

2021 USGS Earthquake Science Center Internship Program Announcement

Do you want to work as part of a diverse science institution that researches and monitors earthquakes and faults? The U.S. Geological Survey Earthquake Science Center is recruiting interns to work on earthquake monitoring, research, science support administration, and information technology in Summer 2021.

Join us for an information session via Zoom at 7 PM Pacific on Thursday March 25, 2021:

<https://zoom.us/join>

Meeting ID: 894 3311 5413

Passcode: 031821

[direct Zoom link](#)

Or just aim your camera at the QR code



Please take a moment to review these notes below before calling in: A computer connected to audio is preferred (phone/tablet doesn't work as well). If possible, join the call 5 to 10 minutes early. Use your full name (first and last) when joining. You'll be placed in a waiting room briefly before entering. Update your Zoom client to the latest version before you join. If you're not familiar with Zoom, we will teach you everything you need to know.

At the information session, Earthquake Science Center staff will describe the opportunities, provide advice for applying, and answer questions. We encourage students at 2-year and 4-year colleges and universities who are considering careers or degrees in earth science, computer science, mathematics, physics, engineering, information technology, or other related fields. Applications from students with any level of experience are encouraged, we hope to hire a diverse cohort of interns. Positions are initially for summer 2021, but some may be extended. Start date is flexible.

Although the vacancy announcements are generic, you may indicate interest in a specific opportunity on the application. To apply for these USGS Pathways internships, go to <https://www.usajobs.gov/> and enter the job number (to be shared at the zoom event, or email esc_internships@usgs.gov if you need it or can't find the posting). **The job application process will open at 9 PM Pacific on Monday, March 29, and close after we receive a limited number of applicants; we recommend you apply ASAP.** We suggest that you set up your account and upload the required documents (resume/CV and transcripts) in USAJOBS.gov in advance. **Make sure to include unofficial transcripts (readable pdf format preferred) from all institutions and provide proof of enrollment at your current institution.** These positions are only open to U.S. citizens. There will be more than one posting to cover the range of positions, we will describe this, but feel send us an email if needed.

The internship opportunities are listed beginning on the next page. Mentor name and location are listed, as is the type of student that might fit best. Some positions may only be filled when staff return to offices when mandatory remote telework ends following the COVID-19 pandemic. If you would like to contact the potential mentor, find contact info here: <https://www.usgs.gov/centers/earthquake-science-center/employee-directory>

Feel free to send any questions to esc_internships@usgs.gov

<https://www.usgs.gov/centers/earthquake-science-center>

https://twitter.com/USGS_Quakes

https://www.instagram.com/usgs_quakes/

Internship Opportunities

A) Undergraduate or graduate student

Research Support

1. Assist the seismic hazards team to maintain, program and download seismometer nodes. Also assist with small, local seismic projects. (Mark Goldman – Moffett Field) *any level student*
2. Develop model for how the strength of shaking grows and declines over the course of an earthquake by processing seismic records and then fitting a model to those data. Students should have mathematical, computer science, and/or geoscience experience. Curve fitting methods and/or python/matlab experience beneficial. (Sarah Minson, Elizabeth Cochran – Moffett Field or Pasadena) *undergrad or graduate student*
3. Assist with the collection and analysis of sedimentological samples of late Quaternary sediments. Candidate would conduct field and laboratory work examining the character and age of deposits associated with earthquakes. Candidate should have experience in geologic field mapping, completing standard sedimentological analyses, and using programs such as Arc GIS. (Kate Scharer – Pasadena) *undergrad or graduate student*
4. Assist in the planning, acquisition, and processing phases of a seismic imaging investigation of the Serra Fault, located along the San Francisco Peninsula. This work involves fieldwork, whereby a large number of seismometers and sources will be deployed, and laboratory work, which involves computer evaluation of the data (Rufus Catchings – Moffett Field) *undergrad or graduate student*
5. Develop a comprehensive inventory of coastal landslides from lidar images and compilation of existing sources. This work will contribute to the identification of landslides triggered by Cascadia Subduction Zone earthquakes. Candidates should have experience with GIS, python/matlab experience beneficial but not required. (Alex Grant – Seattle) *undergrad or graduate student*
6. Characterize shallow fault zone structure, properties, and processes of the San Gregorio fault system along the Santa Cruz and San Mateo County coastlines. Tasks may include field mapping, interpretation of aerial photos and lidar data, collection and laboratory analysis of samples, and/or analysis of previously collected seismic data. (Josie Nevitt – Moffett Field) *undergrad or graduate student*
7. Collect evidence of the strongest past earthquake shaking. Use aerial photographs and other remote sensing data to survey fragile features in the landscape. Candidates will benefit from experience with GIS or basic computer programming skills, but neither is required. (Devin McPhillips – Pasadena) *undergrad or graduate student*
8. For this project, a student will first use online newspaper repositories to compile media accounts of the 1971 Sylmar earthquake, which was widely felt in the greater Los Angeles area. The student will then compare the distribution of media accounts with the distribution of the ~1000 responses that have been received (retroactively) by the DYFI system, identify underserved communities, and help develop strategies to better engage with them. Attention to detail, basic computer proficiency (GIS or excel experience helpful), Spanish proficiency helpful but not required. (Sue Hough – Pasadena) *undergrad or graduate student*
9. To accurately characterize the earthquake source, effects of travel path and location recording site must be mitigated, which can typically be a significant undertaking. In this project, however, we will make use recently developed ground-motion models for Fourier amplitude spectrum to determine relative earthquake source spectra. Then, earthquake source parameters such as corner frequency and stress drop to determine

- correlations with high-frequency ground motion. Ability to use Matlab at an introductory level or another programming language (such as Python or R) at a higher level (as PI can help more closely with Matlab development) is necessary. (Annemarie Baltay – Moffett Field) *undergrad or graduate student*
10. Work with the USGS Operational Aftershock Forecasting Team to develop software that monitors the forecasts by downloading them from our website, making plots that compare them to the aftershocks that actually occurred, and flagging forecasts that are performing poorly. Candidates should have programming experience, preferably with the statistical package R or other languages that support plotting. USGS Aftershock forecasts let people know what to expect during earthquake sequences, helping the public to cope, and guiding priorities for response and recovery operations: see <https://earthquake.usgs.gov/data/oaf/> for more information on the forecasts. (Andrew Michael – Moffett Field or Pasadena) *undergrad or graduate student*
 11. Explore trends in a large dataset of USGS "Did You Feel It?" shaking intensity reports. This work will aim to find earthquake magnitude and shaking intensity relationships for use in earthquake early warning applications. Experience with programming in Python would be beneficial. (Jessie Saunders – Moffett Field) *undergrad or graduate student*
 12. Develop an online system for compiling and distributing post-earthquake ground deformation observations and interpretations. Following significant earthquakes, the USGS Earthquake Science Center acquires information from GNSS stations, specialized instrumentation, and imaging satellites and uses these data to derive models of the causative subsurface faulting. These data and simple automated models fit to them need to be integrated into an informative web-based display that can be updated as new data are acquired. Experience with web-based coding, GIS, MATLAB, and shell scripting would be helpful. (Evelyn Roeloffs – Moffett Field) *undergrad or graduate student*

Earthquake Monitoring Network Support

13. Assist in the field operations of seismic stations and communications towers, including scouting, installation, maintenance, weed abatement, inventory, building cables, testing equipment, and ordering supplies for the Earthquake Monitoring Project. Will also assist with the packing and moving of supplies to new NC field Ops Stockton office. Desired skills include: some experience with electronics and fabrication, Linux experience a plus, attention to detail, and willingness to work in the dirt. (Jim Smith – Menlo Park) *undergrad or graduate student*
14. Assist in the field operations of seismic stations, including scouting, installation, maintenance, weed abatement, inventory, building cables, testing equipment, and ordering supplies for the Earthquake Monitoring Project. Desired skills include: some experience with electronics and fabrication, Linux experience a plus, attention to detail, and willingness to work in the dirt. (Dean Childs – Menlo Park) *undergrad or graduate student*
15. Assist with collection, aggregation, review, modification, and creation of schematic drawings and site photographs of seismic stations (including deployments in buildings, dams, and bridges) monitored by the USGS Earthquake Monitoring Project. Useful skills include working with databases, drafting in Adobe Illustrator, Computer Aided Design (CAD) experience, and map production using Geographic Information Systems (GIS). (Lisa Schleicher – Moffett Field) *undergrad or graduate student*
16. Assist with monitoring impacts of wildfire hazards to seismic instrumentation and other infrastructure critical to maintaining reliable operation of ShakeAlert earthquake early warning. This project would focus on applying a combination of geographic information systems (GIS) and python coding skills to develop web-tools for extracting real-time wildfire information, as well as geology and site response information for other applications

in the Earthquake Science Center, at unique station input lists to make data accessible a larger diversity of users. (Lisa Schleicher – Moffett Field) *undergrad or graduate student*

17. Participate in planning processes for developing a next generation version of the ANSS Quake Monitoring System software. Some of the areas that the next generation version is envisioned to address are implementation of new and revised techniques associated with the detection and characterization of seismic events, providing better interoperability with other applications used within the community, modernizing and applying software development and engineering best practices into legacy code, and addressing deficiencies and issues cited by the AQMS community. Desired education background in software engineering, high-level programming languages (C++, Java, Python) and object-oriented programming concepts. (Jeff Brody – Menlo Park) *undergrad or graduate student*
18. Establish instances of seismic data acquisition and processing applications in a cloud environment. Some applications can transition like-for-like from on-premises physical to cloud-based virtual systems. Other applications require redevelopment work or modifications into a cloud-native application for optimizing use of cloud services. Skills desired are experience with Amazon Web Services, architecting cloud solutions, Python, Unix-based operating systems, and networking. (Jeff Brody – Menlo Park) *undergrad or graduate student*
19. Design and develop new scripts as well as update and improve existing scripts in Python for a variety of applications in seismic network operations including data acquisition, processing, distribution, data quality control, monitoring state of health information and other activities. Python programming experience required. (Jeff Brody – Menlo Park) *undergrad or graduate student*

B) Undergraduate student preferred

Research Support

20. Work with GIS coordinator for the Earthquake Science Center on various GIS applications for scientists. Also, potentially works with Center Web Developer for migration of online content into Drupal environment. GIS skills required; web developer skills desired but not necessary. (Shane Detweiler – Moffett Field) *undergrad*,
21. A student project to help characterize areas of localized ground deformation (aquifers, fluid injection, landslides, faults) in Southern California using satellite radar measurements. The student will be responsible for finding anomalous features in deformation data, investigating the details of the deformation, performing computations, and comparing with other datasets. The computational tools will be in Python and Google Earth; programming experience helpful but not required. (Kathryn Materna – Moffett Field) *undergrad*

Earthquake Monitoring Network Support

22. Assist in the daily earthquake monitoring of current Northern California earthquake activity. The student would be trained in using waveform analysis software to process captured seismic events for the Northern California Seismic System. Student would pick P and S phases along with first motion values for waveform onsets. Running location and magnitude calculations, Checking for quality to final form. Student will also get familiar with current and historical nature of seismicity in Northern California to aid in performing this work. Desired skills would be someone with a basic knowledge of seismic theory like P and S seismic waves and how they are used in location of a hypocenter. Other skills would be someone that demonstrates good visual perception to see small changes in appearance, like noticing slight seismic onset phases and seismic decay over background noise for event waveforms. Basic computer skills using a PC to use the AQMS Jiggle software. Work will be

repetitive in nature as the Earth never stops shaking us. Strong preference for someone willing to continue working during the school year. (Hal Macbeth – Menlo Park) *undergrad*

Science Administration Support

23. Work with development team to design an Access database to consolidate all lease and permit information for seismic network locations in 3 states and update data. Familiarity with Access, programming experience desirable, strong problem-solving skills. (Jane Meyer – Pasadena) *undergrad*
24. Work with network operations and Admin team to correct inventory issues and dispose of surplus equipment. Familiarity with MSOffice, enterprise system experience or web research experience desirable, strong problem-solving skills. (Jane Meyer – Pasadena) *undergrad*
25. Survey team members to develop a file plan and index for administrative records noting locations (both physical and network locations), accessibility and security issues. Using the USGS records schedule, compile the required information and work with the Admin/IT team to post a reference webpage on our internal site. Familiarity with MSOffice, web research experience desirable, strong problem-solving skills essential. (Jane Meyer – Moffett Field or Menlo Park) *undergrad*

C) Graduate student preferred

Research support

26. Earthquake and microtremor recordings are key inputs for seismic site response analyses that are used to predict a location's propensity to strongly amplify or de-amplify earthquake motions. Student will assist by retrieving and archiving US and international recordings for analyzing Horizontal-to-vertical spectral ratios from various data sources that include seismological consortiums and network operators. Desired skills include efficient coding in MATLAB, Python, and/or R; familiarity with seismic instrumentation and data processing methods preferred. (Alan Yong – Pasadena) *graduate student*
27. Primary and secondary earthquake effects are coupled phenomena which geomorphometry can play a key role for advancing knowledge about their underlying mechanisms. Intern will assist by retrieving recorded data from various online repositories, as well as the analyses of near-surface geophysical and remote sensing (imagery) data. Analyses include methods in geomorphometry and geostatistics. Desired skills include efficient coding in ArcGIS, GMT, MATLAB, Python, and/or R; familiarity with seismic instrumentation and data processing methods preferred. (Alan Yong – Pasadena) *graduate student*
28. Site specific recordings are key to understanding the character of strong ground motions that have a direct effect on the engineered environment. Intern will be trained on the deployment of seismic instrumentation known as single stations. Then, intern with other student(s) will travel to sites to record microtremor data in Southern California where permanent seismic monitoring stations are situated. Desired skills include efficient coding in ArcGIS, GMT, MATLAB, Python, and/or R; familiarity with seismic instrumentation and data processing methods preferred. (Alan Yong – Pasadena) *graduate student*
29. Inversion methods have been used extensively in seismic source identification for a long time; however, recent development in computational resources provided an opportunity to carry out model-based source inversion. A large area will be numerically modeled and parameters of the seismic source as well as the wave propagation domain are updated using recorded ground surface motions. This computationally expensive approach includes

high-performance computing resources (hardware as well as parallel numerical computing algorithms) and advanced physics-based stimulation techniques. An intern will help with numerical modeling, running the simulations, and collecting and processing data; Finite Element Analysis, C & Python skills required. (Jon Fletcher – Pasadena) *graduate student*

30. We seek a student to carry out and improve earthquake detections using previously not analyzed continuous data from a local borehole network at the Coso Geothermal Field. These data span the time after the Ridgecrest earthquake, will utilize well established template matching routines drawing from a long history of events, and will likely yield significant additional insights into the reservoir deformation following the M7.1 Ridgecrest earthquake. (Ole Kaven – Moffett Field) *graduate student*
31. We seek a student to carry out microseismic detections using data from a distributed acoustic sensor (DAS) installed in an injection well at the Blue Mountain, NV, geothermal site. Those data and detections will be compared to events detected and located using a near-surface seismic network. The work would require advanced processing of large data sets, optimize filtering to account for noise from well operations, and creating detection methods using large and noisy data sets derived from DAS. (Ole Kaven – Moffett Field) *graduate student*

Earthquake Monitoring Network Operations Support

32. Work with the USGS/Caltech Southern California Seismic Network IT team to integrate new networking equipment and optimize networking protocols. Familiarity with networking protocols required, strong troubleshooting, communication, and documentation skills essential, as is a willingness to adapt and learn new skills in a rapidly evolving open-source networking environment. (Valerie Thomas – Pasadena) *graduate student*
33. Exploration of and development of frameworks for machine learning applications to identify stations and telemetry links, devices that are nearing a point of degradation/impairment. Learning application that leverages SOH data, but also operates in a mode that doesn't consist of a training data set, rather learns from patterns (unsupervised learning) in real-time to eventually make a call on if a station needs attention. Desired education background in data analytics, data visualization, math (eg. statistics, linear algebra). (Jeff Brody – Menlo Park) *graduate student*