SURFACE EXPRESSION OF RADAR REFLECTIONS WITHIN PROMETHEI LINGULA, SOUTH POLAR LAYERED DEPOSITS. S. M. Milkovich, M/S 264-535, NASA Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, sarah.m.milkovich@jpl.nasa.gov

Introduction: The south polar layered deposits (SPLD) of Mars have been studied extensively for decades in images [e.g., 1-6], and more recently in subsurface sounding radar [e.g., 7-9]. The Promethei Lingula region is a lobe of the SPLD located approximately between 90˚E to 150˚E, where the SPLD extend into the Prometheus Basin (Fig. 1). It is bounded by Chasma Australe on the west and Promethei Chasma on the east, and contains the canyon system Australe Sulci in its southern region, in which layers are exposed at the surface of the SPLD. Promethei Lingula is unusual within the SPLD due to the presence of many clear subsurface radar reflections directly below the surface, and thus is an excellent location to relate what is observed in images to what is observed by the radar.

Datasets and Method: Radargrams produced by the SHallow RADar (SHARAD) subsurface sounding radar onboard Mars Reconnaissance Orbiter (MRO) were selected in this region based on the clarity of reflections near the surface. For each radargram, individual reflections were traced to the polar surface and the point at which each reflection intersected the surface identified. The latitude and longitude of each point was plotted on top of map-projected Context Camera (CTX) images (6 m/pxl) rendered in the JMARS GIS program (available at http://jmars.mars.asu.edu) (Figure 2).

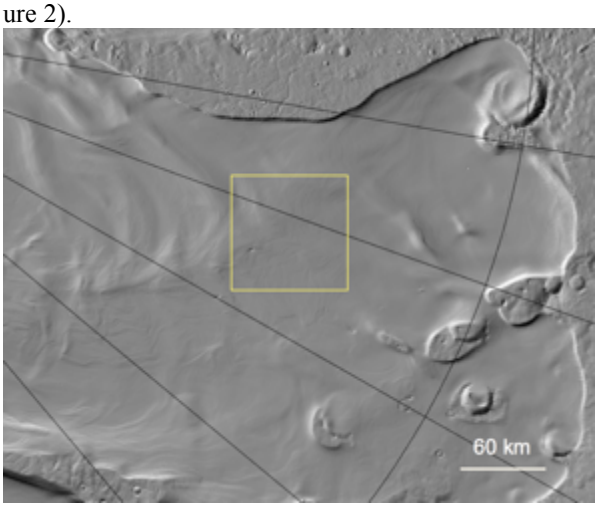

Fig. 1: Study location (yellow box) on Promethei Lingula, south polar layered deposits. Base map is MOLA gridded topography.

Two layers exposed on the surface of Promethei Lingula were traced across the region in the CTX images. Thee layers are indicated as Layer A (yellow line in Fig 2) and Layer B (pink line in Fig 2). The SHARAD reflection-surface intersection points that fall along each line are indicated with color coding to match the lines.

Each SHARAD reflection-surface intersection point identified as falling along a layer was then examined to determine which individual reflection within the radar stratigraphy it represented.

Results: From a comparison of the 5 radargrams containting points corresponding to Layer A and the 8 radargrams containing points corresponding to Layer B, it is concluded that this is indeed the same reflective surface in each radargram: each reflection that intersects with layer A (yellow in Figure 3) is the top of a packet of bright layers, while each reflection that intersects with layer B (pink in Figure 3) is in turn on top of the dark radar-free zone immediately above layer A. The pattern of the radar reflections further down the stratigraphic column are also directly comparable between radargrams.

Future Work: This is a promising first step in determining the physical characteristic of the SPLD that causes radar reflections. There are a number of avenues along which this analysis will be expanded.

Additional layers in the CTX images will be compared to the locations where the SHARAD radargrams intersect the surface. Radargrams that "should" intersect with a layer but do not (i.e., other reflectors within the radargram intersect with other layers) will be examined closely to see if a cause can be determined.

CTX layers that correspond to SHARAD reflections will be examined in the available HiRISE imagery (including DTMs) to determine if there are physical differences (e.g., erosion style, groupings of layers) between areas that correlate with SHARAD reflections and areas that do not, as proposed by Milkovich et al [9,10].

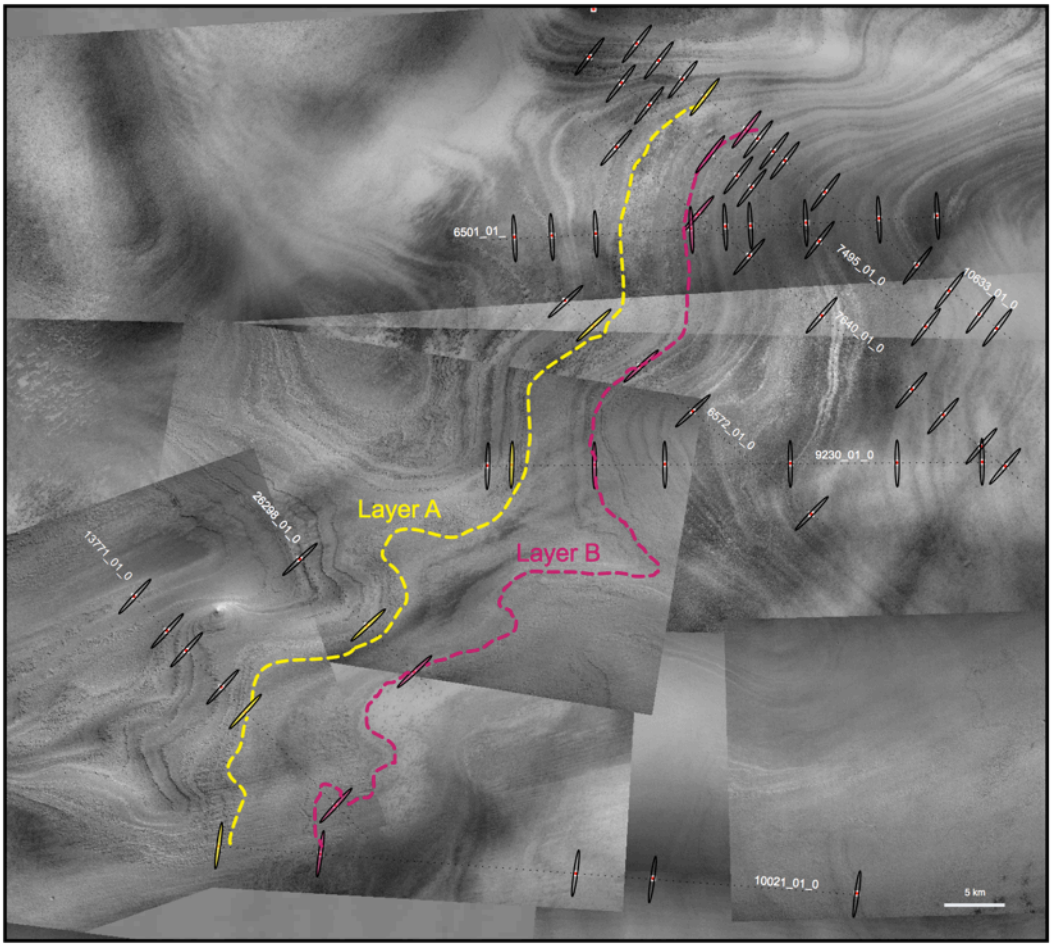

Fig 2. Reflection-Surface Intersections and CTX Images. Black dotted lines are SHARAD radargram ground tracks. Red dots are locations where SHARAD reflections intersect the surface of the SPLD (the 0.3 km x 3 km "footprint" of an individual SHARAD pulse is represented by the black ovals). The yellow and pink lines each trace a single layer visible in CTX images. SHARAD reflectors that are interpreted to intersect that layer are colored yellow and pink, respectively.

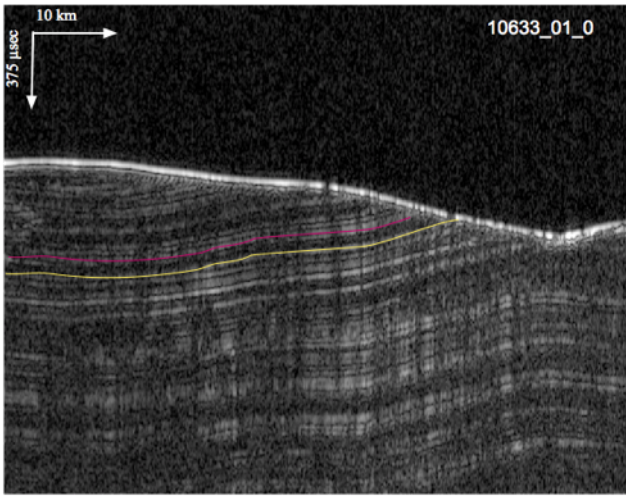

Fig. 3: Reflections corresponding to individual CTX layers (Layer A = yellow line; Layer B = pink line) in three SHARAD radargrams.

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References: [1] Murray, B. et al. (1972) *Icarus, 17*, 328-345. [2] Thomas, P. et al. (1992) in *Mars, ed. H. Kieffer et al.* pp. 767-798, Univ of AZ Press. [3] Malin, M., Edgett, K. (2001) *JGR 106,* 23429-23570. [4] Kolb, E., Tanaka, K. (2006) *Mars, 2,* 1-9. [5] Milkovich, S, Plaut, J. (2008) *JGR 113,* doi:10.1029/2007JE002987. [6] Herkenhoff, K. et. al. (2008) *LPSC 39*, 2361. [7] Seu, R. et al. (2004) *Planet Space Sci 52,* 157-166. [8] Seu, R. et al. (2007), *Science 317,* 1715-1718. [9] Milkovich, S. et al. (2009) *JGR 114*, doi:10.1029/2008JE003162. [10] Milkovich, S. (2010) *LPSC 41, 1533*