Mustagh Resources Ltd.

BASIC PROCESSING OF SEISMIC DATA
COURSE OUTLINE

- **Introduction**
- **Overview**
  - Review of basic seismic principles
  - Sampling the wavefield
  - Aliasing in time and space
  - Bandwidth, phase and resolution
  - Energy loss mechanisms
  - 3D basics
  - Acquisition tools and techniques
  - Land versus Marine
  - Recent developments
- **Modeling**
  - Synthetic seismograms
  - Ray tracing
  - Full Wave Equation models
    - Acoustic
    - Elastic
    - Anisotropic
- **Review of some shot records**
  - What is signal?
  - What is Noise?
    - Random, time variant
    - Source variant
    - Receiver variant
    - Offset variant (source generated)
  - Multiples
    - Marine
    - Land
  - Trapped Mode
    - Guided waves
- **First Breaks and LVL**
  - Direct waves
  - Refractors
  - LVL and datum corrections
  - Detailed refraction surveys
  - Uphole surveys
  - Survey tolerances
- **CDP Method**
  - Basic principles
  - Stacking charts
  - Bent line processing and binning
  - Stack array
  - Gaps, skids and offsets
- **Gain Recovery**
  - Exponential
  - AGC
  - Surface consistent
  - AVO considerations
- **Deconvolution**
  - Convolutional model
  - Basic deconvolution
  - Prewhitening
  - Operator length
  - Surface Consistent
  - AVO considerations
- **Velocity Analysis**
  - NMO
  - Semblance
  - Common offset stacks
  - Common velocity stacks
  - Stretch mute
  - Multiples
  - High order moveout
  - Anisotropy and eta terms
  - AVO considerations
- **Statics**
  - Surface consistent
  - Iteration
  - Non-surface consistent
  - Correlation Trim statics
- **Filtering and Noise Suppression**
  - Temporal
  - Spatial
  - Geophone arrays as spatial anti-alias filters
  - F-K filtering
    - Filtering of well sampled data
    - Problems of filtering sparsely sampled data
    - Mild filtering to pass all signal
    - Harsh filtering to attenuate all noise
  - FX Prediction and Projection
  - Karhunnen-Loeve (Eigen filtering)
  - AVO friendly verus non-friendly methods
- **Migration**
  - Basic Principles and Kirchoff methods
  - Migration velocities
  - Aperture
  - FK (Stolt)
  - Finite Difference
  - Post-Stack
  - Pre-stack Time
    - Migration to gathers
    - Migration to non-natural bins
  - Depth Imaging
- **Other considerations**
  - Spectral Balancing
  - Inversion
  - AVO applications
  - AVA applications
  - Converted waves
  - VSPs
- **Case Histories**
  - 3D Seismic and Horizontal Drilling
  - 3D Seismic Out of Plane Resolution
  - Unnecessary dry holes
  - How little we know about geology