GEOLOGIC CONTEXT OF ANGSA APOLLO 17 DOUBLE DRIVE TUBE CORE 73001/2. H. H. Schmitt[1]
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Introduction: Apollo 17's Station 3 is located in Taurus-Littrow on the younger of two light mantle avalanche units, ~50 m southeast of the rim of the partially buried Lara Crater, and on a lobe of the Lee Lincoln fault scarp (**Fig. 1**). The two light mantle units, originally thought to be one deposit by Schmitt [1] and Wolfe, et al. [2] after being defined by Lucchitta [3]). High Sun LROC images led Schmitt, et al.[4] to conclude that an older, partially buried avalanche lies southeast of the main light mantle deposit. Rover sample 72141 was obtained on the apparently older unit, and comparison of its high maturity index against lower maturity samples from the younger light mantle appears to confirm this conclusion [4].

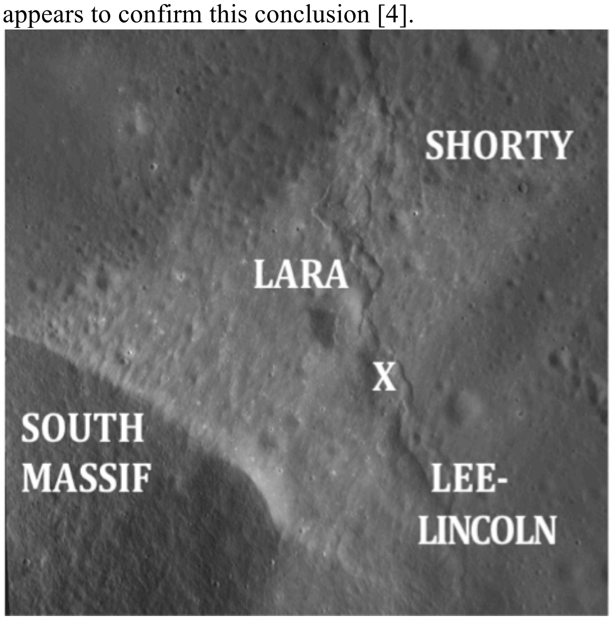

Fig. 1 Location of Station 3 (X) and core 73001/2 relative to the South Massif, Lara Crater, the Lee-Lincoln Scarp, and Shorty Crater. (LROC M104311715)

The light mantle consists of regolith that previously accumulated on the north side of the South Massif. The source regolith included both commutated melt-breccia, similar to rake sample 72500, and pre-mare lithoclastic ash similar to that present as a component of rake sample 76500 from the North Massif [5].

The minimum thickness of the light mantle in the vicinity of Station 3 is about 2 m, based on the penetration depth of the largest (~10 m), nearby post-light mantle impact crater (Ballet Crater). Immediately underlying the light mantle unit at Station 3, from younger to older, are (1) regolith developed on the older light mantle unit, (2) the older light mantle unit, (3) regolith developed on Lara ejecta, (4) Lara basaltic ejecta, subsequently disturbed by the Lee-Lincoln thrust fault, and (5) dark mantle basalt+pyroclastic regolith (e.g., 72131). The darker hue and high maturity index of a regolith sample (73260) from the trench on Ballet Crater's rim suggest that this material might be from the older light mantle unit.

The length of the lobe of the Lee-Lincoln scarp on which Station 3 is located is approximately ~120 m, as measured from the crest of the scarp directly west of Station 3. The station's relationship to the fault trace that produced the scarp, however, is complicated by the structural complexity of the pre-fault Lara Crater versus the more uniform structure of basalt flows and overlying basaltic regolith. Elsewhere on the valley floor, the length of scarp lobes reaches ~500 m.

Station 3 Trench Samples: The author dug a shallow trench (Fig. 2) in the rim of the 10 m diameter Ballet Crater and sampled the four irregular, visible units. The characteristics of the four trench samples are summarized in Table 1. These same regolith units may be encountered in the Station 3 drive tube core.

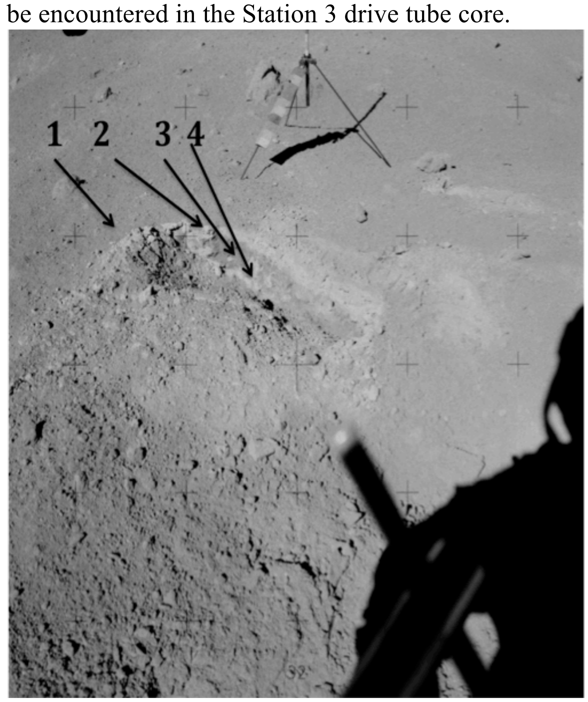

Fig. 2 Apollo 17 Station 3 (EVA-2) trench in rim ejecta of Ballet Crater with indicated location of samples described in Table 1. Long dimension of color chips on gnomon is ~3 cm and gnomon shadow points west northwest. 73001/2 drive tube core site is ~15 m to southwest. (NASA Photo AS17 138 21149)

Primary Nature of a Light Mantle Avalanche: Based on fluidized deposition and collected samples, the following are expected: (1) Fines would be concentrated at the top of the avalanche; (2) Coarse fragments would increase in size with depth; (3) the ratio of basalt to impact breccias in the coarse fragments may be about 1:7 [2]; (4) sulfur content about half that of the North Massif regolith [4] indicates that troilite (specific gravity 4.9 g/cm^3) may be more abundant at depth.

Table 1. Maturity Index [6], Size-frequency [7], and Type-frequency [8] data on Station 3 Trench Samples.

Sample Number	Depth (cm)	MI / Agglu. (%)	Size-Frequency Shape / Peak (µm)	Notes
1-73220	1	43/26.3	Asymmetric toward fines / ~20 µm	Light-medium gray Surface skim
2-73240	1-3	18/8.4	Flat to Irregular / ~60 µm	Light gray marbling mixed with surface
3-73260	5-10	45/34.3	Asymmetric toward fines / ~20 µm	Medium gray marbling
4-73280	10-15	34/24.6	Asymmetric toward fines / ~20 µm	Lower, white marbling
72701	1-5	61/43.6	Moderately Asymmetric toward fines / ~20 µm	Rake Sample on light mantle near Station 2

Potential Ejecta Sources: Several small, post-light mantle impact craters are near enough to the location of 73001/2 to have contributed significant light mantle derived regolith ejecta to the stratigraphy sampled by the core 73001/2 (Fig.3 and Table 2).

Since the light mantle avalanche settled in place at about 0.100-0.075 Ga [4], ejecta from the craters labeled in Fig. 3 and listed in Table 2 have been deposited on the site of core 73001/2. The fact that none of these craters fully penetrated either light mantle unit means that ejecta regolith units in the core consist of light mantle material. The planned maturity index profile will assist in identifying these eject units.

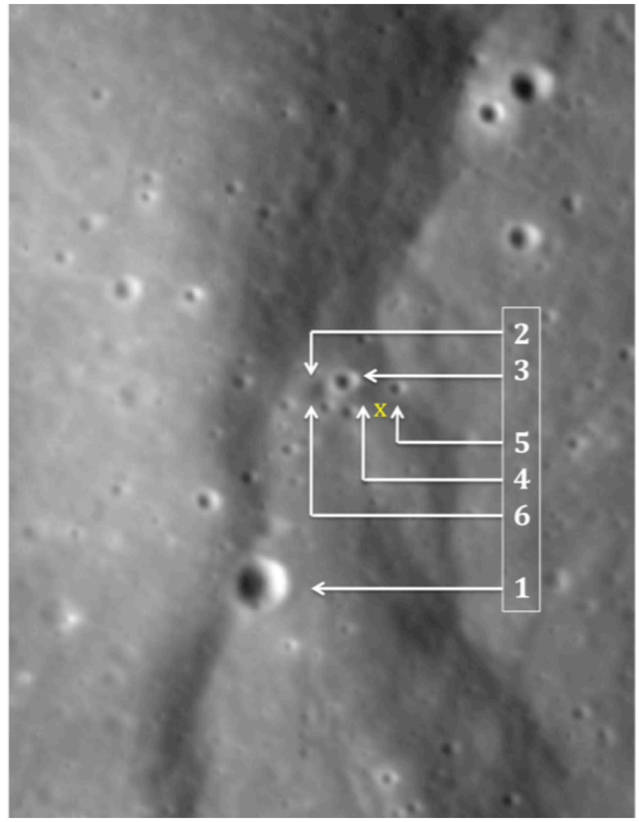

Fig. 3 Location of double drive tube core 73001/2 (x) relative to six, post-light mantle impact craters (Table 2) . (LROC M104311715)

Table 2. Craters, and their diameters, estimated depths, and rim distance to the core site (in meters), that may have contributed measurable amounts of regolith ejecta to core double drive tube core 73001/2.

Num.	~Dia.	~Depth~	Rim to Core Distance	Rim Definition
3-1	30 m	6 m	120 m	Sharp
3-2?	10	2	20	Degraded or topo depression
3-3	10	2	15	Sharp
3-4	8	1.6	10	Spread out
3-5	8	1.6	10	Spread out
3-6	6	1.2	20	Spread out

References: {1} Schmitt, H. H. (1973) Science, 182, 681-690. [2] Wolfe, E. W. et al. (1983) USGS Prof. Paper 1080, 6. 78. [3] Lucchitta. B. K. (1972) USGS Map 1-800, Sheet 2. [4] Schmitt, H. H. et al. (2017) Icarus, 298, 17-21. [5] Schmitt, H. H. (2016) *LEAG Ann. Mtg*. Abstract 5008. [6] Morris, R. V. (1973) [7] Graf, J. C. (1973) NASA Ref Pub. 1265, 370-384. [8] Heiken G. H. and McKay D. S. (1974) *LPS V*, 843-860.