The Environmental and Engineering Geophysical Society

Fast TIMES

The EEGS Newsletter

February, 2000

President's Message

Phil Sirles
President, EEGS

In This Issue

"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…

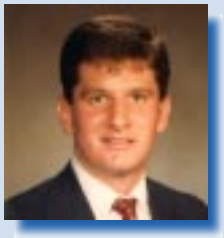
attend a webcentric annual convention this year. Instead, I will attend the premier conference of a society that promotes "…a common aim…"; which is, the mission statement of this society (look for it elsewhere in this newsletter)!

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?!



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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.

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From the Editor

Ronald Kaufmann

As you read this February issue of *FastTimes*, 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.*

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.

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[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.

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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

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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 re-invigorate 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

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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).

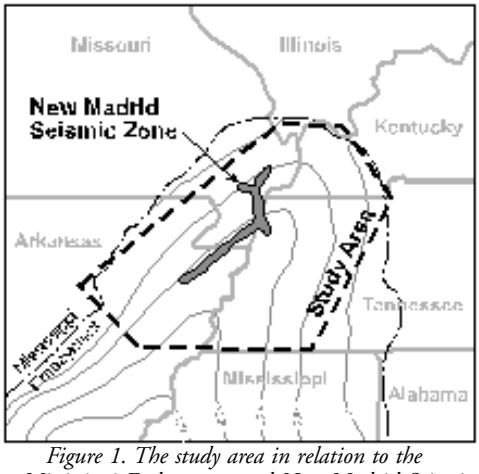

Figure 1. The study area in relation to the Mississippi Embayment and New Madrid Seismic Zone. The poorly consolidated sediments are in excess of 1 km in some parts of the study area.

Soil Type	General Description	Ave. V_s (m/s)
A	Hard rock	>1525
B	Rock	760 - 1525
C	Very dense soil and soft rock Most gravels	360 - 760
D	Stiff soil Some gravels	180 - 360
E_1	Soft soil (thickness >10.7m) Soft clay, Plastic silt	<180
E_2	Soft soil (thickness >10.7m) Liquefiable soil	<180
F	Soils susceptible to failure	Site specific modeling

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

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, 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.

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.

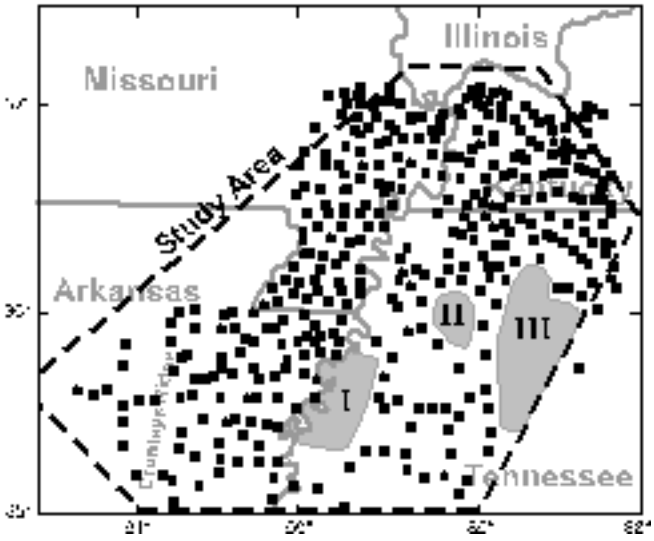

Figure 2 (Right). Approximately 400 SH-wave soundings have been performed in the Upper Mississippi embayment since 1990. Sites predominantly fall into Site Class D. A few Site Class C sites in western Kentucky and near the edges of the embayment, as well as scattered Site Class E sites adjacent to the 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.

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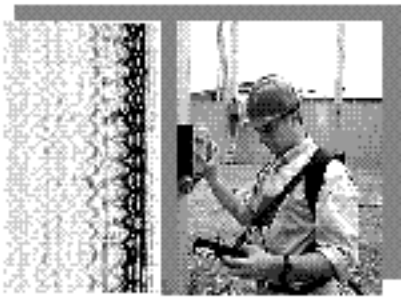

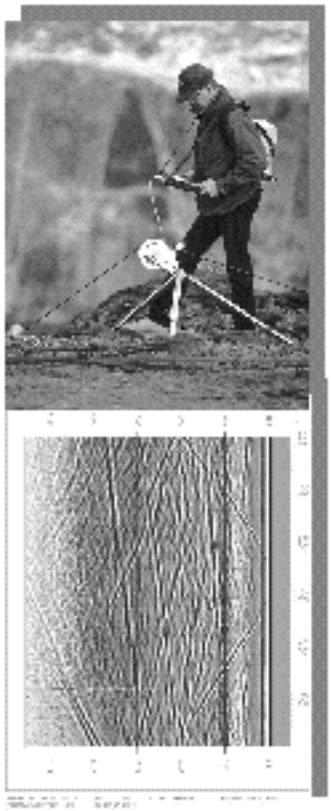

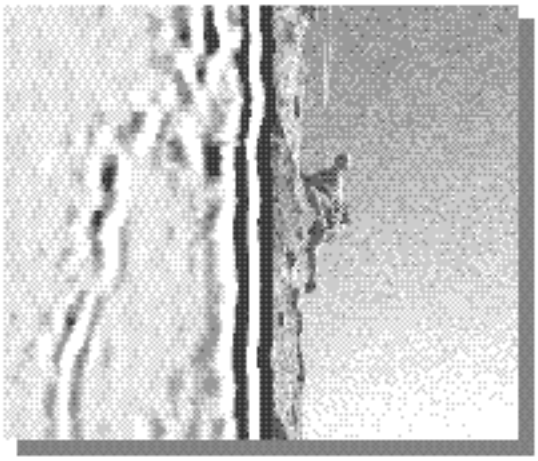

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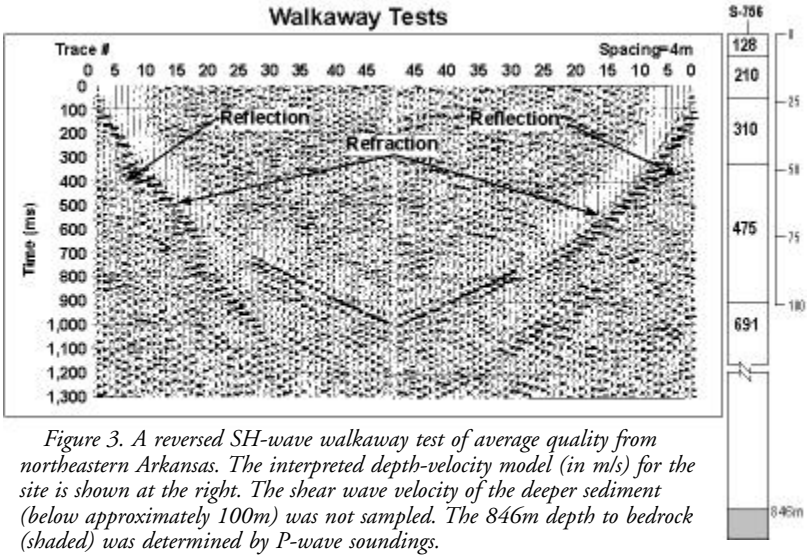


Figure 3. A reversed SH-wave walkaway test of average quality from northeastern Arkansas. The interpreted depth-velocity model (in m/s) for the site is shown at the right. The shear wave velocity of the deeper sediment (below approximately 100m) was not sampled. The 846m depth to bedrock (shaded) was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

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.

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.

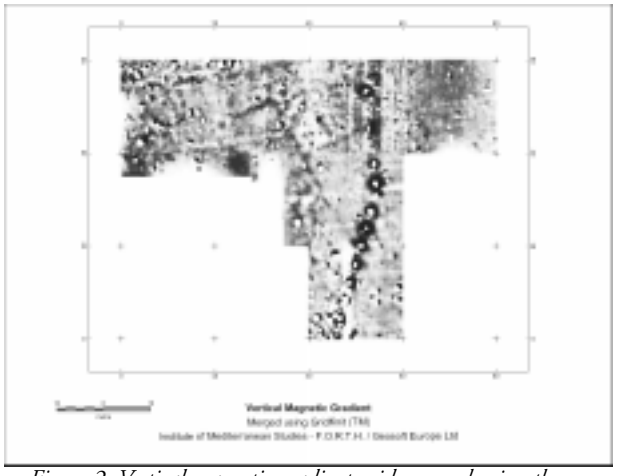


Figure 2. Vertical magnetic gradient grids merged using the GridKnit™ Suturing technique.

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.

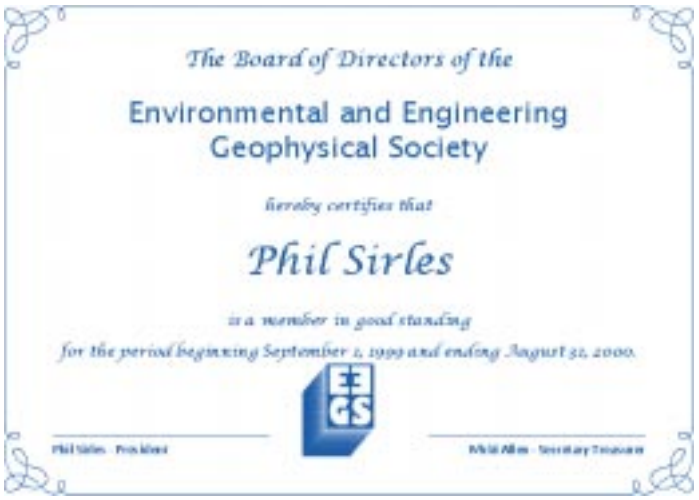
Digital Photo Fun

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.

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.

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303-422-7905 FAX 303-422-8894
<http://www.eegs.org>
<eegs@resourcenter.com>
Canada Post Publication Agreement #: 1583999
Address Correction Requested

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

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