



Geophysical Society of Houston

VOL. 35, NO. 7

NEWSLETTER

FEBRUARY 2001

Technical Luncheon

When: February 20, 2001
Location: HESS Building;
5430 Westheimer
Time: 11:30 a.m.
Cost: \$20

Seismic/Sequence Stratigraphy of Deep-Water Reservoirs, I. Seismic Facies and Recognition Criteria; Past Experiences and New Observations

GOULDING, FRANK J., TIM R. GARFIELD and KURT W. RUDOLPH, ExxonMobil Exploration Co.; GERRICK N. JENSEN, ExxonMobil Production Co.; RICK T. BEAUBOUEF, ExxonMobil Upstream Research Co., Houston, TX

ABSTRACT

Seismic facies analysis is a method developed by Exxon in the 1970s for the description and geologic interpretation of seismic reflection parameters. Seismic facies are mappable, three-dimensional groups of reflections whose parameters differ from those of adjacent

facies units. Application of this method for reservoir prediction has increased in deep marine settings due to increased exploration activity and the paucity of well control. Through integrated studies of deep-water reservoirs in several basins, Exxon has made significant enhancements to seismic recognition criteria, mapping techniques and resulting depositional models. The dramatic increase in the use of 3D seismic has made many of the improvements possible. Early seismic stratigraphic analysis recognized convex-upward external mounding as a characteristic of deep-water reservoirs. Our current deep-water seismic facies classification scheme builds on this earlier work and is based on reflection amplitude, continuity and external form. Major reservoir-prone reflection configurations include: High Amplitude Continuous Onlapping (HACO), High Amplitude Semi-Continuous (HASC), High and Low Amplitude Semi-Continuous mounded and "gull-wing" facies. The most reservoir-prone facies differ between basins. In the Gulf of Mexico,

the most reservoir prone facies is HACO whereas in the lower Congo basin HASC seismic facies in confined channel complexes are the most reservoir prone. New techniques to interpret and map seismic facies on 3D data are providing the greatest potential for improving our reservoir predictions in the immediate future.

Franklin J. Goulding



Frank J. Goulding is a senior geophysicist with ExxonMobil Exploration Company in Houston, Texas. Frank joined Imperial Oil, Calgary, in 1987 after graduating from the University of Calgary in Geophysics. Since 1991, Frank has been with ExxonMobil in Houston where he has been active in both exploration for deep-water reservoirs and research in seismic stratigraphy of deep-water reservoirs. Frank's current assignment focuses on exploration of the Nigerian Slope.

**GSH Golf
Tournament is
coming soon.
See next issue
for details.**

I N S I D E T H I S I S S U E

GSH Meetings	_____
GSH Technical Luncheon	
February 20	1
GSH Technical Breakfast	
February 20	4
SIG Meetings	5

Articles and Comments	_____
GAH	4
Dobrin Lecture	6
HEC Joint Luncheon	7
SEG Continuing Education Courses	7

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 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 patty@diamondg.com or faxed to 713/783-9780. If you have any questions please call Patty Cardwell-Swords at 713/783-7837.

2001 GSH Newsletter Deadlines

Issue March, 2001
Deadline .. February 9, 2001

Issue April, 2001
Deadline .. March 9, 2001

New Members

Active

Robert Bosley
John Faulkner
Mark Gregg
Bob Heaton
Ronnie Johnson
John Lemke
William Manthey III
Chester Payton
Sudarshan Singh
Robert Yorke

Associate

Meredith Appelt
Paul Huff
Renee Kierstein
Jeffrey Ogilvie
Dwayne Runcer
Mail Yang
Chuan Yin

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 713/917-0218.

Reservation Codes

Use these codes to make voice mail meeting reservations:

Technical Luncheon	601
Data Processing SIG	602
Interpretation SIG	603
Reservoir SIG	604
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:

bp

ExxonMobil



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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) 423-5036 or the GSH office at (713) 785-6403.

Technical Breakfast

Location: Anadarko Petroleum
When: Tuesday,
February 20, 2001
Speaker: Steven Maione of Scott
Pickford division of
CoreLab.
Title:
" Discovery of Ring Faults Associated
With Salt Withdrawal Basins of Early
Cretaceous Age In The East Texas Ba-
sin".

The meeting will begin with a continental breakfast provided by Anadarko from 7:00AM until 7:30AM. The presentation will be from 7:30AM until 8:00AM, with a brief question and answer period to follow.

ABSTRACT

The Jurassic Louann salt in the East Texas Basin has played a dominant role in influencing the structural and depositional history of the basin, particularly during the Jurassic and Cretaceous periods. Salt tectonics is closely associated with sandstone distribution, depositional facies, and reef growth, and consequently, with petroleum traps in the basin. Salt withdrawal basins, developed during the Early Cretaceous in response to salt movement and dissolution processes, are characterized by the presence of an expanded section of Lower Cretaceous marine and deltaic sedimentary rocks. Recognition of fault sets associ-

ated with the evolution of these salt-withdrawal basins has gone undetected until the recent Coherence Cube™ processing of a non-proprietary 3-D seismic survey conducted by Schlumberger in the La Rue dome - Fairway Field area, Henderson and Anderson Counties, Texas.

Images from Coherence Cube processing aptly exhibit extraordinary sets of concentric ring faults that comprise the periphery of two salt withdrawal basins. The Fairway oil field is located at the junction of these two sets of ring faults. The structural style of these high-angle ring faults creates a multitude of possible fault traps in a previously unattractive structural setting. Early Cretaceous age of the ring faults establishes that these faults are a significant element in evaluating petroleum migration patterns and traps in the basin. The discovery of Early Cretaceous ring faults in the East Texas Basin by Coherence Cube processing brings new perspectives to development and exploration drilling in this mature petroleum province.

Biographical Sketch

Steven J. Maione, senior geophysicist for Scott Pickford, A Core Laboratories Company, received degrees in Geological Engineering and Masters in Geology from the Colorado School of Mines. He joined Union Oil Company of California (now Unocal Corp.) in

1971 as an exploration petroleum geologist in Casper, Wyoming. Between 1974 and 1992 he worked as an exploration geologist for the Unocal Geothermal Division, and participated in geothermal exploration and development projects in North America, Philippines, Indonesia and Japan. In 1992 he re-entered the field of petroleum exploration with the Unocal Worldwide Exploration Division in Sugar Land, Texas. In 1997, Steve became an Associate of Valenti Engineering Services of Kingwood, Texas, where he specialized in 3-D seismic interpretation. In 1998 he joined the seismic interpretation services group with Coherence Technology Company (CTC), and later with Core Laboratories Company following its purchase of CTC. He has interpreted numerous 3-D surveys, including offshore Nigeria, eastern Saudi Arabia, Anadarko Basin, East Texas Basin, China, Venezuela, Texas Gulf Coast, and Mexico. He has assisted numerous corporate exploration staffs in effectively utilizing Coherence Cube(tm) processing in achieving successful 3-D interpretations.

Steve is a member of the American Association of Petroleum Geologists, the Houston Geological and Geophysical Societies, the Society of Exploration Geophysicists, the Geological Society of America, Sigma Xi, and the Rocky Mountain Association of Geologists.

Email: smaione@corelab.com

Join the Geophysical Auxiliary of Houston!

The Geophysical Auxiliary of Houston invites the wife of any present or past member of the GSH or SEG, the widows of former members of the GSH or SEG, and women members of the GSH or SEG to join us for our 2000-2001 events.

Sunday March 11, the Spring Brunch will be held at Lakeside Country Club, 100 Wilcrest Drive. For a "space walk on the wild side" we will hear from Dr. Pat Dickerson who trains the astronauts at NASA in Clear Lake and may be able to get us a seat on a flight to Mars.

Yearly dues are only \$15.00. Call Marinell Williams at 713-467-4517 or Donna Parrish at 281-589-8088 for information on how to join. For more information about the programs and to offer suggestions, please call Georgeann Massell at 281-353-4517.

The GAH encourages social relationships among its members, donates money to the GSH scholarship fund and assists the GSH in any manner possible.

"Strangers are just friends waiting to happen." We look forward to having you join us!

SIG Meetings

DATA PROCESSING

Theme: Multiple Attenuation

Speaker 1: Dr. Roald G van Borselen, PGS, London, UK.

Title: Multiple removal in subsalt areas: a comparison of methods.

Speaker 2: Dan Heinze, Applied Geophysical Services

Title: A New Model Based, Coherent Noise Suppression Tool for High Production Environments

Date: Wednesday,
February 21, 2001
Time: Social 4:30
Presentations
5:00 to 6:30
Cost: NONE

Location:
Shell Technology Center 3737
Bellaire Blvd. Between Buffalo Speedway and Stella Link. Park in front of the building with the circular drive and flag pole or in front of neighboring Shell buildings, if full, or nearby (smile) if full.

Check in with the receptionist if before 4:30. If after 4:30 enter through gate #2 (main gate). Ask to be directed to "Lecture Hall". If lost, call receptionist at (713) 245-7230. Don't get lost after 4:30.

ABSTRACT

Title: Multiple removal in subsalt areas: a comparison of methods.

By: Dr. Roald G van Borselen, PGS, London, UK.

The presence of free-surface-related wave phenomena are a classic problem in marine seismic data processing. Especially in areas where the waterbottom has a high velocity contrast, the surface-related multiples tend to decay slowly and degrade the quality for the seismogram severely. Often, these multiples are excited by strong reflections off structurally complex 3D salt bodies or chalk layers to create a complex set of reverberations that can easily obscure primary

reflections from relatively weak subsalt / subchalk sedimentary interfaces. Obviously, adequate multiple removal is a key ingredient for successful exploration. Conventional multiple suppression methods such as predictive deconvolution and differential move-out filtering are based on general characteristic differences between primaries and multiples. Since the underlying assumptions may not be met in the field, the effectiveness of these methods can be limited: too much multiple energy is passed while too much primary energy is rejected. However, these methods are still being applied on a large scale in demultiple processing. In complex geological configurations, where primary/multiple energy ratios are generally low, it is preferred to employ multiple removal methods that require no a priori information, neither structural nor material, about the subsurface geology. Only recently, companies have started to adopt these methods in their demultiple processing efforts. In the presentation, a comparison is made between these different multiple removal methods. Results will be presented for distinct configurations that are representative for subsalt plays in the Gulf of Mexico.

BIOGRAPHY

Roald G. van Borselen received his PhD (1995) in Technical Geophysics at Delft University of Technology. He spent three years in Amoco's Strategic Exploration Group in Houston, working on 3D depth migration and velocity model building. He then worked for one year in Amoco's Exploration and Production Technology Group in Tulsa, working on 3D depth migration, tomography and special processing. In 1999, he joined PGS in London where he is currently team leader at PGS Seres' processing R&D group.

ABSTRACT

Title: A New Model Based, Coherent Noise Suppression Tool for High Production Environments

By: Dan Heinze

Wave equation methods that do not require a detailed earth model appear to offer significant technical advantages

for multiple suppression. These methods still tend to be expensive, especially for suppression of internal plegg multiples. Even with these techniques, shear wave related primaries pose an imaging barrier in certain instances.

A fundamental problem for all multiple suppression techniques is that the primary wavefield, because of economics, tends to be somewhat undersampled in the spatial domain. When this is the case, predicting the multiple wavefield from the primaries with full fidelity is not possible. Even more difficult is the problem that for marine shooting the shape of the free surface is usually not flat, horizontal, or constant in time. This suggests that other, less rigorous and less expensive, methods still merit consideration for multiple suppression.

In particular we address model-based approaches. An example is shown of a targeted event removal scheme that effectively identifies and suppresses P-SV converted primaries, imaging them as well. A significant interpretive barrier is removed by the P-SV suppression.

More significant for the future, a new generalized model-based approach is demonstrated. The principal deficiency in model-based demultiple approaches of the past is that the "model" of the multiples and/or primaries was only crudely known. With the now frequent application of prestack depth processing, earth models are often known to reasonable accuracy on a fine spatial grid. Energy that is not consistent with the characteristics of primary reflections associated with this model can be discriminated against as noise. The suppressed noise may arise from almost any shot generated mechanism, such as conventional P-P multiples, P-SV primaries or even headwave related energy. This technique is applied during migration and is computationally efficient. Full 3D examples of this approach are shown from the SEG/EAGE synthetic salt model and from Gulf of Mexico salt environments.

BIOGRAPHY

Dan Heinze received a BS degree

Data Processing continued on page 6

in geophysics at Texas A&M (1970) having been supported by an AMOCO scholarship and done summer work for AMOCO and Shell. He completed his MS at MIT (1973), studying rock mechanics and finite element analysis. He received a PhD for work in rock mechanics and signal processing from Texas A&M (1977). As a Post Doctoral Fellow (1978-80) at the Department of Terrestrial Magnetism, Carnegie Institute of Washington, he studied crustal seismology and earthquake prediction. He has been with Applied Geophysical Software, Inc. (now Applied Geophysical Services, Inc.) since he founded it in 1978. Dan wrote his first depth processing related software in 1974 and his early travel time inversion work was supported by Shell (Bellaire Research) in 1977-78. Applied Geophysical Services, Inc. has focussed on depth processing and multiple suppression since its inception.

Near Surface

Where: Fugro-South, 6100 Hillcroft, Conference Room #160
When: February 14, 2001
Time: Social 5.30 pm
Presentation 6.00 pm
Speaker: Finn Michelsen
Contact: Mustafa Saribudak, Chair-Near-Surface SIG, at 281-370-7066; ega@pdq.net

Presentation - Application of High Resolution Marine Seismic for Characterization of Near Surface Carbonates.

Seafloor and shallow sub-bottom carbonate formations are often difficult to map using conventional Sub-Bottom Profiling techniques, particularly if the target depth is greater than 20 feet. "Boomer" and "Sparker" type marine acquisition systems offer very high frequency resolution, however, signal penetration over hard bottom carbonate formations often reduce the subsurface imaging to no more than a few feet. Offshore engineering companies often need detailed high resolution stratigraphic and structural geologic informa-

tion at depths to 100 + feet to plan shallow geotechnical drilling operations, locate shallow fault systems, voids, or other hazards that will affect pipeline routes and trenching operations.

This presentation reviews the technique and results of an ultra high-resolution seismic survey in Western Offshore Florida to profile the upper 20 feet of sub-bottom stratigraphy (1 ft resolution), and to locate structural anomalies such as shallow faults and remnant sinkholes. The survey, which uses a short offset streamer method, produced remarkable resolution and detail of the near surface geology. A previous conventional sub-bottom profile conducted over the same area produce only a good water bottom profile, but no information deeper than 1 foot. Pipeline systems that need to be buried in trenches as deep as 10-12 feet require continuous profile information, as well as detailed geotechnical data taken from drill cores. With the use of new high performance data acquisition systems, accurate GPS, lightweight short offset 24 channel streamers, and low volume/high pressure air guns, the survey proved to be an economical method for obtaining high-resolution data along a proposed 120-mile pipeline route.

Short Biography

**Finn B. Michelsen P. G.
Fugro South, Inc.**

Finn B. Michelsen is a graduate from the University of Hawaii, Institute of Geophysics (1980), specializing in Marine Geology and Geophysics studies. He is currently a Principal Geophysicist with Fugro South, Inc and is Geophysical Manager for their Applied Geophysics Organization. Mr. Michelsen's professional experience covers a broad range of geophysical and geotechnical activities, having first worked with major oil and gas exploration companies early in his career on marine 3D developments. Throughout his career he has contributed to development of marine/land instrument technology and application technique for shallow seismic investigation applications. His current interest is integrated application of geophysical survey methods for engineering and shallow oil and gas investigations. He is a member of SEG, SAGEEP, and HGS.

DOBRIN LECTURE

When: Tuesday March 6, 2000
Speaker: Dr. Leon Thomsen
Title: "Seismic Anisotropy: its effects on exploration and exploitation in the 21st Century"

Abstract:

The topic of seismic anisotropy in exploration and exploitation has seen a great deal of progress in the past decade-and-a-half. The principal reason for this is the increased (and increasing) quality of seismic data, and of the processing done to it, and of the interpretation expected from it. No longer an academic subject of little practical interest, seismic anisotropy is now often viewed as one of the crucial factors which, if not taken into account, severely hampers our effective use of the data. When it is taken into account, it enables better imaging, and better subsurface characterization, as well as the effective utilization of shear waves and converted waves.

Bio:

Leon holds degrees in geophysics from Caltech (B.S. 1964) and Columbia (Ph.D. 1969). His academic career began with post-doctoral appointments at CNRS in Paris, and at Caltech, followed by faculty appointments at the State University of New York at Binghamton (1972-80). His industrial career began with 14 years at Amoco, at its famous Tulsa Research Center. Following the change of its mission in 1994, he joined Amoco's worldwide exploration department in Houston. Following the recent merger, he serves in BP Amoco's Upstream Technology Group in Houston, as Principal Geophysicist.

For his work in seismic anisotropy, Leon was given the Fessenden Award in 1994 by the SEG. He served as its Distinguished Lecturer in 1997, and as Chair of its Research Committee (99-00). He and his colleagues received the EAGE's Best Paper Award in 1997 for their converted-wave analysis at Valhall; he has scored several near-misses with the SEG. He was given Honorary Membership in the GSH in 1998.

HEC Joint Luncheon

(hosted by Houston Association of Professional Landmen)

Title: Review of the Current Gas Market

Date: February 8, 2000
Location: Hyatt Regency Hotel
Time: 11:30 a.m.;
Lunch at noon
Speaker: Ralph Eads, Executive Vice President for El Paso Energy
Cost: \$25

All reservations should be made directly to the GSH by February the 5th. Due to a limited amount of seating, making reservations early is encouraged.

Bio

RALPH EADS is group executive vice president of Production and Global Markets for El Paso Energy Corporation. With assets totaling more than \$30 billion following the close of the merger with The Coastal Corporation, El Paso Energy Corporation is one of the world's leading energy merchants and is the fourth largest energy company as measured by market value in the United States. The company owns the largest gas pipeline network in North America, is among the top five gas producers in the country, and is one of the largest traders and marketers of all forms of energy globally. In his current position, Mr. Eads is responsible for El Paso Energy's production, power generation, and merchant energy services on a

worldwide basis.

Prior to assuming his current position in 1999, Mr. Eads was managing director and co-head of the Energy Group at Donaldson, Lufkin & Jenrette (DLJ), a leading international investment and merchant bank. He was head of the energy practice at SBC Warburg before joining DLJ and previously worked at Lehman Brothers and Merrill Lynch.

Mr. Eads earned a Bachelor of Arts degree in economics from Duke University, graduating with honors.

Mr. Eads serves on the Board of Visitors of Duke University and the boards of trustees of the Nature Conservancy of Texas and the Kinkaid School Foundation. He also is a member of the Campaign Committee of the Houston Music Hall Foundation.

SEG Continuing Education Courses

February 22-23, 2001
Houston, Texas

Seismic Fundamentals

Instructor: Don Macpherson

This course is intended to be a thorough review of all the key geophysical concepts relevant to the interpretation of seismic data. It also contains a detailed description of technologies that have recently become "hot topics" in our industry such as 4-D seismic data. Additionally, the course attempts to provide the attendee with a clear understanding of technologies that have a significant impact on the economics of a project such as depth migration or AVO processing.

The Role of Geophysics in Risk Assessment

Instructors: William D. Brumbaugh and Laura Kay Etherton

Risk is intrinsic to all international and domestic petroleum ventures. Today's geophysicist is expected to use technical expertise to assess and minimize this risk. As advancing technology gives geophysicists increasing ability, industry is driving them to go beyond the workstation and demonstrably

add value. This course examines how geophysics impacts the abatement of technical and economic risk through sound, cost effective decisions. Geophysics is presented as a risk management tool with methods to promote optimal business decisions.

The course is build around an analysis of a live petroleum venture. Participants will evaluate a development opportunity with exploration potential. Emphasis is placed on the necessity of geophysics to advance technical understanding and minimize risk. An information strategy is thus generated that closes the gap between risk assessment and risk tolerance. An economic analysis of this strategy and its impact on expected monetary value concludes the course. The decision as to whether to pursue the venture is decided in the wrap-up.

Exploration Vertical Seismic Profiling

Instructors: Ronald C. Hinds and Richard D. Kuzmiski

This course is not research - this is what an explorationist does in the search for clastic and carbonate exploration results.

This course transmits to each participant real experience in the usage of VSP data starting from the exploration design right through to the final interpretations where real exploration decisions are made. This course is designed for any explorationist who asks the question, "What is the value added to the exploration program?"

Attendees can be interpretive and processing geo-physicists, geologists, and geological and production engineers. The bulk of the course is designed around the SEG Special Publication #3, VSP Interpretive Processing: Theory and Practice. Two new topics, AVO VSP and 3-D P-P and P-SV VSP, are included along with real data examples. The fun begins with the use of real data panels that are extensively interpreted by the attendees. The course reserves mathematical explanations for the textbook Appendix, and the mathematical ideas used in the course are explained using conceptual models.

For detailed course descriptions, instructor biographies, and on-line course enrollment visit <http://ce.seg.org>
Tuition: \$595/\$665 (SEG member/non-member), \$630/\$700 (if received after January 22, 2001)

FEBRUARY 2001

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1	2
4	5	6	7	8	9 NEWSLETTER DEADLINE	10
11	12	13	14 Near Surface SIG 5:30 p.m. Fugro-South 6100 Hillcroft	15 SPE's Ebiz workshop (\$how me the money) location to be announced	16	17
18	19	20 Techincal Breakfast 7:30 a.m. Anadarko Petroleum Technical Luncheon 11:30 a.m. HESS Bldg.	21 DP SIG 5:00 p.m. Shell Technology Center	22 SEG Continuing Education	23 SEG Continuing Education	24
25	26	27	28			

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