



CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s) Dorothy L. Silverman	Project Number S0832
Project Title The Effects of Anthropogenic Biomes on Perceived Ground Shaking	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Do anthropogenic biomes, or man-made environments, affect our perception of ground shaking? I hypothesize that: 1. Ground shaking reports, or Modified Mercalli Intensity (MMI) reports, are affected by the man-made environment, or anthropogenic biome, in which a person lives. 2. MMI reports are most influenced by highly populated urban anthromes because there is more destruction to witness. 3. Objective peak ground acceleration recordings are more accurate in predicting ground motion than MMI reports.</p> <p>Methods/Materials MMI reports were collected from 5 major earthquakes ($7 < M < 7.9$) that occurred in different global regions. 10 reports were collected from each earthquake. I used a Google Earth anthropogenic biome map, and MultiSpec, a satellite image analysis program, to find the anthropogenic distribution surrounding all 50 response sites. I normalized the data and ran multiple regression analyses to establish a relationship between MMI and anthropogenic biomes. I created a "General Model" by running an analysis on all 50 MMI reports, and five "Specific Models" by running analyses on MMI reports specific to their corresponding earthquake. All models were compared to the equation used by the USGS for shakemaps.</p> <p>Results The Village anthrome is directly related to MMI in the #General Model#, where $F(x) = 4.803 - 0.003(\text{Distance}) + 0.028(\text{Village})$. The #General Model# is directly related to and dependent on the village anthrome, while the #Specific Models# are inversely related to and dependent on a variety of anthromes. In the residual model for slope analysis, the #General Model#, #Specific Models#, and #USGS Model# had slopes within a 0.005 range of each other. Finally, a one-sample T-test comparing the #General Model# to the #USGS model# produced a P-value=0.002, suggesting that MMI reports are not significantly inflated.</p> <p>Conclusions/Discussion The T-test and slope analysis suggest that humans can accurately estimate ground shaking. Because the #General Model# is created from a globally-diverse pool of data, it may be used to estimate MMI from around the world; the nuances of a single global region will not greatly affect estimated MMI. The synergy between Village#s high population and total area may be why is it the most influential anthrome</p>	
Summary Statement My project aims to determine how our perception of seismic shaking is influenced by the anthropogenic biome, or man-made environment, in which we live.	
Help Received Mr. Frost taught me statistics. Dr. Steve Chien introduced me to satellite image analysis.	