

GEO 391/371C – The Ins and Outs of Subduction Zones (Spring 2012)

Unique Number 27935/27725

Class: EPS 1.126; MWF 11:00-12:00

Professors:

Jaime Barnes, JGB 3.320A, 471-5379, jdbarnes@jsg.utexas.edu

Office hours: MW 10:00 am to 11:00 pm; or by appointment

Online course information on Blackboard: <https://courses.utexas.edu/webapps/login>

Textbook:

There is no textbook for this course. We will be reading and discussing peer-reviewed papers which will be distributed on Blackboard.

Supplemental Resources:

Subduction Top to Bottom (1996) Bebout, G.E., Scholl, D.W., Kirby, S.H., and Platt, J.P., Eds., American Geophysical Union, Geophysical Monograph 96

Inside the Subduction Factory (2003) Eiler, J, Ed., American Geophysical Union, Geophysical Monograph 138

www.geoprisms.org

General:

Subduction zones are sites of lithospheric scale recycling and are critical to our understanding the chemical evolution of the Earth's crust and mantle, volcanism, earthquakes, and orogenesis. This course is designed to provide an overview of topics, such as the thermal and seismic structure of subduction zones, volatile and geochemical cycling, seismicity, mantle wedge dynamics, and volcanism. A topic will be introduced by an overview lecture, followed by several classes devoted to readings and student-led discussions of scientific publications. We will then use these concepts to compare and contrast subduction zones from around the world (e.g., Central America, Izu-Bonin-Mariana, Aleutian).

Course Schedule:

Week	Date	Topic	Reading
1	18-Jan	Introduction	
	20-Jan	What is a subduction zone?	Stern (2002); Tatsumi (2005)
2	23-Jan		Stern (2002); Tatsumi (2005)
	25-Jan	Sean Gulick	
	27-Jan	The Margin (Accretionary vs. Non-accretionary)	Scholl and von Huene 2007
3	30-Jan		Scholl and von Huene 2007
	1-Feb	Seismogenic zone	Hyndman (2007)
	3-Feb		Hyndman (2007)

4	6-Feb	Slow Slip Events	Ide et al. (2007); Rogers and Dragert (2003)
	8-Feb		Ide et al. (2007); Rogers and Dragert (2003)
	10-Feb	Great Earthquakes	McCaffrey (2008); Llenos and McGuire (2007)
5	13-Feb		McCaffrey (2008); Llenos and McGuire (2007)
	15-Feb	Patrick Fulton	
	17-Feb	Thermostructure of the slab	Abers et al. (2006); Syracuse et al. (2010)
6	20-Feb		Abers et al. (2006); Syracuse et al. (2010)
	22-Feb	Petrology and metamorphism of the subducting slab	Schmidt and Poli (1998); Hacker et al. (2003)
	24-Feb		Schmidt and Poli (1998); Hacker et al. (2003)
7	27-Feb	What goes in vs. what comes out-tracers of the slab	Wallace (2005); Shaw et al. (2003); Plank and Langmuir (1993)
	29-Feb		Wallace (2005); Shaw et al. (2003); Plank and Langmuir (1993)
	2-Mar	Role of water	Grove et al. (2009); Rupke et al. (2004)
8	5-Mar		Grove et al. (2009); Rupke et al. (2004)
	7-Mar	Serpentinite- Is it just a "green herring"?	Hyndman and Peacock (2003); Ranero et al. (2003)
	9-Mar		Hyndman and Peacock (2003); Ranero et al. (2003)
9	12-Mar	<i>No class- Spring Break!</i>	
	14-Mar	<i>No class- Spring Break!</i>	
	16-Mar	<i>No class- Spring Break!</i>	
10	19-Mar	Making of continental crust	Kelemen (1995); Rudnick (1995)
	21-Mar		Kelemen (1995); Rudnick (1995)
	23-Mar	Mantle tomography and seismic anisotropy	Karato et al. (2008)
11	26-Mar		Karato et al. (2008)
	28-Mar	Mantle wedge	Hoernle et al. (2008); van Keken (2003)
	30-Mar		Hoernle et al. (2008); van Keken (2003)
12	2-Apr	How does it all begin? Subduction Initiation	Gurnis et al. (2004); Stern (2004)
	4-Apr		Gurnis et al. (2004); Stern (2004)
	6-Apr	The role of subduction throughout Earth's history	Chen et al. (2009); O'Neill et al. (2007)
13	9-Apr		Chen et al. (2009); O'Neill et al. (2007)
	11-Apr	Central America	Eiler et al (2005); Abers et al. (2003)
	13-Apr		Eiler et al (2005); Abers et al. (2003)
14	16-Apr	Harm van Avendonk	
	18-Apr	Izu-Bonin-Mariana	Reagan et al. (2010); Fryer et al. (1999)
	20-Apr	<i>No class- Jaime out of town</i>	

15	23-Apr		Reagan et al. (2010); Fryer et al. (1999)
	25-Apr	Aleutian	Holbrook et al. (1999)
	27-Apr		Holbrook et al. (1999)
16	30-Apr	Cascadia	Abers et al. (2009); Chapman and Melbourne (2009)
	2-May		Abers et al. (2009); Chapman and Melbourne (2009)
	4-May	Course wrap-up and Outstanding questions	

Lecture:

The schedule gives the order of topics. Each topic will begin with a ~20-25 minute overview lecture followed by a discussion of associated reading assignments. Note, the lecture schedule is subject to change as needed throughout the semester, and reading assignments may be modified. Please read the given assignment *BEFORE* coming to class. Many of the readings are “transformative” scientific papers. Everyone should be prepared to participate in class.

Grading:

Lecture and moderating discussion of your topic = 35%

Final Paper = 35%

Participation = 30%

Your grade is based on three things: your lecture and discussion moderation of a topic, final paper, and participation.

Topic: On the first day of class everyone will sign up for a topic in which you will become an “expert” in. You will read the assigned papers plus ~5 more on that topic and give a 20-25 minute general lecture on key concepts and what you learned to introduce the subject. You are then responsible for moderating the following discussion and keeping the discussion going.

Final Paper: A final paper is due on the last day of class in class (May 4th). The final paper is any topic of your choosing as long as it is related to subduction zones. Most of you may find that it is easiest to write on a subset of the topic that you presented in class. You can turn your paper earlier than May 4th. You may find it easier to write up your paper soon after you present on it. 10 pages, space-and-a half, including figures, NOT including references.

Participation: A third of your grade is from class participation. This course will not succeed if you do not read the assigned readings prior to coming to class and actively participate in class.

Blackboard:

We will use Blackboard (<https://courses.utexas.edu/webapps/login>) to post course materials. You can find support in using Blackboard at the ITS Help Desk at 475-9400,

Monday through Friday, 8 a.m. to 6 p.m., so plan accordingly. Check your Blackboard and email regularly for class updates. Email is recognized as an official mode of university correspondence; therefore, you are responsible for reading your email for university and course-related information and announcements.

Special Needs:

The University of Texas is committed to helping students with special physical or learning needs. Any student with a documented disability who requires academic accommodations should contact Services for Students with Disabilities (SSD) at (512) 471-6259 (voice) or 1-866-329-3986 (video phone). Students with special needs should contact me as soon as possible to ensure that your needs are met in a timely manner. Students with special test-taking needs should contact me *at least* one week before a scheduled exam.

The University of Texas Honor Code: “The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.”

Students are expected to read and to strictly adhere to the University’s Honor Code and written policies on academic dishonesty. Cheating or plagiarism will not be tolerated. Any student caught violating University policy will be referred to the Dean of Student Affairs for disciplinary action. *All written work must be in your own words!*