USGS NSF Internship Opportunity

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USGS Center: USGS Earthquake Science Center
Project Title: Towards Near Surface Ground Motion Characterization in Oklahoma and Texas through Active- and Passive-Seismic Site Characterization
Summary: Earthquakes, such as the 2011 M5.7 Prague, Oklahoma, and recent northern Texas M4 event, demonstrate the need for improved understanding of site amplification and seismic hazards in the central United States. The intern will be trained by USGS scientists to use the state-of-the-art site investigation methods at seismic station sites in California before applying the methods in Oklahoma and Texas.

Project Hypothesis or Objectives: Earthquake ground motions have been known to be strongly affected by the character of near-surface site conditions. The overall goal of the proposed project is to characterize seismic site conditions of the shallow surface and estimate the susceptibility of the ground to amplify earthquake motions. We (USGS Geophysicists Alan Yong and William Stephenson) seek funding to train Oklahoma University PhD. Graduate Student Raymond Ng on the use of traditional surface array-based geophysical methods by supporting Ng's participation in an ongoing USGS site characterization project in California for four to six months as led by Yong. Following the training, Ng will apply the aforementioned methods in Oklahoma and Texas—led (respectively) by Professor Nakata and Texas Bureau of Economic Geology (BEG) TexNet Network Manager/Research Scientist Alexandros Savvaidis—for an additional six to eight months. With guidance from Nakata, Savvaidis, Stephenson, and Yong, Ng is expected to apply his experience from California to characterize the near surface in terms of shear-wave velocity for sites in Oklahoma and Texas. In Oklahoma, there are more than 100 permanent or temporary seismic stations monitored by various networks that have recorded seismic data. In Texas, the TexNet network has deployed more than 60 permanent and portable stations. This cooperative study will investigate a number of select Oklahoma and Texas sites (approximately 4–6) that reflect the variability of site conditions in this region. Following site characterization, Ng will proceed to estimate theoretical and empirical...
Travel-related costs for site investigations to be performed at TexNet seismic station sites will be funded by BEG-TexNet.

**Duration:** Up to 12 months

**Internship Location:** Pasadena, CA 91106

**Keywords:** Computer/Data Science, Earthquakes, Engineering, Geology, Geologic Hazards/Volcanology, Geomorphology, Geophysics, Modeling, Statistics

**Applicable NSF Division:** GEO (Atmospheric, Earth Sciences, Ocean Sciences, Polar Programs)

**Intern Type Preference:** Any Type of Intern

**Duties/Responsibilities:** This proposed collaboration offers the student professional experiences they cannot get at their home institution, such as access to USGS facilities, field sites, and data they would not otherwise have. These aforementioned USGS experience include: the use of USGS Earthquake Science Center (Pasadena Field Office) laboratories to prepare instruments for field deployments, as well as post-fieldwork tasks; permitted access to seismographic station sites; and field data, as recorded during fieldwork in California. For work in Oklahoma and Texas, field equipment from the USGS Geologic Hazards Science Center will also be accessible. The student will also have the opportunity to develop new skills such as acquisition, processing, modeling of in situ recordings of seismic data using the state-of-the-art methods and collaboration in a new scientific direction that has been developed by USGS and non-USGS investigators. The student will be exposed to the USGS work culture ethics that are exemplified by USGS scientific publications.

**Expected Outcome:** The project has the potential to increase to the state-of-knowledge on seismic site amplification; thus, contribute to the mitigation of earthquake hazards in the Oklahoma and Texas region. Directly, the student will be presented with the opportunity to acquire knowledge and experience from USGS scientists investigating seismic site amplification in California. At the same time, the student is expected to contribute to the USGS site characterization efforts by directly participating in fieldwork while training as an intern.

**Special skills/training Required:** For laboratory work, student should possess basic computer programming skills (Unix command line functions) and experience in using Generic Mapping Tools, MATLAB, Python, R, and other Microsoft Office suites. For fieldwork, the student should possess physical fitness at the level that enables endurance of variable field temperatures ranging from 50 – 95° F and be able to lift 30–50 lbs. of mass, typical of field seismic equipment.