

Geophysics 5364
Geophysical Framework of North America

Lecture: TR 10:30-11:50

FALL 2002

Instructor: Drs. Kate Miller and Randy Keller

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Grading*: Class Participation: 25%, Weekly Summaries of Readings: 50%, Term Paper: 25%.

Office Hours: TR 1:30-2:30

Text: Pakiser and Mooney eds., Geophysical Framework of the Continental United States

Prerequisites: Graduate standing and an introductory geophysics course

Course Outline

This class is a seminar designed to provide a survey of the regional geophysics and tectonics of North America. Reading material for the seminar will center on discussion and critical analysis of readings from Geological Society of America Memoir 172. Supplemental readings will come from more recent literature. A major goal of the class will be to develop a background for proposing new geophysical experiments that might ultimately be carried out as a part of the upcoming USArray project, a 10-year long effort to study the lithospheric structure of the United States, that will be funded this year by the National Science Foundation.

Schedule

(Subject to Change)

<i>Date</i>	<i>Topic</i>	<i>Assign.</i>
1 Aug. 27	Seismic Methods for Determining Lithospheric Structure	
2 Sept. 3, 5	Seismic Constraints on the Composition of the Crust and Upper Mantle	
3 Sept. 10, 12	Gravity and Magnetic Methods in Regional Studies	1, 2 Due
4 Sept. 17, 19	Geophysical Characterization of the mid-Continent	3 Due
5 Sept. 24, 26	Reflection Seismology of the western United States	4 Due
6 Oct. 1, 3	Rio Grande Rift, Intermontane System	5 Due
7 Oct. 15, 17	Rio Grande Rift, Basin and Range	6 Due
8 Oct. 22, 24	Basin and Range, Colorado Plateau,	7 Due
9 Oct. 29, 31	The upper mantle, Rocky Mountains, Term Paper Proposal Due	8 Due
10 Nov. 5, 7	Rocky Mountains	9 Due
11 Nov. 12, 14	U.S. Western Margin	10 Due
12 Nov. 19, 21	Eastern United States	11 Due
13 Nov. 26	Southeastern United States, Gulf of Mexico	12 Due
Dec. 3, 5	Term Paper Presentations	13 Due
Dec. 6	Dead Day	
Dec. 12	Term Paper Due	

***Grading**

Class Participation (25%)

Students are expected to read the assigned material prior to class and to come prepared to discuss the readings. Questions to guide the reading will be handed out on a regular basis. In the first third of the class, faculty will develop the guide questions. During the rest of the class, students will take turns developing questions and leading the discussion.

Weekly Written Summaries (50%)

A written summary of the main points of ONE of the articles assigned as reading is due each week. Late papers will NOT be accepted. However, class participants are required to hand in only 11 of 13 possible summaries. In general, the summaries should be one page in length (single-spaced, 1" margins, size 12 font). Three of the summaries must be expanded to two pages and include material from additional articles. The choice of weeks for the expanded summary is at the student's discretion.

Term Paper (25%)

A term paper will take the form of a proposal for a geophysical experiment to study the lithospheric structure of one of the regions of the continental United States discussed during the term. The paper will use one of the chapters in the text as a starting point, but will also incorporate articles from more recent literature. The term paper will be 7-10 pages long. Students will present their term findings during the last week of class.

Important Date: October 18 - Last Day to Drop.

Readings

(Subject to Change)

<i>Date</i>	<i>Material</i>
Aug. 27	<ul style="list-style-type: none"> • Ch. 2 Seismic methods for determining earthquake source parameters and lithospheric structure • Ch. 7 Laboratory techniques for determining seismic velocities and attenuations, with applications to the continental lithosphere
Sept. 3	<ul style="list-style-type: none"> • Ch. 30 Composition of the continental crust and upper mantle; A review • Rudnick and Fountain, Nature and composition of the continental crust: A lower crustal perspective • Christensen and Mooney, Seismic velocity structure and composition of the continental crust: A global view
Sept. 10	<ul style="list-style-type: none"> • Ch. 3 Gravity methods in regional studies • Ch. 4 Crustal studies using magnetic data • Kaban and Mooney, Density structure of the lithosphere in the southwestern United States and its tectonic significance
Sept. 17	<ul style="list-style-type: none"> • Ch. 15 Crustal structure of the continental interior • Ch. 28 Seismic properties of the crust and uppermost mantle of the conterminous United States and adjacent Canada • Clowes et al. 1996, LITHOPROBE reflection studies of Archean and Proterozoic Crust in Canada Pratt et al., 1992, Widespread buried Precambrian layered sequences in the U.S. mid-continent: Evidence for large Proterozoic depositional basins
Sept. 24	<ul style="list-style-type: none"> • Ch. 26 Crustal structure of the western U.S. based on reflection seismology •
Oct. 1	<ul style="list-style-type: none"> • Ch. 10 Tectonic evolution of the Intermontane System: Basin and Range, Colorado Plateau, and High Lava Plains • Keller et al., Crustal structure, gravity anomalies and heat flow in the southern Rio Grande Rift • Keller et al. Comparison of Rio Grande Rift and East African Rift
Oct. 15	<ul style="list-style-type: none"> • Ch. 11 Geophysics of the western Basin and Range Province • Ch. 12 Geophysical Framework of the eastern Basin Range – Colorado Plateau-Rocky Mountain transition • Holbrook/Catchings controversy papers?
Oct. 22	<ul style="list-style-type: none"> • Ch. 13 Geophysics of the Intermontane system • Ch. 14 Crustal structure of the Rocky Mountain region • Snelson et al., Crustal and uppermost mantle structure along the Deep Probe seismic profile • Keller et al., Geophysical studies of crustal structure in the Rocky Mountain region: A review
Oct. 29	<ul style="list-style-type: none"> • Ch. 29 Upper mantle velocity structure in the continental U.S. and Canada •
Nov. 5	<ul style="list-style-type: none"> • Ch. 8 The crustal structure of the western continental margin of North America • Ch. 9 Regional crustal structure and tectonics of the Pacific Coastal States

Readings

(Subject to Change)

<i>Date</i>	<i>Material</i>
	<i>California, Oregon, and Washington</i>
<i>Nov. 12</i>	<ul style="list-style-type: none">• <i>Fuis, West margin of North America – a synthesis of recent seismic transects</i>• <i>Ruppert et al., Thin crust and active upper mantle beneath the southern Sierra Nevada</i>
<i>Nov. 19</i>	<ul style="list-style-type: none">• <i>Ch. 16 Geophysical Framework of the Appalachians and adjacent Grenville Province</i>• <i>Ch. 27 Reflection seismic studies of crustal structure in the eastern United States</i>
<i>Nov. 26</i>	<ul style="list-style-type: none">• <i>Ch. 17 Atlantic and Gulf of Mexico continental margins</i>• <i>Keller and Hatcher</i>