

SIO227B Global seismology

This class is intended to cover all aspects of seismology that go into the construction of global 1D and 3D models of the Earth, as well as the retrieval of moment tensor source solutions. This class used to focus on long-period seismology so the first part of the class covers free oscillations in some detail. The class has now been extended to include surface waves and body waves indeed, it is only by combining all these data types that we can get reliable 3D models of the Earth.

Your progress in the class will be evaluated by your performance in 4 or 5 "practicals" including:

- 1) Measuring and interpreting mode frequencies
- 2) Computing mode frequencies for simple models
- 3) Performing moment tensor inversions using real data sets
- 4) Performing tomographic inversions for upper mantle structure using surface wave data

Preliminary Schedule, 2014

Lecture	Topic	Chapter
1, 1 Apr	Introduction to class, long period data, free oscillations	Chapter 1/Review paper
2, 3 Apr	Continuum mechanics: conservation laws	Chapter 2
3, 8 Apr	Continuum mechanics, elasticity and attenuation	Chapter 2
4, 10 Apr	Equations of motion, boundary conditions	Chapter 2
5, 15 Apr	Separation of variables, numerical methods	Chapter 3
6, 17 Apr	Some simple mode solutions, asymptotics	Chapter 3
7, 22 Apr	Perturbation theory for 1D structure mean mode freq	Chapter 4
8, 24 Apr	1d elastic and attenuation models, resolution	Chapter 4 + paper
9, 29 Apr	Moment tensor sources, mode excitation	Chapter 4
10, 1 May	Moment tensor retrieval, theory and practice	Chapter 4
11, 6 May	Mode splitting by 3D structure	Chapter 5
12, 8 May	Data analysis of split modes, inner core anisotropy	Chapter 5
13, 13 May	IC rotation, peak shifting, mode coupling	papers
14, 15 May	Surface wave asymptotics, phase and group, observations	Chapter 6
15, 20 May	Ray theory, inverting phase and group data, ray tracing	Chapter 6
16, 22 May	Fermat's principle, anisotropy, finite frequency kernels	Chapter 6
17, 27 May	Solving large systems, practical phase inversion	Chapters 6 + 7
18, 29 May	Body waves, short and long period data, ray theory	Chapter 7
19, 3 June	Finite frequency kernels for body waves, source location	Chapter 7 + papers
20, 5 June	S models, joint P and S, thermal and chemical heterogeneity	papers

NB: The "Chapters" are extensive course notes available on the web (<http://igppweb.ucsd.edu/guy/sio227b>)