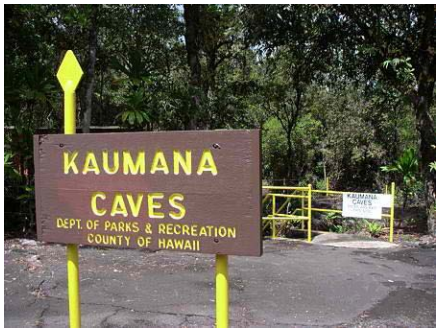
PROPOSED METHOD FOR LOCATING AND IDENTIFYING TERRESTRIAL PYRODUCTS. I. G. Seely[1.]
[1]University of Hawaii at Hilo, 200 West Kawili St. Hilo, HI 96720, ianseely@hawaii.edu

Introduction: Pyroducts (lava tubes) outside of the Earth provide possible implications for astro-biologic discoveries as well as potential reservoirs for condensed volatiles. With the signing of Hawai`i Senate Bill 1256 in 2013 [1], Hawai`i moved to expand the State's role as a contributor to, and beneficiary of, the national space enterprise. There has been a renewed focus on the lunar surface and the potential benefits it provides to mankind. The long term goal of this project is to assist in the prospecting of space, including the Moon, asteroids, and Mars.

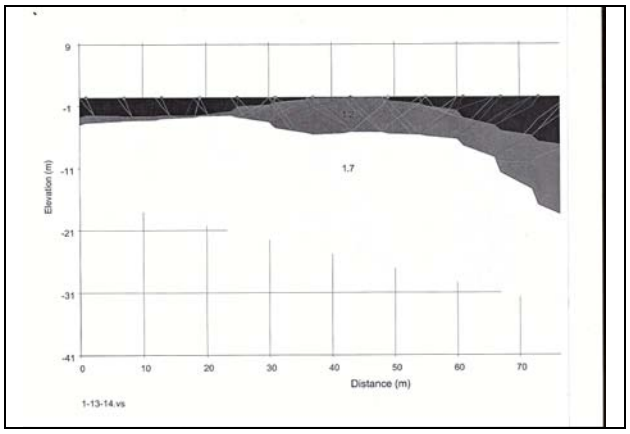
Detection Experiment: This portion of the project explores the feasibility of a technique[2,3] to measure the physical dimensions of a local Hawaiian pyroduct using a seismic refraction method[4]. The local chosen was the popular Kaumana Caves just outside of Hilo, Hawai`i.



This is a county park is frequented by locals and visitors alike, with unrestricted access (no special permits required). This experiment is intended to serve as an analogue for application on lunar pyroducts of undetermined dimensions.

Photo credit: Web blogger "Xavier" http://nomadify.me/2012/04/exploring-kaumana-caves/

The survey included ten stacks at fifteen different shot locations perpendicular across the surface of the pyroduct. Two display filters were used one at 15 Hz to filter out noise caused by traffic, and one at 60 Hz to filter the noise introduced by power-lines. After locating the first and second breaks in the data sets, an image was produced displaying the depth of each unit with a different velocity. The most recent interpretation of the data yielded an RMS of 1.6 after ray-tracing.



Lastly the results were compared to manual measurements of the pyroduct to determine a final accuracy. Upon finalizing the results, the future goal of this project and our team, is to develop an automated version of this experiment for use on extraterrestrial surfaces beyond Earth. The recent discovery of skylights on the Lunar and Martian surface via the LRO and MRO imagery establishes the wide application for this technique.

References: [1] SB 1256 SD1 HD2 CD1, Hawaii State Legislature 2013 Archives, http://www.capitol.hawaii.gov/Archives/measure_indiv_Archives.aspx?billtype=SB&billnumber=1256&year=201, [2] Calvert A.J. et al. (2011) *Can. J Earth Sci*, 48:1021-1037. [3] Petersen U.K. (2012) *Geophysical Prospecting*, 168-186, , [4] Lankston, R.W. (1988) High Resolution Refraction Data Acquisition and Interpretation, *Proc. SAGEEP*, Golden, CO.

Additional Information: I'd like to thank my faculty advisor and mentor Norman Purves, Dept of Physics and Astronomy, University of Hawaii - Hilo. Also thanks to PISCES for encouraging and inspiring space related research at the University.