Wavelets - *Geophysics for Astronauts!*

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Figure 1: Photo of the eight new NASA astronaut candidates plus UH and NASA instructors and assistants at the La Marque Geophysical Observatory during the April, 2014 training session.

Figure 2: The Rio Grande Gorge cuts through the basalts of the Taos Plateau volcanic field, New Mexico. We undertook surveys along the top of the basalts.

Many GSH members undoubtedly have exploration in their genes and look forward to the day when humans will visit the Moon again, and more exhilarating yet, another planet! Much of the Apollo Program's mandate was to collect exploration geophysical data as well as rock samples from our lunar neighbor. The aspiration for human presence on Solar System bodies is being kept active by many in NASA, including astronaut Dr. Andrew Feustel and Dr. Dean Eppler at the Johnson Space Center. To be prepared for that happy future, NASA introduces its new astronaut candidates to the concepts and methods of planetary exploration.

In April and July, 2014, the Allied Geophysical Lab (AGL) at the University of Houston (UH), in partnership with NASA, provided geophysical training to eight, rather exceptional new "jug-hounds" ***(Figure 1)*** at our La Marque Geophysical Observatory, south of Houston. Dr. Tien Grauch of the USGS, Drs. Feustel and Eppler, the authors, UH graduate students, J. Zong, L. Huang, and J. Wang as well as AGL staff, A. William and A. Geda, assisted with the instruction.

The educational content for the astronauts-in-training included instruction and practice in seismic, gravity, magnetics, ground-penetrating radar, GPS, total station, and petrophysical techniques. The goal of the activities was to further develop the astronaut candidates' understanding of planetary geology and to provide hands-on experience of the tools and techniques of geophysical exploration. We trust they'll get to use it!

To set up situations of geological interest and challenge, we developed exercises on the basalts of the Taos Plateau near the Rio Grande Gorge, New Mexico ***(Figure 2)*** – a Mars-like environment. The eight distinguished students were divided into four groups and they collected geophysical data from different stations across a scarp on the plateau near the gorge. They quickly learned the deployment techniques and operation of the instruments as well as the data types. The seismic exercise included a traverse across the scarp (surface expression of the underlying fault) separating a high-velocity basalt and recent sediments.

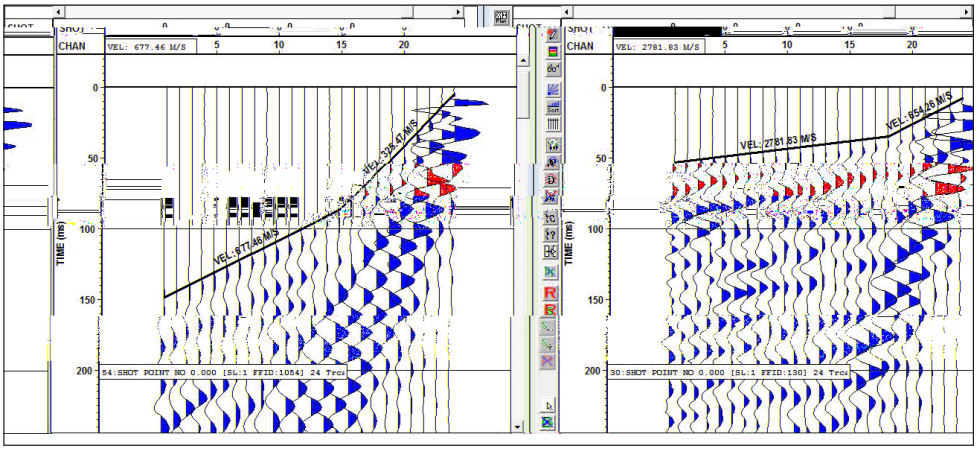

Figure 3: Seismic shot gathers from locations on the low-velocity recent sediments (left) and high-velocity basalts (right).

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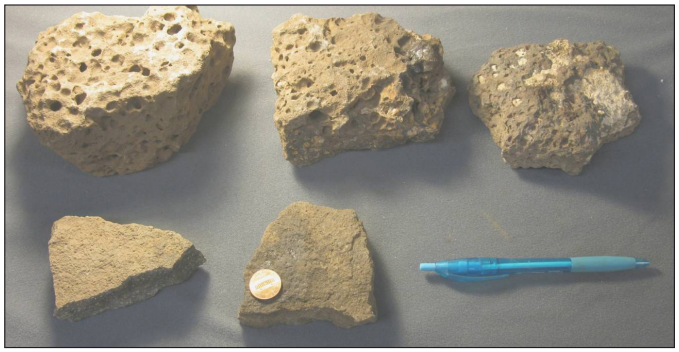

Figure 4: Basalt hand samples collected on the scarp at the training site on the Taos Plateau.

Seismic shot gathers ***(Figure 3)***, from both sides of the fault scarp, show distinct refraction velocity differences.

We also gathered hand samples of the basalts ***(Figure 4)*** and made ultrasonic velocity measurements on them, yielding: Vp = 5.1 - 5.5 km/s; Vs = 2.8 – 3.0 km/s; and Vp/Vs ~ 1.8.

The final day's activities were deliciously capped with a BBQ ably created by the astronauts and NASA staff. We enthusiastically anticipate that our future planetary explorers will undertake additional excellent geophysical surveys (and eat well too)!

Looking for more ways to participate in the Geophysical Society of Houston?

Consider how you can make a difference by volunteering at one of our events!

Contact Nicola Maitland to learn more about this excellent networking opportunity:

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