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Moderately to Poorly Welded Tuff, Bishop, California: Geophysical and Geological Characterization to Determine the Source of Radar Scattering

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The National Research Council Decadal Study on Terrestrial Analogs to Mars recommended the Bishop Tuff exposed in the Volcanic Tableland (Bishop, California) as an analog site because some Martian volcanoes and the Stealth region of southwestern Tharsis are thought to be composed of pyroclastic deposits [1,2]. Contrary to our previous forecasts, which were based solely upon combined use of transient electromagnetic and vertical electrical soundings [3], the water table >100 m below the moderately welded, electrically resistive Bishop Tuff caprock cannot be imaged by low-frequency (12.5-50 MHz) ground penetrating radar (GPR) because of strong scattering and absorption attenuation [4,5]. We returned to the Volcanic Tableland to assess the source of near-surface scattering using differential GPS- based structural mapping, multielectrode resistivity profiling, rock and alluvium sample collection for specific gravity and EM property analyses, and higher-frequency GPR profiling. We used the 10-channel, 96 electrode Syscal Pro (IRIS) resistivity meter and the Sensors & Software pE 100 GPR and the GSSI SIR 3000 GPR with 50, 100, 200 MHz, and 270, 500, and 900 MHz antennas, respectively, to scan five 100-m-long parallel transects that were separated laterally by no more than 3.5 m. Initial results suggest that deformation in the form of polygonal cooling joints and at least one geologically mappable fault in the moderately welded caprock may be sources of near-surface scattering in radar profiles. These features, exposed at the surface, may be interpreted in the subsurface and should provide fluid pathways to pond percolating water or promote conduit flow. Discrete, subhorizontal signatures in radargrams may be indicative of localized primary cooling joints or secondary unloading joints. Ponding of water will promote erosion and dissolution both vertically and horizontally, ultimately further segmenting joint-bounded blocks of tuff. We observe these signatures in both resistivity and radar data. Our results should enhance the technical basis for future interpretation of MARSIS and SHARAD data. [1] Farr T. et al. (2001) NRC Decadal Study of Terrestrial Analogs to Mars. [2] Edgett, K.S. et al. (1997) JGR 102, 21545ï¿½21568. [3] Gonzalez, S.H. et al. (2004) Eos

Trans AGU Fall Meeting 85. [4] Grimm, R.E. et al. (2006) JGR 111, 2005JE002619. [5] Grimm, R.E. et al. (2006) this volume.

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