

UT GEOL 371T/391: Tectonic Geodynamics

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Overview

This class is geared toward all interested undergraduate and graduate students from the Earth sciences and related fields in the natural sciences, in particular geologists and geophysicists alike. We seek an understanding of the dynamic processes that govern plate tectonics and lithospheric deformation, combining tectonics, structural geology, and geodynamics from the ground up.

The class will consist of a mix of lectures, homework assignments, discussions of reading with student presentations, and a few, simple numerical exercises using Matlab or similar software.

Prerequisites: A basic, kinematic understanding of plate tectonics. Some exposure to Earth science, physics, and math a plus, but no classes required.

Logistics

Instructors:

Claudio Faccenna, claudio.Faccenna@jsg.utexas.edu, JGB 5.226B

Thorsten Becker, twb@ig.utexas.edu, JGB 4.220AA

Office hours: TBA

Meeting time: TTh 12:30 - 2pm

Location: JGB3.222

Grading: class participation (presentations) and homework.

Homework is due the evening of the day of class the week after.

Textbook:

None required. Draft lecture notes (will be modified throughout class) at:

https://www.dropbox.com/s/z729fhqxijuemnv/tectonic_geodynamics.pdf?dl=0

Suggested textbooks:

- Dynamic Earth: Plates, plumes, and paradigms, G. Davies. Cambridge University Press, 1999.
- Rheology of the Earth, Ranalli, G., 2nd edition, Chapman and Hall. (Out of press, local copies might be available)
- Geodynamics. Turcotte and Schubert, Cambridge University Press (any edition)

Syllabus

#	date		topic	reading/assignments from lecture notes and exercises
1	01/29	TWB	Introduction I - present day plate tectonics	
2	01/31	TWB	Introduction II - plates and the deep Earth	
3	02/05	TWB	Continuum Mechanics Fundamentals - Strain	3.1, 3.1.1-3.1.3
4	02/07	TWB	Continuum Mechanics Fundamentals - Stress	3.1.4
5	02/12	CF	Rheology	
6	02/14	CF	Rheology	
7	02/19	CF	Plate kinematics and evolution	3.2.5-3.2.10
8	02/21	CF	Force balance and Pacific (Gplates)	3.2.1-3.2.4,3.4.1
9	02/26	CF	West Pacific and Backarc extension	
10	02/28	CF	East pacific Cordillera	
11	03/05	TWB	Fluid dynamics I	3.4.1,3.4.3
12	03/07	TWB	Fluid dynamics II	
13	03/12	TWB	Heat transport I: Conduction	3.7
14	03/14	TWB	Heat transport II: Convection	3.8.1-3.8.7, 3.9
15	03/26		PLATES Symposium	
16	03/28	TWB	Thermal boundary layers and oceanic lithosphere	3.9
17	04/02	CF	early earth	
18	04/04	CF	Geoid, gravity,	
19	04/09	CF	isostasy, Dynamic topography, Post-glacial rebound, sea level	
20	04/11	CF	Dynamic topography: regional examples	
21	04/16	CF	Subduction-Collision Orogeny	4.4
22	04/18	CF	Mediterranean	4.2
23	04/23	TWB	Global geodynamics and mantle circulation I	
24	04/25	TWB	Global geodynamics and mantle circulation II	
25	04/30	TWB	Faults and crustal strain	
26	05/02	TWB	Glacial isostatic adjustment and viscosity	
27	05/07		Class presentation	

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