Soran University

Faculty of Science

Department of Petroleum Geosciences

Course Book

Introduction to Sequence Stratigraphy

Third Class

Second Semester – Academic Year 2014 / 2015

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Office Hours: by appointment

Class: Wednesday (8.30-10.30)am

Course Objectives

The sequence stratigraphy approach to the analysis of sedimentary successions has taken some time to become widely accepted and widely used. There were two issues in the earlier of its development which caused problems. First, the concept was initially linked with the idea that a global eustatic sea-level curve could be established and used as a means of correlating strata : doubts about the curve led to doubts about the methodology, but in fact the principles underlying sequence stratigraphy are sound and valid whether there is a global sea-level curve or not.A second barrier to acceptance was the plethora of new terms that were introduced as the concepts were developed. To some extent these served to make the subject appear more complicated than it actually is, because sequence stratigraphy is really quite a straightforward and elegant approach to the analysis of sedimentary successions. It is now applied very extensively,especially in the hydrocarbon exploration industry, and several texts are now available that provide comprehensive accounts of the principles and applications of sequence stratigraphy.

Forms of Teaching

Before talking about this item it is worth to mention important notes or general instructions for students which include:

- **Always, be present in the hall before the instructor**
- **You must close mobile before entering the hall**
- **You must be ready to hear the lecture**
- **You must sit down and don't talk especially during explan**ation

- **You must discuss and ask about all informations that you can't understand**
- **Always, you must read the required or text books to compare with lecture that you receive**

Teaching includes different manners:

- **Power point presentations**
- **Overhead presentations**
- **Explanations on blackboard**
- **Classroom discussions**

Grading

Theoretical part equals 12.5%; this degree will be approached by at least two examinations in addition to quizzes plus the degree of the scientific trip. Sometimes the activity of the students within the classroom is evaluated and counted with the above-mentioned degree. Practical part takes 7.5% (details are shown in attached papers of practical part).

Final Examination: 30% (20% theoretical plus 10 practical)

Course Material

Required references include several types namely the main **text books, additional books , journals, bulletins, thesis of Master and Ph.D degree plus the more recent informations from internet.**

Main Text Books

Boggs,S.Jr., 2006 : Principles of Sedimentology and Stratigraphy, Fourth Edition. Pearson Education,Inc,662p.

Nichols,G., 2009 : Sedimentology and Stratigraphy, Second Edition. Wiley-Blackwell,419p.

Additional References

Catuneanu,O., 2006 : Principles of Sequence Stratigraphy. Elsevier, Amsterdam.

Emery,D. And Myers,K.J.,(Eds.), 1996 : Sequence Stratigraphy. Blackwell Science, Oxford.

Course Program

Week-1

Definition

Some Important Terms

Depositional Sequence, Depositional System, System Tract, Parasequence Set, Parasequence, Marine Flooding Surface

Week-2

Relationships between Strata

Vertical Relationships

A. Conformable Relationships : 1.Abrupt Contacts

2.Gradational Contacts

Mixed Gradation

Continuous Gradation

3.Intercalated Contacts

Week-3

B. Unconformable Relationships :

1. Angular Unconformity

2. Paraconformity = Disconformity

3. Nonconformity

Nature of Unconformable Surfaces

Recognition of Unconformities

Week-4

Lateral Relationships : 1. Pinch-out

2. Intertonguing

3. Lateral Gradation

Mixed

Contiuous

Week-5

Combined Lateral and Vertical Relationships

Instablility of Sedimentary Environments

Transgression and Regression

Overlap and Offlap

Onlap and Overstep

Week-6

Sediment Pattern and Geometry

Sea-Level Changes and Sedimentation

Changes to Shoreline

Sea-Level and Sedimentation

Transgression, Regression and Forced Regression

The Concept of Accommodation

Rates of Sea-Level Change and Sediment Supply

Shoreline Trajectory

Depositional Slope, Onshore and Offshore

Progradation,Aggradation and Retrogradation

Cycles of Sea-Level Change

First Examination

Week-7

Depositional Sequences and Systems Tracts

Shelf-Break Margin Depositional Sequence

High Stand, Sequence Boundary, Lowstand, Transgressive Surface, Transgressive Systems Tract, Maximum Flooding Surface, High Stand.

Week-8

Ramp Margin Depositional Sequence

- **High Stand, Sequence Boundary, Falling Stage Systems Tracts, Lowstand, Transgressive Surface, Transgressive Systems Tract, Maximum Flooding Surface, High Stand**

Week-9

Parasequences : Components of Systems Tracts

- **Parasequences**
  - **Parasequence Boundaries**
  - **Parasequence Thickness**
  - **Parasequence Sets and Systems Tracts**
- **Sequences and Parasequences : Scales and Variations**

Week-10

Carbonate Sequence Stratigraphy

Sequence Stratigraphy in Non-marine Basins

Week-11

Applications of Sequence Stratigraphy

- **Sequence Stratigraphy Analysis of Seismic Section**
- **Sequence Stratigraphy Analysis of Graphic Sedimentary Logs**
- **Sequence Stratigraphy Analysis of Geophysical Logs**
- **Correlation of Sections using Sequence Stratigraphic Principles**

Week-12

Causes of Sea-Level Fluctuations

- **Local Changes in Sea-Level**
- **Glacio-Eustasy**
- **Thermo-Tectonic Causes of Sea-Level Change**
- **Cyclicity in Changes in Sea-Level**
  - **First-order Cycles**
  - **Second-order Cycles**
  - **Third-order Cycles**
- **Short-Term Changes in Sea-Level**

Global Synchroneity of Sea-Level Fluctuations

Second Examination