# Strategic Seismic Data Acquisition, Processing & Interpretation Onshore/Offshore 2011

## A World-Class Seminar for exploring Africa, with many case studies and exercises

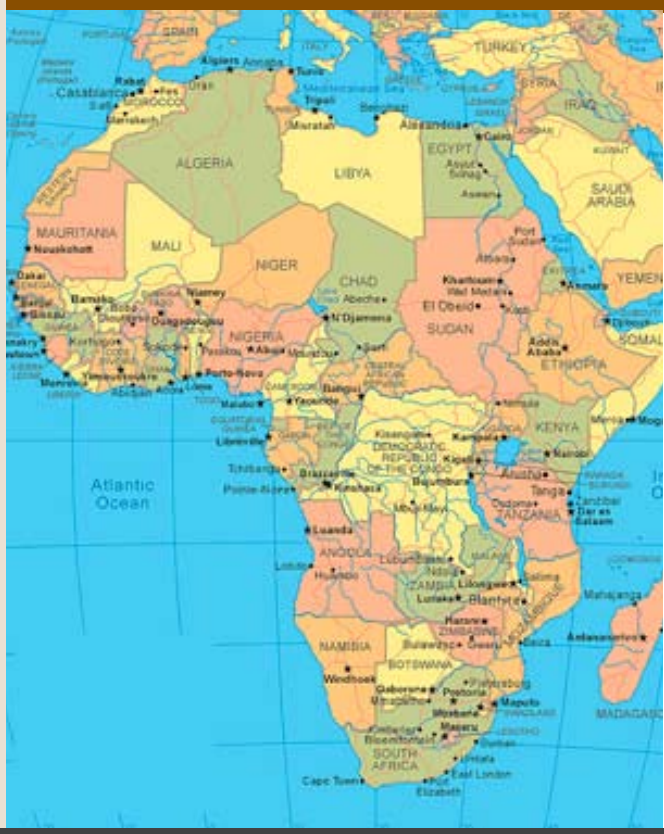
**Specially designed for seismic, geophysical and other geological professionals in Africa, the Middle East and Asia**

*Highlights of the Strategic Seismic Data Acquisition, Processing & Interpretation Masterclass:*

- Latest developments in Seismic Data acquisition, the practical & more accurate approach
- Major steps in seismic exploration projects
- Seismic Wave Propagation
- Signal Analysis
- How to design a seismic survey using existing seismic data, maps & geological data
- Acquisition implementation and operations
- Seismic data processing workflows
- Velocity and velocity analysis
- Migration and Imaging
- Pitfalls in seismic data processing and how to avoid them
- Inversion, attributes, AVO, multi-component seismic
- Illustrated with many case studies and examples from Africa, the Middle East, Asia, Europe and the Americas.

19 – 21 October 2011,

Movenpick Royal Palm Hotel,
Dar es Salaam, Tanzania




*Course Leader:*

Dr Piet Gerritsma

*International Renowned Seismic Expert*

*Organised by:*

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**Limited Places Available**
**Book Early!**
Register & pay before 18 September 2011 and save US$200 on the seat price!

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FAX: (+65) 6392 3592 / 6392 2102
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# Strategic Seismic Data Acquisition, Processing & Interpretation Onshore/Offshore 2011

## About this course?

During the last decade, seismic has become the key tool to exploration and development success. With the advance of computer technology, processing has increasingly helped to acquire a competitive edge. A profitable development of an oil or gas field starts with a good understanding of the subsurface. There is a drive to extract more and more from the data and therefore scope for reprocessing. With the presence of new data acquisition techniques, like multi-component and ocean bottom cable, multi-azimuth and wide-azimuth, also new processing methods have to be developed.

This important course will update seismic interpreters and entry level geophysicists with the latest in key concepts and principles that form the technical basis for value added seismic applications in exploration, field appraisal and reservoir management. Emphasis is on practical understanding of seismic acquisition, processing, imaging and technical requirements for extraction of geological and petrophysical information. Data examples from both onshore and offshore fields, exercises and workshops are used to illustrate key concepts, practical issues and pitfalls as they affect seismic data quality and interpretation.

During the course, there will be many examples/case studies of applications and interpretations of this type of data, based on the many scenarios in Africa, the Middle East, Asia, Europe and the Americas. Delegates are encouraged to bring up cases in Africa, Asia, the Middle East, the Americas where they worked with, for consultation with the expert trainer.

## Who should attend?

This course is meant for seismic professionals, geophysicists involved in seismic data acquisition, processing and interpretation, geologists, petrophysicists, petroleum and reservoir engineers involved with the exploration and development of oil and gas fields, who want to familiarize themselves with this type of seismic data processing and its deliverables will also benefit from this course. University geophysical & geological researchers and geological processing service providers are also welcome.

*Registration commences at 8.00 am on Day One. Course begins from 8.30 am to 5.30 pm for all days. There will be mid-morning and mid-afternoon refreshments. Lunch will be served from 12.45 pm to 1.45 pm each day*

## DAY ONE

08.00 Registration

08.30 Course Welcome

### Seismic Acquisition Primer

- The seismic experiment and basic measurements
- Characteristics of seismic data
- Definitions of seismic trace, record, coverage, section and cube
- Major steps in seismic exploration projects
- Role of seismic in the reservoir life cycle
- Exercise on acquisition pitfalls.

### Seismic Wave Propagation

- Stress, strain, elastic moduli and the wave equation
- P-wave and S-wave velocity in terms of elastic moduli
- Raypaths, wavefronts, Huygen's principle, Snell's law
- Reflection, refraction and diffraction
- Effect of porosity, depth of burial and incidence angle on velocity, density and reflection strength
- Refraction seismic method with exercise
- Fourier analysis
- The convolutional trace model
- Spectral properties of the seismic wavelet and vertical resolution
- Fresnel zone and lateral resolution
- Bin size, bandwidth and resolution
- Geometric spreading and absorption
- Exercises on vertical and lateral resolution

### Signal Analysis

- Sampling of signals in time and space
- The Nyquist criteria and the causes of aliasing
- Fourier analysis to convert signals to their spectral components
- Wavelet phase and its effect on wavelet shape
- F-K transform and apparent velocity
- Relationship between seismic events and their F-K transform
- The linear Radon transform and the tau-p domain
- Exercises on spatial aliasing

### Seismic Acquisition Principles

- Land, marine, transition zone, multi-component, ocean bottom, borehole and 4D seismic acquisition
- Definitions of acquisition parameters
- Identifying seismic signals and noise
- The causes and effects of noise
- Noise suppression with field arrays
- The seismic acquisition business process and cost overview
- The survey design workflow: E&P company perspective
- Exercises on identifying seismic signals and noise from field records and field array design

## Day Two

### Seismic Survey Design

- Introduction to Survey Design
- Acquisition geometries
- Trace gather types
- Offset and azimuth distribution and fold requirements
- Shotpoint and receiver interval
- Binning, spatial sampling, fold and bin size
- Migration aperture
- Survey orientation
- Acquisition footprint
- Workshop on designing a survey using existing seismic data, maps and geological data

### Acquisition Implementation and Operations
- Positioning principles
- The GPS revolution
- Marine cable positioning, compasses and depth control
- Marine airgun characteristics; airgun array design
- Explosive sources
- Land vibrator characteristics
- Vibroseis sweep, cross-correlation, Klauder wavelet
- Hydrophones, geophones and coupling
- Recording systems
- Land and marine acquisition quality control

### Processing workflows
- Introduction
- Definitions
- Data processing steps
- Processing flow charts:
  - Land 3D
  - Marine 3D

### Prestack Analysis and Signal Corrections
- Geometry, trace sorting and gathers
- Deterministic and adaptive amplitude corrections: gain and scaling
- Noise suppression and signal enhancement
- Filtering
- F-K/Velocity filtering – (f-k) exercises
- Deconvolution
- Multiple suppression
  - Types of multiples
  - F-K domain multiple attenuation
  - Radon domain multiple attenuation
  - Wave equation multiple attenuation
- Model based wavelet processing and zero phasing

### Velocity and Velocity Analysis
- Types of velocity measures – definitions
  - Velocity exercise
- Moveout behaviour and correction
- Effect of 3D and dip
- DMO concept
- Velocity analysis methods
  - Velocity spectra exercise
- Factors and pitfalls affecting velocity analysis
- Information contained is stacking velocities

## Day Three

### Statics and Near Surface Corrections
- Problem definition and effects
- Datum, long period and short period statics
- Correction techniques:
  - Elevation statics
  - Refraction statics
  - Tomographic statics
  - Residual statics
  - Prestack imaging/Redatuming
- Statics exercise

### Migration and Imaging
- The migration problem
- Wavefield extrapolation
- Migration strategies
  - Prestack vs poststack
  - Depth vs time
- DMO and prestack time migration
- The critical role of velocity
- Modern 3D imaging
  - Prestack time
  - Prestack depth
- Velocity model building and updating
- Case studies
- Migration algorithms
- The anisotropy problem
- Migration exercise

### Pitfalls and Quality Assurance
- Pitfalls in seismic data processing
- Quality assurance of the various processing steps

### Inversion, Attributes, AVO, Multi-component Seismic
- Objectives of inversion
- Processing for inversion
- Characterization of attributes and attribute measurement
- Reflection coefficients and approximate versions of the Zoeppritz equation
- Processing for AVO measurements
- Measurement of AVO attributes
- Cross plot analysis of AVO attributes and the background normal
- Thin bed effects (tuning) on amplitudes
- P-waves and S-waves: properties and relationships
- Land and marine = OBC multi-component seismic data acquisition
- Rock properties and the Gassmann equation for fluid substitution
- PS or C(onverted) -waves: acquisition and processing

17.30 *End of Masterclass*

*Case Studies: In order to enhance the learning experience, many case studies using examples in many parts of the world including Africa, the Asia Pacific region, the Middle East, Europe, the Americas, will be used accordingly to illustrate learning points*

## About the Course Leader:

Dr Piet Gerritsma, International Renowned Expert of geophysics and seismic processing and interpretation, has more than 41 years of field experience in the oil and gas sector, 30 of which he served with Shell as its Senior Geophysicist, in its offices in Asia, Europe and North America, including Houston. Currently as international consultant on seismic processing and advanced geophysical studies, Piet has advised international oil and gas companies on a number of international projects, such as with Woodside, Shell, NIOC, and so on. More recently, he was the international consultant to:

- Woodside Australia: processing for imaging, AVO analysis and seismic inversion of marine data for gas detection
- Cad Cam Iran: imaging through a scattering overburden
- KACST Saudi Arabia: static corrections and imaging through a scattering overburden
- Resolution Resources Netherlands: detection of DNAPL's (pollutants) with high resolution shallow seismic
- Geofizyka Torun Poland: imaging of Rotliegend and sub-Permian reflectors

More specifically, in the area of geophysical research, Piet is well-known as a specialist in structural imaging, velocity model building and seismic migration. In the area of seismic data processing, at Shell, in addition to his processing expertise and experience in managing processing contractors, he has also experience with special studies in multidisciplinary teams with Brunei Shell (seismic-to-well matching and lateral extrapolation) and Shell Canada (structural imaging of complicated Foothill's data, statics and AVO). In Advanced Studies, he headed geophysical research teams involved with AVO, inversion, multi-component seismic and anisotropy on fields in various continents. As a leading researcher in his field, he has also worked closely with top universities and research institutes such as IFP, the Stanford Exploration Project, Russian Academy of Sciences, Russia's Ministry of Geology and the Corolado School of Mines. He is effectively competent in English and French, amongst many others.

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# Registration Form

# Strategic Seismic Data Acquisition, Processing & Interpretation Onshore/ Offshore 2011

19 – 21 October 2011, Movenpick Royal Palm Hotel,
Dar es Salaam, Tanzania

**Strategic Seismic Data Acquisition, Processing & Interpretation Onshore/ Offshore 2011 (CR0242)**

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## VENUE INFORMATION

Mövenpick Royal Palm Hotel
Ohio Street
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Dar es Salaam, Tanzania
Phone +255 22 2112416
Fax +255 22 2113981
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E-Mail:evangelista.mango @moevenpick.com

## PAYMENT DETAILS:

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Payment by telegraphic transfer must be made payable to **Magenta Global Pte Ltd** Account No. 556-002236-301, SWIFT Code: OCBCSGSG, OCBC Bank, Hougang Mall Branch, 90 Hougang Avenue 10, #01-01/02/03 Hougang Mall, Singapore 538766

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## HOW TO BOOK:

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POST the completed form together with payment to **Magenta Global Pte Ltd**, 20 Kallang Avenue, Level 2 Pico Creative Centre, Singapore 339411.

## BOOKING CONDITIONS

Full payment must be received prior to the event for entrance to be guaranteed. If payment is not received a personal credit card will be required to allow entry.

A confirmation letter and invoice will be sent to you on receipt of your booking. If you are unable to attend, a substitute delegate is always welcome. If you cancel your place in writing 10 working days before the event, a cancellation fee of 10% shall be applicable. Thereafter cancellations are not refundable.

It may be necessary for reasons beyond the control of the organizers to alter the content, timings or venue. The company will not accept liability for any transport disruption or any claims whatsoever and in such circumstances the normal cancellation restrictions apply.

## DATA PROTECTION

The personal information provided by you will be held on a database and may be shared with companies in the Magenta Group. Sometimes your details may be made available to external companies for marketing purposes. If you do not wish your details to be used for this purpose, please email the Database Administrator at **enquiry@magenta-global.com.sg**