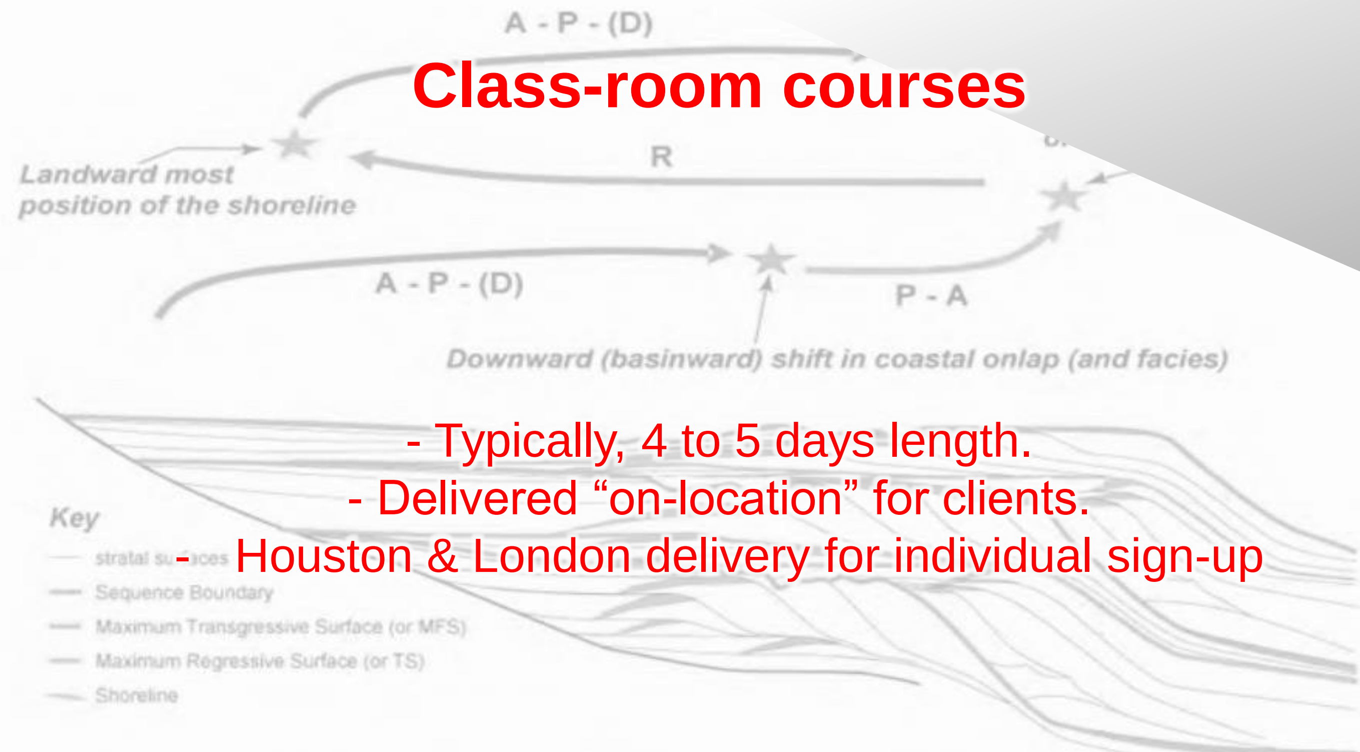
Class-room courses



- Typically, 4 to 5 days length.
- Delivered "on-location" for clients.
- Houston & London delivery for individual sign-up

Course List:

Basic Sequence Stratigraphic Method – Cores, Logs, Seismic

Advanced Sequence Stratigraphic Application – Cores, Logs, Seismic

Integrated Deep-water Depositional Systems

Integrated Shallow-water Depositional Systems

Prospect Generation, Assessment and Risking

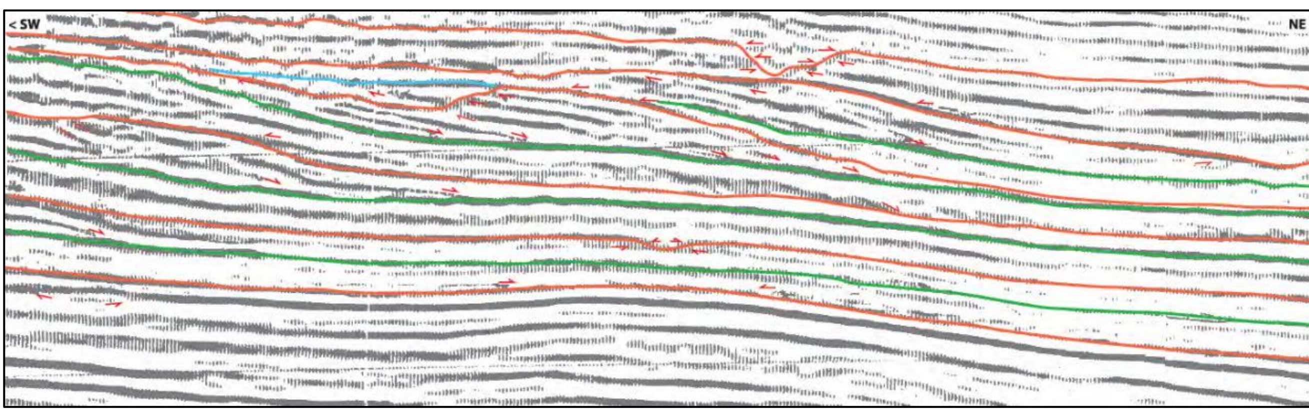
Expression of Clastic Reservoirs in Core, Well Logs & Seismic Data

Core Description of Clastic Reservoirs: Tools & Methods

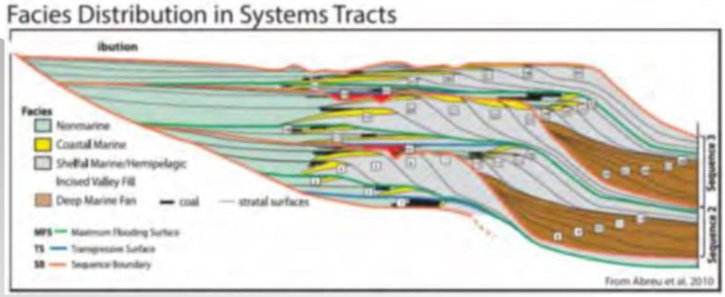
Basic sequence stratigraphic methods – cores, logs & seismic

The sequence stratigraphic method was developed to support geoscientists with the geologic interpretation of subsurface data. This method is utilized to predict the presence of petroleum play elements and to assess their quality before drilling. Sequence stratigraphy is applied to core, outcrop, well logs as well as 2- D and 3-D seismic data across all depositional environments.

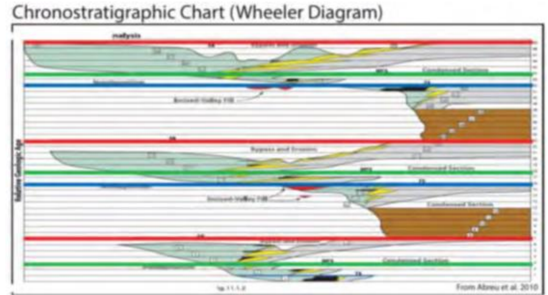
This course reviews basic definitions and terminology of surfaces and systems tracts and introduces the sequence stratigraphic hierarchy. Training exercises and datasets are thoroughly discussed, and participants later interpret subsurface data in terrestrial, shallow marine, and deep-marine depositional settings within a sequence stratigraphic framework. Based on the sequence stratigraphic method, the recognition and mapping of play elements from exploration to production scales is emphasized in this course.



Facies Distribution in Systems Tracts



Chronostratigraphic Chart (Wheeler Diagram)



Basic sequence stratigraphic methods – cores, logs & seismic

COURSE CONTENT

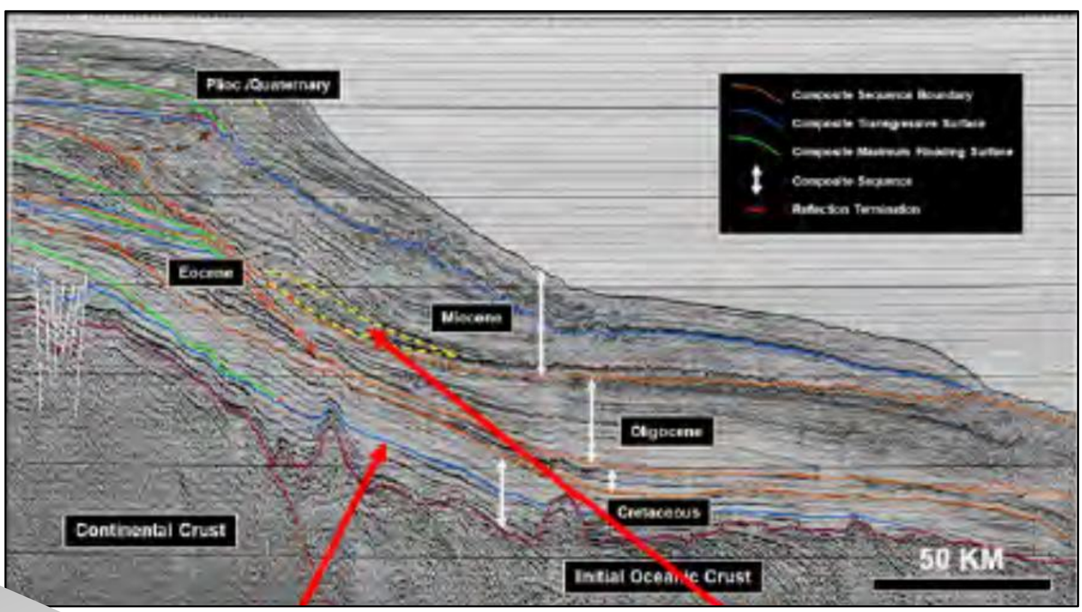
- Lithostratigraphy vs. chronostratigraphy interpretations
- Fundamentals of sequence stratigraphy
- Well-log interpretation, correlation, and mapping
- Seismic response of key stratigraphic surfaces
- Seismic reflection termination mapping
- seismic facies analyses
- Hydrocarbon play element mapping
- Criteria and mapping strategies for play elements in non-marine, shallow-marine, and deep-marine depositional settings

LEARNING OUTCOMES

- Explain sequence stratigraphic concepts
- Define sequence stratigraphic terminology
- Interpret facies and facies stacking patterns
- Implement the concept of facies, facies stacking and shoreline trajectory to identify parasequences, systems tracts & stratigraphic surfaces.
- Differentiate the main controls on depositional sequences
- Interpret core, outcrop, well-logs, and seismic lines
- Apply the sequence stratigraphic method across depositional environments
- Recognize and map hydrocarbon play elements across depositional settings

Sequence Stratigraphy - Advanced Applications

Advanced applications in sequence stratigraphy provides a methodology to recognize, interpret, and map the key play elements of the petroleum system (source rock, reservoir, seal, and trap). This workshop presents a methodology to predict the presence, distribution, and quality of play elements and to perform pre-drill estimates for exploration, appraisal and well development. During the exploration stage, the workflow focuses on identifying play elements on seismic lines and integrating well information. The exploration, appraisal, and production stages in the course place emphasis on play element distribution and trapping styles from shelf to deep-water settings. Primary goals for the production stage include describing reservoir connectivity and continuity as well as identifying flow baffles and barriers.



Source mapping

Deep-water Stratigraphic trap mapping

Sequence Stratigraphy - Advanced Applications

COURSE CONTENT

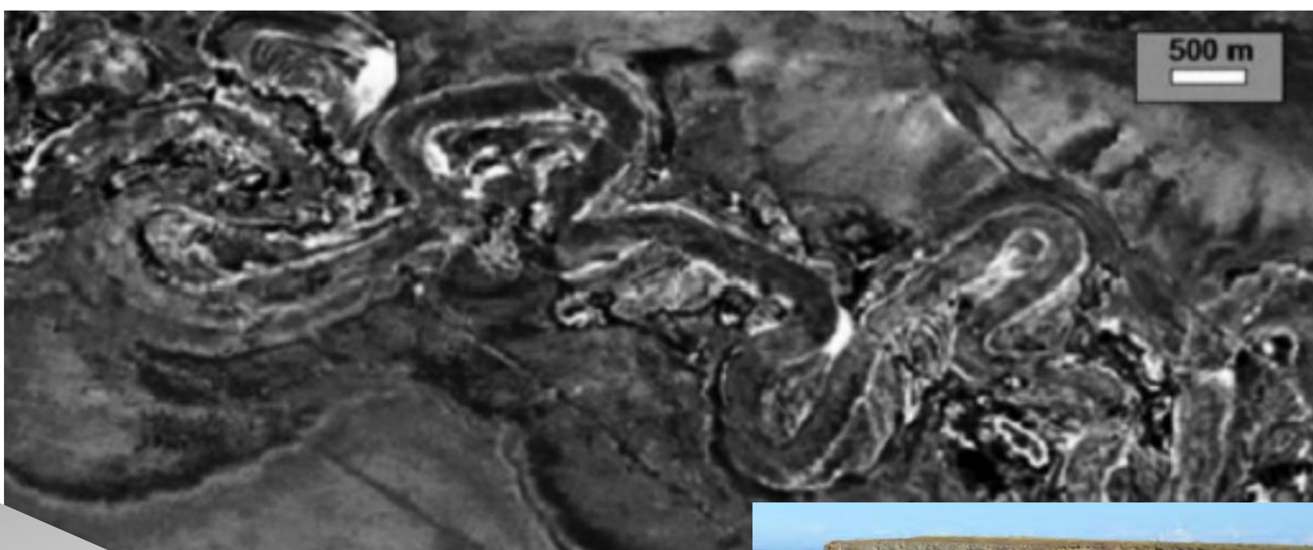
• Review application of sequence stratigraphy in subsurface data
• Examine sequence stratigraphy in different tectonic settings
• Application of sequence stratigraphy at exploration scale
• Definition of hydrocarbon plays and prospect mapping
• Presence and risk of play elements
• Fairway mapping of reservoirs and net-to-gross predictions
• Application of sequence stratigraphy and production scale
• High-resolution reservoir mapping and production strategies

LEARNING OUTCOMES

• Apply concepts of facies, facies stacking and shoreline trajectory to define parasequences, surfaces and systems tracts
• Create tectono-stratigraphic interpretations
• Utilize the sequence stratigraphic method to identify and map play elements in different depositional environments and tectonic settings
• Employ method and concepts in sequence stratigraphy to define hydrocarbon plays and prospects
• Conduct high-resolution reservoir mapping
• Map reservoir architectures across depositional settings
• Predict presence of play elements, assess associated risks and quality across different depositional settings
• Estimate net-to-gross and reservoir connectivity
• Map reservoir flow units at production scale

Integrated Deep-water depositional systems

This course combines field observations with in-class lectures and exercises to examine six deep water (DW) depositional systems. Field exercises emphasize practical applications by focusing on descriptions of DW lithofacies, stratal geometries, and the recognition of key stratigraphic surfaces. Participants learn how to describe core, integrate core datasets and well-log information with seismic for generating high-resolution fairway maps of reservoirs in different DW settings. Demonstrations in this course incorporate engineering data and show participants how to improve reservoir performance predictions. Examples of integrated core, well-log, and seismic datasets are compared and contrasted to outcrop datasets to help refine interpretation skills and extrapolate 2-D outcrop information into 3-D views of reservoir depositional systems.



Integrated Deep-water depositional systems

COURSE CONTENT

- Interpretation of sequence stratigraphics urfaces in outcrop, logs, and seismic in DW settings
- Utility and pitfall for use of outcrop datasets as reservoir analogs
- DW depositional models
- Main DW reservoirs archetypes
- Reservoir architecture of confined, weakly confined & distributive DW systems
- Recognition criteria and mapping strategies for play elements in DW depositional settings
- Risking reservoir presence and predicting net-to-gross in DW systems
- Production strategies for the different archetypes of DW reservoirs

LEARNING OUTCOMES

- Comprehend sedimentological processes in deep water (DW) systems
- Recall DW lithofacies nomenclature and definitions
- Describe DW lithofacies from core and how to relate facies to reservoir architecture and environment of deposition (EoD)
- Interpret DW EoD based on lithofacies associations, stacking, and diversity
- Extrapolate key stratigraphic surfaces based on variations in lithofacies stacking patterns and associations
- Apply outcrop analogues and depositional models to better understand 3-D distribution of reservoir facies
- Build geologic models by tying rock properties to facies
- Map EoD and predict reservoir architecture
- Integrate core, well-logs, & seismic data to describe 3-dimensional architecture

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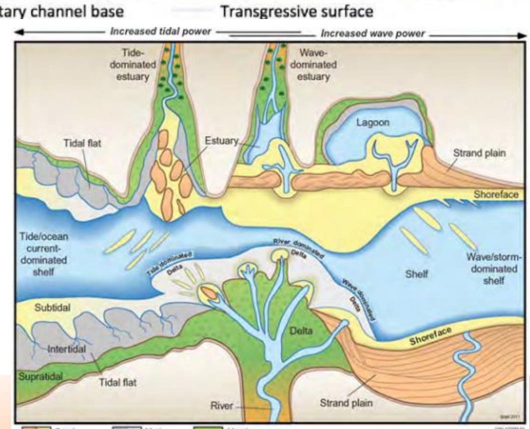
Integrated Shallow-water depositional systems

This hands-on course provides participants with practical recognition criteria, mapping strategies, dimensional datasets, and reservoir architectures of different coastal to shallow marine depositional systems that are known for producing conventional subsurface reservoirs.
From a landward to basinward transect, this course systematically introduces participants to the main environments of deposition (EoD) and focuses on where reservoir quality sands are deposited. This course delivers modern examples, outcrop analogues, core photos, well-log signatures and seismic data for each EoD.
Facies, facies associations, log and seismic response, geomorphology, as well as recognition criteria for each EoD is thoroughly discussed and evaluated. By the end of the course, participants predict reservoir geometries, dimensions, and net-to-gross ratios of fluvial and paralic sedimentary systems.

Sequence boundary (inferred/covered) Distributary channel base Transgressive surface



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Integrated Shallow-water depositional systems

COURSE CONTENT

- Sequence stratigraphic interpretation method
- Clastic facies in transitional marine environments
- Facies, log motif and seismic response of fluvial and transitional systems
- Facies, log motif and seismic response of river-, wave-, and tide-dominated systems
- Recognition criteria and mapping strategies for play elements in terrestrial and shallow marine settings

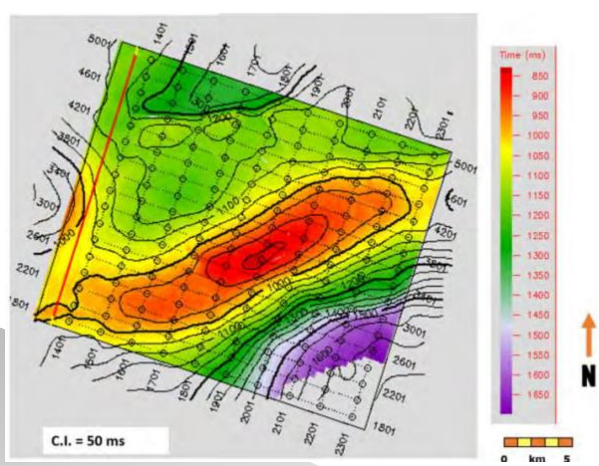
LEARNING OUTCOMES

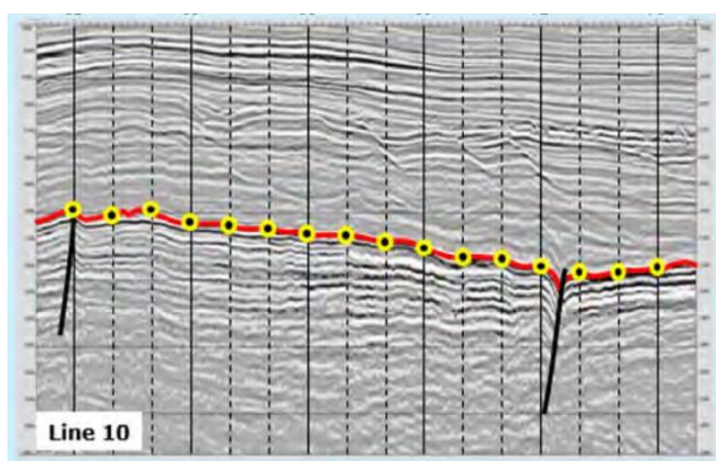
- Recognize and describe sedimentary structures from coastal plain to shallow marine strata
- Document coastal plain to shallow marine (also known as marginal marine, paralic or transitional) siliciclastic systems from core
- Interpret siliciclastic depositional environments from core, well logs, and seismic data
- Identify reservoir quality sandstone using subsurface datasets from siliciclastic systems
- Predict distributions of clastic reservoirs and architectures along depositional strike and dip
- Map seismic facies to de-risk reservoir presence and predict net-to-gross ratios in shallow marine and fluvial systems
- Acquire exploration techniques for transitional marine reservoirs

ACT GEO

Prospect generation, assessment and risking

This hands-on course enables attendees to enhance their mapping skills and their critical evaluation of prospects.
This course demonstrates how to use play fairway mapping and petroleum system analyses to identify plays and prospects with high potential, even in areas with limited data. Once participants identify prospects, the course outlines how to derive geologically map based, objective inputs for prospect assessment and risking.
This stepwise approach creates well-documented results that are used to confidently rank opportunities and make smart business decisions.
Upon completion of the course, participants are able to: comprehend prospect definitions and workflows, estimate original hydrocarbons in place, delineate risk and uncertainty related to original hydrocarbon in place, reduce risk impacts, and understand fundamental concepts in regard to portfolio and resource management.





Prospect generation, assessment and risking

COURSE CONTENT

• Exploration methods and strategies
• Evaluation of petroleum assessment potential in basins
• Key workflow stages in exploration
• Subsurface mapping techniques for well and seismic datasets
• Principles of stratigraphic and structural mapping
• Generation, contouring and quality control of geologic maps
• Hands-on exercises on prospect generation and maturation
• Prospect risking strategies
• Hands-on exercises and case studies of exploration

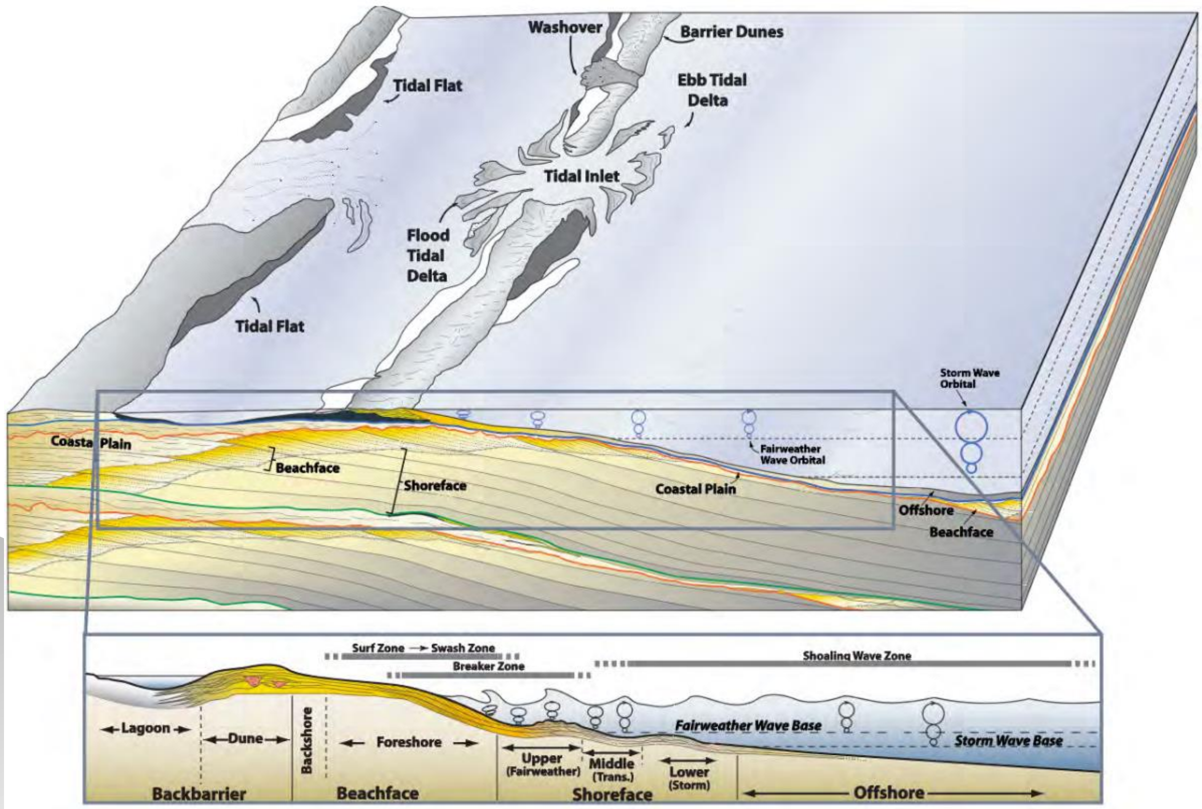
LEARNING OUTCOMES

• Recall play element definitions and hone mapping skills
• Understand tectonic phases and play types with respect to the history of basin evolution
• Interpretation and integration of well and seismic data
• Subsurface mapping of prospects and maturation to drillable status
• Risk and rank prospects
• Identify and assess risks and uncertainties related to geological factors (source, reservoir, seal, trap and preservation)
• Evaluate prospect success

ACT GEO

Expression of Clastic reservoirs in core, well logs and seismic data

Reservoir mapping at a production scale requires a thorough understanding of clastic depositional systems combined with the full integration of core, core-plugs, well logs, seismic and production data. This workshop focuses on common clastic reservoir facies in transitional, marine, and deep-water systems. This course explores fluvial-, wave- and tide-dominated deltas, incised valleys, deep-water channel systems and distributary channel-lobe systems (deep-water fans). Course discussions and materials include dimensional datasets of sand bodies across these environments and recognition criteria for interpreting these depositional environments in core, well logs and seismic. This class presents optimized workflows for reservoir mapping, including the deliverables at different business stages.



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Expression of Clastic reservoirs in core, well logs and seismic data

COURSE CONTENT

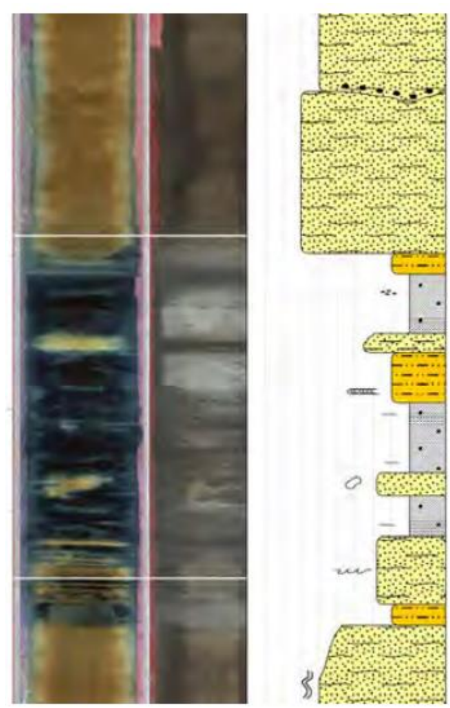
- Classification schemes for clastic EoDs
- Common facies and stacking patterns in transitional, marine, and deep marine EoDs
- Sediment transport mechanisms associated with different depositional environments and impacts in reservoir rock properties
- Well-log patterns of classic depositional systems
- Typical seismic maps & cross-sectional views of sand-rich systems
- integrate core, core plugs, information from reservoir analyses to tie into well-log and seismic datasets
- Pre-drilling predictions based on EoD and seismic response
- Dimensional data for sand bodies in different EoD's
- Reservoir mapping workflows emphasizing data integration and main deliverables in different business stages.

LEARNING OUTCOMES

- Utilize core information for interpreting environments of deposition (EoD) in transitional, shallow marine, and deep-water realms
- Recognize the different EoD and sub-EoD in core, well logs, seismic, and outcrop
- Interpret and mapping techniques for core, well-logs and seismic lines in DW settings in both exploration and production scales
- Interpret EoD in different settings and map reservoir fairways
- Perform reservoir presence and risk and pre-drill prediction in different transitional, shallow marine, and deep-water settings
- Evaluate reservoir geometry and connectivity in different EoD's and sub-EoD's, integrating with production data

Core Description of Clastic Reservoirs: Tools and Methods

This course introduces participants to the observational skills needed to describe clastic lithofacies, recognize vertical facies stacking patterns, and interpret key stratigraphic surfaces in core. Lectures cover all main clastic environments of deposition (EoD), core descriptions, and methods for core logging. Participants describe and identify facies in core, link core descriptions to rock properties and interpret EoD and sub-EoD. Core exercises are tied to well logs and seismic lines to correlate 1-D core information to 3-D views of reservoir-scale depositional systems. This course provides participants with the necessary skills to integrate core, well-log, and seismic data for generating high-resolution EoD maps. Group discussions and exercises also help participants understand the importance of integrating engineering data and how vital integrating geoscience data when characterizing the reservoir behavior.



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Core Description of Clastic Reservoirs: Tools and Methods

COURSE CONTENT

- Basic concepts in clastic sedimentology
- Sedimentologic techniques for core descriptions and interpretations of lithofacies in core
- Interpret EoD and reservoir architecture for clastic depositional systems
- Interpretation of vertical stacking of facies and identifying sequence stratigraphic surfaces in core
- Interpretation and mapping techniques for core, well-logs, and seismic lines in different clastic settings at different scales
- Evaluation of reservoir geometry and connectivity across EoDs

LEARNING OUTCOMES

- Definition and recognition criteria for different clastic lithofacies, lithofacies associations and vertical stacking patterns of facies
- Recognize key stratigraphic surfaces in clastic depositional systems
- Quantify grain size by visual comparison to grain-size charts
- Qualitatively evaluate provenance, sediment maturity and distance to sediment source based on grain composition, roundness, and sorting
- Understand sedimentary processes and their resulting sedimentary structures and fabric, and how to relate processes to different lithofacies
- Correlate lithofacies described in core to well-logs
- Utilize core data to calibrate well-log and seismic data for the recognition of EoD
- Interpret and map flow units at production scale based on the integration of core, well-log and production data

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