

Course Outline and Reading List - GEOL 701(i) - Western US Tectonic Framework Fall 2012

Expectations

Course will consist of reading 2-4 papers per week with students presenting the papers orally in class. Students are expected to 1) do the reading, 2) formulate questions about the reading, and 3) articulate those questions during class time. Participation element of grading will follow from performance in these three categories.

The required paper will take the form and style of a proposal, written to the NSF to request funding for research activities. This document will provide a brief synthesis of a topic, suggest a course of action that must be taken to answer research questions on the topic. 15 pages maximum, not including references (which are required). Budgets need not be developed in detail but project should be realistic and attainable for 'reasonable' costs. If you are familiar with NSF proposal structure, this means that only the Project Description and References need to be done. Figures are allowed and can be very helpful to communicate project context.

The class will participate in a peer-review of these proposals. Each class member will review one of the proposals submitted by their classmates, randomly assigned by the instructor. Reviewers will know the identity of proposal authors, but authors will not know the identity of their reviewers. Review will address both NSF criteria 1) Intellectual Merit and 2) Broader Impacts and the total will be less than one page. Comments should convey a constructive critique of the merits of the project. Do not engage in detailed editing of the proposal as you would as a manuscript reviewer. Rather, focus on the clarity of the presentation, value of the research, and likelihood of the project to be successful.

The reading list will be initiated by instructor and developed over the term by the students and instructor. There is no final.

Course is graded 40% participation 50% final paper, 10% review.

Course structure

Overview: Geologic History and Provinces of the Western United States (4 weeks)

Provinces/Features

- San Andreas Fault system
- Coast ranges, Transverse Ranges, Peninsular Ranges
- Great Valley
- Great Basin
- Cascadia
- Modoc Plateau
- Columbia River basalts

The OWL (Olympic - Wallowa Lineament)
Colorado Plateau
Mendocino Triple junction
Rocky Mountains
Yellowstone

Concepts of the Cordillera

Thrusts, Ridges, Transforms, Subduction
Forearcs, backarcs, transgressions
Triple junction migration
Volcanic arcs
Sr ratio $>.706$ line
Major Western US orogenies
 Antler
 Sonoma
 Nevadan
 Sevier
 Laramide

Seismic Structure & Tectonic History (3 weeks)

Inferring structure from seismology
Techniques:
 Receiver functions, P to S conversions
 tomography,
 anisotropy,
 splits,
 surface waves,
 ambient noise
The Moho and its definitions
Lithosphere/Asthenosphere boundary
Upper mantle structure
Mantle flow: delaminations, drips, blobs, curls, rolls, and tacos

Discussion of Topics for Papers/Proposals

Discuss as a group, and individually with Bill
Will set up meeting times week before.

Geodetic Measurement: Cases (3 weeks)

San Andreas Fault - Central California
San Andreas Fault System - Northern California
San Andreas Fault System - Southern California
 - Discussion of comparison between geologic and geodetic slip rates
Cascadia
 - Discussion of relative importance of temporary elastic vs. permanent deformation
Colorado Plateau
 - Rotation, Rigidity and the Rio Grande Rift

Great Basin/Walker Lane
Baja California?

Dynamic Framework (3 weeks)

Topography, isostasy and gravity
Dynamic topography
San Andreas Fault - weak or strong?
Coherence and admittance between gravity and topography
Strength
Viscosity
Stress

Week 14 Reserved catch up and topics revealed.

Reference List

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- Also see Tanya's animations at:
at:http://emvc.geol.ucsb.edu/1_DownloadPage/Download_Page.html#WNA_TectGeolHist
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