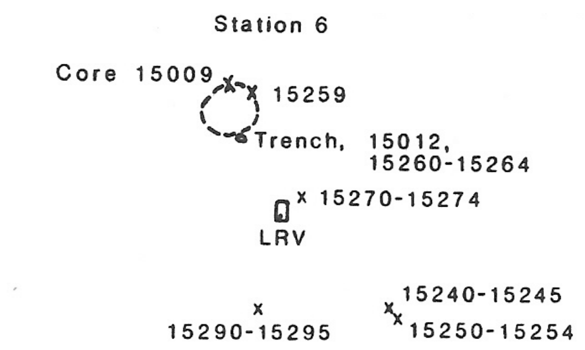
15291
Soil
246.3 grams



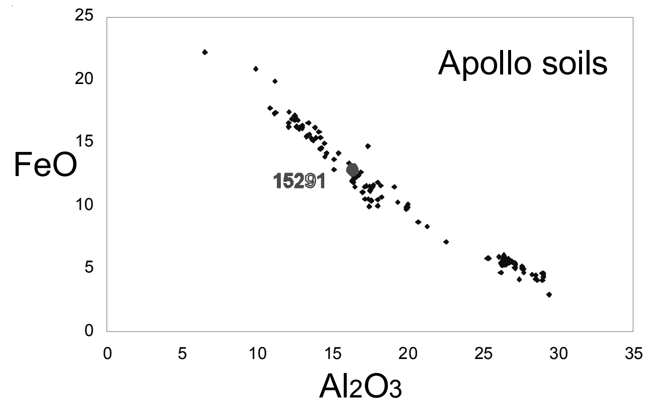


Figure 1: Chemical composition of 15291 compared with other Apollo soils.

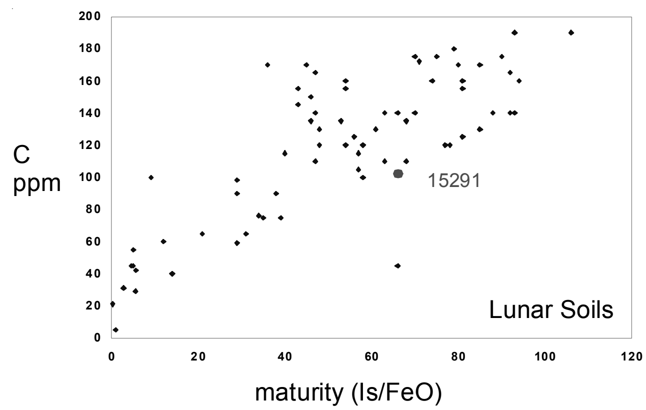


Figure 2: The carbon content and matruity index for 15291 (Moore et al. 1973, Morris 1978)..

Introduction
15291 is the soil collected with 15295 (a large breccia) at station 6, on the Apennine Front. This soil should be similar to 15271 collected nearby.

Petrography
The maturity index (I_s/FeO) of 15291 is 68 (mature)(Morris et al. 1978) and the average grain size is very fine (56 microns). The grain size distribution indicates that some fragments may have broken off of the large rock (figure 4).

Morris et al. (1983) report a mineral mode determined by Heiken and McKay.

Modal content of soils 15291.
From Morris et al. 1983

Agglutinates	16 5
Basalt	8
Breccia	32
Anorthosite	4
Norite	
Gabbro	
Plagioclase	12
Pyroxene	12
Olivine	2
Green glass	3
Brown glass	2
Glass other	5

Powell (1972) and Ryder and Sherman (1989) cataloged the coarse-fine particles. Laul et al. (1987) studied an impact melt rock from 15294 (table 1).

Chemistry
Cuttitta et al. (1972), Brunfelt et al. (1972), Korotev (1987) and others have determined the composition of 15291 (figure 1 and 3). It has the same dominat KREEP-like rare-earth element pattern as other soils from the Apennine Front. The carbon content of 15291 was determined by Moore et al. (1973) as 105 ppm C (figure 2).

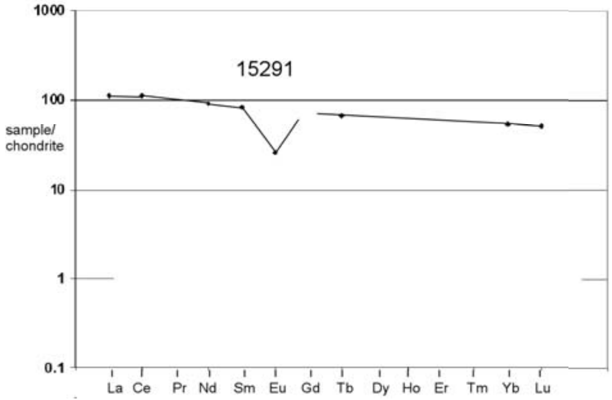


Figure 3: Normalized rare-earth-element diagram for 15291 (Korotev 1987).

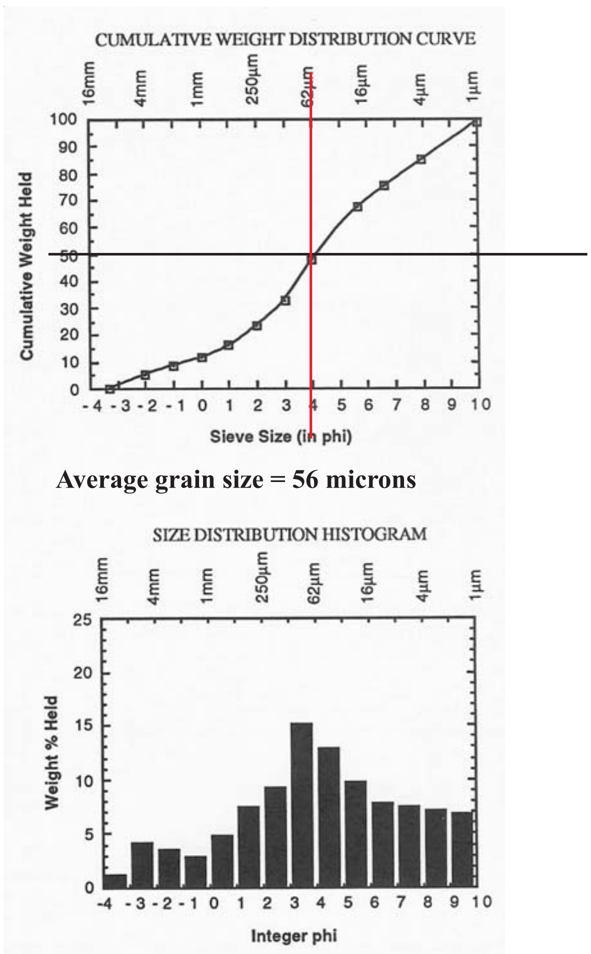


Figure 4: Grain size distribution of 15290 (Graf 1993)

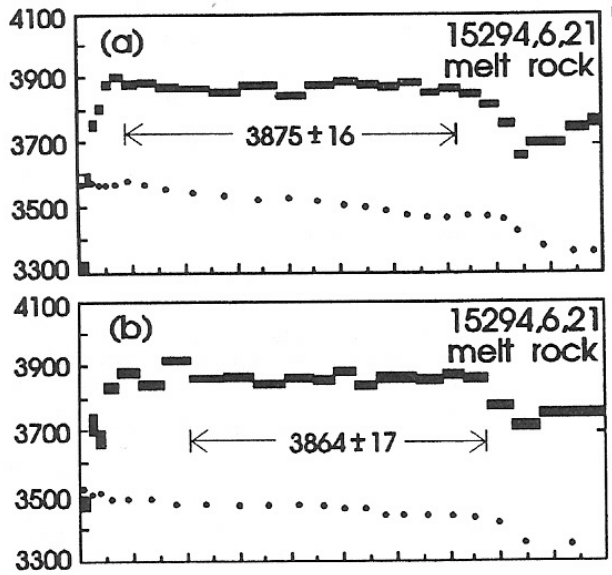


Figure 5: Ar/Ar plateau diagrams for an impact melt breccia from the coarse fine fraction of 15290 (Dalrymple and Ryder 1993).

Summary of Age Data for 15294

	Ar/Ar
Dalrymple and Ryder 1991	3875 ± 16 m.y.
	3864 ± 17 m.y.

Walker and Papike (1981) calculate that 15291 is made up of 30 % KREEP and 30 % mare basalt.

Radiogenic age dating

Dalrymple and Ryder (1991, 1993) determined the age of an impact melt rock found in the coarse-fines using the Ar/Ar dating technique (figure 5); concluding that this was the age of Imbrium!

Other Studies

Bogard and Nyquist (1973) determined the rare gas content and isotopic ratios for 15291.

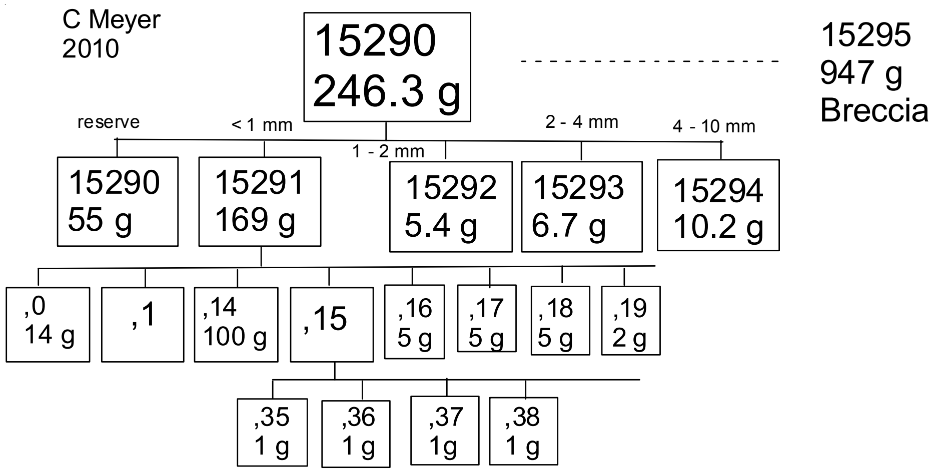
Processing

Sample 15290 was returned in SCB#3 placed in ALSRC#2 (which did not seal).

Table 1. Chemical composition of 15291.

											15294,20	
reference	Korotev87		Cuttitta72		Juan72				Brunfelt72		Laul87	
weight											Impact melt	
SiO2 %			47.21	(b)	47.6	47.3	47.4	(c)				
TiO2	1.44		1.44	(b)	1.58	1.65	1.54	(c)	1.35	(a)	1	(a)
Al2O3	16.4		16.4	(b)	16.3	17.2	16.51	(c)	16.1	(a)	19.3	(a)
FeO	11.9	(a)	11.75	(b)	12.25	12.8	12.5	(c)	11.45	(a)	7.8	(a)
MnO	0.17	(a)	0.17	(b)	0.16	0.156	0.16	(c)	0.152	(a)	0.1	(a)
MgO	10.2	(a)	10.25	(b)	10.14	10.24	19.14	(c)			21.5	(a)
CaO	11.1	(a)	11.47	(b)	11.18	9.48	10.88	(c)	11.9	(a)	9.4	(a)
Na2O	0.47	(a)	0.53	(b)	0.45	0.45	0.41	(c)	0.44	(a)	0.36	(a)
K2O			0.21	(b)	0.238	0.133	0.236	(c)			0.14	(a)
P2O5			0.25	(b)								
S %												
sum												
Sc ppm	23.7	(a)	24	(b)					22.3	(a)	13	(a)
V	85	(a)	103	(b)					140	(a)	50	(a)
Cr	2190	(a)	1984	(b)					2330	(a)		
Co	37.6	(a)	46	(b)	73	64	71	(c)	39.2	(a)	32.4	(a)
Ni	228	(a)	300	(b)	252	248	264	(c)	220	(a)	240	(a)
Cu			12	(b)	8	5	3	(c)	6.8	(a)		
Zn			22	(b)	34	34	30	(c)	20	(a)		
Ga			3.7	(b)					4.4	(a)		
Ge ppb												
As												
Se									360	(a)		
Rb			6	(b)	5	6.2	6.2	(c)	6.3	(a)		
Sr	155	(a)	160	(b)	268	255	268	(c)	131	(a)	120	(a)
Y			94	(b)								
Zr	360	(a)	340	(b)							230	(a)
Nb			18	(b)								
Mo												
Ru												
Rh												
Pd ppb												
Ag ppb					56	32	32	(c)	65	(a)		
Cd ppb												
In ppb									23	(a)		
Sn ppb												
Sb ppb												
Te ppb												
Cs ppm	0.26	(a)							0.26	(a)		
Ba	266	(a)	350	(b)					241	(a)	210	(a)
La	26	(a)	42	(b)					23	(a)	18.5	(a)
Ce	67	(a)							84	(a)	48	(a)
Pr												
Nd	41	(a)									32	(a)
Sm	12.1	(a)							12.2	(a)	8.9	(a)
Eu	1.44	(a)							1.73	(a)	1.25	(a)
Gd											10.3	(a)
Tb	2.41	(a)							2.33	(a)	1.8	(a)
Dy									12.4	(a)	11	(a)
Ho									2.8	(a)	2.5	(a)
Er									9	(a)		
Tm											0.9	(a)
Yb	8.7	(a)	12	(b)					6.7	(a)	5.9	(a)
Lu	1.23	(a)							0.84	(a)	0.85	(a)
Hf	9.7	(a)							12.4	(a)	6	(a)
Ta	1.15	(a)							1.09	(a)	0.8	(a)
W ppb									1.8	(a)		
Re ppb												
Os ppb												
Ir ppb	6.6	(a)							6.4	(a)	3.2	(a)
Pt ppb												
Au ppb	3.2	(a)							6.8	(a)	1.8	(a)
Th ppm	4.6	(a)							3.7	(a)	3	(a)
U ppm	1.06	(a)							1.13	(a)	0.73	(a)

technique: (a) INAA, (b) "microchemical" and OES, (c) conventional?



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