DEPOSITIONAL UNITS IN DRIVE TUBE 64002/1

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Of all the Apollo cores, drive tube 64002/1 may yield the greatest amount of information on regolith make-up and dynamics. Lithologic units within the core correlate with changes in penetrometer resistance, which was reported by (4), suggesting some units in the core may be laterally continuous. If the core is located as in (7), internal directional features of two thick units can be related to two local craters, and general depositional conditions of many other units can be inferred. Reconstruction of the sequence and timing of events in the history of this core can give insight into processes occurring on lunar slopes. Furthermore, at a depth of $\sim$42 cm, there is a thin zone of very unusual rock fragments.

Nine lithologic units were recognized in 64002/1. They were defined on differences seen in preliminary examination (X-radiograph), in dissection (Cohesiveness, color, grain size, structures and abundance of rock types > 1mm) supplemented by post-disection observations (2,3). Dissection data are summarized in Fig. 1.

To reconstruct depositional history, it is first necessary to identify stratigraphic (genetic) units. Relatively sophisticated criteria are more likely to reflect boundaries between separate strata than are simple changes in one parameter. For instance, variations in grain size, mineralogy, soil cohesiveness, and variations in FMR may indicate boundaries of genetic units, but such variations could also reflect complexities within one depositional unit. Therefore, to identify boundaries of strata, it is important to also look for discordances in trends, such as: directional structures that point to different sources, successions of clast shapes that reflect differing depositional conditions, concentrations of unfragmented aggregates, track profiles, and radionuclide gradients that may reflect buried surfaces. Even if discordant trends are identified, apparent stratal boundaries could be incorrectly identified, if older depositional features that included buried surfaces were partially incorporated into younger units. Because of the tendency for ejecta to be overturned and foreshortened, such a possibility is unlikely, but cannot be ruled out.

For the 64002/1 core, the following lithologic boundaries, which are shown in Fig. 1, are most likely to be stratigraphic boundaries: (1) At 2 cm there is a concentration of unfragmented glass-soil aggregates and a FMR maximum (3), (2) At 10 cm, there is a major increase in soil cohesiveness, a concentration of unfragmented aggregates, a FMR maximum (3), and an abrupt, stepwise change in the ^{53}Mn profile (2). (3) At 20 cm, there is an increase in cohesiveness, a concentration of unfragmented aggregates, accompanied by changes in grain size, mineralogy, and FMR (3). Immediately overlying the dark soil at 20 cm, clasts at the base of the light soil are flattened; such features are characteristic of the base of an ejecta deposit (6). (4) At 35 cm, there is a change in grain size, mineralogy, X-radiograph texture and a concentration of unfragmented aggregates. (5) At 42 cm, there is a concentration of exotic rock types, accompanied by changes in X-radiograph density and texture, and friable clasts at the base of the overlying unit are flattened, similar to those at 19-20 cm. (6) At 50 and 58 cm are changes in grain size, mineralogy, and occurrence of unfragmented aggregates. These boundaries correlate with depths at which increases in penetrometer resistance were observed (4).

No *in situ* crater bottom structures were identified in this core. Independent studies of accumulation rate are needed to determine if this lack is due to random chance or specific processes, such as active downslope regolith movement.

Bedrock-derived rocks (light-matrix breccia, grey crystallines, and plagioclase) are anti-correlated with rock types of regolith origin (vesicular glass, dark-matrix breccia, and soil breccia) suggesting regolithic rocks were produced at the expense of bedrock-derived material (5). Rock classification is from (1). Plagioclase and light matrix breccia vary together through the core, and may be related; but grey crystalline rock fragments show no correlation to the other bedrock-derived components and probably have a different source. Because the crystallines represent a relatively mature clast population, that varies little from unit to unit, it is suggested that they are ejecta from a relatively old, moderately distant crater, such as Stubby.

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At ~42 cm, there are a number of unusual rock fragments. Most abundant are clods, rich in black droplets, with subordinate orange glass. Fragments of coarse-grained subophitic crystalline rocks with 35-50% black opaques are common, and some coarse crystalline rocks with distinctive greenish minerals are also present. An exciting possibility is that these distinctive rocks may represent a suite of mare lithologies from a ray deposit. Whatever its origin, this unusual suite of rocks deserves further investigation.

References

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Fig. 1