EXTENSIONAL VOLCANOTECTONICS: 
LONG VALLEY VOLCANIC REGION, CALIFORNIA

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INTRODUCTION
Mammoth Mountain is located in Eastern California. The complexity of Mammoth Mountain and its association with the Long Valley Caldera are subjects of ongoing research. One study suggested that the volcanism of Mammoth Mountain had no direct relation to the Long Valley Caldera or the extensional tectonics of the caldera’s ring-fault zone (Hildreth et al. 2014). With the use of sand table analog experiments, and fault mapping, we have explored the relation of the ring-fault zone of the Caldera and the development of Mammoth Mountain.

RESULTS AND DISCUSSION

HYPOTHESIS
Is the observed morphology of Mammoth Mountain, CA governed by extensional volcanotectonics occurring to the east of the mountain?

Figure 3: Looking Southeast towards the Cleft on Mammoth Mountain, CA.

METHODS
Sand Table Experimentation
By layering sand atop a rubber sheet and then extending that rubber sheet with a motor; extensional features were modeled.

Remote Sensing Results
This study has found that it is plausible that the morphology of Mammoth Mountain, CA, is controlled by extensional tectonism to the east. The source of this extensional tectonism is Long Valley Caldera. As the Caldera remains active, an extensional regime will govern the structures located on its sides. Through remote sensing data, 3D modeling, and analogue experimentation it is quite possible that the morphology of Mammoth Mountain appears the way it does, due to the extensional regime present on the western side of Long Valley Caldera.

REFERENCES

Remote Sensing & DEM Analysis
Using TOPSAR, SPOT imagery, and ASTER data allowed for the digitization of the faults and simulation of topography.

Digital Elevation Modeling Results
Figure 7: 3D Sand Table elevation model with fault interpretation from Kinect data
Figure 8: 3D TOPSAR elevation model of Mammoth Mountain, CA with fault interpretation

CONCLUSIONS

Previous Geological Investigations
Dr. Marcus Bursik conducted fault surveying of the Mammoth Mountain region. The USGS published a map in 2016, which mapped all known structures and lithologies of the Long Valley Caldera Region. After the May 25th and 27th, 1980 earthquakes the USGS surveyed surface ruptures that appeared in the region.

Figure 1: Map of the Long valley Caldera, with Mammoth Mountain located on the Southwest edge of the caldera ring.

Figure 2: The Sand Table Set up has a rubber mat attached to a motor, and a kinect camera.

Figure 4: A Visual digitization of the structures present near Mammoth Mountain, CA. All known faults and fissures are consistent with an extensional volcanotectonic setting.