73121 and 73141

Soil

287.7 and 345.6 grams

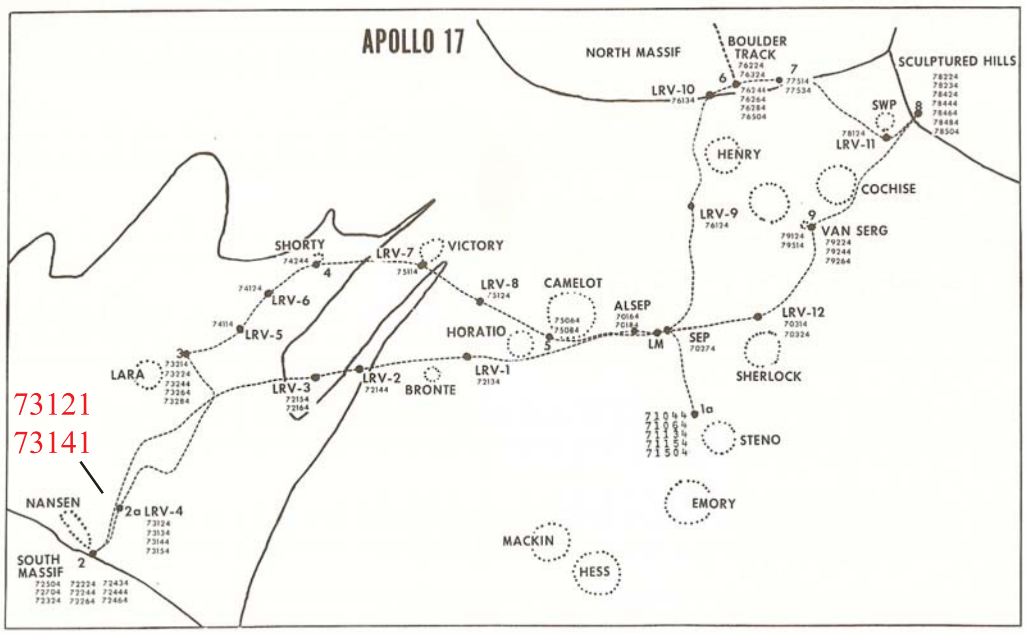


Figure 1: Location of soil sample 73120 at LRV-4 on Apollo 17 map (Meyer 1973). S73-24071

Introduction

73121 and 73141 were collected from the base of the South Massif at LRV – 4 (station 2a). 73121 was dark soil from the upper few centimeters of regolith, while 73141 was lighter-colored soil from about 15 cm deep Wolfe et al. 1981).

Petrography

The maturity index of 73121 is I_s/FeO = 78 and the average grain size is 56 microns, while the maturity of 73141 is I_s/FeO = 48 and the average grain size is 63 microns (Morris 1978, Graf 1993). The agglutinate count was 42 % for 73121 and 32 % for 73141.

Meyer (1973) found that while 73121 contained agglutinates, 73141 contained numerous feldspathic

Modal content of soil 73121 and 73141 (90-150 micron).

From Heiken and McKay 1974.

	73121	73141
Agglutinates	41.7	32 %
Basalt		2.6
Breccia	32	38.5
Anorthosite	1.3	2.3
Norite	0.3	0.3
Gabbro		
Plagioclase	8.3	14
Pyroxene	6.6	5.2
Olivine	1	1
Ilmenite	2	0.7
Orange glass	1.7	
Glass other	5	2.8

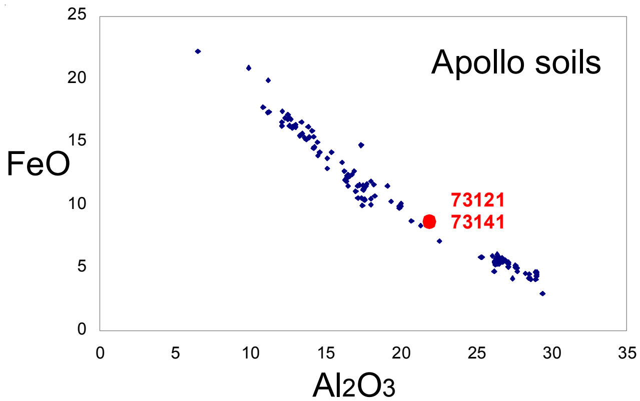


Figure 2: Composition of 73121 and 73141 compared with other Apollo soil samples.

breccia particles and no large agglutinates in the 4 – 10 mm size range (hence lighter color).

Chemistry

These two soil samples have been repeatedly analyzed – with the same result (tables 1 and 2). They are highly

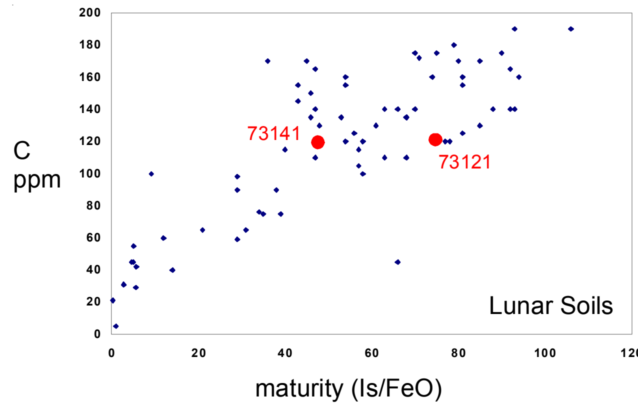
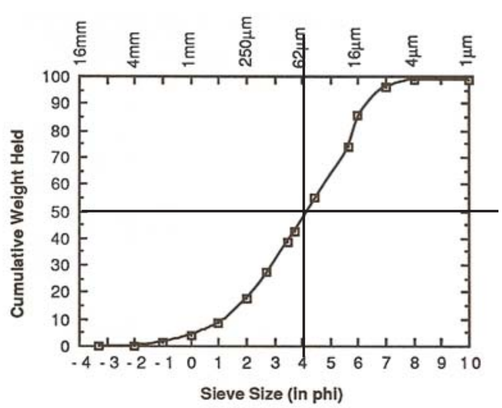


Figure 3: Carbon content and maturity index of 73121 and 73141 compared with other Apollo soils.

aluminous (figure 2), with rare earth element patterns intermediate between mare and highland.

Moore et al. (1974) determined 120 ppm carbon for both 73121 and 72141 (figure 3). DesMarais et al.



average grain size = 56 microns

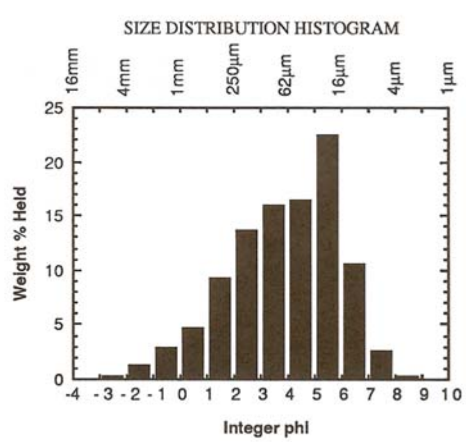
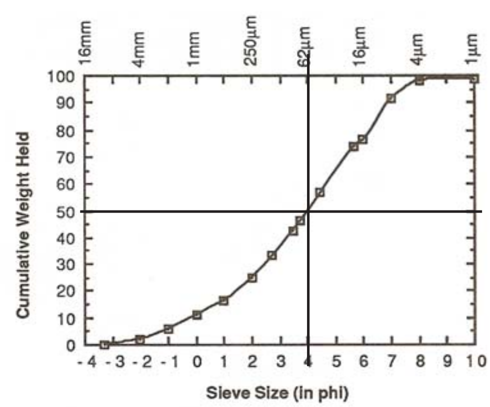


Figure 4: Grain size distribution of 73120 (Graf 1993, data by McKay).



average grain size = 63 microns

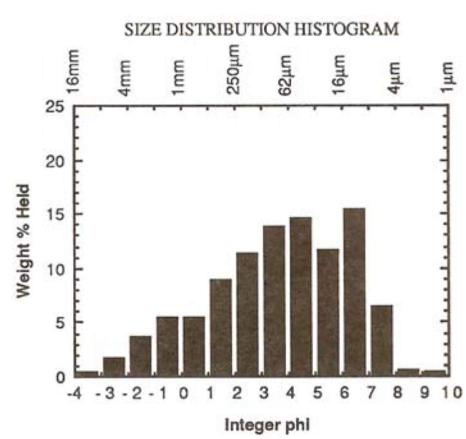


Figure 5: Grain size distribution of 73140 (Graf 1993, data by McKay).

(1975) found 123 ppm C in 73121. Gibson and Moore (1974) reported 630 ppm sulfur.

Cosmogenic isotopes and exposure ages

O'Kelley et al. (1974) determined the cosmic-ray-induced activity of ^{22}Na = 189 dpm/kg, ^{26}Al = 189 dpm/kg, ^{46}Sc = 15 dpm/kg, ^{54}Mn = 137 dpm/kg, and ^{56}Co = 218 dpm/kg.

Other Studies

Epstein and Taylor (1975) and Becker (1980) used a unique fluorine stripping technique to study the sighting and isotopic variations of H, He, C and N in 73121.

Curtis and Wasserburg (1977) used Gd isotopes to measure the accumulated neutron flux in 73121.

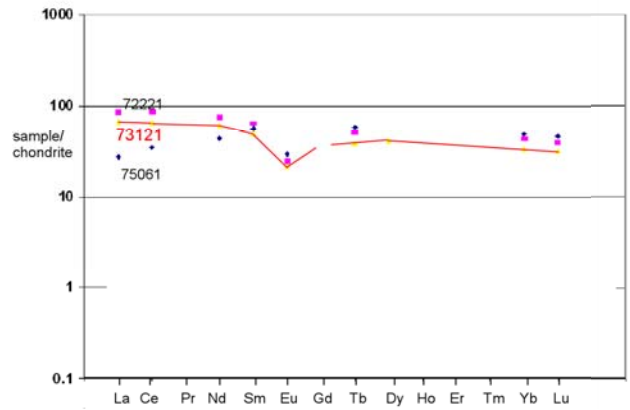


Figure 6: Normalized rare-earth-element diagram for 73121 showing that it is intermediate to mare and highland soil.

Table 1. Chemical composition of 73121.

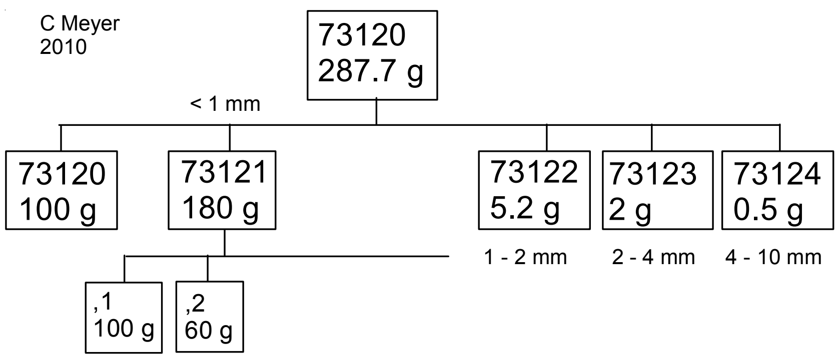
reference	Laul74	Laul78	Laul79		Philpotts74		Wanke74		Rose74		Eldridge74		Miller74
weight													
SiO2 %		45.4					45.58	(c)	45.56	(d)			45.4
TiO2	1.4	1.4	1.3	(a)			1.34	(c)	1.39	(d)			~1.5
Al2O3	21.3	20.6	20.8	(a)			20.8	(c)	21.23	(d)			21.3
FeO	8.5	8.5	9	(a)			8.58	(c)	8.45	(d)			8.6
MnO	0.11	0.11	0.11	(a)			0.11	(c)	0.11	(d)			0.12
MgO	10	10	10	(a)			10.18	(c)	9.73	(d)			10.8
CaO	12.7	13.1	12.9	(a)			13.2	(c)	12.82	(d)			13.4
Na2O	0.45	0.39	0.43	(a)			0.43	(c)	0.39	(d)			0.46
K2O	0.14	0.14	0.14	(a)	0.139	(b)	0.14	(c)	0.15	(d)	0.14	(e)	
P2O5							0.135	(c)	0.15	(d)			
S %													
sum													
Sc ppm	17	18.3	19.6	(a)			17.3	(c)	22	(d)			
V	50	50	50	(a)					33	(d)			
Cr	1416	1437	1437	(a)			1440	(c)	1916	(d)			
Co	31	31	31.4	(a)			37	(c)	355	(d)			
Ni	280	330	320	(a)			315	(c)	42	(d)			
Cu									24	(d)			
Zn		20	15	(a)					16	(d)			
Ga		6	6	(a)					2.9	(d)			
Ge ppb													
As													
Se													
Rb					3.51	(b)			3.2	(d)			
Sr		160	150	(a)	144	(b)	160	(c)	149	(d)			
Y									62	(d)			
Zr	200				238	(b)			250	(d)			
Nb									13	(d)			
Mo													
Ru													
Rh													
Pd ppb													
Ag ppb													
Cd ppb													
In ppb													
Sn ppb													
Sb ppb													
Te ppb													
Cs ppm							0.17	(c)					
Ba	150	170	190	(a)	171	(b)	190	(c)	186	(d)			
La	15.6	15.1	15.3	(a)			15.6	(c)	21	(d)			
Ce	39	38	39	(a)	38.1	(b)	38.4	(c)					
Pr													
Nd	27	26	24	(a)	24.8	(b)							
Sm	7.2	7.2	7.3	(a)	7.14	(b)	7.34	(c)					
Eu	1.2	1.3	1.3	(a)	1.26	(b)	1.3	(c)					
Gd					8.75	(b)							
Tb	1.4	1.5	1.5	(a)			1.6	(c)					
Dy	10	9.2	9.5	(a)	9.65	(b)	10.1	(c)					
Ho		2.2	2.2	(a)			2.5	(c)					
Er					5.85	(b)							
Tm			0.85	(a)									
Yb	5.3	5.4	5.5	(a)	5.38	(b)	5.63	(c)	6	(d)			
Lu	0.77	0.76	0.79	(a)			0.78	(c)					
Hf	5	5.5	5.4	(a)			5.52	(c)					
Ta	0.78	0.73	0.83	(a)			0.73	(c)					
W ppb													
Re ppb													
Os ppb													
Ir ppb	11	16	14	(a)			15	(c)					
Pt ppb													
Au ppb	3	4	3	(a)			6	(c)					
Th ppm	2.4	2.9	2.8	(a)			2.8	(c)			2.63	(e)	
U ppm	0.7	0.85	0.8	(a)							0.72	(e)	

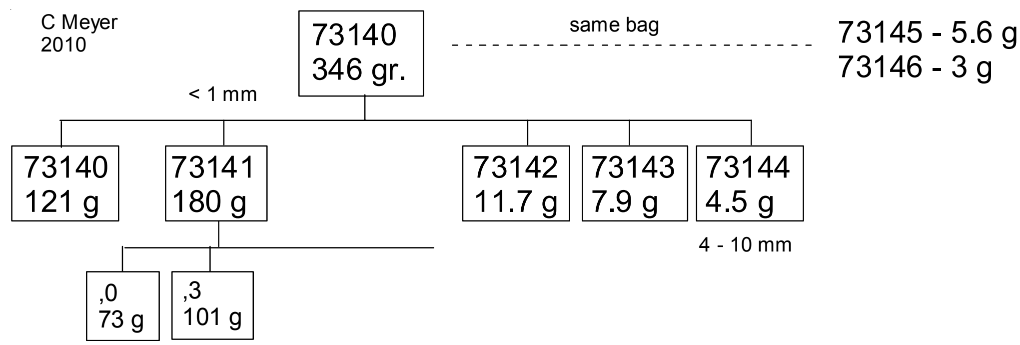
technique: (a) INAA, (b) IDMS, (c) multiple, (d) "microchem.", (e) radiation count.

Table 2. Chemical composition of 73141.

reference	LSPET73		Rhodes74		Rhodes74		Laul74		Philpotts74		Wanke74		Rose74		Eldridge74		Miller74
weight					Wiesmann76												
SiO2 %	45.06	(a)	44.91	(a)							45.8	(d)	45.35	(e)			44.7
TiO2	1.29	(a)	1.24	(a)			1.1	(c)			1.23	(d)	1.26	(e)			~1.7
Al2O3	21.52	(a)	21.42	(a)			21.4	(c)			21.17	(d)	21.56	(e)			21.2
FeO	8.1	(a)	8.14	(a)			7.8	(c)			8.12	(d)	8.02	(e)			7.5
MnO	0.11	(a)	0.12	(a)			0.103	(c)			0.11	(d)	0.11	(e)			0.11
MgO	10.04	(a)	9.94	(a)			10	(c)			10.1	(d)	10.28	(e)			8.3
CaO	13.04	(a)	13.06	(a)			12.6	(c)			12.9	(d)	12.91	(e)			13.6
Na2O	0.38	(a)	0.44	(a)	0.47		0.45	(c)			0.43	(d)	0.38	(e)			0.46
K2O	0.15	(a)	0.15	(a)	0.147	(b)	0.14	(c)	0.14	(b)	0.13	(d)	0.14	(e)	0.136	(f)	
P2O5	0.12	(a)	0.12	(a)							0.12	(d)	0.12	(e)			
S %	0.06	(a)	0.06	(a)													
sum																	
Sc ppm							17	(c)			16.6	(d)	15	(e)			
V							45	(c)					30	(e)			
Cr	1437	(a)	1437	(a)	1320	(b)	1368	(c)			1460	(d)	1642	(e)			
Co							30	(c)			26.5	(d)	25	(e)			
Ni			193	(a)			240	(c)			250	(d)	272	(e)			
Cu													6.3	(e)			
Zn			19	(a)									14	(e)			
Ga													2.6	(e)			
Ge ppb																	
As																	
Se																	
Rb			3.8	(a)	3.62	(b)			3.56	(b)			2.8	(e)			
Sr			151	(a)	151	(b)			147	(b)	130	(d)	122	(e)			
Y			55	(a)							46	(d)	48	(e)			
Zr			238	(a)	231	(b)	220	(c)	235	(b)	225	(d)	197	(e)			
Nb			15	(a)							14	(d)	11	(e)			
Mo																	
Ru																	
Rh																	
Pd ppb																	
Ag ppb																	
Cd ppb																	
In ppb																	
Sn ppb																	
Sb ppb																	
Te ppb																	
Cs ppm																	
Ba					169	(b)	160	(c)	171	(b)	195	(d)	272	(e)			
La					13.8	(b)	15.5	(c)			15.4	(d)					
Ce					37.1	(b)	38	(c)	37.7	(b)	37.3	(d)					
Pr																	
Nd					24	(b)	25	(c)	24.8	(b)							
Sm					6.93	(b)	7.2	(c)	7	(b)	6.93						
Eu					1.22	(b)	1.15	(c)	1.24	(b)	1.22						
Gd					9.15	(b)			8.15	(b)							
Tb							1.4	(c)			1.6	(d)					
Dy					9.42	(b)	9	(c)	9.39	(b)	9.5	(d)					
Ho											2.4	(d)					
Er					5.6	(b)			5.73	(b)							
Tm																	
Yb					5.25	(b)	5.1	(c)	5.46	(b)	5.5	(d)	4.7	(e)			
Lu							0.75	(c)	0.825	(b)	0.81	(d)					
Hf							4.9	(c)			5.55	(d)					
Ta							0.75	(c)			0.76	(d)					
W ppb																	
Re ppb																	
Os ppb																	
Ir ppb							8	(c)			17	(d)					
Pt ppb																	
Au ppb							4	(c)			8	(d)					
Th ppm					2.64	(b)	2.1	(c)			2.6	(d)			2.25	(f)	
U ppm					0.73	(b)	0.7	(c)							0.63	(f)	

technique: (a) XRF, (b) IDMS, (c) INAA, (d) multiple, (e) "microchem.", (f) radaition cout.





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