SEQUENCE STRATIGRAPHY in Carbonate and Siliciclastic Systems

Apply effective sequence stratigraphical analysis on carbonates & siliciclastic reservoirs for improved exploration & development

10th NOVEMBER 2014 - 14th NOVEMBER 2014 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 sequence stratigraphic concepts in carbonate & siliciclastic systems
- APPRECIATE the value of siliciclastic and carbonate sequence stratigraphy
- IDENTIFY sequence stratigraphic elements in core, log, and seismic data
- UNDERSTAND the sequence stratigraphic workflow for reservoir characterization and prediction
- INTEGRATE geological and geophysical data through the use of sequence stratigraphic analysis
- APPLY sequence stratigraphic analysis to the prediction of reservoir properties in exploration and production settings

Specially Designed for
This course is designed for delegates who seek to understand and apply the principles of sequence stratigraphy to reservoir characterization or prediction in exploration, development, and production settings.

- Sedimentologists (Sample & Core Description)
- Geoscientists (Interpretation, Modeling & Processing)
- Geophysicists (Seismic Stratigraphy and Interpretation, Seismic Attribute)
- Reservoir, Petroleum, and Project Engineers (Evaluation, Properties, &Volumetrics)
- 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.
Course Overview

Sequence stratigraphy has proven to be a powerful tool in understanding and predicting the distribution, geometry, and continuity of elements of reservoir, source, and seal. The aim of this one-week course is to provide a general overview of the principles of sequence stratigraphy, and to demonstrate its application to exploration and production.

The course will include providing conceptual models, developing a workflow to examine core, log, and seismic data, and reviewing how these data can be integrated in a sequence stratigraphic framework. Key examples will illustrate how sequence stratigraphy can be used to 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. The course will include discussion of concepts and applications, and practical hands-on examples, from both carbonate and siliciclastic systems.

Case Studies Include:

Sequence stratigraphic concepts will be applied to examples from areas including:
- Indonesia
- Malaysia
- Sumatra
- Vietnam
- Phillipines
- North America, the Middle East, and Europe

These case studies will include well-log and seismic sequence stratigraphic analyses of carbonate and siliciclastic examples from a variety of settings. They will illustrate both the key aspects of the sequence stratigraphic methodology and the unique insights that sequence stratigraphy provides.

Course Outline

**DAY ONE - SILICICLASTIC SEQUENCE STRATIGRAPHY**

**Historical Framework**
- Chronostratigraphy vs lithostratigraphy – So What?

**Formation and Architecture of Sedimentary Basins**

**Sequence Stratigraphic Concepts**
- Facies, parasequences, systems tracks, and sequences
- Walther’s Law, flooding surfaces and sequence boundaries
- Fundamental controls on sequence stratigraphic patterns

**Introduction to Examples of Siliciclastic Sequence Stratigraphy**
- Shelf/Nearshore
- Deltaic
- Deep Marine Slope/Basin

**Case Studies:** Java fluvial systems, Cretaceous Nearshore Siliciclastics

**Exercises:** Time in stratigraphy, 1D-Stacking Pattern Analysis

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
Course Outline

DAY TWO - SILICICLASTIC SEQUENCE STRATIGRAPHY

Siliciclastic Sequence Stratigraphy in Well Logs
- Facies delineation, stacking patterns, and sequence stratigraphy

Siliciclastic Seismic Sequence Stratigraphy
- Seismic geomorphology and sequence stratigraphy

Case Studies: Cretaceous shallow-marine systems, Western Interior Basin; Deepwater, Gulf of Mexico

Exercises: Miocene incised valleys; Seismic stratigraphy and seismic facies mapping

DAY THREE - CARBONATE SEQUENCE STRATIGRAPHY

General Aspects of Carbonate Systems
- Carbonate sediments and textures
- Carbonate facies, geomorphic forms, and macro-geomorphic forms
- Differences between carbonates and siliciclastics and implications

Case Studies: Bahamas, Pacific, and Southeast Asia isolated platforms, Yucatan ramp

Exercise: Scales of heterogeneity - Inter-well facies variations

Carbonate Sequence Stratigraphic Concepts
- Global controls on carbonate sediment accumulations
- Sequence stratigraphic model and fundamental controls on sequence stratigraphic patterns
- Time (and variability) in the conceptual model
- Stratigraphic hierarchy – from facies to cycles (1D, then 2D, and 3D) to sequences
- Carbonate reservoirs in a sequence framework

Case Studies: Bahamas, SE Asia Miocene sequence stratigraphy

Exercise: 1D stacking pattern analysis in carbonates

PROGRAM SCHEDULE

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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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<tr>
<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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<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>
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<tr>
<td>15:45 – 17:00</td>
<td>Session IV</td>
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<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 - CARBONATE SEQUENCE STRATIGRAPHY**

**Carbonate Seismic Stratigraphy**
- Seismic geometries (stratal terminations; pseudo-geometries; seismic stratigraphic modeling)
- Seismic attributes (Seismic facies and geomorphology; Quantitative use of attributes to predict reservoir distribution and quality)

**Carbonate Diagenesis, Rock Types and Petrophysics**
- Pore types in carbonate systems (porosity classification, characterization)
- Diagenetic processes and products, porosity evolution (cementation and dissolution, diagenetic environments; links between diagenesis and sequence stratigraphy)
- Carbonate petrophysics (carbonate reservoir rock types; relations among porosity, velocity, and permeability)

**Case Studies:** Seismic modeling and pseudo-geometries; Sequence stratigraphy of isolated platforms - Devonian and Miocene

**Exercises:** Australia; SE Asia isolated platforms, Bahamas

**DAY FIVE - CARBONATE SEQUENCE STRATIGRAPHY**

**Carbonate Reservoir Characterization**
- Mechanical properties of carbonates – facies and diagenetic controls
- Reservoir zonation
- Integrated, sequence-based reservoir models and workflows
- Potential pitfalls

**Case Studies:** Miocene of Spain, Cretaceous and Jurassic of Middle East; Miocene of SE Asia

**Exercise:** Integrated sequence stratigraphic analysis of west Texas shelf-basin system

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**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 focuses 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 GOM, 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:


**INVESTMENT PACKAGES**

<table>
<thead>
<tr>
<th>Investment Package</th>
<th>Deadline</th>
<th>5-DAY MASTERCLASS</th>
<th>Sequence Stratigraphy in Siliciclastic Systems NOV 10–11 (2 Days)</th>
<th>Sequence Stratigraphy in Carbonate Systems NOV 12-13 (3 Days)</th>
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<tr>
<td>Standard Price</td>
<td>07 NOV 2014</td>
<td>SGD $ 5995</td>
<td>SGD $ 2995</td>
<td>SGD $ 3995</td>
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<td>Early Bird Offer</td>
<td>10 OCT 2014</td>
<td>SGD $ 5795</td>
<td>SGD $ 2795</td>
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<td>Group Discount (3 or more Delegates)</td>
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<td>10% discount for groups of 3 registering from the same organization at the same time</td>
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* 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**

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**2nd Delegate Name**

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**INVOICE DETAILS**

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Please note:
- If you have not received an acknowledgement before the training, please call us to confirm your booking.

**PAYMENT METHODS**

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<th>By Credit Card</th>
<th>please quote invoice number(s) on remittance advice PetroSync LLP Bank details: Account Name: PetroSync LLP Bank Number: 7144 - Branch Code: 013 - Account No: 13-1-005531-6 Name of Correspondent Bank: Standard Chartered Bank, 6 Battery Road, Singapore 049909 SWIFT Code of Correspondent Bank: SCBLSGSGXXX All bank charges to be borne by payer. Please ensure that PetroSync LLP receives the full invoiced amount.</th>
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**CERTIFICATE OF ATTENDANCE**

70% attendance is required for PetroSync's Certificate Details

Please accept our apologies for mail or email that is incorrectly addressed. Please email us at registration@petrosync.com and inform us of any incorrect details. We will amend them accordingly.

**CHARGES & FEE(s)**

- For Payment by Direct Telegraphic Transfer, client has to bear both local and overseas bank charges.
- For credit card payment, there is an additional 4% credit card processing fee.

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.