THE APOLLO 17 DRILL CORE, PART I: MODAL PETROLOGY OF THE > 20μm SIZE FRACTION; S. B. Simon*, J. J. Papike, and D. T. Vaniman, Dept. of Earth and Space Sciences, State Univ. of New York, Stony Brook, N. Y. 11794

Introduction: The 280 cm Apollo 17 drill core constitutes the longest soil column returned from the moon. This core was taken from the valley of Taurus-Littrow, an interface region between high-Ti mare basalts and the feldspathic North and South Massifs. The core thus represents a sedimentary record comprised of regolith components derived from two diverse chemical environments (highland and mare).

Earlier studies (1,2,3,4) emphasized the upper core sections (70009-70006). We have now completed our study of the entire core. This abstract (Part I) concerns the modal petrology of the > 20μm soil fraction, while companion abstracts (Part II, Labotka et al.,; Part III, Vaniman et al.; Part IV, Papike et al.) concern, respectively, the modal petrology of the 20-10μm soil fraction, the mineral chemistry of the 20-10μm soil fraction, and the calculated chemistry of the 2000-20μm soil fraction.

Methods: Optical petrographic examination was conducted on 101 polished thin sections that comprise a continuous record along the entire 280 cm length of the core. The petrographic examination of the core was executed by conducting 198 individual 1000-point modal analyses using a Zeiss photomicroscope. Each of the 198,000 grid points were examined in both reflected and transmitted light; the data thus collected are the basis for this report.

Results: The modal data for particles in the size range 2000-20μm for 198 depth levels in the core is presented in Fig. 1. In order to increase the signal-to-noise ratio in the modal data, we used a smoothing function which is a simple moving average. The smoothed value Y is calculated by $Y_i = \Sigma_{j+i-k}^{i+k} Y_j/m$, where $k = (m-1)/2$ and m is the length of the smoothing interval or number of points over which the average is to be computed (5). We found m = 5 to be most satisfactory for our data. The data thus treated allow easy recognition of the important stratigraphic units. The continuous depth trends are illustrated in Fig. 1, while averaged data for the five stratigraphic units are presented in Table 1 and Fig. 2.

Unit A (greatest depth) is mature and is characterized by a high highland lithic/mare lithic ratio. Unit B is relatively immature, has a relatively high highland lithic/mare lithic ratio and has the highest glass content. KREEP glass is especially abundant in this horizon. Unit C is mature and has a relatively high highland lithic/mare lithic ratio. Unit D is immature, has a low highland lithic/mare lithic ratio, a high pyroxene content, and a low clear + yellow glass content. Unit E is relatively mature and has a low highland lithic/mare lithic ratio.

Figure 3 gives the clast size population data as a function of depth, and the much discussed coarse-grained unit (D) is clearly defined.

Concluding Statement: The Apollo 17 drill core preserves a well-defined stratigraphy with units D and E representing regolith highly enriched in components derived by comminution of the local high-Ti basalts. Units A, B and C, on the other hand, are greatly enriched in highland components representative of North Massif, South Massif and Sculptured Hills.

References:

(1) Vaniman D. T. and Papike J. J. (1977) Proc. Lunar Sci. Conf. 8th, p. 3161-3193.

(2) Vaniman D. T. and Papike J. J. (1977) Proc. Lunar Sci. Conf. 8th, p. 3123-3159.

(3) Taylor G. J. et al. (1977) Proc. Lunar Sci. Conf. 8th, p. 3195-3222.

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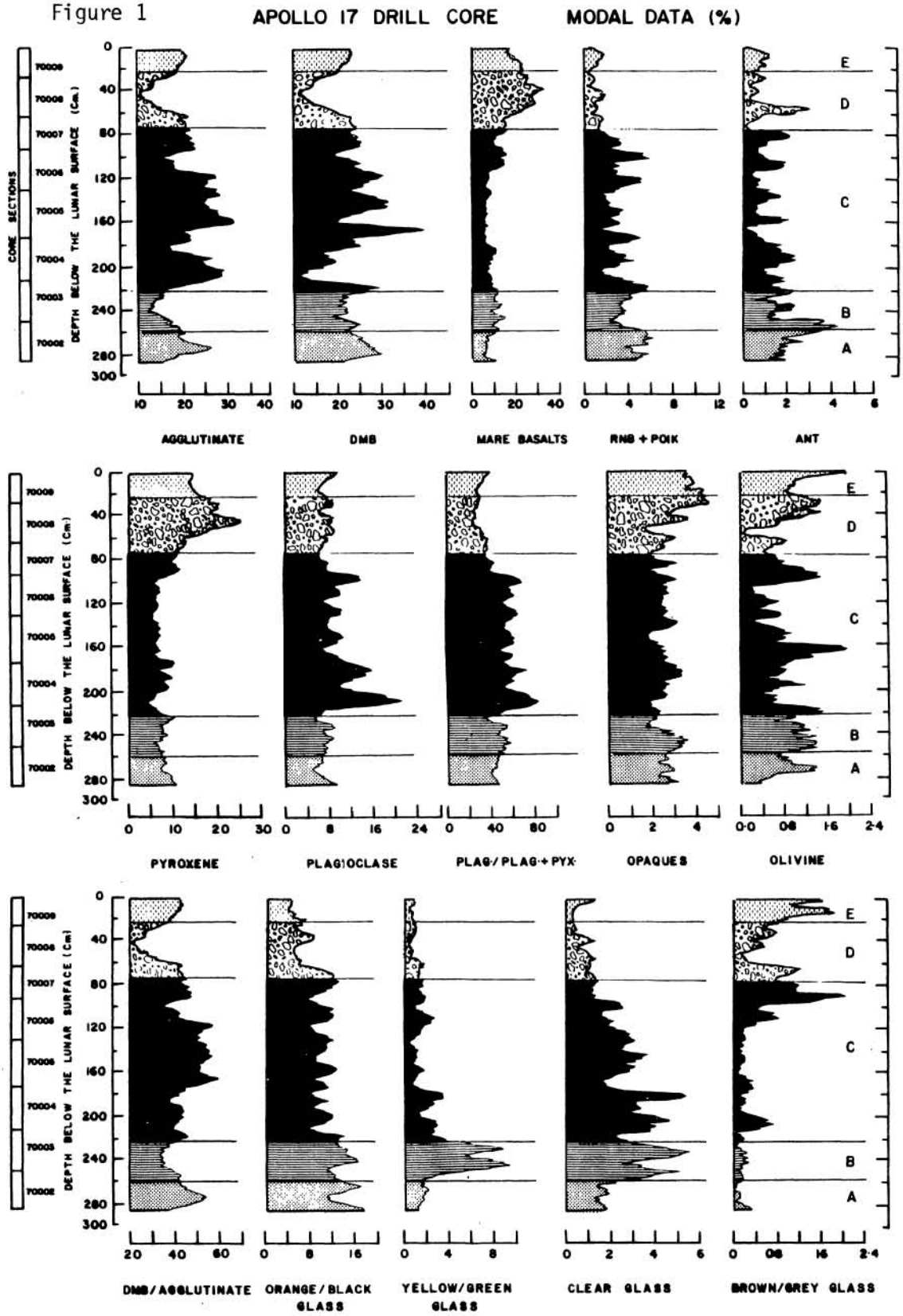
Figure 1



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(4) Laul J. C. et al. (1978) Proc. Lunar Sci. Conf. 9th, in press.
(5) Davis J. C. (1973) Statistics and Data Analysis in Geology (John Wiley and Sons, Inc., N. Y.), 550p.

Figure 2

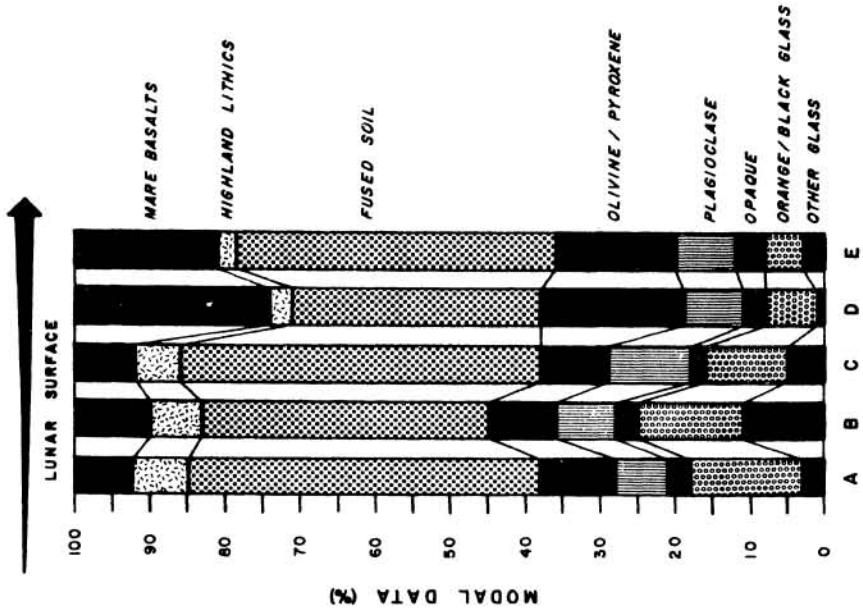

TABLE I AVERAGED MODAL DATA (%)

STRATIGRAPHIC UNITS	A	B	C	D	E
MARE BASALT	7.5	11.4	9.2	24.3	19.7
ANT	3.4	3.5	2.8	2.0	1.4
RNB/POIK	5.0	3.5	3.2	1.1	1.2
DMB	25.9	21.8	23.8	17.2	22.1
AGGLUTINATE	20.8	15.7	23.8	15.9	20.1
OLIVINE	0.8	1.1	0.8	0.8	1.2
PYROXENE	9.0	7.9	7.8	18.3	15.2
PLAGIOCLASE	7.0	7.8	10.6	7.9	7.5
OPAQUE	2.6	2.7	2.5	3.0	4.0
ORANGE/BLACK GLASS	14.6	13.8	10.6	6.9	5.0
BROWN/GREY GLASS	0.1	0.1	0.4	0.6	1.4
CLEAR GLASS	1.7	4.2	2.8	0.9	0.6
YELLOW/GREEN	1.6	6.5	1.9	1.0	0.8
	100.0	100.0	100.2	99.9	100.2

Figure 3