77531 and 77511

Soil

219 and 201 grams

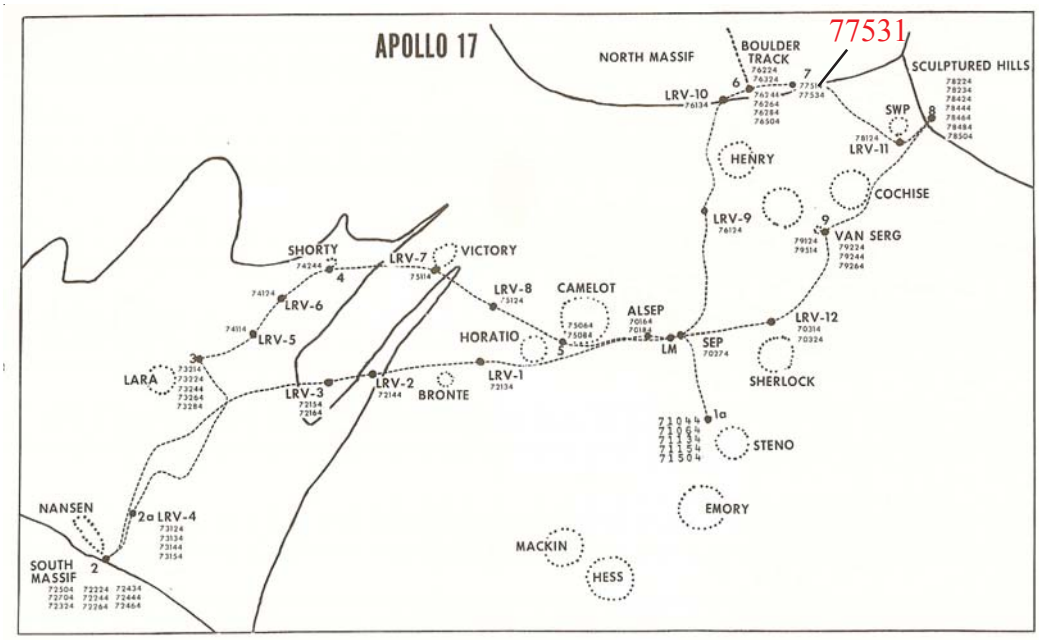


Figure 1: Location of soil sample 77530 at station 7 on Apollo 17 map (Meyer 1973). S73-24071

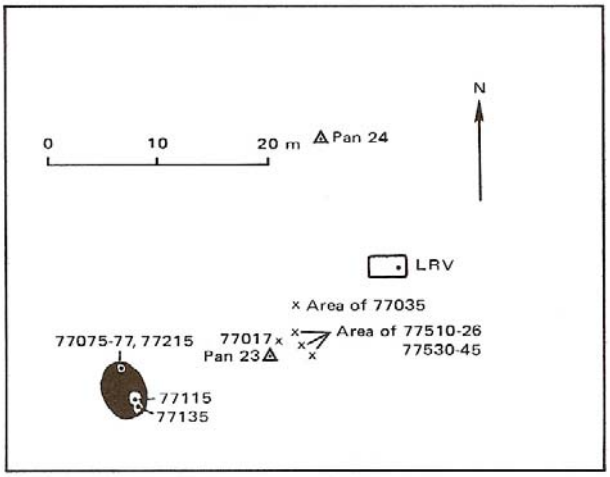


Figure 2: Map of station 7, Apollo 17

Modal content of soil 77531 (90-150 micron).

From Heiken and McKay 1974.

	77531
Agglutinates	54
Basalt	4.7
Breccia	17.6
Anorthosite	1.7
Norite	
Gabbro	
Plagioclase	9.3
Pyroxene	4.3
Olivine	0.7
Ilmenite	1.3
Orange glass	0.3
Glass other	5.6

Introduction

77531 and 77511 are rake samples from station 7 on the flank of the North Massif (Apollo 17) (figure 1 and 2).

Petrography

The maturity of 77531 and 77511 is I_s/FeO = 79 and 80, respectively. The agglutinate content is 54 % (Morris 1978, Heiken and McKay 1974). The average grain size is 50 microns (McKay et al. 1974). This is a very mature soil.

A summary of the research on the large rocks is found in Wolfe et al. (1981) and Meyer (1994) and the 4 – 10 mm coarse-fines are cataloged in Meyer (1973).

Chemistry

Rhodes et al. (1974) determined the major element composition (figure 3) and Wiesmann and Hubbard

Table 1. Composition of 77531 and 77511.

					77531	77511	
reference	Rhodes74		Rhodes74		Korotev92	Korotev92	
weight			Wiesmann76				
SiO2 %	43.07	(a)					
TiO2	3.91	(a)					
Al2O3	17.16	(a)					
FeO	11.7	(a)			11.9	11.4	(c)
MnO	0.17	(a)					
MgO	10.19	(a)					
CaO	11.93	(a)					
Na2O	0.44	(a)			0.402	0.396	(c)
K2O	0.11	(a)	0.11	(b)			
P2O5	0.08	(a)					
S %	0.08	(a)					
sum							
Sc ppm					34.3	32.1	(c)
V							
Cr	2121	(a)	1320	(b)	2170	2160	(c)
Co					32.1	31.3	(c)
Ni	231	(a)			260	240	(c)
Cu							
Zn	31	(a)					
Ga							
Ge ppb							
As							
Se							
Rb	2.7	(a)	2.49	(b)			
Sr	153	(a)	155	(b)	160	130	(c)
Y	52	(a)					
Zr	198	(a)	203	(b)	200	210	(c)
Nb	15	(a)					
Mo							
Ru							
Rh							
Pd ppb							
Ag ppb							
Cd ppb							
In ppb							
Sn ppb							
Sb ppb							
Te ppb							
Cs ppm							
Ba			123	(b)	135	127	(c)
La			9.96	(b)	9.99	10.1	(c)
Ce			26.7	(b)	27.6	27.2	(c)
Pr							
Nd			19.4	(b)	17	20	(c)
Sm			6.47	(b)	6.51	6.44	(c)
Eu			1.35	(b)	1.37	1.33	(c)
Gd			8.64	(b)			
Tb					1.54	1.46	(c)
Dy			9.55	(b)			
Ho							
Er			5.72	(b)			
Tm							
Yb			5.26	(b)	5.4	5.21	(c)
Lu					0.757	0.739	(c)
Hf					5.42	5.24	(c)
Ta					0.87	0.77	(c)
W ppb							
Re ppb							
Os ppb							
Ir ppb					8.5	7	(c)
Pt ppb							
Au ppb					9.4	2.3	(c)
Th ppm					1.45	1.69	(c)
U ppm			0.48	(b)	0.42	0.41	(c)
technique	*(a) XRF, (b) IDMS, (c) INAA*						

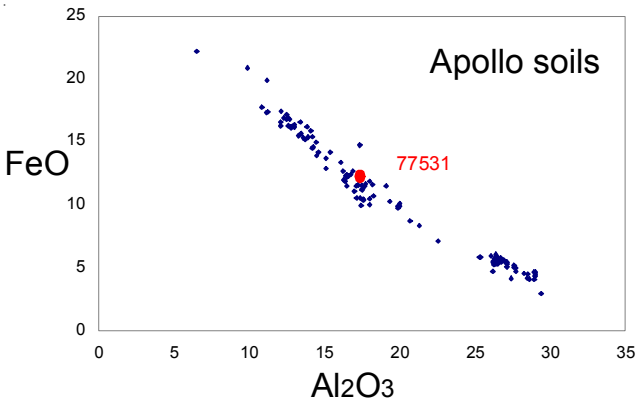


Figure 3: Composition of 77531 compared with all other Apollo soil samples.

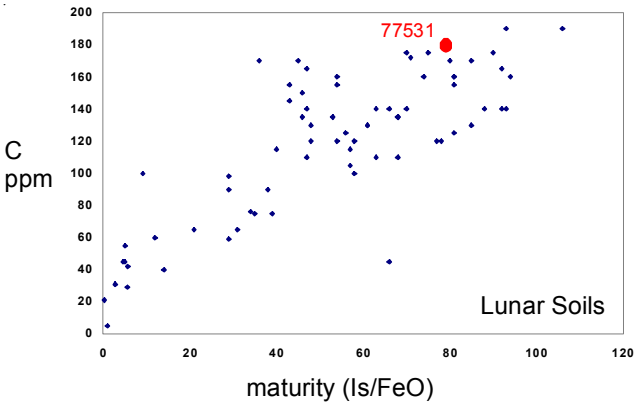


Figure 4: Carbon content and maturity of 77531 compared with other Apollo soils.

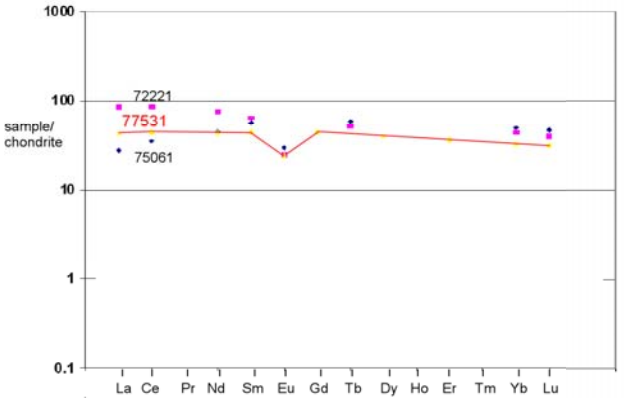
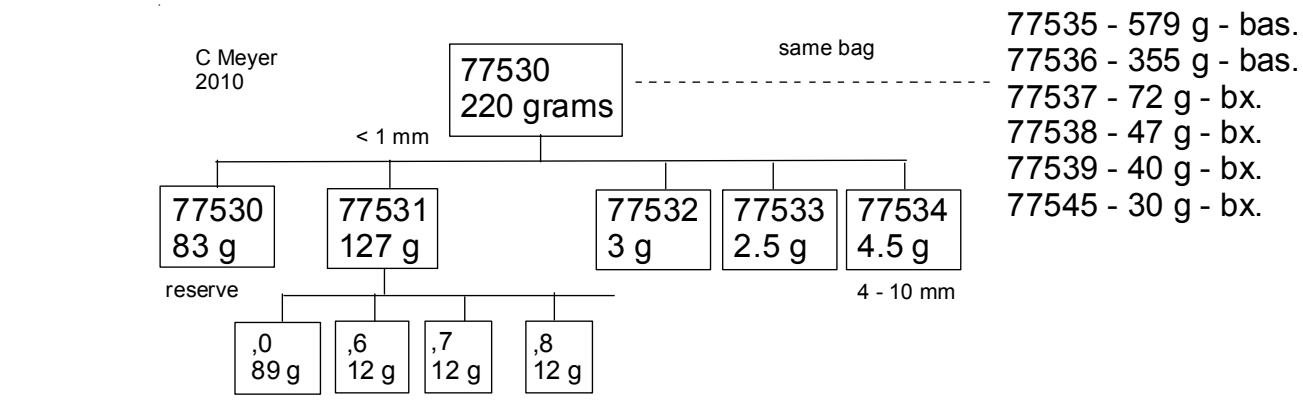
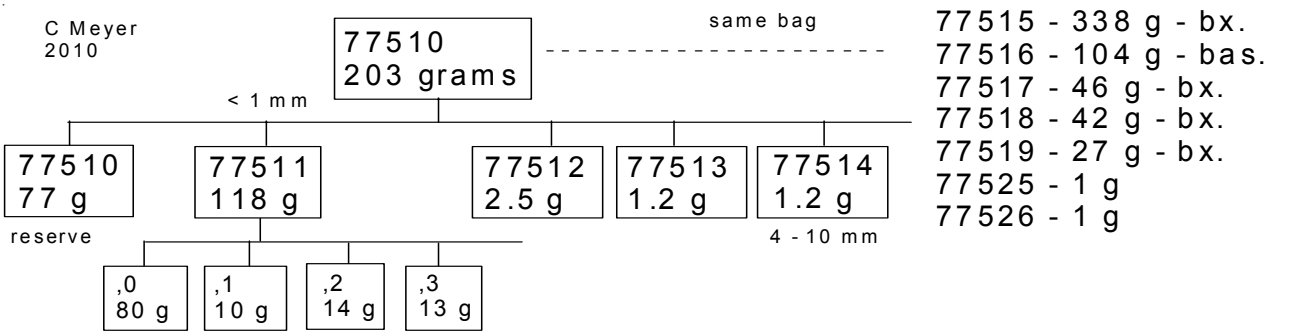


Figure 5: Normalized rare-earth-element diagram of 77531 compared with mare and highland soils.

(1976) and Korotev and Kremser (1992) reported the trace element composition (figure 5). The heavy rare earth elements (Gd to Lu) are depleted compared with the mare or highland soils.

LSPET (1973) and Moore et al. (1974) reported 180 ppm carbon for 77531 (figure 4).





References for 77531

Butler P. (1973) Lunar Sample Information Catalog Apollo 17. Lunar Receiving Laboratory. MSC 03211 Curator's Catalog. pp. 447.

Heiken G.H. (1974) A catalog of lunar soils. JSC Curator

Heiken G.H. (1975) Petrology of lunar soils. *Rev. Geophys. Space Phys.* **13**, 567-587.

Heiken G.H. and McKay D.S. (1974) Petrology of Apollo 17 soils. *Proc. 5th Lunar Sci. Conf.* 843-860.

Korotev R.L. and Kremser D. (1992) Compositional variations in Apollo 17 soils and their relationships to the geology of the Taurus-Littrow site. *Proc. 22nd Lunar Planet. Sci. Conf.* 275-301.

LSPET (1973a) Apollo 17 lunar samples : Chemical and petrographic description. *Science* **182**, 659-690.

LSPET (1973c) Preliminary examination of lunar samples. Apollo 17 Preliminary Science Report. NASA SP-330, 7-1—7-46.

McKay D.S., Fruland R.M. and Heiken G.H. (1974) Grain size and the evolution of lunar soils. *Proc. 5th Lunar Sci. Conf.* 887-906.

Meyer C. (1973) Apollo 17 Coarse Fines (4-10 mm) Sample Location, Classification and Photo Index. Curator Report. pp. 182.

Meyer C. (1994) **Catalog of Apollo 17 rocks**: Volume 4. Curator's Office JSC 26088 pp. 644

Mitchell J.K., Carrier W.D., Costes N.C., Houston W.N., Scott R.F. and Hovland H.J. (1973) 8. Soil-Mechanics. *In* Apollo 17 Preliminary Science Rpt. NASA SP-330. pages 8-1-22.

Moore C.B., Lewis C.F. and Cripe J.D. (1974a) Total carbon and sulfur contents of Apollo 17 lunar samples. *Proc. 5th Lunar Sci. Conf.* 1897-1906.

Moore C.B., Lewis C.F., Cripe J.D. and Volk M. (1974b) Total carbon and sulfur contents of Apollo 17 lunar samples (abs). *Lunar Sci.* **V**, 520-522. Lunar Planetary Institute, Houston.

Morris R.V. (1976) Surface exposure indicies of lunar soils: A comparative FMR study. *Proc. 7th Lunar Sci. Conf.* 315-335.

Morris R.V., Score R., Dardano C. and Heiken G. (1983) Handbook of Lunar Soils. Two Parts. JSC 19069. Curator's Office, Houston

Morris R.V. (1978) The surface exposure (maturity) of lunar soils: Some concepts and Is/FeO compilation. *Proc. 9th Lunar Sci. Conf.* 2287-2297.

Papike J.J., Simon S.B. and Laul J.C. (1982) The lunar regolith: Chemistry, Mineralogy and Petrology. *Rev. Geophys. Space Phys*. **20**, 761-826.

Rhodes J.M., Rodgers K.V., Shih C., Bansal B.M., Nyquist L.E., Wiesmann H. and Hubbard N.J. (1974) The relationships between geology and soil chemistry at the Apollo 17 landing site. *Proc. 5th Lunar Sci. Conf.* 1097-1117.

Schonfeld E. (1974) The contamination of lunar highland rocks by KREEP: Interpretations by mixing models. *Proc. 5th Lunar Sci. Conf.* 1269-1286.

Wiesmann H. and Hubbard N.J. (1975) A compilation of the Lunar Sample Data Generated by the Gast, Nyquist and Hubbard Lunar Sample PI-Ships. Unpublished. JSC

Wolfe E.W., Bailey N.G., Lucchitta B.K., Muehlberger W.R., Scott D.H., Sutton R.L and Wilshire H.G. (1981) The geologic investigation of the Taurus-Littrow Valley: Apollo 17 Landing Site. US Geol. Survey Prof. Paper, 1080, pp. 280.