

# **GPR 2002 Final Program**

(text only)

Welcome to the Ninth International Conference on Ground Penetrating Radar (GPR 2002) in Santa Barbara, California, USA, at the Radisson Hotel Santa Barbara.

GPR 2002 is a biennial series of international scientific symposia devoted to the development of ground penetrating radar. The conference presents the most recent technical information and case studies on ground penetrating radar for engineers, scientists, and end users.

The Conference Proceedings contains 131 papers from 21 countries that will be presented in oral and interactive poster sessions.

There will be a Special Session with a Panel Discussion on “The New Regulatory Environment for GPR” where the latest information on the FCC/NTIA rulings on wideband systems will be discussed.

The conference has received generous sponsorship from four organizations: GroundProbe, Sensors & Software, Inc., Mala Geoscience, and Geophysical Survey Systems, Inc. In addition to contributing valuable funds to ensure a successful conference, the active involvement of the sponsors at GPR2002 has demonstrated the importance that GPR technology now plays in solving geophysical and geotechnical problems.

Conference contact information:

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## **GPR 2002 Organization**

Executive Committee:

General Chair:

Steven Koppenjan

Co-Chair:

Hua Lee

Technical Review Panel:

Team Leader:

Michael Powers, USA

Panel:

Robert Freeland, USA

Duane Gardner, USA

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## **SUNDAY, APRIL 28**

### **TUTORIAL REGISTRATION**

8:00 - 8:30 a.m.

### **TUTORIAL 1 - Introduction to GPR**

8:30 a.m. - 5:00 p.m. El Cabrillo Room

Presenter: Dr. Peter Annan  
Sensors & Software (Canada)

8:30 - 10:00 Tutorial 1  
10:00 - 10:20 Morning Break  
10:20 - 12:00 Tutorial 1 (cont)  
12:00 - 1:15 Lunch  
1:15 - 3:00 Tutorial 1 (cont)  
3:00 - 3:30 Afternoon Break  
3:30 - 5:00 Tutorial 1 (cont)

### **TUTORIAL 2 - Three-Dimensional Acquisition, Processing, and Imaging of GPR data**

8:30 a.m. - 5:00 p.m. La Cantina Room

Presenters: Swiss Federal Institute of Technology (ETH)  
Alan Green Heinrich Horstmeyer  
Klaus Holliger Jens Tronicke  
Hansruedi Mauer Jan van der Kruk

8:30 - 10:00 Tutorial 2  
10:00 - 10:20 Morning Break  
10:20 - 12:00 Tutorial 2 (cont)  
12:00 - 1:15 Lunch (El Cabrillo room)  
1:15 - 3:00 Tutorial 2 (cont)  
3:00 - 3:30 Afternoon Break  
3:30 - 5:00 Tutorial 2 (cont)

**2:00 - 7:00 Conference Registration**  
Foyer of the El Cabrillo Room

**6:00 - 7:30 Opening Cocktail Reception**  
El Cabrillo Room

## MONDAY, APRIL 29

### CONFERENCE REGISTRATION

8:00 - 8:50 a.m. Foyer of the El Cabrillo Room

### SPECIAL SESSION 1

8:50 - 9:50 El Cabrillo Room

*Chair: Steven Koppenjan, Bechtel Nevada, Special Technologies Laboratory, USA*

8:50 - 9:00 Welcome Address  
*Steve Koppenjan, General Chair*

9:00 - 9:20 **Sponsor/Exhibitor Introductions** (2 minutes each)

*GroundProbe*  
*Sensors & Software Inc.*  
*Mala Geoscience*  
*Geophysics Survey Systems, Inc.*  
*Parallel Geoscience Corporation*  
*Geophysical Archaeometry Laboratory*  
*IDS Electronics*  
*Roadscanners*

9:20 - 9:40 Miniature ground penetrating radar for planetary subsurface characterization: preliminary field test results  
*Soon Sam Kim, Steven R. Carnres, Narayan R. Mysoor, Christopher T. Ulmer, and Raymond Arvidson [pg 1]*

### Poster Highlight

9:40 - 9:50 Ground-penetrating radar soil suitability map of the conterminous United States  
*James A. Doolittle, Fred E. Minzenmayer, Sharon W. Waltman, and Ellis C. Benham [pg 7]*

9:50 - 10:10 Morning Break

### POSTER SESSION 1

10:10 - 12:00 El Cabrillo Room

*Chair: Duane Gardner, Bechtel Nevada, Special Technologies Laboratory, USA*

10:10 - 10:50 **Poster Introductions** (2 minutes each)

10:50 - 12:00 **Poster Viewing**

1. Stratigraphic profiling of Antarctic firn with 400-MHz GPR at 1500 ns  
*Steven A. Arcone [pg 433]*

2. Characterization of a tropical ice body on Iztaccíhuatl volcano, Mexico  
*Román Alvarez and Hugo Delgado* [pg 438]
3. The detection of forensic burials in Florida using GPR  
*John J. Schultz, Anthony B. Falsetti, Mary E. Collins, Steven Koppenjan, and Michael W. Warren* [pg 443]
4. Resonance of input impedance of bow-tie antenna placed on ground surface  
*Fan-Nian Kong* [pg 449]
5. The influence of antenna configurations on 2-D GPR data. Information from polarization and amplitude measurement  
*P. Lutz, H. Perroud, and S. Garambois* [pg 454]
6. Characterization of agricultural contaminant transport using ground penetrating radar and electrical data  
*P. Sénéchal, H. Perroud, and A.C.M. Bourg* [pg 460]
7. Water detection in the Martian subsurface  
*E. Heggy, P. Paillou, F. Demontoux, G. Ruffié, and G. Grandjean* [pg 466]
8. The integration of ground-penetrating radar and downhole soil moisture data to map the thickness and continuity of landfill capping  
*Tony S. Faulkner, Philip C. Mill, and Kyle T. Moyle* [pg 471]
9. Mapping golf green drainage systems and subsurface features using ground penetrating radar  
*R. Boniak, S.K. Chong, S.J. Indorante, and J.A. Doolittle* [pg 477]
10. GPR imaging of a turbidite outcrop in Almada Basin (Brazil)  
*J.M. Travassos, M.A.R. Ceia, and A. Abel G. Carrasquilla* [pg 482]
11. Application of GPR to ornamental rock quarry  
*Paula L.F. da Rocha, Maracelo M. dos Anjos, Carlos J. de Abreu, Henrique Lorenzo, Adriano Caranassos, and Rinaldo Marques* [pg 487]
12. Imaging karstic structures with GPR along a motorway under construction  
*Sophie Geraads and Gildas Omnes* [pg 493]
13. A novel GPR system for high resolution inspection of walls and structures  
*Antonio Sarri, Guido Manacorda, and Mario Miniati* [pg 498]
14. Improved optical positioning for GPR based structure mapping  
*Kyle Doerksen* [pg 503]
15. Application possibilities of super resolution technique for GPR imaging  
*Shanker Man Shrestha, Ikuo Arai, and Takashi Miwa* [pg 508]

16. Numerical analysis of surface clutter in GPR scenarios  
*A.G. Yarovoy* [pg 563]
17. Microwave hologram reconstruction for the rascan type subsurface radar  
*V.V. Chapursky, S.I. Ivashov, W.W. Razevig, A.P. Sheyko, and I.A. Vasilyev* [pg 520]
18. Ground-penetrating radar soil suitability map of the conterminous United States  
*James A. Doolittle, Fred E. Minzenmayer, Sharon W. Waltman, and Ellis C. Benham* [pg 7]

12:00 - 1:15 Lunch - Vista Mar Monte Room

**Borehole Radar - 3D Imaging** [pg 13]

1:15 - 3:00 El Cabrillo Room

Chair: Jan van der Kruk, ETH, Switzerland

- 1:15 - 1:35 Basalt-flow imaging using a high-resolution directional borehole radar  
*Craig W. Moulton, David L. Wright, S.Raymond Hutton, David vonG. Smith, and Jarad D. Abraham*
- 1:35 - 1:55 Interferometric borehole radar system  
*Kazunori Takahashi, Sixin Liu, and Motoyuki Sato*
- 1:55 - 2:15 A directional borehole radar for three-dimensional imaging  
*K.W.A. van Dongen, P.M. van den Berg, and J.T. Fokkema*
- 2:15 - 2:35 A slimline borehole radar for in-mine use  
*Declan Vogt*
- 2:35 - 2:55 Borehole radar imaging in three-dimensions  
*N. Osman, I. Mason, G. Turner, and E. Wedepohl*

**NDT – Geotechnical** [pg42]

1:15 - 3:00 La Cantina Room

Chair: Lanbo Liu, University of Connecticut, USA

- 1:15 - 1:35 Development of material properties for railway application of ground penetrating radar  
*Theodore R. Sussmann, Katherine R. O'Hara, and Ernest T. Selig*
- 1:35 - 1:55 Ground penetrating radar evaluation of railway track substructure conditions  
*G.R. Olhoeft and E.T. Selig*
- 1:55 - 2:15 Non-destructive evaluation of soil hardness using elevated focused-beam radar  
*Matthew B. Higgins and Chi-Chih Chen*

- 2:15 - 2:35 Imaging tree root system in situ  
*Lucian Wielopolski, George Hendry, Michael McGuigan, and Jeff Daniels*
- 2:35 - 2:55 GPR investigations to reconstruct the geometry of the wooden structures in historical buildings  
*M. Lualdi and L. Zanzi*

3:00 - 3:30 Afternoon Break

**Antennas** [pg 68]

3:30 - 5:00 El Cabrillo Room

Chair: Duane Gardner, Bechtel Nevada, USA

- 3:30 - 3:50 Radiation pattern of a borehole radar antenna  
*Karl J. Ellefsen and David L. Wright*
- 3:50 - 4:10 GPR antenna simulations in time domain  
*A.G. Yarovoy, G. Mur, and L.P. Ligthart*
- 4:10 - 4:30 Characterization of transient bow-tie antennas for ground penetrating radar  
*A.A. Lestari, A.G. Yarovoy, and L.P. Ligthart*
- 4:30 - 4:50 Analysis of antennas for step-frequency ground penetrating radar  
*V. Mikhnev, Y. Maksimovitch, and P. Vainikainen*

**Archaeological Applications** [pg 91]

3:30 - 5:00 La Cantina Room

Chair: Robert Freeland, Univ. of Tennessee, USA

- 3:30 - 3:50 Archaeological GPR investigation at Reenes-Le-Château, France  
*H.M. Jol, R.J. DeChaine, and R. Eisenman*
- 3:50 - 4:10 Imaging the past: archaeological radar stratigraphic analysis at Mahram Bilqis  
*B.J. Moorman, J.-M. Maillol, J.L. Williams, F.S. Walter, and W.D. Glanzman*
- 4:10 - 4:30 Barcombe Roman villa: an exercise in GPR time slicing and comparative geophysics  
*Erica Utsi and Amir Alani*
- 4:30 - 4:50 3D imaging of an iron age archaeological site: GPR analysis at Muweilah, United Arab Emirates  
*R. Evangelista, P. Magee, and E. Wedepohl*

## TUESDAY, APRIL 30

### SPECIAL SESSION 2

8:30 - 9:20 El Cabrillo Room

Chair: Hua Lee, University of California, Santa Barbara, USA

8:30 - 8:50 The new ground penetrating radar regulatory environment  
*G.R. Olhoeft* [pg 115]

8:50 - 9:20 Automatic 3-dimensional mapping of features using GPR  
*W. Al-Nuaimy, H. Lu, S. Shihab, and A. Ericksen* [pg 121]

### Poster Highlight

9:10 - 9:20 GPR investigations at Qumran, Israel: site of the Dead Sea Scrolls discovery  
*H.M. Jol, M. Broshi, H. Eshel, R.A. Freund, J.F. Shroder, Jr., P. Reeder, and R. Dubay* [pg 125]

9:20 - 9:50 Morning Break

### POSTER SESSION 2

9:50 - 12:00 El Cabrillo Room

Chair: Duane Gardner, Bechtel Nevada, Special Technologies Laboratory, USA

9:50 - 10:30 Poster Introductions (2 minutes each)

10:30 - 12:00 Poster Viewing

1. Ground-based radar, close-range photogrammetry and digital terrain data applied together to archaeological heritage documentation  
*H. Lorenzo, P. Arias, M.C. Hernández, S. Álvarez, and T. Teixeira* [pg 527]
2. Forensic application of sweep-frequency and impulse GPR  
*Robert S. Freeland, Ronald E. Yoder, Michelle L. Miller, and Steven K. Koppenjan* [pg 533]
3. Searching for concealed human remains using GPR imaging of decomposition  
*Michelle L. Miller, Robert S. Freeland, and Steven K. Koppenjan* [pg 539]
4. Ground water monitoring by GPR in Mongolia  
*Qi Lu, Motoyuki Sato* [pg 545]
5. 3-D estimation of target positions with borehole radar using E-field sensor array  
*S. Ebihara and M. Sato* [pg 551]
6. Characteristic features of radar detection of boundary between two dispersive media having minimum electrical contrast  
*N. Chubinsky, A. Krampuls, and O. Shishkova* [pg 558]

7. Electric field integral equation model for transient GPR antennas  
*A.A. Lestari, A.G. Yarovoy, and L.P. Lighthart* [pg 567]
8. An optimized bowtie antenna for pulsed low frequency ground penetrating radar  
*M. Birch and K.D. Palmer (Wessel J.A. von Brakel)* [pg 573]
9. Amplitude and waveform analysis of repetitive GPR reflections: a Lake Bonneville delta, Utah  
*Sarah E. Kruse and H.M. Jol* [pg 285]
10. Application of music algorithm for imaging point reflectors near transmitting and receiving array  
*Takashi Miwa and Ikuo Arai* [pg 583]
11. Application of 3D GPR plots to interpreting distribution of paint pigment contamination  
*Jutta Hager and Mario Carnevale* [pg 590]
12. A new pseudo-3D GPR data method for hydraulic conductivity estimation over an unconfined aquifer  
*Erwan Gloaguen, Michel Chouteau, and Denis Marcotte* [pg 595]
13. Estimating hydrogeologic parameters from radar data  
*Charles T. Young* [pg 601]
14. Suitability of GPR for characterizing variably saturated sediments during transient flow  
*Michael B. Kowalsky, Yoram Rubin* [pg 605]
15. Advanced processing of crosshole radar-tomographic data: inversion of partial data sets and error analysis  
*A. Becht, E. Appel, and P. Dietrich* [pg 609]
16. GPR rapid survey system for small diameter tunnels  
*Eiji Sakurada and Masaharu Inagaki* [pg 614]
17. A high frequency penetrating radar for masonry investigation  
*Massimiliano Pieraccini, Guido Luzi, Daniele Mecatti, Linhsia Noferini, and Carlo Atzeni* [pg 620]
18. A case study-GPR testing of Shanghai historical bank building  
*Xiongyao Xie, Yonghui Zhao, and Chen Wang* [pg 625]
19. GPR investigations at Qumran, Israel: site of the Dead Sea Scrolls discovery  
*H.M. Jol, M. Broshi, H. Eshel, R.A. Freund, J.F. Shroder, Jr., P. Reeder, and R. Dubay* [pg 125]

12:00 - 1:15 Lunch - Vista Mar Monte Room

## **Hydrogeological Applications** [pg 156]

1:15 - 3:00 El Cabrillo Room

Chair: David vonG Smith, U.S. Geological Survey

- 1:15 - 1:35 Field studies of GPR air launched surface reflectivity measurements of soil water content  
*J.D. Redman, J.L. Davis, L.W. Galagedara, and G.W. Parkin*
- 1:35 - 1:55 Mapping surface soil water content with the ground wave of ground-penetrating radar  
*J.A. Huisman and W. Bouten*
- 1:55 - 2:15 Combining crosshole georadar velocity and attenuation tomography for site characterization: a case study in an unconsolidated aquifer  
*J. Tronicke, H. Paasche, K. Holliger, and A.G. Green*
- 2:15 - 2:35 Measuring the advance of a wetting front using cross borehole GPR  
*Dale F. Rucker and Ty P.A. Ferré*
- 2:35 - 2:55 Temporal and spatial variation of soil water content measured by borehole GPR under irrigation and drainage  
*L.W. Galagedara, G.W. Parkin, J.D. Redman, and A.L. Endres*

## **Data and Image Processing** [pg 130]

1:15 - 3:00 La Cantina Room

Chair: Klaus Holliger, ETH, Switzerland

- 1:15 - 1:35 Synthetic-aperture GPR imaging with pulse-echo and step frequency FMCW systems  
**Hua Lee**
- 1:35 - 1:55 Neural network target identifier based on statistical features of GPR signals  
**S. Shihab**, W. Al-Nuaimy, Y. Huang, and A. Eriksen
- 1:55 - 2:15 Automatic target detection in GPR data  
**W. Al-Nuaimy**, Y. Huang, S. Shihab, and A. Eriksen
- 2:15 - 2:35 Effective source wavelet determination  
**Jan van der Kruk** and Evert Slob
- 2:35 - 2:55 Multicomponent imaging of different objects with different strike orientations  
**Jan van der Kruk**, J.H. Zeeman, and J. Groenenboom
- 3:00 - 3:30 Afternoon Break

## **Radar Systems and Technology** [pg 186]

3:30 - 5:00 El Cabrillo Room

Chair: David Noon, Univ. of Queensland, Australia

3:30 - 3:50 Efficient large-scale underground utility mapping in New York City using a multi-channel ground-penetrating imaging radar system

*Ralk Birken, Douglas E. Miller, Maclyn Burns, Paul Albats, Robert Casadonte, Ross Deming, Tony Derubeis, Thorkild Hansen, and Michael Oristaglio*

3:50 - 4:10 3D utility mapping using electronically scanned antenna array

*Egil S. Eide and Jens F. Hjelmstad*

4:10 - 4:30 The ground penetrating radar of the Netlander mission

*R. Ney, J.J. Berthelier, V. Ciarletti, B. Martinat, M. Hamelin, M. Rodriguez-Cassola, F. Dolon, S. Bonaime, A. Reineix, D. Nevejans, C. Duvanaud, F. Costard, and P. Paillou*

4:30 - 4:50 A dynamically configurable GPR data acquisition and display application

*A. Wallis, A. Langman, and M.R. Inggs*

## **Geological Applications** [pg 207]

3:30 - 5:00 La Cantina Room

Chair: James Doolittle, USDA, USA

3:30 - 3:50 Geological mapping using GPR and differential GPS positioning - a case study

*J. Aaltonen and J. Nissen*

3:50 - 4:10 Reassessment of local paleocurrent directions in the Miami oolitic limestone with 3-D ground-penetrating radar

*Mark Grasmueck and Ralf Weger*

4:10 - 4:30 Subsurface imaging with low frequency SAR, field validation in France and Egypt using a ground-penetrating radar

*G. Grandjean, Ph. Paillou, N. Baghdadi, E. Heggy, Th. August, and J. Achache*

4:30 - 4:50 3-D georadar surveying in areas of moderate topographic relief

*B. Heincke, T. Spillmann, H. Horstmeyer, and A.G. Green*

## **BUSINESS MEETING**

5:30 - 6:00 p.m. The Gazebo of the El Cabrillo Room

Agenda – Bid Presentations to host GPR 2004 Conference (10 minutes each)

## WEDNESDAY, MAY 1

### SPECIAL SESSION 3 - PANEL DISCUSSION

8:30 - 9:40 El Cabrillo Room

Chair: Gary Olhoeft, Colorado School of Mines, USA

Topic: **The New Regulatory Environment for GPR**

Panel Members:

Glen Stickley (Australia), Peter Annan (Canada), Richard Chignell (UK), Alan Schutz (USA), David Wright (USA)

9:40 - 9:45 GPR 2004 Venue Announcement

9:45 - 10:10 Morning Break

### POSTER SESSION 3

10:10-12:00 El Cabrillo Room

Chair: Duane Gardner, Bechtel Nevada, Special Technologies Laboratory, USA

10:10 - 10:50 Poster Introductions (2 minutes each)

10:50 - 12:00 Poster Viewing

1. A back propagation neural network for identifying first-break times on cross borehole ground penetrating radar traces  
*Dale F. Rucker, Ty P.A. Ferré, and Mary Poulton* [pg 630]
2. Unsupervised segmentation of subsurface radar images  
*W. Al-Nuaimy, Y. Huang, S. Shihab, and A. Eriksen* [pg 635]
3. An algorithm for estimating the object depth accurately by ground-penetrating radar  
*Anxue-Zhang, Yansheng-Jiang, and Wenbing-Wang* [pg 639]
4. A polarimetric model for a stepped frequency continuous wave ground penetrating radar  
*A. Langman and M.R. Inggs* [pg 645]
5. Automatic GPR target detection and clutter reduction using neural network  
*Hyoung-Sun Youn and Chi-Chih Chen* [pg 579]
6. A novel method of plastic landmine radar detection  
*N. Chubinsky and A. Krampuls* [pg 657]
7. Near-range phase-based detection of small subsurface objects and characterization of local rough surfaces with bistatic wide-beamwidth antennas  
*B. Sai and L.P. Ligthart* [pg 662]

8. An array of phase-shifted transmitters for GPR purposes  
*P. Lutz, H. Perroud, J.B. Daban, and E. De Bazelaire* [pg 669]
9. Searching out mammoth remains in permafrost (Taimyr, Siberia) using ground-penetrating radar  
*Gilles Grandjean, Christian De Marliave, Bernard Buigues, Dick Mol, and Gilles Ruffie* [pg 675]
10. Airborne ice thickness surveys using pulse radar and stepped frequency radar - possibilities and constraints  
*V. Damm, D. Eisenburger, M. Jenett, and H. Lentz* [pg 679]
11. Application of ground penetrating radar in placer mining, a case study from Guyana's Potaro Region  
*Csaba Ékes, Adrian Hickin, Paul Matysek, and Eric Kinnan* [pg 685]
12. GPR assessment of creep-fault induced damage in urban areas  
*D. Ibáñez-Garduño, R. Alvarez, V.H. Garduño-Monroy, I. Israde-Alcantara, and E. Arreygue-Rocha* [pg 691]
13. GPR radar imaging of water table, salty water and sand stratigraphy in a coastal zone in Rio de Janeiro  
*T. Teixeira, H. Lorenzo, A. da Costa, and P. Arias* [pg 697]
14. Cross-hole geo-radar monitoring for moisture distribution and migration in soil beneath an infiltration pit: a case study of an artificial groundwater recharge test in Niigata, Japan  
*Seiichiro Kuroda, Hiroomi Nakazato, Satoshi Nihira, Motoharu Hatekeyama, Mutsuo Takeuchi, Masato Asano, Yoshinori Todoroki, and Michiaki Konno* [pg 703]
15. GPR experimental evaluation of subgrade soil characteristics for rehabilitation of roads  
*A. Benedetto and F. Benedetto* [pg 708]
16. Applying a wavenumber notch filter to remove interferences caused by railway sleepers from a GPR section  
*Sophie Geraads, Bruno Charachon, Olivier Loeffler, and Gildas Omnes* [pg 715]
17. A customized GPR system for railroad tracks verification  
*Guido Manacorda, Davide Morandi, Antonio Sarri, and Giuseppe Staccone* [pg 719]
18. Resolution of GPR bow-tie antennas  
*S.G Millard, A. Shaari, and J.H. Bungey* [pg 724]

12:00 - 1:30 Lunch - Vista Mar Monte Room

## **GPR Field Demonstrations**

1:30 - 4:00 Dwight Murphy Park (Exit the Radisson towards the mountain side)

## **Conference Banquet**

5:00 - 6:00 Shuttle bus to El Paseo Restaurant

Catch the Santa Barbara Airbus Shuttle just outside of the conference meeting area and towards the east corner of the Radisson. The bus will make the trip continuously from 5:00 to 10:00 pm (roundtrip time approximately 20 minutes). Your name badge is your ticket for the ride. You can also take the State Street shuttle, get off at the 800 block or enjoy a pre-dinner walk along the beach and up State Street. Dinner ticket is behind the name badge. Happy hour drinks will be served from 5:30 pm to 7:00 pm.

6:00 - 10:00 **El Paseo Restaurant**, in the El Paseo Court, 800 block of State Street

Dinner will start at 7:00 pm and feature a full buffet of Santa Barbara style Mexican cuisine including a taco bar with fresh hand-made tortillas, tri-tip, halibut VeraCruz and enchiladas.

The El Paseo Restaurant was first built in 1922 as part of an 1826 adobe complex which housed the Commandante of the Presidio Royale de Santa Barbara. La Casa de la Guerra was home of the civilian governor of the Central Coast area. It was a natural setting for galas, including the three-day wedding fiesta immortalized by Richard Henry Dana in *Two Years Before the Mast*.

## THURSDAY, MAY 2

### **Data Display and Interpretation** [pg 251]

8:30 - 9:55 El Cabrillo Room

Chair: Alan Langman, Univ. of Cape Town, South Africa

8:30 - 8:50 Advances in directional borehole radar data analysis and visualization

*David vonG. Smith and Philip J. Brown II*

8:50 - 9:10 Enhanced target imaging in 3-D using GPR data from orthogonal profile lines

*Roger Roberts and David Cist*

9:10 - 9:30 Better time picks = better travel times = better velocities; progress in developing public domain software

*John F. Hermance and Rabi N. Bohidar*

9:30 - 9:50 GPR time slice images of the villa of Emperor Trajanus, Arcinazzo, Italy (a.d. 52-117)

*D. Goodman, S. Piro, and Y. Nishimura*

### **UXO / Mine Detection** [pg 228]

8:30 - 9:55 La Cantina Room

Chair: Chi-Chih Chen, Ohio State Univ., USA

8:30 - 8:50 Evolution of buried UXO classification using broadband, fully polarimetric GPR

*Chi-Chih Chen, Matthew B. Higgins, and Kevin O'Neill*

8:50 - 9:10 Radar response approximations for buried plastic landmines

*Friedrich Roth, Piet van Genderen, and Michel Verhaegen*

9:10 - 9:30 An ultra high frequency radar sensor for humanitarian demining tested on different scenarios in 3D imaging mode

*L. Zanzi, M. Lualdi, H.M. Braun, W. Borisch, G. Trilzsch*

9:30 - 9:50 Full-polarimetric video impulse radar for landmine detection

*A.G. Yarovoy, L.P. Ligthart, A.D. Schukin, and I.V. Kaploun*

9:55 - 10:20 Morning Break

**Sedimentology/Environmental Applications** [pg 302]

10:20 - 12:00 El Cabrillo Room

Chair: Harry Jol, Univ. of Wisconsin-Eau Claire, USA

10:20 - 10:40 A field study of GPR attenuation rates in natural and contaminated silt  
*Steve A. Arcone and Allan J. Delaney*

10:40 - 11:00 Sandy till characterized by ground penetrating radar  
*Ingelise Moller and Peter R. Jakobsen*

11:00 - 11:20 Integration of ground penetrating radar, global positioning systems, and geographic information systems to create three-dimensional soil models  
*M. Tischler, M.E. Collins, S. Grunwald*

11:20 - 11:40 A comparison of ground-penetrating radar facies and sediment characteristics in a pleistocene push moraine in the Netherlands  
*M.A.J. Bakker and J.J.M. van der Meer*

11:40 - 12:00 Characterization of an aquitard and direct detection of LNAPL at Hill Air Force Base using GPR AVO and migration velocity analyses  
*Jake Deeds and John Bradford*

**Numerical Modeling** [pg 273]

10:20 - 12:00 La Cantina Room

Chair: Alex Yarovoy, Delft Univ. of Technology, Netherlands

10:20 - 10:40 Numerical simulation of near-surface GPR in TE and TM modes  
*Lanbo Liu and Steve A. Arcone*

10:40 - 11:00 Efficient calculation of scattering from a buried circular cylinder  
*Thorkild B. Hansen and Peter Meincke*

11:00 - 11:20 Numerical modeling development for characterizing GPR problems  
*Kwan-Ho Lee, N.V. Venkatarayalu, Chi-Chih Chen, Fernando Teixeira, and Robert Lee* [pg 652]

11:20 - 11:40 An electromagnetic model for a stepped-frequency continuous wave ground penetrating radar  
*A. Langman and M.R. Inggs*

11:40 - 12:00 Detecting and classifying of physical and geometrical characteristics of the sub-surface through the use of computing diagnostics method for ground penetrating radar  
*V.N. Sablin, A. Yu. Grinev, and I.A. Chebakov*

12:00 - 1:15 Lunch Vista Mar Monte Room

**NDT – Concrete** [pg 359]

1:15 - 3:00 El Cabrillo Room

Chair: Steven Millard, Univ. of Liverpool, UK

- 1:15 - 1:35 Application of GPR to map concrete to delineate embedded structural elements and defects  
*A.P. Annan, S.W. Cosway, and T. DeSouza*
- 1:35 - 1:55 Review of NDT methods on a weak post-tensioned beam before autopsy  
*X. Dérobert, Ch. Aubagnac Ch., and O. Abraham*
- 1:55 - 2:15 Depth of first detectable defect in a masonry wall using GPR  
*S. Colombo, A. Giannopoulos, and M.C. Forde*
- 2:15 - 2:35 GPR detection of voids in post-tensioned concrete bridge beams  
*Antonios Giannopoulos, Paul Macintrye, Scott Rodgers, and Mike C. Forde*
- 2:35 - 2:55 Application of impulse radar for non-destructive investigation of concrete structures  
*Ch. Maierhofer and Th. Kind*

**Inverse Problems / Tomography** [pg 330]

1:15 - 3:00 La Cantina Room

Chair: Hansruedi Maurer, ETH, Switzerland

- 1:15 - 1:35 Polarimetric borehole radar application for characterizing subsurface structure  
*Motoyuki Sato, Tomohiro Abe, Hui Zhou, and Jung-Woong Ra*
- 1:35 - 1:55 GPR processing using local plane-wave imaging  
*Svein-Erik Hamran, Isabelle Lecomte, and Leiv-J. Gelius*
- 1:55 - 2:15 Effects of random heterogeneities and topographic fluctuations on ground-penetrating radar antenna radiation  
*B. Lampe and K. Holliger*
- 2:15 - 2:35 Processing and inversion of multi-offset and multi-azimuth GPR data for environmental and engineering applications  
*M. Pipan, E. Forte and I. Finetti*
- 2:35 - 2:55 A tomographic approach for imaging targets embedded in a layered medium  
*Lorenzo Crocco, Raffaele Persico, and Francesco Soldovieri*
- 3:00 - 3:30 Afternoon Break

**Borehole Radar – Modeling** [pg 388]

3:30 - 5:00 El Cabrillo Room

Chair: Motoyuki Sato, Tohoku Univ., Japan

- 3:30 - 3:50 Effects of small-scale stochastic heterogeneity on the tomographic inversion of crosshole georadar data  
*K. Holliger and H.R. Maurer*
- 3:50 - 4:10 The effect of wet drilling in Kaolinitic strata on borehole radar performance  
*Wessel J.A. van Brakel, Marius D. van Wyk, Marc Rutschlin, and Johannes H. Cloete*
- 4:10 - 4:30 3D radar response of a karstic zone  
*Bernard Giroux and Michel Chouteau*
- 4:30 - 4:50 Borehole radar imaging from deviating boreholes  
*C.M. Simmat, N. Osman, J.E. Hargreaves, and I.M. Mason*

**Concrete / Pavement Evaluation** [pg 410]

3:30 -5:00 La Cantina room

Chair: Mike Forde, Univ. of Edinburgh, UK

- 3:30 - 3:50 Dielectric property of asphalt pavement specimens in dry, water-saturated, and frozen conditions  
*Lanbo Liu and Tieshuan Guo*
- 3:50 - 4:10 A wide band system for measuring dielectric properties of concrete  
*S.G. Millard, J. David, Y. Huang, and J.H. Bungey*
- 4:10 - 4:30 A simple method for estimation of water content of roadbeds using multi-offset GPR  
*J. Emilsson, P. Englund, and J. Friborg*
- 4:30 - 4:50 A one-to-one comparison between radar results and reality on a concrete bridge  
*Johannes Hugenschmidt*
- 5:00 - 6:30 **Closing Drinks**  
Pool Side, Ocean side of the Radisson

# Conference Information

## CONFERENCE VENUE

All meetings will be held at GPR 2002's official hotel, the Radisson Hotel Santa Barbara. Field demonstrations will be held at Dwight Murphy Park.

Adjacent to Santa Barbara's famous East Beach, and overlooking the harbor, the Radisson offers spectacular ocean views and sunsets. The historic hotel, with its Spanish mission-style arches and courtyards, opened its doors in 1931 to cater to Hollywood celebrities visiting the seaside resort. Today, it hosts business groups and vacationers from all over the globe.

From the hotel, it's an easy walk along the beach (about 1 mile) to Stearn's Wharf and State Street - where down-town meets the beach, at the Dolphin Fountain. There is also a free shuttle service. Stearn's Wharf was built in 1872 and is the oldest operating wharf on the West Coast. This historic area features hundreds of small shops and quaint restaurants as well as a bustling nightlife with numerous bars and clubs that host local bands and entertainers. The upscale Paseo Nuevo Shopping Mall is located 1 mile north on State Street, with large department stores such as Macy's and Nordstrom's and nearby Saks Fifth Avenue.

## LUNCH MENUS

All lunches are included with the conference fee and have been designed to give a flavor of Santa Barbara. Please alert the registration desk or Radisson conference staff if you have a food allergy. Name badges must be worn to gain entry to the Vista Mar Monte room.

Sunday, April 28 (Tutorial attendees only)  
"Santa Barbara Chicken"

Monday, April 29  
"Santa Maria Tri-tip" a specialty of Santa Barbara county.

Tuesday, April 30  
Italian-Mediterranean Buffet

Wednesday, May 1  
A light Chicken Caesar Salad

Thursday, May 2  
The Radisson Santa Barbara Buffet - California cuisine including salad bar, seafood, steak, and chicken.

## **SOCIAL EVENTS**

Name badges of delegates and registered accompanying persons must be worn to gain entry to all social events.

### **Open Cocktail Reception** – El Cabrillo Room

Sunday, April 28, 6:00-7:30 pm

Reacquaint yourself with old friends and meet new delegates over some local “Firestone” microbrew beer or a local Santa Barbara wine, and some light appetizers.

### **GPR Field Demonstrations** – Dwight Murphy Park

Wednesday, May 1, 1:30-4:00 pm

After lunch participate in the outside demonstration of GPR equipment in a park directly behind the Radisson (mountain side). Afternoon snacks and drinks can be purchased at the East Beach Grill, on the beach across the street from the Radisson (ocean side).

### **Conference Banquet** – El Paseo Restaurant

Wednesday, May 1, 6:00-10:00 pm

Come fiesta and dine, Santa Barbara style, at the world famous El Paseo Restaurant. Enjoy some margaritas and a full buffet of Santa Barbara style Mexican cuisine including a taco bar with fresh hand-made tortillas, tri-tip, halibut Vera-Cruz and enchiladas. The dinner ticket is behind the name badge.

Catch the Santa Barbara Airbus Shuttle just outside of the conference meeting area and towards the east corner of the Radisson. The bus will make the trip continuously from 5:00 to 10:00 pm (roundtrip time approximately 20 minutes). Your name badge is your ticket for the ride. You can also take the State Street shuttle, get off at the 800 block or enjoy a pre-dinner walk along the beach and up State Street. For those with cars, there are also several parking lots on the streets parallel to State Street, Anacapa Street or Chapala Street.

### **Closing Drinks** – Pool side

Thursday, May 2, 5:00-6:30 pm

Enjoy a beer and the cool ocean breeze as we complete the ninth GPR conference and look forward to the tenth.

## ACCOMPANYING PERSONS PROGRAM

Adults and children accompanying conference delegates may wish to participate in organized day excursions and conference social activities. A fee of \$100 for adults and \$50 for children under 18 years will cover the transport costs for the day excursions and admittance to the conference social activities (child's fee does not include conference banquet). Entry fees for excursions are additional and must be paid separately by accompanying persons at the gate. Lunches are not included except for the Wine Tour. Indicative entry fees are shown below.

A separate program will be distributed to the accompanying persons when the register.  
The Accompanying Persons program is:

### *Sunday, April 28*

Beachside arts and crafts market, free  
Along Cabrillo Blvd.

Opening cocktail reception, 6:00-7:30 pm  
El Cabrillo room

### *Monday, April 29*

Santa Barbara Mission (morning), \$4  
Santa Barbara Botanic Gardens (afternoon), \$5

### *Tuesday, April 30*

Whale watching tour (morning)  
Cruise the Santa Barbara Channel, see the Channel Islands.  
Price payable at the harbor/boarding is \$32 (\$18 child).

Santa Barbara Courthouse and Sunken Gardens (afternoon)

### *Wednesday, May 1*

Free social day for the beach, shopping, and bike rides

Santa Barbara Zoological Gardens, \$8  
Visit the unique SB Zoo which is directly behind the Radisson Hotel and Dwight Murphy Park.

GPR field demonstrations, 1:30-4:00 pm  
Dwight Murphy Park

Conference banquet, 6:00-10:00 pm  
El Paseo Restaurant

### *Thursday, May 2*

Wine tour of Santa Barbara  
Visit four of the premier wineries in the area.  
Winery admission fee for all four and lunch is \$50.

Closing drinks, 5:00-6:30 pm  
Pool side at the Radisson

## **TOURIST INFORMATION**

Please check the Web site under tourist info for information and interesting Web sites.

Official Santa Barbara tourist office: <http://www.santabarbaraca.com/visitor.html>

Other Santa Barbara tourist sites: <http://totalsantabarbara.com/visitor.shtml>

### **Additional Social Activities:**

Beaches, hiking and bike riding

Golf (8 local courses)

Wine tours

Shopping (Paseo Nuevo mall and along State Street)

Local arts and crafts market along Cabrillo Blvd (Sundays)

## **OTHER INFORMATION**

### **Restaurants:**

As a longtime Santa Barbara resident the General Chair presents a personal dining guide to conference delegates. See the Dining Guide insert in your conference package.

### **Internet Access:**

Free internet access through America On-Line (AOL) is available on a computer located in Room 128, which is the first room in the hallway between the La Cantina foyer and the hotel lobby. Please limit you access to 10 minutes as there is only one computer for the entire conference.

### **Speakers Preparation Room:**

A speaker's preparation room will be setup on the 2<sup>nd</sup> Floor, in Room 226, just outside of the foyer of the El Cabrillo Room. Presenters are requested to use this room to familiarize themselves with the operation of the Audio/Video equipment. The presenter's PowerPoint presentations on laptops or CD-Roms can be checked with a data projector. This is also where the presenters can practice their talks prior to the session. In the case where a PowerPoint is not used, a slide carousel can be loaded and should be given to the AV assistant prior to the start of the session.

### **ATM:**

There is an Automated Teller Machine at the Radisson located next to the lobby.

### **Banks/Money Exchange:**

For cash money exchanges, the closest bank is on Coast Village Road. The front desk can assist you with directions.

### **Post Office:**

Please see the front desk for stamps and mail.

### **Photocopying/Fax:**

Please see the front desk for photocopying and faxes.

## **Journal of Applied Geophysics - GPR 2002 SPECIAL ISSUE**

The Executive Committee of GPR 2002 and Elsevier Science B.V. plan to publish selected, expanded manuscripts from GPR 2002 as a special issue of the Journal of Applied Geophysics. Co-guest Editors for this special issue will be Steven Koppenjan and Hua Lee.

The manuscripts for this special issue must be prepared according to the Guide for Authors of Elsevier Science (see GPR 2002 web site), and not according to the author instructions for the Conference Proceedings of GPR 2002. As a full paper in a scientific journal, the manuscript must contain more information than the articles in the Proceedings. All submitted manuscripts will be independently reviewed by at least two reviewers, and selection of papers to be published in this special issue will be made by the Guest Editors of the special issue and the Editors of the Journal of Applied Geophysics. The total number of pages of this special issue will be limited; therefore, all submitted papers for the special issue may not be published.

**The deadline for submission of manuscripts for the Special Journal Issue is August 9, 2002.**

Authors are requested to submit two hardcopies and a disk or CD copy of their journal manuscript directly to:

GPR 2002 Special Journal - Hua Lee  
Department of Electrical & Computer Engineering  
University of California, Santa Barbara  
Santa Barbara, CA 93106 USA

Guidelines available on Web: <http://www.ece.ucsb.edu/gpr2002/SpecialIssue>

## **GPR 2002 CONFERENCE PROCEEDINGS**

Additional copies of the conference proceedings are available at the registration desk.  
GPR 2002 Hardcopy, \$100  
GPR 2002 CD-Rom, \$25

## **PAST GPR CONFERENCE PROCEEDINGS**

The conference proceedings for GPR 2000 and GPR'98, CD-Rom version, are available at the registration desk for \$25 each (cash only).

## **GPR 2002 SURVEY and FEEDBACK**

Please fill out the GPR 2002 Survey Form and return it to the registration desk before you depart.