage. This merging of surveys is a vital step in the processing and analysis of survey results, which is too often both time-consuming and inaccurate. This paper will present an example of merging a number of small-scale survey blocks using a newly developed automatic grid suturing process.

Data acquisition

During 1997 and 1998, a series of vertical magnetic gradient and EM31 surveys were carried out over the archaeological site of Dimini-Volos in Greece. EM31 data were acquired at 1m-station intervals and the magnetic gradient data at 0.5 m intervals. We will present the magnetic gradient data here. The survey area was divided into 8 blocks, each of which was surveyed separately with a single line of overlap between surveys. The data were processed individually and a grid with cell size

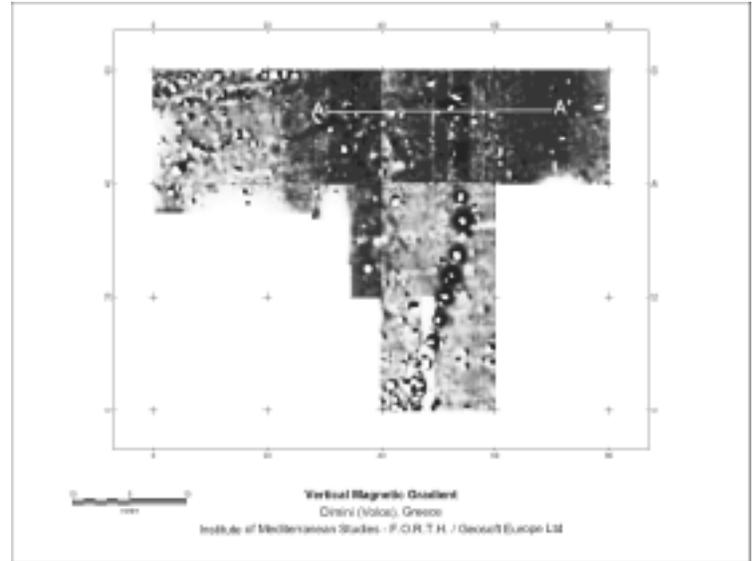


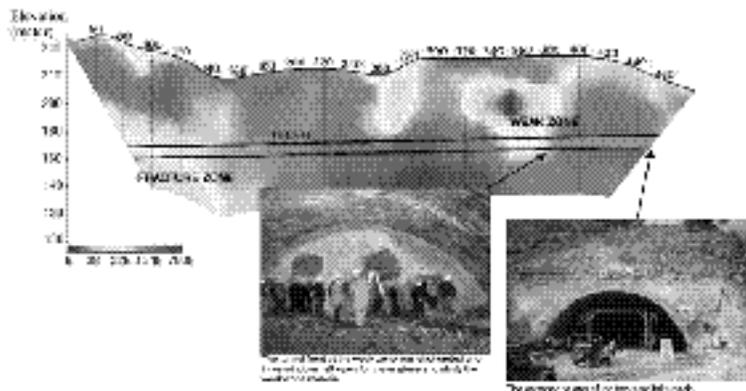
Figure 1. Magnetic grids over the Dimini (Volos) site prior to grid merging. AA' marks the position of the profile shown in Figure 2.

Sting/Swift Resistivity Imaging System Great Depth Penetration, Easy to Use

An automated and easy method for the modern geophysicist to use. This instrument is well for:

- Site investigation for construction
- Detect leakage at damsites
- Map utility pipelines
- Foundation studies
- Map depth to bedrock
- Locate fracture zones in bedrock
- Map solution channels
- Monitor waste sites
- Find boulders and many more applications

We offer sales, rentals and training



Contact us for details and availability.

SAGA Geophysics, Inc.

10710 D-K Ranch Rd Building B • Austin, Texas 78759, USA

Tel: +1 (512) 258-7599 • Fax: +1 (512) 258-9958

Email: ronnie@sga.com • Web site: <http://www.saga.com>

0.25 m created for each block. When these grids are displayed on a single map (Figure 1) it is clear that the grids do not match, and a number of offsets and possible trends occur in the original data.

Grid Suturing

Grid Suturing is one of the techniques available in the GridKnit™ program, which is part of Geosoft's OASIS montaj™ Data Processing and Analysis system. The main advantage of this newly-developed FFT-based method over conventional blending or averaging methods is that no wavelengths are introduced into the data set that do not exist in the original grids.

Results

Each of the 8 vertical gradient grids were sutured in series using the GridKnit™ program. The suture path was chosen automatically in each case, and the correction was weighted evenly between the two grids. The resulting grid is shown in Figure 2.



Figure 2. Vertical magnetic gradient grids merged using the GridKnit™ Suturing technique.

Announcements

Graduate Education and Research in Environmental and Engineering Geophysics at Boise State University

By: Dr. J. R. Pelton

Boise State University announces a new Doctor of Philosophy (PhD) program in geophysics with an emphasis on environmental and engineering geophysics, a major focus of the geophysics program at the University since 1975. Faculty and students are active in research on the nature of subsurface properties and processes at shallow depths. Research includes the capabilities and limitations of geophysical methods used for near-surface investigations, the development of new field and analytical techniques, and the quantitative integration of geophysical data with information from other scientific and engineering disciplines. Applications to hydrogeology, geologic hazards, paleoclimatology, and geotechnical engineering are stressed throughout the research.

The Department of Geosciences is implementing this new program in close cooperation with the Center for Geophysical Investigation of the Shallow Subsurface (CGISS) at Boise State University. Additional information, including fellowship information, descriptions of specific research projects, faculty profiles, and program requirements are available at <http://cgiss.boisestate.edu/geoweb/home.html>.

Request application materials from: Dr. J. R. Pelton, Department of Geosciences, 1910 University Drive, Boise State University, Boise, ID 83725, Voice: 208-426-3640, FAX: 208-426-3888, Email: jrp@cgiss.boisestate.edu. Funding is still available for students interested in beginning graduate study in September 2000 or January 2001.

Digital Photo Fun

As digital cameras become more popular and less expensive, more of us geophysicists are putting them to use in the field. They provide an easy way to document a geophysical survey and have the images immediately available for review or email to the home office.

I am requesting unique photos that you have captured while in the field and would like to share with us all. I'll choose one or two to be included in each issue. Email your submissions to: kaufmannrd@worldnet.att.net.

The following digital photo was captured by Rich Hopkins while in St. Croix, Virgin Islands performing a downhole seismic survey. The survey quickly took a back seat to weather conditions as Hurricane Lenny ripped through the island.





SARIS

Scintrex Automated Resistivity Imaging System

- Combined Resistivity Transmitter and Receiver
- Hi-Power, 100 Watts, 500 Volts, 1 Amp
- 4 IP Windows
- 1-D Inversion in the field
- Micro-processor controlled, internal memory, graphics display
- Supports intelligent multi-electrode cable systems without external switchboxes or computers
- Multi-electrode cables are automatically expandable and are built to meet your requirements
- Modular, stackable design allows for future expansion
- Supports more than 65,000 electrodes
- Reliability, Convenience, Accuracy

SCINTREX
Earth Science Instrumentation



IN CANADA
222 Seiderscroft Road
Concord, Ontario, Canada L4K 1B5
Tel: (905) 669-2208 - Fax: (905) 669-6403
e-mail: scintrex@idsdetection.com

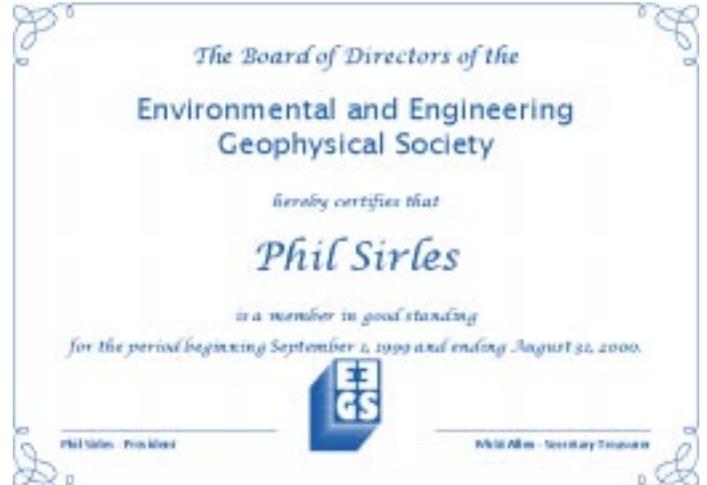
IN EUROPE / FRENCH AFRICA
56 avenue Denis Papin
45808 Saint-Jean-de-Braye, cedex, France
Tel: (33-2) 38-61-97-80 - Fax: (33-2) 38-61-97-01
e-mail: scintrexeurope@wanadoo.fr

IN THE U.S.A.
563 Woodrow Lane, Suite 100
Denton, Texas 76206
Tel: (940) 501-7755 - Fax: (940) 501-1950
e-mail: scintrexusa@compuserve.com

IN AUSTRALIA / SE ASIA
P.O. Box 125 Summer Park
83 Jijames Street, Brisbane, QLD Australia 4074
Tel: (61-7) 3376-5180 - Fax: (61-7) 3376-8028
e-mail: austlog@austrlog.com.au

Internet: www.ids-detection.com

EEGS Membership Certificate to be offered



At the request of many EEGS members, the Board of Directors has decided to make available a membership certificate, suitable for framing. The rough draft appears above. You may purchase your certificate for \$10 from the EEGS office at the address below:

Attn: Membership

EEGS

10200 W 44th Ave Ste 304

Wheat Ridge CO 80033-2840

FAX: 303-422-8894

Payment in US Funds should accompany the order, and can be made by check, VISA or MasterCard. Make checks payable to EEGS.

**Can you rely on your
ground penetrating radar system
provider when you need them most?**



With Sensors & Software you can!

Sensors & Software Inc. is your full service ground penetrating radar (GPR) system provider. Rely on us for all your GPR needs, from equipment to support, training and advice.

The premiere pulseEKKO GPR systems are designed for the professional user and offer a multitude of system configurations and software for users mapping complex regimes where data processing and manipulation are a must. The innovative Noggin subsurface imaging systems offer the latest GPR technology and are optimal for beginners or those requiring a quick map of subsurface conditions. **Buy, rent, or lease, Sensors & Software has a system to suit your needs, and budget.**

- ⊙ technical support
- ⊙ data interpretation advice
- ⊙ on-line 24 hours
- ⊙ world-wide SWAP support
- ⊙ training and education
- ⊙ GPR systems for all skill levels & budgets

**Call & find out how we can help you get all the
GPR systems, service, and support you need**

toll-free Canada & USA: 800-267-6013

web site: www.sensoft.on.ca



1091 Brevik Place
Mississauga, ON L4W 3R7
Canada

phone: 905-624-8909
fax: 905-624-9365
e-mail: radar@sensoft.on.ca

ARTEMIS

A revolutionary concept for Time-Domain EM surveys of the future

An integrated, intelligent receiver acquisition system with solid state data storage to be used in an array of cable-less receiver modules, OR as a stand-alone 3-axis receiver coil.



348 Rocky Point Rd Ramsgate
NSW 2217 Sydney, Australia
Ph: +61 2 9529 2355 • Fax: +61 2 9529 9726

Array Receiver TEM for Intelligent Surveys

Perform simultaneous data acquisition over large areas with an unlimited number of intelligent, cable-less ARTEMIS array receivers.It's now possible!!

- Configure multiple receivers in a linear or 2D array & record simultaneously in the same noise background
- Control & display by standard notebook PC
- Records magnetic ("B") field & transient voltage
- Superior noise rejection
- Eliminates common-mode problems associated with cable connected receivers
- Light-weight and very compact receiver. Measures only 45cm x 45cm x 10cm thick.
- Higher spatial resolution

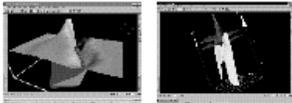
www.geoinstruments.com.au or email artemis@geoinstruments.com.au

EMIGMA for WINDOWS 95/98/NT

Sophisticated Interpretation Tools for the practicing Geoscientist

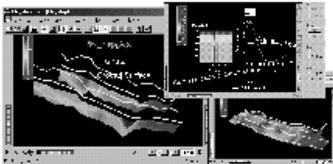
3D Interpretation Software for EM, IP and Magnetics

comprehensive data representation and simulation platform. Includes data imports, 3D visualization, contouring, pseudosections



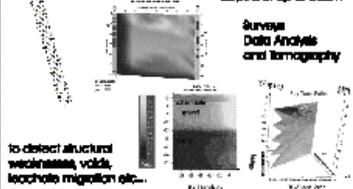
Depth Section Processing

For ground or airborne EM data, including velocity-depth transformations and TD inversion



X-hole RIM Technology

3m RWMA antenna: 1 kHz-1.5 MHz



Purchase or lease EMIGMA at very competitive prices contact our geophysical expertise and modelling services

PetRos Eikon Inc
Leader in electromagnetic and magnetic imaging
617 Nipling Road, Milton, ON L1T 2E3 Canada
Tel: (905) 669-1914 Fax: (905) 663-1918
E-mail: PetRosEikon@compuserve.com
Web Site: <http://www.petros.com/homepages/PetRosEikon>

Geophysical Instrument Rental

Phone: 800-272-0301, Fax: 409-396-6524

Reflection & Refraction Seismographs & Accessories
Magnetometers
Ground Conductivity Meters
Ground Resistivity Meters
Ground Penetrating Radar

B.R. Jones Instrument Company

OSR @ CR 351, Normangee, Texas 77871

Geophysical Contracting & Consulting Services

Geotechnical Engineering, Environmental Site Assessment, Groundwater Exploration

Acquisition, Processing & Interpretation Capabilities

- Seismic Reflection, Refraction, Tomography
- Time & Frequency Domain EM
- Resistivity & Induced Polarization
- Gravity & Magnetics
- Vibration Monitoring
- P-S Logging



Blackhawk Geophysics

GE Division

Borehole Geophones

Motorized clamp
Compass oriented

Wall-lock geophones for downhole P- and S-wave surveys to 300 meter depths or more. Positive, rugged and reliable motor-driven clamp mechanism. Available with flux gate compass servo orientation of horizontal sensors. Boreholes from 50 to 450 mm.



Rollalong Switches

12 to 144 channels
Rugged, compact
and light

Rollalong switches for all size reflection surveys. Up to 264 group input and 144 channel output for deep reflection surveys. Economical, compact units for 12, 24 and 48 channel seismographs for shallow reflection surveys.

GEOSTUFF

19623 Via Escuela Drive
Saratoga, California 95070 USA
phone 408-867-3792
fax 408-867-4900

LAND Engineering and Environmental AIRBORNE

Geophysical Surveys

MARINE BOREHOLE

Geophex, Ltd.
605 Mercury Street, Raleigh, NC 27603
Tel: (919) 839-8515 or Fax (919) 839-8528
email: geophex@geophex.com; website: www.geophex.com

New!

METAL DETECTOR

EM61-HH

The EM61-HH Metal Detector is a "hand-held" complement to the popular EM61, designed to provide greater sensitivity to smaller targets at shallow depths.

Applications of the EM61-HH Metal Detector include the detection of:



- unexploded ordnance (UXO)
- utilities/pipelines
- engineering structures, such as reinforced concrete foundations and supports
- construction debris
- industrial waste
- environmental hazards, such as drums, waste containers and underground storage tanks

For product information, or purchase or rental inquires, please contact:

GEONICS LIMITED

176 Meyerside Dr., Unit 8
Mississauga, Ontario,
CANADA L5T 1G5
Tel: (905) 670-9680 Fax: (905) 670-9204
E-mail: geonics@sympatico.ca
URL: <http://www.geonics.com>





Environmental and Engineering Geophysical Society

10200 W 44th Ave Ste 304
Wheat Ridge CO 80033-2840
303-422-7905 FAX 303-422-8894
<<http://www.eegs.org>>
<eegs@resourcenter.com>

Canada Post Publication Agreement #: 1583999

Address Correction Requested

PRESORT STD
US POSTAGE
PAID
Permit #77
Wheat Ridge, CO

Calendar of Events

February 20-24, 2000

SAGEEP 2000

Arlington, Virginia

<http://www.sageep.com>

Jeff Wynn, General Chair, jwynn@usgs.gov

March 13-15, 2000

Northeast GSA Meeting

New Brunswick, New Jersey

<http://www-rci.rutgers.edu/~geolweb/negsa.html>

April 9 – 12, 2000

Seismological Society of America 95th

Annual Meeting

San Diego, California

<http://www.ssay2k.ucsd.edu>

May 1 – 4, 2000

Offshore Technology Conference 2000

Houston, Texas

<http://www.otcnet.org>

May 23 – 26, 2000

GPR 2000

Queensland, Australia

<http://www.cssip.uq.edu.au/gpr2000>

August 6-11, 2000

SEG Annual Meeting

Calgary, Canada

September 17-26, 2000

Karst 20000

Marmaris, Turkey

<http://www.karst.hun.edu.tr>

October 15-18, 2000

GSA Annual Meeting

Boston, Massachusetts

(303) 447-2020

December 11-15, 2000

International Conference on Application of
Geophysical Technologies to Planning,
Design, Construction, and Maintenance of
Transportation Facilities

St. Louis, Missouri

<http://www.fhwa.dot.gov/bridge/geophys.htm>

Advertisers Index

| | |
|--|-------|
| Blackhawk Geometrics | 14 |
| BR Jones Geophysical | |
| Instrument Rental | 14 |
| Dualem, Inc | 4 |
| Geo Instruments | 14 |
| Geonics, Ltd. | 15 |
| Geophex | 15 |
| Geostuff | 15 |
| Intelligent Resources — Rayfract | 6 |
| Interpex | 8 |
| MÅLA Geoscience | 7 |
| PetRos EiKon, Inc. | 14 |
| Saga Geophysics, Inc. | 10 |
| Scintrex | 9, 12 |
| Sensors and Software | 13 |