

19 - 23 JUNE 2010

SOCIETY OF PETROPHYSICISTS AND WELL LOG ANALYSTS

51st ANNUAL SYMPOSIUM

PERTH CONVENTION
EXHIBITION CENTRE

SPWLA2010

PERTH
WESTERN
AUSTRALIA



Short Course 1: Correlations, Cycles and Cosmic Catastrophes. Looking for Patterns in Depth Based Data

Instructor: Martin Kennedy, MSK Scientific

This is a wide ranging course that looks at different ways of interpreting quantitative data. The course can broadly be split into a review of traditional statistical methods and a look at some more novel ways of extracting information from logs. In either case the course deals more with the interpretation of the results than the details of the calculations. There is therefore a strong emphasis on the importance of using scientific knowledge to compliment 'blind statistics'.

Quantitative Petrophysics and Log Analysis makes much use of statistical tools to pick parameters, summarize results and generally reduce large volumes of data to a few numbers. Statistical properties have the advantage of objectivity but are notorious for being misused knowingly or otherwise. In the first half of the course we will look at some of the common tools and ask what they are really telling us and if that is what we really want to know.

In the second part of the course we will look at some of the information that gets lost when we calculate basic statistics: heterogeneity and depth trends for example. Firstly, we will consider why we want to know about these properties and then we will look at some of the measures that have been developed to quantify them. Heterogeneity will be discussed first and in particular its implications for permeability up-scaling. We will finish by looking at how tools developed for analyzing time series can be adapted to look at log data and how to interpret the results.

This is a classroom-based course which uses a mixture of lectures and exercises (the latter can be tackled with calculators and graph paper, computers will not be provided).

Date: Saturday 19 June 2010
Time: 8:30am - 4.30pm
Location: PCEC Meeting 1 (M1), Level 2
Fee: AUD \$330 pre-registered delegates
AUD \$396 non-registered delegates

For registration and cost, see the Pre-Registration Form and Brochure on the website:
www.spwla2010.org.



Short Course 2: Multi-Mineral Solvers

Instructor: John Quirein, Halliburton

The formation mineralogy is important for obtaining accurate porosity estimates in carbonates and also for shale gas reservoirs where unrecognized kerogen can result in erroneous porosity and hydrocarbon volume estimates. This course will focus on using wireline geochemical data and multi-mineral solvers for obtaining mineralogy.

In particular, this short course will cover the fundamentals of the following topics:

- 1) Overview of available commercial well-log based multi-mineral solver applications,
- 2) Comparison of deterministic approaches and multi-mineral solvers,
- 3) Overview of optimization and nonlinear solvers including sum of squares minimization, linear constraints, non-linear constraints,
- 4) Response parameters and response equations linear by volume (ρ_{HOB} , U), linear by weight fraction (Al, Mg, Fe, Ca, Si, K), non-linear (Archie, dual water model, neutron logs),
- 5) Spreadsheet Solvers: Excel's built-in optimization tool called "solver",
- 6) Selection and validation of "mineral models" with cross-plots of the elementals (Al, Mg, Fe, Ca, Si, K, Th), reconstructed logs and core XRD and ICP data,
- 7) Results and model uncertainties,
- 8) Multi-mineral solver examples from carbonates, shale gas reservoirs and shaley sands, and
- 9) Recent technology developments including very thin bed Stochastic inversion, Bayesian inversion and simultaneous inversion of layered models.

Although not mandatory, it is recommended participants bring their laptop with the EXCEL Tools → Add-Ins → Solver Add-in installed for some hands-on familiarity with multi-mineral solvers.

Date: Saturday 19 June 2010
Time: 8:30am - 4.30pm
Location: PCEC Meeting 2 (M2), Level 2
Fee: AUD \$330 pre-registered delegates
AUD \$396 non-registered delegates

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Short Course 3: Clay Minerals and Their Effect on the Electrical Behavior of Shaly Sands

Instructor: E.C. Thomas, Bayou Petrophysics

This short course will cover the fundamentals of the following topics:

1. The Structure of Clay Minerals,
2. The Origin of Cation Exchange Capacity in Clay Minerals,
3. Understanding How the Cation Exchange Properties of Clay Minerals Alters the Conductivity of Brine Saturated Shaly Sands,
4. Development of the Waxman-Smits Equation as a Model for Conductivity Behavior of Shaly Sands,
5. Using the Waxman-Smits Model to Compute Water Saturation when Cores and Their Analyses are Not Available,
6. Bound Water and How it is Measured, including Comparison to NMR,
7. Handling Laminated Shaly Sands Using the Thomas-Stieber Approach to Derive Porosity and Water Saturation of the Sand Laminate, and
8. Advantages of Having Horizontal and Vertical Resistivity Measurement for the Analysis of Shaly Sands.

Date: Sunday 20 June 2010
Time: 8:00am – 5:00pm
Location: PCEC Meeting 1 (M1), Level 2
Fee: AUD \$330 pre-registered delegates
AUD \$396 non-registered delegates

For registration and cost, see the Pre-Registration Form and Brochure on the website:
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Short Course 4: Introduction to the Petrophysics of Unconventional Hydrocarbons

Instructor: Mike Lovell, University of Leicester, UK

This course is an introduction to the concepts of unconventional hydrocarbons (shale gas, coal bed methane and gas hydrates) and their petrophysical properties. How are unconventional hydrocarbons different to conventional reservoirs, and how can understanding the physics and the chemistry of the resources help in their evaluation? Shale gas and coal bed methane are current topics while gas hydrates have potential as both a resource and a hazard.

The course will review unconventional hydrocarbons, their nature and geographical distribution. What makes unconventional hydrocarbons different from a petrophysical perspective? Where are the hydrocarbons in these unconventional resources and how can we assess them?

For each of the unconventional resources we will consider the geological environment; formation properties (mineralogy, chemistry and physical properties); petrophysical characterisation, challenges and pitfalls. Questions we will address include, for shale gas, what is shale and where is the gas? For coal bed methane: what are the applications of core analysis and log analysis in assessing the adsorbed gas, and what about cleats and fractures? For gas hydrates how do pore fluid salinity, and hydrate morphology affect hydrate stability and petrophysical evaluation?

On completion of this course, participants will have been exposed to the fundamental nature of three unconventional hydrocarbon resources. Participants will have explored the petrophysical properties and characteristics of unconventional hydrocarbon resources, the geological setting of these resources, and the petrophysical concepts and models on which their evaluation and interpretation can be based. This course will be of interest to both new and experienced petrophysicists; to those who have yet to work with unconventional hydrocarbons, but also to those who have experience of one type but not the others.

Date: Sunday 20 June 2010
Time: 8:30am – 4:30pm
Location: PCEC Meeting 2 (M2), Level 2
Fee: AUD \$330 pre-registered delegates
AUD \$396 non-registered delegates

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Short Course 5: Fundamentals of Borehole Image Interpretation

Instructor: Jeremy Prosser and Lawrence Bourke, Task Geoscience

Introduction

- Borehole image and LWD acquisition
- Processing techniques

Log quality and artifact images

- Recognition of artefact images and common QC issues
- LWD QC for decision making

Structural interpretation

- Basic principles → quick-look interpretation
- Tectonic tilt identification, unconformities
- Large-scale fault deformation structures
- Fracture analysis
- *In situ* stress identification
- Practical exercises - tectonic tilt, faults, unconformities

Sedimentological interpretation

- Basic principles and philosophy
- Sedimentological interpretation of borehole image and dipmeter data
- Practical exercises - borehole image data
- Sedimentological interpretation of borehole image data - clastics
- Practical exercises - borehole image data

Date: Sunday 20 June 2010
Time: 8:30am – 4:30pm
Location: PCEC Meeting 3 (M3), Level 2
Fee: AUD \$330 pre-registered delegates
AUD \$396 non-registered delegates

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