

**Course Code**

GP05

**Course Name****Sequence Stratigraphy****Instructor**

Dr. Do an Perinçek

**Professional Career**

Dr. Perinçek is Professor of the Department of Geological Engineering at the Çanakkale Onsekiz Mart University since June 2006. He received his MSc in Geology and PhD in Petroleum Geology from the University of Istanbul in 1972 and 1978 respectively. He began his career as an Assistant Professor at University of Istanbul in 1972. He was awarded and promotion to Associate Professor in 1987 and become a full professor in January 2004. Dr. Perinçek has 14 years tertiary education experience and 23 years oil industry experience. He worked for the Turkish Petroleum Corporation as a structural geologist and petroleum explorationist from 1975 until 1989. He gained extensive skill in education. He has lectured in geology and geophysics, supervised the research of or has served on the thesis of graduate students (Istanbul University; 1972-1975, Middle East Technical University; Turkey; 'part time' 1987, King Fahd University of Petroleum & Minerals; Saudi Arabia ; 1989 and 1997-1999, Kuwait University; 1999-2004, Yıldız Technical University; Turkey; 2004-2006 and Çanakkale Onsekiz Mart University - Turkey since June 2006). He taught several courses in Turkey and Kuwait (Sequence Stratigraphy, Subsurface Geology, Geology of Turkey, Basin Analysis, Geoarcheology, Physical Geology, Petroleum Geology, Sedimentology, Stratigraphy and Sedimentation, Stratigraphy and Petrology, Geology of the Arabian Peninsula, Well log Interpretation, Petroleum Exploration Methods, Seismic Stratigraphy, Seismic Exploration, Geology of Turkey, Field Geology, Photogeology ). He worked for several oil company and has extensive experience in petroleum industry (Turkish Petroleum Corporation; 1975-1989, Mobil Exploration Med. Inc., 'consultant'; Turkey; 1990, Huffco Oil 'consultant'; Turkey; 1991, Geological Survey of Victoria, "Basin Studies Section"; Australia; 1991-1994, Geological Survey of Western Australia, "Basin Studies Section"; Australia 1994-1996, World Geoscience & OPES International 'consultant'; Australia and Indonesia, Saudi Aramco 'contractor' 1997-1999, British Petroleum Company 'consultant' 2003-2004 in Iran; Luksar Oil Company 'consultant'; Saudi Arabia 2006). Since 1975, he has been working as an explorationist in determining oil and gas potential of sedimentary basins in several basins and country.

Since 1979, He has published several paper; wrote numerous technical reports and delivered presentations. His work has been cited over 350 times in geological journals scanned by the Science Citation Index. He is member of American Association of Petroleum Geologists and member of Turkish Petroleum Geologists Association, Chamber of Geological Engineers of Turkey and PESA; Australia. Dr Perinçek was President and Vice President of the Geological Society of Turkey, 1979-1981., and Field Trip Leader of First Geol. Congress of the Middle East, 1979., Editorial Board Member of the Fifth and Seventh Petroleum Congress of Turkey; 1980, 1987. He was President of the Australian-Turkish Culture House; 1995-1997

His field of specialization: Petroleum geology, structural geology, stratigraphy, seismic data interpretation, and regional/prospect scale basin evaluation, sequence stratigraphy, comprehensive experience of geological mapping (field mapping, facies maps, paleogeography maps), well-log correlation (using seismic, logs, palynology, lithology, sedimentology, petrology etc), integration of well-core data and seismic data, field development, and knowledge in aspects of seismic acquisition and processing, and skills in the use of geological/geophysical workstations

**Course Objective and Description**

Sequence stratigraphy is a sub-discipline of stratigraphy, the latter being defined broadly as 'the historical geology of stratified rocks'. There have been many definitions of sequence stratigraphy over the years, but perhaps the simplest, and that preferred by Emery and Myers, is 'the subdivision of sedimentary basin fills into genetic packages bounded by unconformities and their correlative conformities and their correlative conformities'. Sequence stratigraphy is used to provide a chronostratigraphic framework for the correlation and mapping of sedimentary facies and for stratigraphic prediction.

Sequence stratigraphy, based on sedimentary response to changes in relative sea level gives the explorationist and the development geoscientist a powerful new predictive tool for regional basin analysis, shelf to basin correlation and reservoir heterogeneity. Perhaps most importantly, sequence stratigraphy gives the geoscientist a superior framework for the integration of geologic, geophysical and engineering data and expertise.

### Sequence Stratigraphy

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Several geological disciplines contribute to the sequence stratigraphic approach, including seismic stratigraphy, biostratigraphy, chronostratigraphy and sedimentology. Lithostratigraphy is the correlation of similar lithologies, which are commonly diachronous and have no time-significance. Lithostratigraphic correlation is useful provided the sequence stratigraphic boundaries enveloping the interval of interest are constrained.

We will develop the basic concepts of sequence stratigraphy such as the integration of eustasy and tectonic subsidence which gives rise to the basic cycle hierarchy that can be observed in the geologic record. Using these basic concepts we will build a general predictive stratigraphic model emphasizing the petroleum system and particularly stressing shelf to basin correlation.

#### Who Should Attend

Students interested in learning sequence stratigraphic methodologies, and their application in sedimentary basin studies and petroleum exploration.

#### Prerequisite

B.S. degree, including stratigraphy

#### Learning Level

Graduate-MS/PhD level

#### Duration

5 days

#### Course Material

Handouts

## Course Outline

### Day One-Part 1

- Geophysical Fundamentals of Seismic Stratigraphy
- Seismic reflection records. Wavelets, reflection coefficients. Synthetic seismogram. Wavelets: Time domain and frequency domain. Amplitude. Un-migrated and migrated seismic sections. Dip and strike sections, seismic ties
- Sequence and facies analysis. Seismic reflection analysis: Seismic resolution. Reflection geometries, Reflection continuity. Polarity. Fluid Contacts

### Day Two

- Concepts and Principles of Sequence Stratigraphy
- Introduction; Basin forming processes, Basin-margin concepts. Relative sea-level, tectonics and eustasy; Definition of sea-level, accommodation, Orders of cyclicity and global correlation, Filling of accommodation
- Sediment supply; Principles of clastic sediment supply, Basin architecture Sequences and systems tracts; Sequences and sequence boundaries, Systems tract definition, Lowstand systems tract, Transgressive systems tract, Highstand systems tract. sequence boundary and the shelf-margin systems tract, Lowstand systems tract on a ramp margin
- High-resolution sequence stratigraphy and parasequences; Parasequences and their continental equivalents, Parasequence sets, Sequence boundaries, Maximum flooding surfaces, Ravinement surfaces
  - o Seismic interpretation; Principles of seismic stratigraphy interpretation, Resolution of seismic data.
  - o Seismic reflection termination patterns; Marking up a seismic section, Categorizing reflection terminations, Seismic facies analysis. Recognition of stratigraphic surfaces
  - o Recognition of systems tracts on seismic data; Recognition of lowstand systems tracts. Recognition of transgressive systems tracts. Recognition of highstand systems tract. Pitfalls in interpretation

### Day Three

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- Chronostratigraphic Charts:
  - o The purpose of chronostratigraphic charts from seismic data; Construction of chronostratigraphy charts from seismic data picking reflection terminations, identification of seismic surfaces, transferring reflections to a time scale, filling in the chronostratigraphic chart. Interpreting a chronostratigraphic chart; Chronostratigraphic expression of sequence boundaries, condensed sections and depositional styles. Chronostratigraphic expression of a seismic example.
  - o Coastal onlap curves and relative sea-level curves.
  - o Producing chronostratigraphic charts from well data
- Biostratigraphy
  - o Fossil groups and zonal schemes
  - o Palaeoenvironmental analysis; benthos and palynofacies, plankton, biofacies
  - o Biostratigraphy and sequence stratigraphy. Sequence boundaries and their correlative conformities

### Day Four

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- Fluvial Systems
  - o Fluvial processes and channel styles. Straight and anastomosing rivers. High-sinuosity and low-sinuosity channel systems. Classification of fluvial systems. The concept of the graded stream profile
  - o Fluvial architecture; Sequence boundaries and lowstand systems tracts in alluvial strata. Transgressive systems tracts and flooding surfaces in alluvial strata. Highstand systems tracts in alluvial strata
- Paralic Successions
  - o Paralic depositional systems; Deltas., Coastal plain to shoreline-shelf systems., Eustaries.
  - o Sequences in paralic successions, sequence boundaries and valley incision, the transgressive surface, forced regressions, the maximum flooding surface
  - o Parasequences in paralic successions
  - o The sequence stratigraphy of coastal plain to shoreline-shelf systems, deltaic systems and estuarine systems. Correlation procedure; Parasequence correlation. Progradation, aggradation, and retrogradation. Sequence boundaries

### Day Five

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- Deep-marine Clastic Systems
  - o Deep-marine clastic systems-depositional processes and classification
  - o Fan development during lowstands. Lowstand models
  - o Fan development during highstand and transgression. Highstand fan systems. Fan development during transgressions
  - o Carbonate Systems
  - o Controls on carbonate sedimentation; Organic and inorganic carbonate production. Highstand' shedding. Carbonate platform drowning. Carbonate platform exposure
  - o Carbonate slopes, platform classification and facies belts
  - o Sequence stratigraphic models for carbonate platforms; ramps, rimmed shelves, escarpment margins, isolated platforms. Cyclicity and parasequences on carbonate platforms
- Well Data
  - o Introduction; Resolution of well data. Sequence stratigraphy of wireline logs, log suits used in sequence stratigraphy, the log response of clinoforms, the log response of parasequences, key surfaces, identification of systems tracts from log response.

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Antalya, Turkey  
31 May - 4 June  
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