CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY

Name(s)

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Project Number

J0603

Project Title

Using Lichenometry to Date Past Earthquakes

Abstract

Objectives/Goals

The objective of this project was to determine the accuracy of using lichenometry to find the dates of past earthquakes. As a result of the seismic shaking that takes place during earthquakes, rockfalls occur and fresh rock surfaces are exposed. Lichens colonize on fresh rock surfaces and, with the formulas that lichenometrists have created regarding the growth rates of specific lichen types, the age of the lichens and thus the age of the substrate can be determined. We hypothesized that after measuring Rhizocarpon lichens in three areas that experienced seismic shaking during the 1857 Fort Tejon earthquake, we would find that on average these lichens would be 147 years old, meaning we were successful in using the lichenometric method to find the accurate date of a past earthquake.

Methods/Materials

We first located three sites that experienced seismic shaking during the 1857 Fort Tejon earthquake and had microclimates that favored lichens. At each of these three sites, using the Fixed Area Largest Lichen method (meaning we only recorded the largest lichen on each rock), we measured as many crustose lichens as possible (preferably Rhizocarpon) and recorded the size of each lichen's longest axis. We then found the ages of these lichens using the average amount in milimeters that Rhizocarpon lichens grow per century.

Results

We determined that the expected size of lichens resulting from the 1857 Fort Tejon earthquake is 22.2 mm. Approximately 17% of the 85 lichens we measured at our third site were between 21 and 23mm. THis means that 17% of the lichens we found at this site were a result of the Fort Tejon earthquake which occurred 147 years ago.

Conclusions/Discussion

The results from the third site supported our hypothsis; although the lichens we measured at our first two sites did not have a strong correlation with the 1857 Fort Tejon earthquake, 14 our of 85 lichens at our third site did. We were not able to classify 84 out of the 85 lichens we measured at this site (we were able to classify the last lichen we measured as Rhizocarpon); however, we knew they were crustose lichens, and many times the growth rates of one type of crustose lichen are similar to the growth rates of another type of crustose lichen.

Summary Statement

Our project is about using the sizes of lichens growing in sites that experienced seismic shaking during the 1857 Fort Tejon earthquake to find the age of the substrate and thus date back to this earthquake.

Help Received

Geologist advised us and recommended specific lichen sites via e-mail; Erin's mother helped with the lichen age calculations and statistical analysis; geologist explained the Chi-squared Goodness-of Fit Test; Jena's father supervised lichen measuring.