PETROLOGIC OBSERVATIONS ON THE APOLLO 15 DRILL CORE 15007/8;
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Apollo 15 drill core 15007/8 was obtained from Station 2 situated at the base of the Apennine Front and between St. George crater on the Front and Elbow crater on the mare bay below. Unlike the rest of the Apollo 15 site, regolith breccia 15205 from this station is compositionally different from the local soils(1). For example, KREEP basalt content of the surface soils is 3.4% on an agglutinate-free basis whereas in the breccia it is about 20% (1-3). Understanding of such an anomaly requires characterization of drill core and surface soils at this station, which would also enhance our knowledge of Apollo 15 regolith stratigraphy and regolith evolution. The core has been described by Nagle(4) and its irradiational and depositional history has been discussed by Bogard et al.(5). We have selected 13 samples from this core on the basis of the above studies for our petrologic investigation, a preliminary discussion of which has been presented earlier (6).

Grain size analyses of the 13 samples show that the core soils are usually bimodal and with a variable range of grain size. The mean grain sizes of the subcentimeter fraction of the soils do not show any strong correlation with either agglutinate abundance or Is/FeO. This is in part due to the fact that course fragments in drill cores are not always representative of the bulk soil, or of the submilimeter fraction (Table 1). Detailed modal analysis in terms of 33 particle types and of 4179 particles in the 90-150 um size fraction show variations in agglutinate content and maturity. A partial set of modal data is given in table 1, but note that because not all particle types are included the abundances do not sum to 100%. Primarily on the basis of agglutinate content and the distribution of lithic and glass fragments, we have tentatively divided the core into four units with boundaries at or near depths of about 17 cm, 24 cm, and 48 cm. Another break at about 55 cm is too close to our bottom sample and is disregarded for this report. Previous workers (4,5) have not recognized the break at about 24 cm. Soils at 18.3 and 22.3 cm depths are, however, much enriched in agglutinates and depleted in glass fragments; the modal abundance of plagioclase also increases below 24 cm. Curiously, the Is/FeO index of these two samples are lower than the average of the core despite the increase in agglutinate content.

Green glass makes up >20% of the upper part of Unit 4, and a third of the soils consists of glass. However, there is no concomitant increase in mare basalt fragments, which suggests that incorporation of green glass is independent of mare basalt contributions to this unit. This is compatible with data in other soils at the Apollo 15 site (7). On the other hand, this core overall contains a higher abundance of crystalline breccias than most of the other Apollo 15 soils, which seems to suggest that both St. George and Elbow craters may have excavated highland rocks. If so, the mare basalt flow at Elbow must have been quite thin. Overall, this core contains 3.8% KREEP basalt fragments on an agglutinate-free basis. Because local surface soils also have a similar KREEP basalt abundance, we conclude that the high KREEP basalt content of the regolith breccia 15205 must be an anomaly. The high KREEP content seen in the mixing models of Station 2 soils (1) is not readily explained. It is possible, however,

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that the very fine fraction of local soils, which cannot be studied petrographically with confidence and which lack rock fragments anyway, may be enriched in KREEP components; or, perhaps the end-member selection for mixing models was not realistic. But the high KREEP basalt content of the regolith breccia 15205 is real; we suspect that 15205 may be truly an anomaly with a non-representative clast population of parent lithologies. If it had rolled down the Apennine Front, an occurrence of a KREEP basalt rich area above St. George has to be postulated, which is also not easily defendable.

REFERENCES : (1) Simon,S.B. et al. (1986) GCActa, 50, 2675-2691. (2) Basu,A. and McKay,D.S. (1979) PLPSC 10, 1413-1424. (3) Dymek,R.F. et al. (1974) PLSC 5, 235-260. (4) Nagle,J.S. (1981) PLPSC 12B, 463-473. (5) Bogard,D.D. et al. (1982) PLPSC 13, A221-A231. (6) McKay,D.S. and Basu,A. (1982) LPSci. XIII, 491-492. (7) Basu,A. et al. (1981) PLPSC 10, 433-449.

Table 1. Relative abundance of selected particle types and mean grain size of the submilimeter fraction of soils at thirteen levels of drill core 15007/8.

Unit (our)	Depth cm	Mz um	Aggl %	Glass %	R.Bx %	Xl.Bx %	ANT %	MB %	KB %	Pl %	Px %	Unit *
	0.7	94	30.5	12.0	12.7	4.2	0.9	5.0	0.6	16.9	13.9	
	5.3	88	32.4	13.8	9.9	3.4	0.9	4.0	0.9	16.2	17.4	
1	9.3	60	36.9	12.5	5.6	5.7	1.2	4.6	1.9	12.5	17.2	1
	13.7	122	30.4	10.9	6.5	3.4	1.8	2.8	1.6	21.1	17.4	
	18.3	54	42.1	9.9	9.0	3.1	2.5	2.5	1.5	12.1	14.6	
2	22.3	54	43 9	9.5	9.0	0.6	0.6	5.9	2.5	10.3	12 8	2
	25.3	58	27.0	14.2	8.2	5.6	1.9	1.6	1.9	18.5	18.8	
	31.9	53	27.9	15.1	7.2	5.0	0.9	3.4	3.4	15.4	19.4	
3	41.9	54	32.7	12.7	6.3	4.8	1.3	1.8	2.2	18.4	16.5	2
	48.3	113	27.7	11.4	6.8	6.1	1.2	2.7	3.4	18.8	17.5	
	50.3	104	19.3	28.6	7.2	6.6	0.9	1.8	3.4	18.1	11.5	
4	54.3	102	18.5	33.8	5.0	4.1	0.6	2.1	3.8	15.4	13.5	3
	55.9	79	19.5	12.7	10.3	5.5	1.5	1.5	3.7	23.2	16.4	4

* Units according to Bogard et al. (1982).