



Colorado Science and Engineering Fair

2025 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Earthquake Asperities Relation to Recurrence

Finalist's Name: Ben Zhao

School and City: Summit Middle Charter School, Boulder

Sponsor's Name: Valerie Keeney

Category: Earth & Environmental Sciences

Division: Junior (grades 6 - 8)

Abstract (250 words or less):

This study explores the relationship between the strength and recurrence of earthquakes by looking into the behavior of asperities, the uneven regions inside the Earth that cause small, repeating earthquakes. A model was built using different types of clay (Sculpey Classic Red, White, and Air Dry) to simulate asperities, with varying hardness levels (3, 5, and 6.5 on the Mohs Hardness Scale) to find the effects of asperity strength on breakage and earthquake recurrence. The results show that as hardness of the asperity increased, both the breakage and time until no breakage also increased. Specifically, harder asperities (hardness 6.5) showed more resistance to breakage and a longer duration before no further breakage, supporting the hypothesis that stronger asperities lead to more frequent seismic activity. The data analysis showed a clear correlation between hardness and breakage, with a R^2 value of 0.999. However, inconsistencies in breakage were observed, which may be due to the small scale of the model compared to real-world conditions. The results suggest that as asperities become stronger, they have a higher recurrence rate of earthquakes, contradicting the assumption that larger fractures lead to shorter earthquake lifespans. In the future, I think this experiment would benefit from a larger scale and more controlled environment to better represent real-world asperities. This study contributes to understanding earthquake prediction by explaining the role of asperity strength in the recurrence and magnitude of earthquakes.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. **A signed copy of this form must be included in your notebook.**