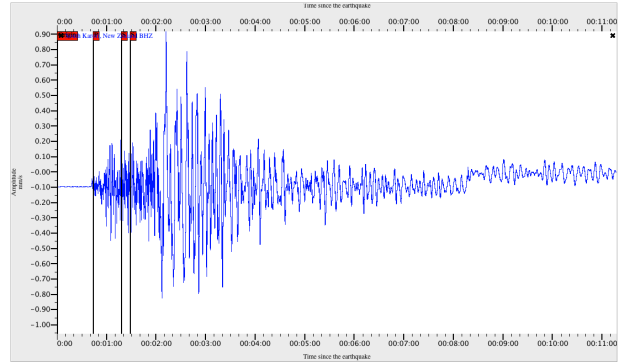


EOSC 256 Earthquakes - Spring 2012



Instructor:

Elizabeth Hearn, ehearn at eos.ubc.ca, EOS South Room 355 (office hours by arrangement)

Textbook:

None.

Website:

www.eos.ubc.ca/courses/eosc256/index.html

(All lecture PDF's will be posted so you can study them. This term, I **cannot** promise that they will be posted before each class. Examinable material is not just from these notes - it's from all class activities, homeworks, and lectures.)

Topics and timing:

1 - WHAT IS AN EARTHQUAKE / WHAT ARE ITS EFFECTS?

Earthquake effects (intensity of shaking), old and new ideas about causes earthquakes, types of faulting.

Introduction to seismic waves and seismographs, how we find earthquake magnitudes and locations.

Frequency-magnitude relationships, focal mechanisms, scaling relationships.

2 - EARTHQUAKE PHYSICS - WHY DO QUAKES HAPPEN?

Strain, stress, and elastic rebound theory. GPS and InSAR observations of deformation.

Friction, the Coulomb failure criterion, and the earthquake cycle.

Frictional instability - the other ingredient required for earthquakes.

3 - EARTHQUAKE FORECASTING, ENGINEERING, HOT TOPICS

Local seismic hazard, Cascadia subduction zone, tsunamis.

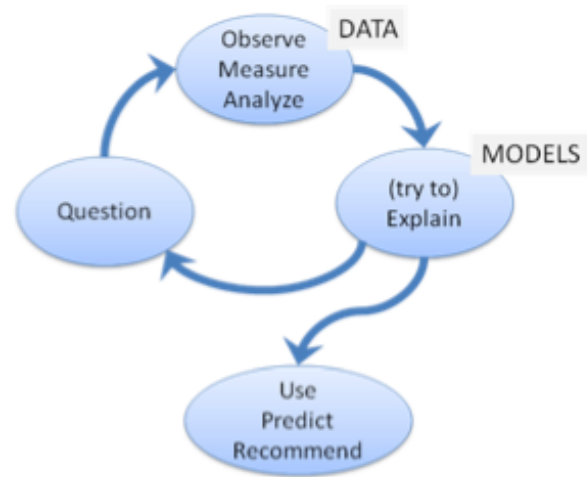
Probability (forecasting), triggering, seismic hazard.

Human-induced earthquakes (fracking, injection wells).

Specific Learning Goals: At the end of the term, you should be able to:

1. explain why earthquakes occur: forces that act, and why energy release is sudden.
2. explain why the ground shakes, and why shaking intensity varies from place to place.
3. describe the sorts of data we use to characterize earthquakes (i.e., locate them and estimate their magnitudes and focal mechanisms).
4. explain why we cannot predict the actual timing of earthquakes but can predict shaking intensity and probability.
5. go to the USGS website after an earthquake has occurred, understand the “scientific and technical” information provided, and summarize the quake at the level required for a typical TV interview.
6. critically assess predictions, human-induced quakes, and other claims: understand how theories must be tested against data to hold up.
7. explain how earthquakes provide evidence of plate tectonics and how tectonic plate motion causes earthquakes.

Overarching goals: Understand how science is actually done (how data and models are used to test hypotheses, and to generate new testable hypotheses). Also, see how material taught in your math and physics classes is used (really!) in earthquake science.



Grading

In-class activities - 20%

Homeworks - 20%

Midterm exam - 20%

Final exam - 40%

Late Homework Penalties (strictly enforced - NO exceptions)

0.0 to 1 week late -10%

1 week or more late -25%

“Activity” marks **cannot** be made up later. I will drop the lowest three marks when computing your final grade.

Let me know *well ahead of time* if you will miss an exam.