Class Information: SIOG 221 Plate Tectonics in Practice
Spring 2024

This class will build upon classic concepts in plate tectonics, with an emphasis on practical implementation of tools that will will be applicable to a wide range of problems. These include quantitative seafloor analysis, plate reconstructions, modeling potential field data, and earthquake data analysis. The homeworks and essay assignment are designed to develop coding, data handling, and writing skills.

Instructor: Ross Parnell-Turner
Office: 333, IGPP Munk Lab; email: rparnellturner@ucsd.edu

Meeting Times and Locations: Mon/Wed 11:00am–12:20pm (Munk 330)

Format: 2 lectures per week; 4-units, letter or S/U grade.
Grades based on essay, homework assignments, and presentations.

Website on Canvas: https://canvas.ucsd.edu/courses/56362
Here you will find class information, lecture recordings and slides, and homeworks.

Learning Outcomes

1. Summarize fundamental concepts in plate tectonic theory
2. Apply plate tectonic concepts to solve geophysical problems such as plate reconstructions
3. Access and appraise digital data such as earthquake catalogs and multibeam bathymetric data
4. Manipulate data and files using bash scripts and tools such as awk
5. Design shell scripts to analyze and plot data using GMT, and produce publication-ready figures
6. Evaluate scientific papers and develop comminication skills, by reading, writing and presenting.

Suggested textbooks

This class will focus on methods and implementation, however the following provide useful background:
Cox, A., and Hart, R. B. (1986). *Plate Tectonics, How it Works*. Blackwell.
Fowler, C. M. R (2005). *The Solid Earth*. Cambridge University Press.
Kearey, P., Klepseis, K. A., and Vine, F. J. (2009). *Global Tectonics*. Wiley-Blackwell.
Turcotte, D. L., and Schubert, G. (2014). *Geodynamics*. Cambridge University Press.

Computing

Computer-based homeworks will need the tools listed on the schedule, all of which will run on most Mac, Linux or Windows machines. If you do not have a computer account we will set you up with one.

Essay assignment

You will write a review essay, in the style of a *Nature* 'News and Views' article, on a recently published peer-reviewed scientific paper, published since 2015 on a topic relevant to plate tectonics. The objective is to improve your writing and critical skills.

Key Dates

1. Choice of peer-reviewed paper: Monday April 15th
2. First draft due: Monday April 29th

3. Discussion/feedback on first drafts: Monday May 6th
4. Final draft due: Monday June 3rd

Format

Essays should be up to 800 words long (including figure captions, but not including title or references), and include one figure. They should be typed in 12 pt size font, with citations using the author-date format, and submitted in pdf format. Grades will be assigned with the aid of the rubric, which can be found on the course website.

Class Schedule

Module			Topic	Homework	Tools
Intro	Week 1	M 1-Apr L1	Class Intro: homeworks, essay intro, elevator talks	1: Elevator talk	
		W 3-Apr L2	Plate tectonics intro: crust vs lithosphere; Elevator Talks 1		
Map projections and sonars	Week 2	M 8-Apr L3	Map projections, datums, and GMT; homework 2 intro, Elevator Talks 2	2. Software install	xterm, bash
		W 10-Apr L4	McKenzie 2005, navigation and mapping methods, Elevator Talks 3		
Oceanic crust	Week 3	M 15-Apr L5	Homework 2 discussion, intro to oceanic seafloor, homework 3 intro, Essay paper choice due	3: Map projections	GMT, bash
		W 17-Apr L6	DeSanto 2019, seafloor fabric and abyssal hills		
Marine magnetic anomalies	Week 4	M 22-Apr L7	Homework 3 discussion, magnetics introduction, homework 4 intro	4: Abyssal hills	GMT, bash
		W 24-Apr L8	Goff et al., 2018; Marine magnetic modeling		
Gravity	Week 5	M 29-Apr L9	Student abyssal hill presentation; gravity intro; homework 5 intro; Essay first draft due	5: Marine magnetics	MODMAG
		W 1-May L10	DeMets, 2016; Marine gravity surveys		
Tectonics on a Sphere	Week 6	M 6-May L11	Student marine magnetics presentation; homework 6 intro; Essay 1st drafts discussion	6: Marine gravity	GMT, bash
		W 8-May L12	Kuo & Forsyth, 1988; plate rotations intro		
Plate Reconstructions	Week 7	M 13-May L13	Student marine gravity presentation; flowlines and poles, homework 7 intro	7: Rotation poles and flowlines	GPlates, GMT
		W 15-May L14	Plate reconstructions in practice		
Earthquakes & Focal Mechanisms	Week 8	M 20-May L15	Student flowlines presentation; earthquake catalogs intro, homework 8 intro	8. East African Rift	GMT, bash
		W 22-May L16	Earthquake catalogs and focal mechanisms in practice		
Active Source Seismology	Week 9	M 27-May	Memorial Day, no class	None: work on essay	
		W 29-May L17	Student plate reconstuctions presentation, active source seismic intro		
California Borderlands	Week 10	M 3-Jun L18	Seismic reflection and chirp methods, California Borderlands intro		
		W 5-Jun L19	Essay feedback; California Borderlands discussion, course review		