

USGS NSF Internship Opportunity

 Point of Contact Name:	Annemarie Baltay Sundstrom
 Point of Contact Email:	abaltay@usgs.gov
 USGS Center:	Earthquake Science Center
 Project Title:	Regional attenuation in California in ground-motion modeling
 Summary:	<p>The goal of this project is to contribute to our understanding of anelastic path attenuation in ground-motion prediction equations (GMPEs) by searching for correlations between seismic attenuation models constrained by 3D geophysical observations and \ ground motion measurements at individual stations. Distance decay (attenuation) in existing GMPEs is currently not region specific, that is, the same anelastic attenuation parameter is used for all of California. Yet we know from geophysical studies that the attenuation, geology, and velocity structure certainly vary across the state. This project seeks to incorporate that geophysical information into a new generation of predictive GMPEs through robust correlation.</p>
 Project Hypothesis or Objectives:	<p>Ground motion prediction equations (GMPEs) form the backbone of probabilistic hazard analysis and site-specific analysis, and directly contribute to the USGS Hazard Maps. However, huge uncertainties exist in the anelastic attenuation component of GMPEs; combining this uncertainty with recurrence rates into hazard space can yield higher hazard levels for very rare events. GMPEs are created from available ground motion data, and as such, can be limited in their spatial resolving power. In this project, you will seek to incorporate geophysical information, specifically a seismic attenuation model, as a new predictor variable for GMPEs. Recent work has shown a good correlation between the observed ground-motion data from the 2014 magnitude 6.0 South Napa earthquake and a completely independent attenuation tomography model developed for northern California; incorporating this information into a GMPE leads to an improved prediction of the shaking at various stations. In this project, you will investigate residuals of existing GMPEs in California in comparison to recent moderate- to- large magnitude earthquakes (such as the 2014 M6.0 South Napa earthquake), and correlate those residuals with 3D attenuation models. You will investigate the azimuthal dependence of</p>

the attenuation, and look for correlations between larger ground motions and basin effects or fault-trapping effects. All of the work will be completed with the intention of creating a new model for predicting isotropic, path-specific attenuation in ground-motion prediction models. In doing so, the resultant attenuation prediction will be more precise (describing the attenuation along a certain path more closely) and more accurate (reduced uncertainty), which will lead to a better understanding of seismic hazard and its variation across the state of California.

- Duration:** Up to 12 months
- Internship Location:** Menlo Park, CA
- Field(s) of Study:** Engineering, Geoscience
- Applicable NSF Division:** EAR Earth Sciences, ENG Engineering, CISE Computer and Information Science and Engineering
- Intern Type Preference:** Any Type of Intern
- Keywords:** earthquakes, ground motion, attenuation, earthquake path, earthquake modeling, earthquake engineering
- Expected Outcome:** The project will culminate in an abstract submitted for presentation to a recognized academic conference (such as AGU, SSA or SCEC), and potentially will result in a journal article. It may also lead to future collaboration between the student and PI.
- Special skills/training Required:** Applicant must have a strong mathematical and computational background, and be motivated to work independently. Applicant must have experience in scientific coding/computing (such as Matlab or Python), to be able to analyze time series or ground motion data, develop simple models, perform straightforward inversions, correlate basic data, and draw conclusions. All of the work performed will be computational in nature. The fellow must have experience conducting literature reviews and have good communication and writing skills. Previous experience writing and publishing a scientific abstract or journal article is a plus.
- Duties/Responsibilities:** This opportunity will provide professional development to a NSF Graduate Research Fellow by enabling interaction with seismologists, engineers and geologists at the USGS Earthquake Science Center in Menlo Park, CA. The fellow will assemble data from existing datasets, analyze the data and draw basic conclusions and observations. All work will be conducted computationally in environments such as Matlab or Python. The fellow will also learn basics and background on the USGS Hazard Mapping analysis through discussion with fellow researchers at the USGS ESC in Menlo Park, to further professional development. The fellow will be first author on an abstract for a scientific conference, and possibly on a journal article to follow.

Internal Information - Not to be posted:

Center Director Name: Stephen Hickman

USGS Responsibilities: Equipment, Facilities, Mentoring, On-boarding, Background Check, Volunteer Agreement Management

Preliminary Approval: This opportunity has my Center's approval

I already have a student in mind:

Comments:
