



Geophysical Society of Houston

VOL. 36, NO. 6

NEWSLETTER

JANUARY 2002

Technical Luncheon

Date: January 15, 2002
Time: 11:30 a.m.
Location: HESS building
Cost: \$20 reservation
\$25 at the door

Speaker:
Jonathan Bork

Title:
Seismic Interpretation of Sonic Logs

Biography:



Jonathan Bork received BS and MS degrees in geology from Michigan State University in 1965 and 1967 and his Ph.D. degree in geophysics from Colorado

School of Mines in 1973. He has worked in exploration offices in New Orleans, Houston, and London for Amoco and spent more than 20 years

at Amoco's Tulsa Research Center as a Research Supervisor in interpretation, field acquisition, modeling, AVO, and inversion. Since 1998, he has worked for Apache Corporation in Houston, doing rock property studies, seismic modeling, and AVO interpretation.

Abstract:

Attributing rock property significance to seismic events has long been a prime objective in exploration geophysics. For good reasons, this is far from a trivial task. First, there thousands if not tens of thousands of rock property variations recorded on seismic rock property (SRP) logs that are compressed to a few score or perhaps a few hundred seismic lobes. Second, a smooth seismic event is dependent on nearby reflection coefficients, while the log data are recorded as point measurements, independent of nearby values. Small wonder we have difficulty relating the two data types.

Clearly some log information is lost to the seismic method. What does this information look like? Does the seismic

method correspond to a simpler log? If so, what does that log look like? Finally, how can we process the SRP logs to make them more compatible with the seismic data without sacrificing the distinct jumps characteristic of geology?

A new method will be discussed that maintains the layer quality of log data but strips the original log of information not seen by the seismic waves, revealing a much simpler log, one that facilitates rock property-to-seismic interpretation. The new log, called the Seismic Detection Log (SDL), allows us to directly interpret complex seismic detection problems because the correct scaling has been maintained. This technique is possible because seismic resolution concepts have been extended to the multi-layer case.

*Have a
Happy
New Year
2002*

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GEOPHYSICAL SOCIETY OF HOUSTON

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Editor's Note

To insure your information reaches the GSH society members in a timely manner it must appear in the in the appropriate newsletter issue. Please note the following deadlines and plan your function's publicity strategy accordingly. Items must be received on or before the corresponding deadline date. Materials may be sent to fklevin@swbell.net. If you have any questions please call Frank Levin at 281/497-1090.

2002 GSH Newsletter

Deadlines

Issue February 2002

Deadline .. **January 10, 2002**

Become a Corporate Member

The categories for becoming a GSH Corporate Member are

Corporate Underwriter

\$100—\$500

Corporate Sponsor

\$501—\$1000

Corporate Benefactor

\$1001—\$5000

Corporate Partner

\$5001+

The GSH would welcome those who wish to help underwrite the following:

SEG Fall Distinguished Lecture

\$300

SEG Spring Distinguished Lecture

\$300

GSH Continuing Education Program

\$1000

Honors and Award Banquet

\$250

GeoEvents Calendar

Make reservations by e-mail at reservations@hgs.org and include your member number (found on Bulletin mailing label), or use the phone reservation system at 713/463-8920.

Reservation Codes

Use these codes to make voice mail meeting reservations:

Technical Luncheon	601
Data Processing SIG	602
Potential Fields SIG	605
Environmental Applications SIG	606
Breakfast	607

The GSH would like to thank the following companies for their support as corporate members:

ExxonMobil

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Corporate Underwriter

Thank you for your supporting the GSH!

For information on how to become a corporate member or to endow a scholarship with an organization's name please contact Pat Starich (281) 654-5036 or the GSH office at (713) 463-9477.

Technical Breakfast

Date: January 9, 2002
Time: 7:30 a.m.
Location: Core Labs. 6316
Windfern, Houston
77040. Telephone:
(713)-328-2673. Take
US290 West and exit at
Gessner. U-turn under
290 to Windfern.

Speaker

Alvaro Chaveste.

Biography

Alvaro Chaveste, Manager for Scott Pickford's Advanced Reservoir Geophysics Group, has worked for 17 years in the exploration industry. He started with GSI as field QC for vibroseis crews in Mexico. Later he was Area Geophysicist for GSI's Mexico office. Transferred to Halliburton Geophysical in Houston (1989), Mr. Chaveste worked on surface and subsurface seismic data processing. In 1994 he moved to the Andrews Group International, where his duties as Senior Geophysicist included preparing and teaching geophysics courses for Pemex and South American personnel. Acting as Seismic Data Processing Manager, he was responsible for Houston and Mexico processing operations.

Title

Risk Reduction in Estimation of Petrophysical Properties from Seismic Data through Well Log Modeling, Seismic Modeling, and Rock Properties Estimation

Abstract

Estimation from seismic data of petrophysical properties that are relevant to reservoir performance has been sought and achieved with various degrees of success since the advent of the seismic method. In this talk I describe methodology to reduce risk in the estimation of these properties that includes well log reconstruction, seismic modeling, and rock properties estimated from seismic data.

Well log modeling involves the reconstruction of P- and S-wave velocity and density logs through the use of porosity (ϕ), shale volume (V_{sh}), and water saturations (S_w) estimated from standard petrophysical evaluation and with the use of Gassmann's equations and effective media theory. Once a satisfactory reconstruction is obtained, the elastic properties of the rocks' constituents are known. The petrophysical properties (ϕ , V_{sh} , and S_w) can be modified and P- and S-wave velocity and density logs analytically reconstructed to model logs as they would have been recorded if the new (modified) petrophysical property had occurred in the logged formations. The reconstructed logs are used to compute rock properties related to incompressibility (Λ^*Rho) and rigidity (μ^*Rho). These properties are also computed from seismic data, thus allowing a direct link between reservoir properties (ϕ , V_{sh} , and S_w) and seismic data. In addition, the evaluation of gradual changes in a specific property (say porosity) allows for the sensitivity analysis of the method to this property, as well as providing an understanding of ambi-

guities between different reservoir conditions at well log resolution.

Sensitivity and ambiguity analyses at seismic resolution of the different reservoir conditions are realized by using the reconstructed P- and S-wave and density logs to compute pre-stack synthetic seismic data. Λ^*Rho and μ^*Rho are then estimated from the synthetic seismograms through AVO analysis and post-stack inversion. Comparison of data computed from well logs and synthetic seismic data provides an understanding of the effect of the band limiting and sparser sampling when going from sampling at well log resolution to seismic resolution. Seismic modeling allows for a clear understanding of the relations between seismic and petrophysical properties.

The final stage in the method consists of computing rock properties from the real seismic data. The processing done to estimate rock properties is best parameterized and calibrated when well data and seismic velocities are incorporated into the process. Since the same properties are obtained from well log and seismic data, it is possible to quality control Λ^*Rho and μ^*Rho results at well locations with hard (log) data. In the end, the process provides datasets of rock properties related to petrophysical properties and calibrated with well data, as well as an understanding of the limitations, sensitivity, and ambiguities when using the technique to reduce risks in the determination of petrophysical properties using seismic data.

(LMR and Λ^*Rho are trademarks of PanCanadian.)

Announcements

2002 SEG/EAGE Distinguished Instructor Short Course, Houston—March 4, 2002

OTC 2002—May 6-9, 2002

Annual Honors and Awards Banquet—May 9, 2002

Annual GSH meeting—May 16, 2002

Salt Water Tournament—June 22, 2002

SEG Annual Meeting—October 6-11, 2002

SIG Meetings

Potential Fields

Subject:

Depth Imaging using FTG Gravity and Pre-Stack Seismic Depth Migration: Case Studies for the Deepwater Gulf of Mexico

Speakers:

Holly Huston*, Craig Barker**, Betty Johnson**, and Mary Murphy**, *Hunter 3D, Inc., **UNOCAL

Date: Thursday,
January 17, 2002
Location: Hess building , 5430
Westheimer, Houston
Time: 5:30pm Social Hour;
6:30pm Dinner;
7:30pm Presentation
Cost: \$25

Contact Afif Saad, Chair –
GSH Potential Fields Group at
281-342-8575
(AfifHSaad@netscape.net) or
Bob Van Nieuwenhuise, Co-Chair at
713-735-6311
(Bob.VanNieuwenhuise@pgs.com) by
Tuesday, January 15, 2002 for
reservations. E-mail is best. Please
honor your reservation! We must bill
no-shows!

Abstract

Gravity and full tensor gradient (FTG) data are highly useful when integrated into the pre-stack depth migration (PrSDM) imaging workflow. The FTG data contribute to a detailed picture of edges, shapes, and approximate depth to dominate mass anomalies. These anomalies in the deepwater GOM are often allochthonous salt bodies with significant density contrasts.

Our workflow has multiple stages and involves interaction between the seismic interpreter, potential fields interpreter, and seismic processor. We use available well control, 3-D and 2-D seismic-derived surfaces, seismic velocities, and regional gravity and magnetic data to construct a complex, constrained 3-D geologic model. Once constructed, a 3-D forward gravity and FTG model is calculated and subtracted from the observed data. The resulting residual

anomalies indicate where mass needs to be increased or decreased within the geologic model. The salt geometry is altered as needed, using both forward and inverse 3-D modeling techniques. The altered surface is then imported into a seismic interpretation software program where it is integrated into a new seismic interpretation and the velocity model is updated for PrSDM.

Our case studies in Keathley Canyon and Walker Ridge OCS areas demonstrate seismic PrSDM imaging subsequently confirming the FTG interpretation. These examples include recumbent salt overhangs, steeply dipping salt/sediment interfaces, and the definition of lateral contacts between salt and a high velocity shale mass.

Our method has been applied to numerous prospect areas and is routinely used for all PrSDM projects for deepwater GOM. The results vary from major changes in the velocity model to confirmation of the original seismic interpretation with an independent data set. Close and continual interaction of all interpreters deriving the velocity volume is critical for FTG data to contribute to an improved model.

Biographies

The authors contribute multi-disciplinary expertise to Unocal's Deepwater Gulf of Mexico Depth Imaging program. Holly Huston, President of Hunter 3-D, has been modeling FTG data since 1997. Craig Barker is a seismic interpreter for Unocal's drillsite maturation team. Elizabeth Johnson is Unocal's potential fields specialist with over 12 years experience in the Gulf of Mexico. Mary Murphy is a seismic processing specialist in depth migration.

Data Processing

Date: Wednesday,
January 16, 2002
Time: 4:30 p.m. social
5:00 p.m. Presentation
Location: Duncan Hall, Rice
University

Subject:

Use of the Internet and Networks in Seismic Applications

Tow Industry Speakers:

To Be Announced

For details contact Alan Foley,
alanfoley@aol.com

2002 Milton Dobrin Memorial Lecture

February 5, 2002
Science and Research Bldg. 1
Room 117
University of Houston,
7 pm followed by reception

Global climate change by James D. Robertson

The climate of the Earth changes over time. The mechanisms forcing the changes include solar radiation, the geometry of continents and oceans, ocean current circulation, atmospheric composition, volcanic activity and other natural phenomena that operate on diverse time scales. The induced climatic changes vary in calendar time from decades to many millions of years and in magnitude as measured by temperature

fluctuations from one or two degrees to as many as twenty degrees celsius. The mechanisms are sufficiently persistent and powerful to reasonably conclude that climatic stability is not an option for the Earth. Humans have had to confront and adapt to substantial climatic changes over both recorded human history (thousands of years) and pre-historic human existence (millions of years). The necessity to adapt to climatic fluctuations will continue to be part of humanity's life on Earth.

Understanding the details of the Earth's climatic variability is a complex and challenging scientific problem. This Dobrin lecture will review the scientific community's current understanding of global climate change. In particular, I will outline the data that (1) support various

hypotheses about mechanisms of change, and (2) provide the basis for predictions of future changes. By appreciating the science, the geophysical community will be better able to participate in social and economic debates about whether humans are currently inducing climate change and whether humans should proactively try to influence future variations in Earth's climate, either to reverse a human-induced change or to mitigate a naturally occurring one.

Jamie Robertson, a graduate of Princeton with a PhD from U. Wisconsin, was Director of Geological and Geophysical Research for ARCO and is now Managing Director of Rannoch Petroleum. He is also a former President of the SEG.

University of Houston Geosciences Short Courses.

Beginning in January, 2002, the University of Houston Geosciences department will offer a series of petroleum short courses.

A list of courses, dates, and instructors follows:

- January 14-17: Rocks, Reservoirs, and Reflectivity—The Evolution of AVO. Dr. Mike Graul
January 21-24: Introduction to Sequence Stratigraphy. Dr. Jory Pacht
January 28-31: Quantitative and Applied Biostratigraphy of the Gulf of Mexico. Dr. Don Van Nieuwenhuise
February 4-8: Integrated Stratigraphic Analysis. Dr. John Armentrout
February 18-22: Introduction to Seismic Interpretation. Dr. Kurt Marfurt
March 4-7: Petroleum Geochemistry in Exploration and Production. Dr. Adry Bissada
March 11-15: Reservoir Characterization and Integrated Flow Modeling. Dr. John Fanchi
April 8-9: Introduction to ArcView GIS. Dr. Beni Patel

All courses will be taught on the University of Houston campus in room 207 of the Science and Research Bldg. 1, Entrance 14 off Cullen Blvd.

Registration forms can be downloaded from www.geosc.uh.edu/shortcourses and faxed to Leanne McGinty at 713-748-7908.

For more information call Leanne McGinty, 713-743-3402, imginty@uh.edu

Geophysical Auxillary Of Houston

Join us on Monday, January 14, 2002 for lunch at the Junior League of Houston. Our members will model beautiful clothes from Drapers and Damon's of Town and Country. Kathi Hilterman, Social Chairperson, at 713-467-2599 will be happy to answer any questions about the event.

If you are not a member, please consider joining our organization for lots of fun times. Call Marinell Williams at 713-467-4517 or Carol Gafford at 281-370-3264 for details on joining. Dues are only \$15.00, and you can be a part of the activities.

Make your plans to join us for the annual Spring Brunch on Sunday, March 17 at Lakeside Country Club. The newly remodeled Pine Lake Room will be the setting for visiting with friends and making new friends. Lakeside is known for its delicious buffet, so put March 17 on your calendar.

2002 SEG/EAGE Distinguished Lecturer

The 2002 SEG/EAGE Distinguished Instructor Short Course will be held in Houston on March 4, 2002. The instructor will be Dr. Leon Thomsen. The title of the course is Understanding Seismic Anisotropy in Exploration and Exploitation. Dr. Thomsen is Principal Geophysicist in BP Amoco's Upstream Technology Group. He is an Honorary Member of the SEG. A description of the course and a biography of Dr. Thomsen will appear in the February Newsletter.

16th Annual Sporting Clays Tournament

The 16th Annual Sporting Clays Tournament was very successful. Thanks are due to the following who provided financial support, prizes, or other help:

Baker Oil Tools, Carl Henderson & Associates, CGG, Alan Foley, Fuji Film, Hampson-Russell Software, Mayne and Mertz, Media Recovery, Petrosys, PGS Diamond, Rag Outfitters, Schlumberger, Seismic Exchange (SEI), Seismic Venture, Seitel, Sovereign Oil & Gas, TGS NOPEC, Unique Digital, Veritas DGC, Veritas Land Surveys, Bob West, WesternGeco.



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Muke Drautzid
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Marti C. Hewell
Neil B. Hokanson
Sandra L. Huss
Wes Knight
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Michael D. McCormack
Larry F. Oakes
Thomas J. Reed
Mike L. Rhodes
Kyle D. Stewart
Ume Strecker

Associate

Andrew Hume
Sue Pritchett
Karen L. Sherlock
Nancy J. Winn

Student

Cory J. Hoelting
Yves S. Simon

**Total Membership
1773**

JANUARY 2002

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
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6	7	8	9 Technical Breakfast Core Labs. 6316 Windfern, Houston	10 NEWSLETTER DEADLINE	11	12
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