THE INTERACTION OF LAVA FLOWS WITH OBSTACLES

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INTRODUCTION

Lava is the molten rock expelled by a volcano during its eruption. When it first erupts from the volcanic vent, the liquid usually reaches around 700 to 1,200°C. Lava being a hazard, we study it to prevent damage but also to understand the topography of our planet and its inner workings. We used corn syrup and polyethylene glycol (PEG), two manageable fluids to mimic the characteristics of basaltic lava.

OBJECTIVE

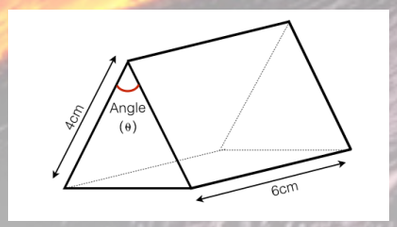
Determine the various barrier angles necessary to provide the most effective protection from lava flows.

METHODS

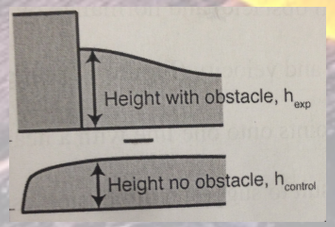
- Pumped a 98% corn syrup and 2% water liquid on a corrugated plastic surface in a tank to mimic a lava flow on a 14° slope.
- Pumped polyethylene glycol (at 25°) into a tank filled with 5° water on a wire substrate.
- Ran experiments with obstacles of 30°, 60°, 90°, 120°, 150°, and 180° twice as well as with no obstacle twice.

CORN EXPERIMENT

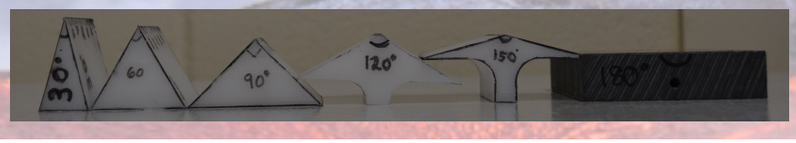
PEG EXPERIMENT

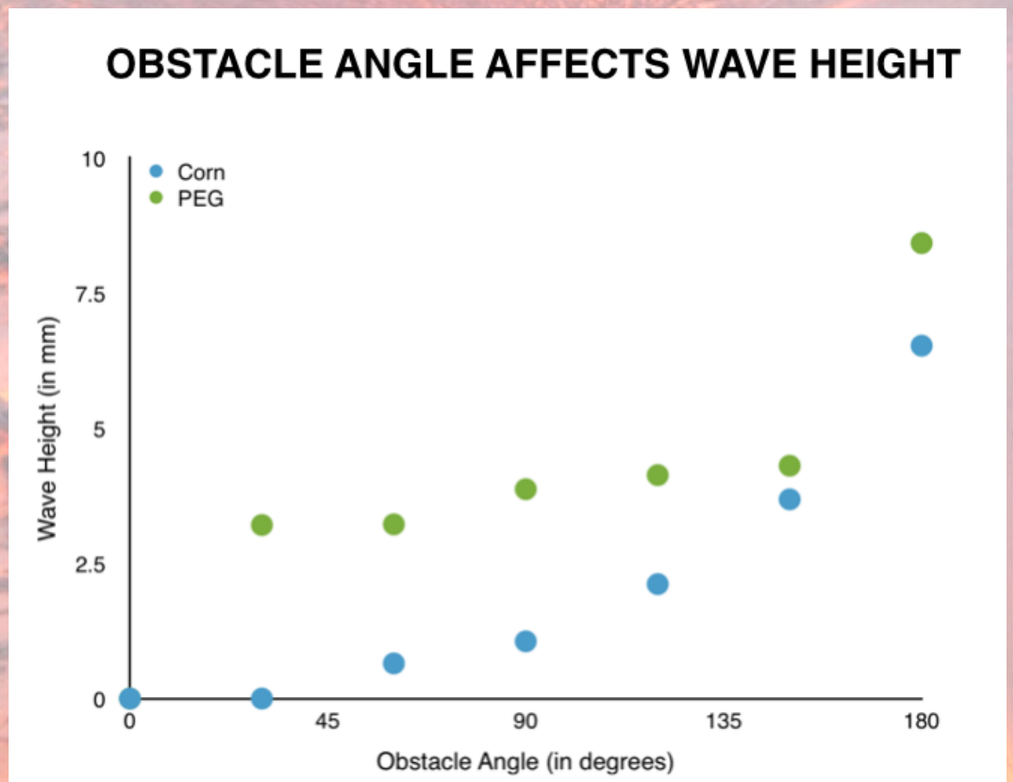


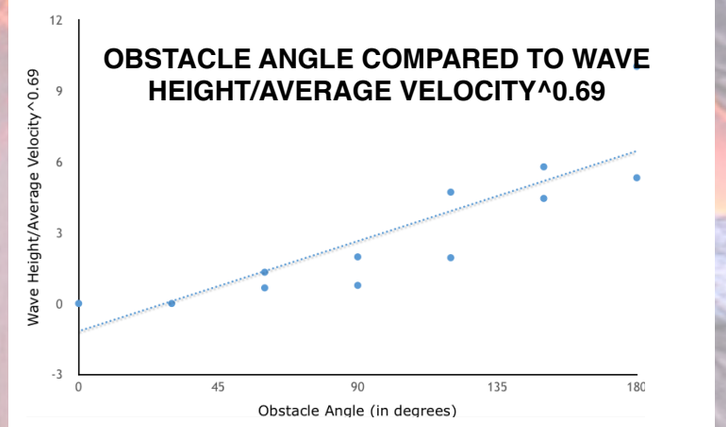
OBSTACLE

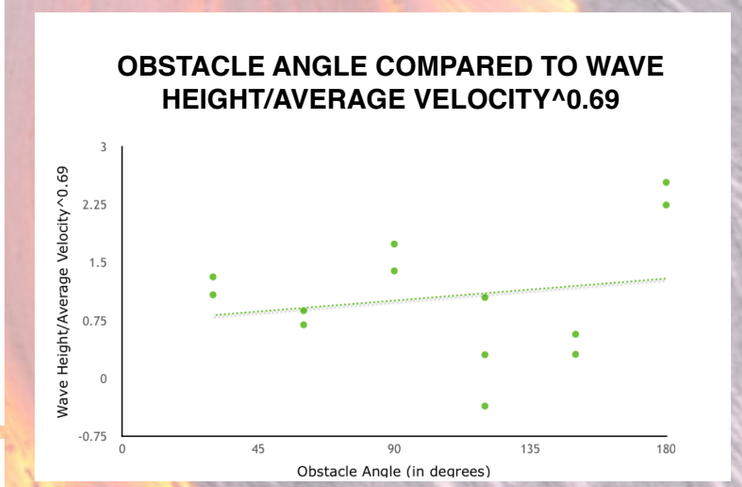


WAVE HEIGHT









CONCLUSIONS

- Wave height increases with angle.
- Gap in between wave heights of angles 150 and 180.
- The bigger the angle of the obstacle is, the wider the flow will be following the obstacle.
- Wave height/average velocity^0.69 is a linear function for Corn but unpredictable for Corn.
- Lava dominated by crust has a behavior that is harder to reproduce or predict.

***REFERENCES:** Dietterich, H. R., Cashman, K. V., Rust, A. C., & Lev, E. (2015). Diverting lava flows in the lab. Nature Geoscience, 8(7), 494-496. ; Dietterich, H. R., & Cashman, K. V. (2014). Channel networks within lava flows: Formation, evolution, and implications for flow behavior. Journal of Geophysical Research: Earth Surface, 119(8), 1704-1724.