PRELIMINARY REPORT ON DRILL STEM 70004

General Description

Drill stem 70004 is the third section above the bit in the Apollo 17 Drill String and contains 39.9 cm of core. Calculations based on x-radiographs and previous dissections place the top of 70004 at 173 cm below the top of the entire drill string column. Due to various factors (such as mechanical compaction) this figure of 173.0 cm is only a close approximation of the depth below Lunar surface. The drill site was about ~~40~~ 180 meters ~~north~~ WSW of the ALSEP central station. The entire drill string, with a total length of about 294.5 cm of core, has three major stratigraphic units: an upper, coarse-grained, basaltic unit, 107 cm thick; a middle, fine-grained zone 56 cm thick, high in anorthosite; and a lower zone of alternating coarse and fine basaltic and breccia material, 131.5 cm thick. It is of the lower major unit which core 70004 is part.

Sample History

Upon extraction of the drill string from the drill hole, the string was separated into three segments for packing. Drill stem 70004 was the top end section of the deepest segment. A negligible amount of soil was reported to have been lost in separation.

The initial opening of the upper end of the tube revealed that filling was essentially complete. PET and cold storage samples were then taken totaling nearly seven grams. Based on a length of 40 cm and weight of 238.8 grams, 7 grams is equivalent to about 12 mm of soil column.

The drill stem was longitudinally split on a milling machine on October 8. 1975. In preparation for milling, the hollow tube plug at the upper end was pushed further into the tube, resulting in a small amount of compaction. The amount of soil spilled through the split seams was greater than usual, upwards of one gram.

After being affixed in a troughed dissection table, the upper half of the tube was lifted off and set aside. Reference scales were mounted so that

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the upper end of the tube was aligned with the zero cm mark and the lower soil/plug interface was aligned with the 40 cm mark. The upper soil/plug interface then became established at the 2.0 cm mark. Since the early end sampling removed 1.2 cm of soil, the compaction resulting from additional plug penetration figures to be 2.0 cm less 1.2 cm or 0.8 cm of shortening. In spite of the additional compaction, the soil in the two or three centimeters immediately adjacent to the plug appears to be less than in the rest of the core.

PREDISSECTION DESCRIPTIONS

From x-radiographs of core 70004, ten units were interpreted on the basis of size distributions and inferred compositions. (See attached chart.) Examination of the exposed surface of the core brought out no color or tonal differences. Consequently, no layering could be determined based on that parameter. The overall color was between 10YR 3/1 and 5Y 3/1 on Munsell's Color Chart.

Variations in the gross surface texture (development of a rind of compacted soil) give some indication of changes in physical properties of the underlying soil. The tentative units outlined below were distinguished using gross surface texture characteristics, plus observable grain size and compositional variations. The soil matrix is about 7 phi (1/128 mm) in mean grain size.

Unit I (35.0-40.0)

The rind in this unit is continuous on one side yet not on the other due to scalpel probing that was necessary to release burrs. Fractures in the rind are longitudinal. The surface texture is generally fine. The top of the unit contains glass particles and beads, plus some crystalline material.

Unit II (28.5-35.0)

Above 33.5, the rind spalls off, but on one side only. The spalling is along deep, longitudinal fissures. This phenomenon is most likely due to disturbances related to lifting off the split half. The fine texture of Unit I is continued. The break between units was determined by the decrease in glass above the boundary. Anorthositic breccia and fresh plagioclase are noticeable as well as a large, lone glass bead.

Unit III (23.5-28.5)

Broken rind along the sides is apparently due to removal of the split half. The longitudinal fissuring is more developed on one side than the other. Texturally, the surface is moderately coarser than Unit II. Large particles tend to be not as heavily dust-coated. The boundary was set by an increase in matrix glass content and the coarsening. Glass-topped soil breccia,

beads, some recrystallized breccia, and traces of orange or "beer" glass were noted.

Unit IV (20.5-23.5)
The rind occurs in narrow strips along either side. The rindless central strip shows large particles which appear to be soil breccia, tightly embedded. The matrix lies smooth in the rind and between large particles. The number of large particles seems lower in the 21.7 to 22.7 interval.

Unit V (18.0-20.5)
Almost total disruption of the rind and a darker albedo due to the roughness of the surface are the distinguishing factors. The particle coarseness is moderate relative to Unit IV. Recrystallized breccia, glass-topped soil breccia, and beads recur.

Unit VI (16.5-18.0)
The rind is continuous on one side until a transverse crack appears at 16.5. The texture is fine in general. Anorthositic breccia is noticeable and a blocky metallic particle can be seen at 17.9.

Unit VII (13.5-16.5)
Rind is continuous on one side to the top of the unit where a deeply-jumbled zone and transverse crack mark the boundary. Coarse soil breccia particles are embedded as in Unit IV. Some recrystallized and anorthositic breccias are seen as well as a few glass beads.

Unit VIII (11.7-13.5)
No rind is intact except for a spalled-off platelet. A sharp transverse break marks the top of the unit. Surface texture is hummocky, giving a feeling of moderate coarseness. Crystalline material is at the bottom of the unit and a few glass beads and anorthositic breccia are found towards the top.

Unit IX (8.0-11.7)
The rind is smooth and continuous on one side. The top of the mound of soil is covered with soil "marbles" apparently formed by a snowball effect which would indicate some vibrational movement. Alternatively, they may simply be the natural disaggregational form of this soil. The coarseness is moderate as in Unit VIII. Anorthositic breccia and glass beads are noticeable near the top of the unit. Tiny beads are scattered throughout the unit, yet are concentrated near the bottom.

Unit X (5.5-8.0)
The rind is continuous on one side and occurs as polygonal platelets. on the central portion of the mound. The matrix texture appears to be coarser than that of the units above. Anorthositic breccia and glasses are abundant near the top of the unit and beads and semi-fresh plagioclase are found elsewhere in the unit. A few soil "marbles" are present.

Unit XI (3.0-5.5)
The rind occurs in larger platelets and also is continuous on one side. The platelets may actually be the rind from the opposing side which was repositioned during lift-off. No large particles stand out, but some soil marbles are present. Beer glass was noted.

Unit XII (2.0-3.0)
The mound of soil appears diminished in volume. Rind occurs on one side. The mound surface is smooth and dusty-looking. Some large glasses and recrystallized breccia can be seen in the spallings.

DISSECTION PLAN

Dissection should begin at the upper end in order to prevent further deterioration of the surface by ambient room vibrations. The upper end shows the most disruption as well as a diminuition in volume. Also, the hollow plug appears less secure than the larger, solid plug at the lower end. Standard intervals should be taken except where sharp differences are noticed, such as the contact between units VII and VIII. X-radiographs show dark transverse streaks between 18 and 19 cm and possibly elsewhere between 15 and 25 cm. These streaks would seem to indicate the presence of fine laminae which were not visible under surface examination. The special technique of rind or smear zone removal should be used in order to precisely locate these features for determination of dissection intervals. Two lead-free samples should be taken simaltaneously with two red light samples in 15 cm wide intervals in fine, massive units near 5 and 35 cm. Additional red light samples should be taken near 15 and 25 cm in standard interval widths.