Measuring Earthquake Ground Motion near the San Andreas Fault with an Urban Deployment of Modern Seismometers
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Introduction
Seismology is the study of seismic waves propagating through the solid Earth. Energy is released in the form of seismic waves when rocks on opposite sides of a fault suddenly break apart within the Earth or from the slipping of tectonic plates. Seismologists study these vibrations with complex instruments called seismometers placed at the Earth’s surface to obtain information about the path the waves have travelled.

Four main types of waves can be observed in the recording of an earthquake: P (primary), S (secondary), and surface waves, which are Rayleigh and Love waves. Primary waves, the fastest of all waves are shown in Fig. 2a. They travel through solid, liquid, or gas. Secondary waves (Fig. 2B) can only travel through solids. If they encounter a liquid, the waves will be reflected back or be converted.

The different waves and their arrival times at the seismometer tell us about the different layers of the Earth. Seismologists use these recordings to establish the structure of the Earth’s interior, telling us what the Earth is made of deep below the surface.

Project Description
The purpose of this project is to record ground motion in the northern part of the Los Angeles metropolitan area with the objective of improving our knowledge of the subsurface and subsequently improving earthquake hazard assessment.

This region contains a series of basins that are known to channel and amplify seismic waves. A predicted 7.8 magnitude earthquake on the southern San Andreas Fault can have devastating effects for Los Angeles residents even though the two areas are ~229 km apart. Poorly constrained structural models of the northern basins seem to be the main reason that ground motion calculations differ in their predictions. To properly determine the earthquake hazard, we need to accurately predict the amount by which these waves will be amplified when they enter these basins. This can be achieved by improving the seismic velocity models of the subsurface and better constraining basin structure with a new style of seismic study.

Methods

* 1/29: Setting up the Job
* 2/12: Shipping off the nodes
* 2/18: Deploying the nodes
* 3/30: Downloading the data

Data

Figure 13: (Left) Map of the active faults in the Peachtree Valley area (blue), the local earthquakes recorded during the experiment (green and purple stars), and the node locations (red dots). The data shown in Fig. 12 was recorded by nodes along Line 3. (Right) Close-up view of the nodes in the figure on the left.

Instruments

Summary

- We collected 35 days of data in the San Gabriel and San Bernardino basins near the San Andreas Fault for an earthquake hazard project.
- We are currently in the process of downloading the data from the nodes.
- After the data download, we will continue to work with CalTech in an effort to analyze and interpret the full data set.
- We are planning on deploying more nodes in the Fall 2017.

Acknowledgements

Jessica and Arlen would like to thank Dr. Persaud, a professor at Louisiana State University’s Department of Geology & Geophysics, and CalTech for the opportunity to participate in such an awesome project. We would also like to express our thanks to Dr. Robert Clayton, a professor at California Institute of Technology, for organizing and managing the fieldwork on the ground in southern California; Dr. D’Reid and Noel Barstow from the BSS PASSEAL (Portable Army Seismic Studies of the Continental Lithosphere) Instrument Center for providing us with an additional 62 nodes for Line 1, and for the on-site training at the PASSEAL Instrument Center; and also for sharing their experience with the nodes; Ian Dippel, an advanced field service engineer at FairfieldNodal, for providing us with valuable technical assistance; and Michael Thrall at LSU for helping us with technical problems. Gus Bates and Phoenix start as interns as well as the numerous other departments and the Louisiana State University, and we are thankful for their help with the fieldwork.