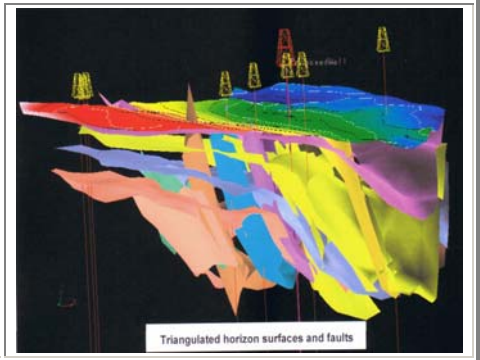


GEOPHYS 380 Seismic Stratigraphy

Instructor: Dr. Kelly Liu



Office: McNutt Hall B-43; Phone: 341-6724; email: liukh@mst.edu

URL: <http://www.mst.edu/~liukh>

*Textbook: Seismic Stratigraphy, Basin Analysis and Reservoir Characterisation
by Veeken*

Catalog Description

A study of the seismic expression of depositional models. Reflection patterns and reflection amplitudes are interpreted to determine bed thicknesses, fluid content, depositional environment, and lithology. Special data acquisition and processing techniques are examined.

Course Objectives

Geophys 380 is a course designed for advanced undergraduate students and graduate students.

- To enhance basic concepts of reflection seismic data processing and interpretation
- To gain an understanding of the geological evolution of sedimentary basins and establish their litho- and chronostratigraphic framework
- To pinpoint source rock and reservoir/seal pairs and define possible hydrocarbon plays. This includes the delineation of structural/stratigraphic traps and analysis of possible direct hydrocarbon indicators.
- To prepare for working in the industry by mastering a powerful 3-D seismic interpretation software package (SMT Kingdom Suite+)

Course Grading

Presentations: 50 points; Exam: 300 points; Labs and Projects: 150 points

A: 450-500 points; B: 400-449; C: 350-399; D: 300-349; F: 0-299

Tentative Course Schedule

- **Week 1**
 - Organization Meeting; Pre-course survey; Introduction

- *Ch2*: Seismic waves; Reflection coefficient; Refraction coefficient; Acoustic impedance; Snell's law; Critical angle of incidence
- **Week 2**
 - *Ch 2*: CMP; CDP; NMO; Seismic velocity analysis; Migration of seismic data
- **Week 3**
 - *Ch. 2*. 3D seismic surveys; Amplitude and frequency
- **Week 4**
 - *Ch. 2*. Seismic wavelet; Seismic display; Seismic velocities; Data conditioning and reprocessing
- **Week 5**
 - *Ch. 2*. Seismic resolution
- **Week 6**
 - *Ch. 3*. Seismic stratigraphic techniques: Sedimentary reflections; Unconformities; Non-sedimentary reflections; Artefacts
- **Week 7**
 - *Ch. 3*. Seismic stratigraphic techniques: Reflection termination mapping; Seismic facies units
- **Week 8 – Oct. 8**
 - *Ch. 3*. Seismic stratigraphic techniques: Geological calibration and well control; Synthetic seismogram; Seismic phase rotation and zerophasing
 - **Midterm Exam**
- **Week 9**
 - *Ch. 3*. Seismic stratigraphic techniques: Depositional environment and gross lithofacies interpretation; Chronostratigraphy
- **Week 10**
 - *Ch. 4*. Dynamics of basinwide sedimentation patterns and sealevel changes: Dynamics of depositional environments; Coastal onlap curves; The link with sequence stratigraphy
- **Week 11**
 - *Ch. 5*. Hydrocarbon habitat; Source rocks and hydrocarbon migration; Structural mapping and interpretation; Direct hydrocarbon indicators; Amplitude and attribute anomalies
- **Week 12**
 - *Ch. 6*. Seismic Reservoir Characterisation: AVO; Angle-dependent reflectivity; Seismic inversion
- **Week 13**
 - *Ch. 6*. Seismic Reservoir Characterisation: Reservoir modeling and fluid substitution-estimation of rock physical parameters; Merging seismics and rock physical parameters
- **Week 14**
 - *Ch. 7*. Volumetrics and prospect evaluation: Pressure differentials; Quantitative assessment; Hydrocarbon development and the global economy
- **Week 15**
 - 4-D; VSP
- **Final exam – TBA**