GEOL 750: Basin Analysis
Spring 2012
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COURSE OVERVIEW

This course will examine the ways in which sedimentary basins develop and fill, and how they and their contents can be used for a variety of purposes, including: (1) plate tectonic, paleogeographic, and paleoclimate reconstructions, (2) the acquisition of natural resources, and (3) understanding the controls on depositional systems, surface processes and stratigraphic architecture. After we get up to speed, we will begin by covering the mechanisms of basin formation, including isostasy, flexure and thermal subsidence. This will be followed by a brief overview of the major depositional systems that create basin-fill, and detailed perspectives of each major type of sedimentary basin. The final segment of the course will explore the variety of stratigraphic, petrographic, geophysical, geochronological and geochemical tools that can be used to augment basin reconstructions and interpretations. Throughout the course, we will focus on learning by doing.

LEARNING OUTCOMES

The course is designed to provide students with a working knowledge of the primary tools of sedimentary basin analysis. Students who successfully complete this course will be able to:

1. Identify the primary types of sedimentary basins from their architectural and compositional contents.
2. Soundly interpret the history of formation and filling of the primary types of sedimentary basins from their contents examined in the field, the laboratory, and in subsurface data.
3. Collect and interpret stratigraphic data from sedimentary basins to address larger paleoclimate, tectonic and paleogeographic scientific problems.

COURSE FORMAT & LOGISTICS

Mondays & Wednesdays, 2:30 - 3:45 pm, EWS 209

This course will be a combination of a) lectures, b) problem sets, c) student presentations & discussions, and d) a field trip & maybe a short course. Active participation in lectures and discussions is expected. Although most topics will be presented in lecture, the development of sedimentary basin analysis skills requires careful reading of the primary literature and textbook readings, and diligence in problem sets. There will be a field trip out west circa March 16-25. I anticipate minimal costs to students. We'll use Blackboard and email to communicate and submit problem sets.

GRADES

Grades will be assigned based on student performance on each of two exams (20% ea.), two research projects (10% ea.), student presentations & discussion participation (10%), and problem sets (30%).

RESOURCES

1. In addition to journal articles, readings will come from a variety of textbooks, including:
   Allen, P.A. & Allen, J.R., Basin Analysis, Blackwell
   Turcotte, D.L. & Schubert, G., Geodynamics, Wiley & Sons
   Reading, H.G., ed., Sedimentary Environments: Processes, Facies & Stratigraphy, Blackwell
   Angevine C.L. et al., Quantitative Sedimentary Basin Modeling, AAPG Short Course Notes Series 32

2. A field notebook. Field notebooks are best if portable (~5" x 7") and hardbound.

ATTENDANCE & ACADEMIC INTEGRITY

The University policies related to attendance:
http://bulletin.sc.edu/content.php?catoid=35&navoid=4221#Attendance

You are encouraged to collaborate with your fellow students. However, verbatim duplication or other forms of plagiarism are unacceptable. The University policy on academic responsibility:
http://www.sc.edu/academicintegrity/policy.html

COURSE SCHEDULE

We'll move at a pace appropriate to the composition of the class. We'll generally follow the schedule listed below, but may adjust the order and/or content to meet our collective needs. Notes: * indicates associated problem set; # indicates associated student presentations.

Basic concepts of plate tectonics & sedimentary geology
Sedimentary basin definitions & terminology
Basin classification schemes
Subsidence mechanisms [*c. Jan. 18*]
- *Gravity & Isostasy
- *Flexure
- *Stretching & thermal subsidence

Depositional systems # [*c. Feb. 1*]
- Terrestrial depositional systems
- Marine depositional systems

Sedimentary basins # [*c. Feb. 13*]
- Foreland basin systems
- Forearc & trench basins
- Rift & supradetachment basins
- Continental margin & ocean basins
- Intracontinental basins
- Intramontane basins
- Strike-slip basins

Stratigraphic architecture [*c. Feb. 22*]
- *Subsidence analysis & basin thermal histories
- *Isopach mapping
- *Sequence stratigraphy
- Paleocurrents & sediment dispersal patterns

Age models* [*c. Mar. 26*]
- Biostratigraphy
- Magnetostratigraphy
- Geochronology

Source-Sink relationships [*c. April 2*]
- *Thermochronology & erosion
- *Provenance analysis
- *Sediment budgets

Petroleum systems [*c. April 11*]
Student Research Presentations [*c. April 16*]

DATES TO KEEP IN MIND:
January 16: no class, MLK Jr. day
February 29: mid-point of semester, EXAM 1 around this date.
March 5-9: no class, Spring Break
March 16-25: field trip sometime during this interval
April 23: last day of classes, EXAM 2 around this date?
April 30, 2 PM: scheduled final exam time