2010 GSA Denver Annual Meeting (31 October –3 November 2010)

Paper No. 19-15

Presentation Time: 11:45 AM-12:00 PM

PLANETARY FIELD GEOLOGY: RIGHT AND WRONG LESSONS FROM TERRESTRIAL ANALOGS

LEE, Pascal[1], BRAHAM, Stephen[2], FONG, Terry[3], HELPER, Mark A.[4], HURTADO, Jose Miguel Jr[5], MCKAY, Chris[6], and SCHUTT, John W.[1], (1) Mars Institute, NASA Ames Research Park, Building 19, Suite 2047, Moffett Field, CA 95050, pascal.lee@marsinstitute.net, (2) Simon Fraser University, Vancouver, BC V6B5K3, (3) NASA Ames Research Center, Intelligent Robotics Group, Bldg. 269, Moffett Field, CA 95050-1000, (4) Geological Sciences, Univ of Texas at Austin, Austin, TX 78712, (5) Department of Geological Sciences, University of Texas at El Paso, 500 West University Avenue, El Paso, TX 79968, (6) NASA Ames Research Center, MS 245-3, Moffett Field, CA 95050-1000

Terrestrial analogs serve four key functions: we use them 1) *to learn* (by comparison); 2) *to test* (hardware, hypotheses, strategies); 3) *to train* (crews and ground personnel); and 4) *to engage* (international partners, the public, students). Analog *sites* are often chosen to serve as many functions as possible. However, the most important consideration in the use of an analog site is its *fidelity for the usage sought*.

The Black Point Lava Flow (BPLF) site used by NASA's Desert RATS field tests is an example we examine. As a site in Northern Arizona presenting basaltic lava flows and relatively simple background geology, the site is a good analog for Moon and Mars work in that: i) it presents a dominant rock composition that is, to first order, relevant to the Moon and Mars, ii) its climatic setting is semi-arid; iii) it allows basic planetary geology training; and iv) it is easy and affordable to access. The site also offers a range of Moon and Mars-relevant terrain types and topography, from rough boulder-filled slopes to soft sandy flats, each presenting relevant challenges for rover mobility tests.

However, the BPLF site may be inadequate as a driver of requirements for lunar surface *science operations.* At BPLF, crews of the Space Exploration Vehicle (SEV), a concept vehicle for future pressurized rovers, are asked to frequently conduct EVA, rock hammer in hand, to access outcrops of bedrock and collect fresh samples. In spite of the SEV's high mobility, the geologic tasks are operationally complex enough that EVAs are required. The "lesson learned" is that *EVAs are required for rock sampling, and frequently so*. However, this lesson may be invalid, at least for the Moon. 95% of all rock samples collected during Apollo (mare and highlands combined) were float. The samples were collected with tongs, not rock hammers. Had the Apollo astronauts disposed of an SEV equipped with a robotic arm, their samples could well have been collected mostly without conducting EVAs. Thus, on the Moon, *EVAs may not be required for rock sampling as frequently as implied from field studies at BPLF*. Sites on Earth with surfaces dominated by float and/or rubble may offer better *science operations* analogs for the Moon, even if rock composition is a poorer match.

We propose a strategy allowing a more optimal use of terrestrial analog sites for planetary geology.

2010 GSA Denver Annual Meeting (31 October –3 November 2010)
General Information for this Meeting

Session No. 19
Field Geology on Other Planets: An Emerging Science
Colorado Convention Center: Room 710/712
8:00 AM-12:00 PM, Sunday, 31 October 2010