GEOLOGICAL SEISMIC INTERPRETATION OF CARBONATE SUCCESSIONS

Apply the principles of carbonate systems and their expression in seismic data to demonstrate its utility for exploration and production.

10th AUGUST 2015 - 14th AUGUST 2015 at KUALA LUMPUR, MALAYSIA

PetroSync Distinguished Instructor: DR. EUGENE RANKEY
Associate Professor in Geology, & Consultant
University of Kansas

Premier consultant and experienced course instructor with over 18 years experience in the O&G industry


Honorable Mention, Outstanding Paper Award, Journal of Sedimentary Research (2012, with Rodrigo Garza-Perez)

Specialized expert in Carbonate Sedimentology and Stratigraphy. Has conducted consultation and various courses including Seismic Expression of Carbonates, Modern Carbonate, and other short courses for ExxonMobil, Shell, BHP Billiton, Chevron, ConocoPhillips, Schlumberger, and Saudi Aramco

Past and Recent Projects include: Miocene (Natuna) Seismic Attributes, South China Sea; Upper Jurassic Regional Sequence Stratigraphy, Abu Dhabi; Jurassic (Arab-D) Sequence Stratigraphy, Ghawar Field, Saudi Arabia; Miocene Isolated Buildups, South China Sea, Jurassic Regional Seismic Stratigraphy, West Africa, Tullow, Mississippian Regional Stratigraphy, Midland and Delaware Basins; Devonian Seismic Stratigraphy and Seismic Attribute Analysis (several pools), Western Canada

Course Objectives

- LEARN fundamental seismic stratigraphic concepts in carbonate & mixed systems
- IDENTIFY sequence stratigraphic elements in seismic data
- APPRECIATE unique aspects of carbonate strata and petrophysics and the resultant challenges in successful utilization of seismic data to predict carbonate reservoir properties
- UNDERSTAND the seismic stratigraphic workflow and seismic attribute analysis for reservoir characterization and prediction
- INTEGRATE geological and geophysical data
- APPLY these concepts to the prediction of reservoir properties in exploration and production settings from a number of examples

Specially Designed for

This course is designed for delegates who seek to understand how seismic data can be used to characterize or predict carbonate reservoir distribution or quality in exploration, development, and production settings. The course is recommended for geoscience professionals who are involved or intend to work with carbonate reservoirs. This course can also serve as a foundation to seismic stratigraphy and uses of seismic data to understanding carbonate reservoirs to those working in the industry, including:

- Sedimentologists and stratigraphers
- Geoscientists (Interpretation, Geologic modeling)
- Geophysicists (Seismic Stratigraphy and Interpretation, Seismic Attributes)
- Reservoir, Petroleum, and Project Engineers
  (Evaluation, Properties, & Volumes)
- Petrophysicists (Rock & Fluid Properties)
- Explorationists / Exploration Managers (Work Planning & Economic Evaluation)

Pre-Requisite: Attendees are expected to have a working knowledge on basic petroleum geology. Basic knowledge of sedimentology and sequence stratigraphy are preferred, but essentials will be covered in the class.

Supported by
Seismic data provide key insights into understanding and predicting the distribution, geometry, and continuity of elements of reservoir, source, and seal in carbonate, carbonate-siliciclastic, and carbonate-evaporite successions. The aim of this one-week course is to provide a general overview of the principles of carbonate systems and their expression in seismic data, and to demonstrate its utility for exploration and production.

Attendees will be able to learn about the overview of seismic stratigraphic principles in carbonate, mixed carbonate-siliciclastic, and carbonate-evaporite systems, the integration of geology and geophysics to more accurately assess carbonate reservoirs, and also the outline of integration of diverse data sets for prediction of reservoir distribution and quality. The course will include conceptual models, practical hands-on exercises, and demonstrations of the utility of the data and derived products. Key examples will illustrate how seismic stratigraphy and seismic attribute analysis can be used to assess reservoir fairways, subdivide a reservoir, constrain reservoir models, and generate high-resolution, geologically constrained predictions of reservoir systems, and exercises will emphasize and expand on these concepts.

Sequence stratigraphic concepts will be applied to examples from areas including:

- Indonesia
- Malaysia
- Sumatra
- Vietnam
- Philippines
- North America, the Middle East, and Europe

These case studies will include seismic analyses of carbonate and mixed examples from a variety of settings, ranging from isolated platforms, to carbonate ramps, to lacustrine carbonates. They will illustrate both the key aspects of the seismic stratigraphic methodology and the unique insights that seismic data and seismic stratigraphy provides.

**Course Outline**

**DAY ONE - Overview of Carbonates**

**Introduction to the Course**

**Overview of Carbonate Sediment**
- Carbonate factories
- Skeletal and non-skeletal carbonate grains
- Differences from siliciclastics

**Carbonate Depositional Systems**
- General facies models - ramps, rimmed shelves, isolated platforms

**Carbonate Sequence Stratigraphy**
- Basic concepts: intro to stratigraphic hierarchy, parasequences, systems tracts, sequences

**Diagenesis and Porosity in Carbonate Systems**
- Pore types and petrophysical classes
- Relation to sequence stratigraphy

**Case Studies:** Bahamas, Pacific, and South China Sea isolated platforms, Yucatan ramp, West Australia shelf

**Exercises:** Facies mapping, Pore typing
Course Outline

DAY TWO - Limits and Applications of Seismic Analyses in Carbonates

Seismic Resolution and Seismic Modeling
- The strengths and limitations of seismic data

Seismic Geometry of Isolated Carbonate Platforms
- Recognition criteria
- Potential impact on reservoir character and production

Seismic Attributes
- Analyses, applications, and limitations of seismic attributes to understand geometry, continuity or quality of carbonate reservoirs

Case Studies: Seismic modeling and pseudo-geometries; Cretaceous platforms; Miocene Southeast Asia
Exercises: Miocene of Australia, Southeast Asia isolated platform geometries

DAY THREE - Application of Seismic Data to Carbonate Reservoir Characterization

Seismic Expression of Carbonate Ramps
- Recognition criteria
- Geometries and reservoir characterization

Advanced Seismic Attributes
- Application of seismic attributes to qualitatively predict reservoir distribution and properties
- Quantitative analyses and predictions of reservoir properties

Seismic Expression of Carbonate Rimmed Shelves
- Recognition criteria
- Geometries and reservoir characterization

Case Studies: Jurassic and Cretaceous shelves and ramps - Arabian Gulf and Atlantic margins; Permian – Permian Basin; Devonian of Western Canadian Basin
Exercises: Bahamas, Australia Miocene seismic stratigraphy

PROGRAM SCHEDULE

<table>
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<tr>
<th>Time</th>
<th>Activity</th>
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<tr>
<td>08:00 – 09:00</td>
<td>Registration (Day1)</td>
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<tr>
<td>09:00 – 11:00</td>
<td>Session I</td>
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<tr>
<td>11:00 – 11:15</td>
<td>Refreshment &amp; Networking Session I</td>
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<td>11:15 – 13:00</td>
<td>Session II</td>
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<td>13:00 – 14:00</td>
<td>Lunch</td>
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<tr>
<td>14:00 – 15:30</td>
<td>Session III</td>
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<tr>
<td>15:30 – 15:45</td>
<td>Refreshment &amp; Networking Session II</td>
</tr>
<tr>
<td>15:45 – 17:00</td>
<td>Session IV</td>
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<tr>
<td>17:00</td>
<td>End of Day</td>
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HYBRID TRAINING SOLUTIONS

FOCUS TRAINING • REDUCE COST • ENHANCED RESULTS

Over the years, there has been a growing demand for hybrid training programs. It is an excellent option to maximize your training dollar for your specific training needs. We make it possible to run a training program that is customized totally to your training needs at a fraction of an in-house budget!

If you like to know more about this excellent program, please contact us on +65 6415 4500 or email general@petrosync.com
Course Outline

DAY FOUR - Application of Seismic Data to Carbonate Reservoir Characterization

Seismic Facies Analysis
- Use of 2D or 3D seismic data to generate predictive maps of reservoir fairways

Advanced Carbonate Petrophysics
- Advanced topics on carbonate rock types, porosity and velocity

Mixed Carbonate and Siliciclastic Systems
- Controls, implications of mixed sedimentologic systems and their seismic expression

Case Studies: Cretaceous of the Middle East, Miocene of Southeast Asia, Devonian of North America
Exercises: Porosity, pore types, and petrophysics; Permian Basin mixed system

DAY FIVE - Application of Seismic Data to Carbonate Reservoir Characterization

Integrated Characterization of Carbonate Reservoirs
- Core, well-log and seismic data integrated to characterize and predict carbonate reservoirs
- Fracture and its characterization
- Unconventional and fine-grained carbonates
- Integration of these data into reservoir models

Facies and Seismic Expression of Lacustrine Carbonates
- Characteristics of microbialites
- Recognition criteria
- Geometries and reservoir characterization

Case Studies: Miocene of Southeast Asia; South Atlantic Pre-Salt
Exercises: Integrated log-seismic study of a Permian Basin mixed system

IN-HOUSE SOLUTIONS

SAVE COST • IMPROVE PERFORMANCE • REDUCE RISK
PetroSync understands that in current economic climate, getting an excellent return on your training investment is critical. This training can be conducted exclusively for your organization. The training can be tailored to meet your specific needs at your preferred location and time. We will meet you anywhere around the globe.

If you like to know more about this program, please contact Jerry Tay (Conference Director) on +65 6415 4502 or email jerry.t@petrosync.com

Petrosync Quality

Limited Attendees
The course has limited seats to ensure maximum learning and experience for all delegates.

Certificate of Attendance
You will receive a Certificate of Attendance bearing the signatures of the Trainer upon successful completion of the course. This certificate is proof of your continuing professional development.

Interactive Training
You will be attending training designed to share both the latest knowledge and practical experience through interactive sessions. This will provide you with a deeper and more long-term understanding of your current issues.

High Quality Course Materials
Printed course manual will provide you with working materials throughout the course and will be an invaluable source of reference for you and your colleagues afterward.
Dr. Rankey's background includes both industry consulting and the academe. He has worked with Exxon and has had various consultancies since then, and is now a co-lead investigator of a 12-company industrial consortium, with member companies including Shell, Statoil, PEMEX, Pioneer Natural Resources, Repsol, ConocoPhillips, BHP Billiton, Devon, Anadarko, Saudi Aramco, Chevron, and Total. More specifically, in terms of consultancies, Dr. Rankey has provided short courses, field short courses, or geological/geophysical consultancy (everything from seismic interpretation to core description to geologic modeling) with the following companies: ExxonMobil, Shell, Pioneer Natural Resources, BHP Billiton, Chevron, ConocoPhillips, Schlumberger, and Saudi Aramco.

He is currently an Associate Professor at the University of Kansas. His research programs focus on understanding and quantifying the nature and controls on variability in surface processes and geomorphic forms in modern tropical marine and nearshore carbonate sedimentary systems. To achieve these goals, his work at KU emphasizes field study of modern systems and atolls, where both process (waves, tides, etc.) and product (sediment accumulations) can be observed, and their relations rigorously evaluated and modeled, to develop testable quantitative and conceptual models for the origin of the stratigraphic record of carbonate successions. Recently, the focus has naturally evolved to evaluating the impact of global change on Earth-surface processes in shallow marine and coastal tropical systems, including reefs and tropical coastlines.

Dr. Rankey's experiences also include integration of geologic data with seismic interpretation, seismic modeling, and seismic attribute analysis, from regions including Gulf of Mexico, Southeast Asia, the Middle East, west Texas, offshore Brazil and Canada. He teaches short courses in seismic interpretation and stratigraphy of carbonate successions as well.

RECENT PROJECTS & CLIENT LIST:
- Mississippian Regional Stratigraphy, Midland Basin - SM Energy
- Pennsylvanian Regional Stratigraphy, Southeast Colorado - Pioneer Natural Resources
- Cretaceous (Edwards) Shelf Margins, Pawnee Field and Regional Aspects, South Texas - Pioneer Natural Resources
- Mississippian Regional Exploration, Southeast Colorado - Pioneer Natural Resources
- Miocene Isolated Buildups, South China Sea - BHPBilliton
- Jurassic Regional Seismic Stratigraphy, West Africa - Tullow Oil
- Mississippian Regional Stratigraphy, Midland and Delaware Basins - Pioneer Natural Resources
- Cretaceous Regional Seismic Stratigraphy, West Africa - Tullow Oil
- Jurassic Play Concepts, Eastern GOM - Anadarko Petroleum Corporation
- Jurassic Regional Seismic Stratigraphy, Eastern GOM - BHPBilliton

RECENT PUBLICATIONS:


Title: GEOLOGICAL SEISMIC INTERPRETATION OF CARBONATE SUCCESSIONS  
Date: 10-14 AUGUST 2015  
Location: KUALA LUMPUR, MALAYSIA

INVESTMENT PACKAGES

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<th>Investment Package</th>
<th>Deadline</th>
<th>5-DAY MASTERCLASS</th>
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<tr>
<td>Standard Price</td>
<td>7 AUG 2015</td>
<td>SGD $ 5995</td>
</tr>
<tr>
<td>Early Bird Offer</td>
<td>10 JUL 2015</td>
<td>SGD $ 5795</td>
</tr>
<tr>
<td>Group Discount (3 or more Delegates)</td>
<td>7 AUG 2015</td>
<td>10% discount for groups of 3 registering at the same organization at the same time</td>
</tr>
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</table>

Group Discount is based on Standard Price

* To enjoy the promotion & discount offer, payment must be made before deadline
* For 7 or more delegates, please inquire for more attractive package.
* Prices include lunches, refreshments and materials. Promotion & discount cannot be combined with other promotional offers.

Important: Please note that registration without payment will incur a SGD 200 administration fee.

DELEGATES DETAILS

1st Delegate Name: Mr  Mrs  Ms  Dr  Others  
Direct Line Number:  
Job Title:  
Head of Department:  
Email:  

2nd Delegate Name: Mr  Mrs  Ms  Dr  Others  
Direct Line Number:  
Job Title:  
Head of Department:  
Email:  

3rd Delegate Name: Mr  Mrs  Ms  Dr  Others  
Direct Line Number:  
Job Title:  
Head of Department:  
Email:  

INVOICE DETAILS

Attention Invoice to:  
Direct Line Number:  
Fax:  
Company:  
Industry:  
Address:  
Postcode:  
Country:  
Email:  

Please note:
• Indicate if you have already registered by Phone  Fax  Email  Web  
• If you have not received an acknowledgement before the training, please call us to confirm your booking.

PAYMENT METHODS

☐ By Credit Card:  
Please debit my credit card:  
Visa  MasterCard  AMEX  Security Code:  
Card Number:  
Expiry Date:  

☐ By Direct Transfer:  
Name printed on card:  

PAYMENT TERMS: Payment is due in full at the time of registration. Full payment is mandatory for event attendance.

CERTIFICATE OF ATTENDANCE

70% attendance is required for PetroSync’s Certificate of Attendance.

Data Protection

The information you provide will be safeguarded by PetroSync that may be used to keep you informed of relevant products and services. As an international group we may transfer your data on a global basis for the purpose indicated above. If you do not want us to share your information with other reputable companies, please tick this box ☐.

Cancellation Policy

You may substitute delegates at any time as long as reasonable advance notice is given to PetroSync. For any cancellation received in writing not less than fourteen (14) working days prior to the training course, you will receive a SGD $200 administration fee and any related bank or credit card charges.

Delegates who cancel less than fourteen (14) working days of the training course, or who do not attend the course, are liable to pay the full course fee and no refunds will be granted.

In the event that PetroSync cancels or postpones an event for any reason and that the delegate is unable or unwilling to attend in on the rescheduled date, you will receive a credit voucher for 100% of the contract fee paid. You may use this credit voucher for another PetroSync event or for a future event.

PetroSync is not responsible for any loss or damage as a result of the cancellation policy. PetroSync will assume no liability whatsoever in the event this event is cancelled, rescheduled or postponed due to any Act of God, fire, act of government or state, war, civil commotion, insurrection, embargo, industrial action, or any other reason beyond management control.

Failure to attend the course for any reason and that the delegate is unable or unwilling to attend in on the rescheduled date, you will receive a credit voucher for 100% of the contract fee paid. You may use this credit voucher for another PetroSync event or for a future event.

If you do not want us to share your information with other reputable companies, please tick this box ☐.

Authorized Signature:  
PetroSync Global Pte Ltd Bank details:  
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Bank Name: DBS Bank Ltd  
Bank Code: 7171  Bank Swift Code: DBSSSGSGXXX  Branch code: 288  
Account No.:  SGD: 2889018980  USD: 0288002682016  
Bank Address: 12 Marina Boulevard, Level 3, Marina Bay Financial Centre Tower 3. Singapore 018982

All bank charges to be borne by payer. Please ensure that PetroSync Global Pte Ltd receives the full invoiced amount.

Course Confirmation

I agree to PetroSync’s terms & conditions, payment terms and cancellation policy.

Authorized Signature:  
PAYMENT TERMS: Payment is due in full at the time of registration. Full payment is mandatory for event attendance.