

14307

Regolith Breccia

155 grams



Figure 1: Photo of 14307. Sample is about 7 cm long. NASA S71-30361.



Figure 2: West end of 14307 is hackly. Cube is 1 cm. S71-28488.



Figure 3: East end of 14307. Cube is 1 cm. S71-28479.

Introduction

14307 was picked up at station G near the trench and core tubes (figure 4). Its lunar orientation is known from the micrometeorite removal of glass splatter on

one side (Horz 1972). It contains glass in the matrix, so it is a regolith breccia. It also has excess ^{40}Ar so it may be considered an ancient regolith breccia.

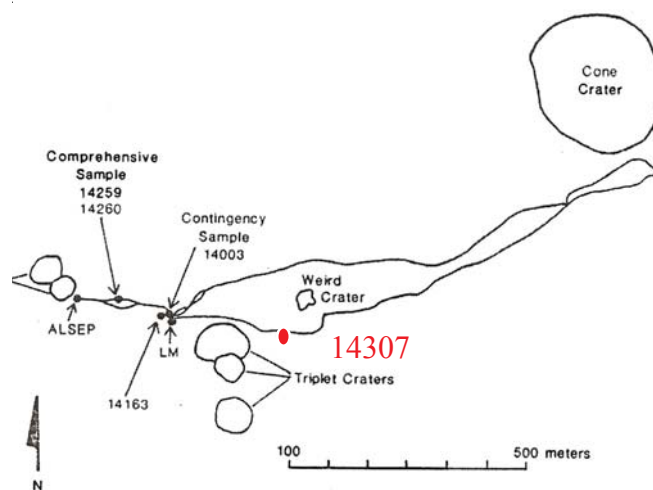


Figure 4: Traverse map for Apollo 14 with location of 14307.

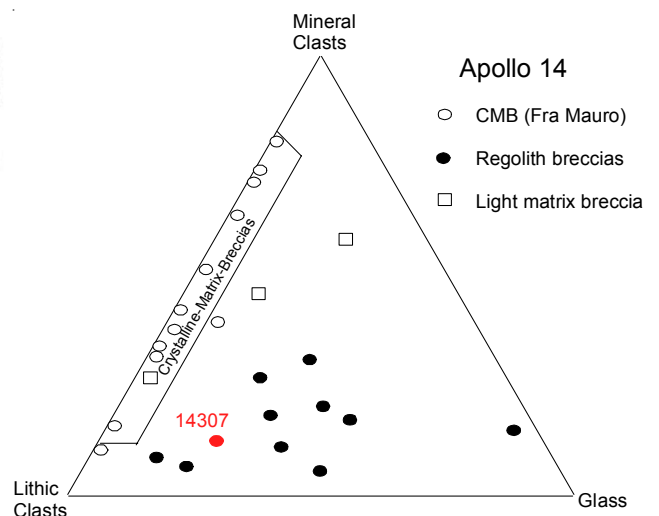


Figure 5: Simonds diagram for Apollo 14 breccias.



Figure 6: Photomicrograph of thin section 14307,41 with large clast of impact melt breccia. S71-38802. Field of view is ~1.5 cm.

Petrography

14307 is a clast-rich regolith breccia with glass spheres and agglutinates in the matrix (Fruland 1983). Simonds et al. (1977) classified it as a vitric matrix breccias with abundant clasts (figure 5). Simon et al. (1989) compared 14307 with other Apollo 14 regolith breccias and Delano (1987) studied the numerous glass spheres.

There are two large clasts (>5 mm). Clast A is exposed on the east end (figure 1 and 11). Clast B is rounded and was found in the slabs made through the center of the sample. One of these clasts has a portion that is mare basalt (figure 9).

Chemistry

The Apollo 14 regolith breccias (vitric matrix breccias) are slightly more aluminous than the Fra Mauro breccias (crystalline matrix breccias) (figure 7). 14307 has a high content of REE (figure 8).

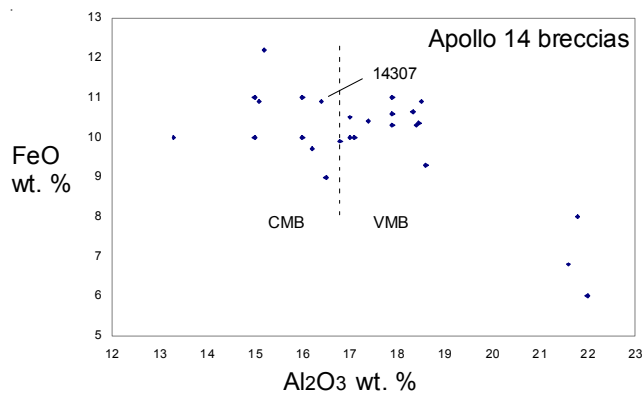


Figure 7: Composition of Apollo 14 breccias with 14307.

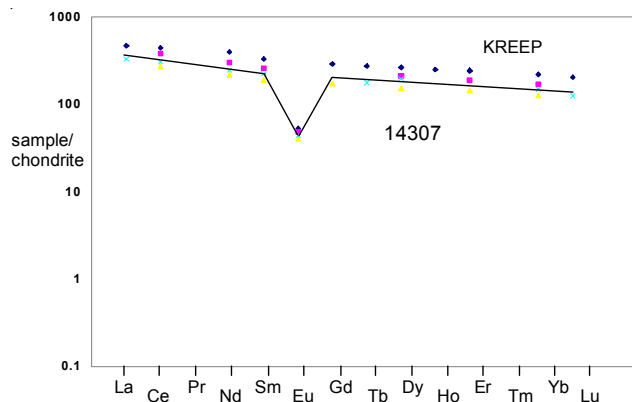


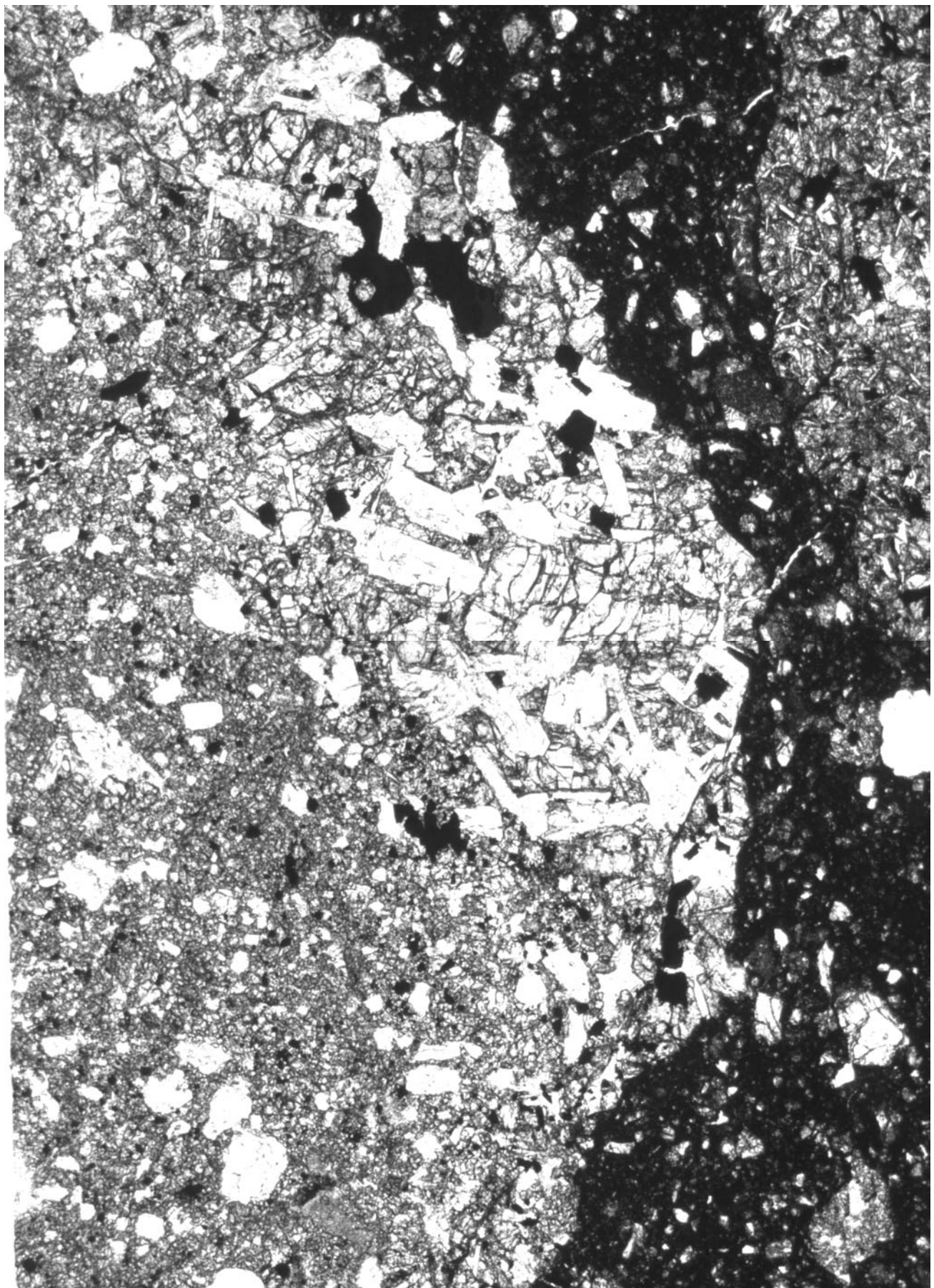
Figure 8: Normalized rare-earth-element diagram for 14307, compared with KREEP.

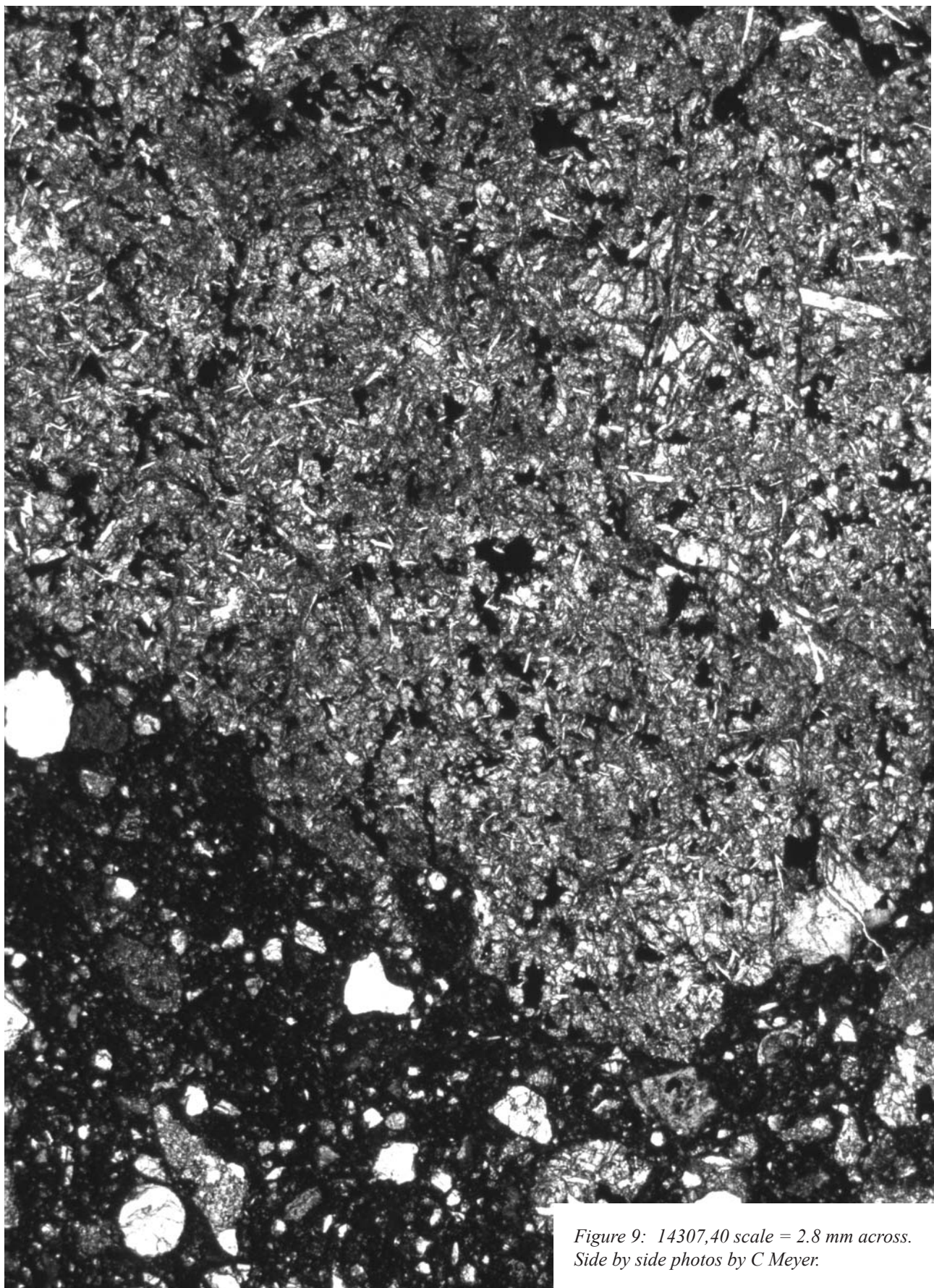
Other Studies

Bogard and Nyquist (1972) found very high ^{22}Ne in the dark portion of 14307. Bernatowitz et al. (1977) and Eugster et al. (2001) also studied trapped, fissionogenic and cosmogenic noble gases in 14307. There is an excess of ^{40}Ar in the matrix (figure 10).

Mineralogical Mode for 14307

	Simonds et al. 1977	Simon et al. 1989
Matrix	65 %	58
Clasts		
Plagioclase	1.5	4.4
Mafic	3	6.1
Breccia	12	
Glass	1	9.3
Agglutinate	1	2
Granulite	9	1.4
Mare basalt	6.5	1.2





*Figure 9: 14307,40 scale = 2.8 mm across.
Side by side photos by C Meyer.*

Table 1. Chemical composition of 14307.

reference weight	Hubbard72	Wiesmann76 Hubbard72	Simon 89 162 mg	
SiO ₂ %	46.9 (b)	matrix		
TiO ₂	1.84 (b)	1.75 1.98	(a) 1.93 (c)	
Al ₂ O ₃	16.5 (b)		16.2 (c)	
FeO	12.3 (b)		10.4 (c)	
MnO	0.14 (b)		0.153 (c)	
MgO	9.76 (b)	10.9 9.45	(a) 9.7 (c)	
CaO	10.8 (b)	10.8 10.5	(a) 9.7 (c)	
Na ₂ O	0.7 (b)	0.9 0.75	(a) 0.82 (c)	
K ₂ O	0.55 (b)	0.64 0.59	(a) 0.84 (c)	
P ₂ O ₅	0.51 (b)			
S %	0.1 (b)			
sum				
Sc ppm			21.4 (c)	
V			42 (c)	
Cr	1574 (b)		1290 (c)	
Co			29 (c)	
Ni	251 (b)		290 (c)	
Cu				
Zn				
Ga				
Ge ppb				
As				
Se				
Rb	14 (b)	16 15.3	(a) 28 (c)	
Sr	163 (b)	192 166	(a) 130 (c)	
Y	188 (b)			
Zr	842 (b)		740 (c)	
Nb	53 (b)			
Mo				
Ru				
Rh				
Pd ppb				
Ag ppb				
Cd ppb				
In ppb				
Sn ppb				
Sb ppb				
Te ppb				
Cs ppm			1.1 (c)	
Ba		890 735	(a) 920 (c)	
La			78.4 (c)	
Ce		230 164	(a) 187 (c)	
Pr				
Nd		138 99.2	(a) 112 (c)	
Sm		38.8 28	(a) 33.4 (c)	
Eu		2.74 2.25	(a) 2.5 (c)	
Gd		34	(a)	
Tb			6.5 (c)	
Dy		52 37.2	(a) 48 (c)	
Ho				
Er		30.1 22.9	(a)	
Tm				
Yb		28 20.6	(a) 24.5 (c)	
Lu			3.06 (c)	
Hf			21.7 (c)	
Ta			3.2 (c)	
W ppb				
Re ppb				
Os ppb				
Ir ppb			5 (c)	
Pt ppb				
Au ppb			5.2 (c)	
Th ppm	12 (b)		13 (c)	
U ppm		4.9 3.28	(a) 3.5 (c)	

technique: (a) IDMS, (b) XRF, (c) INAA

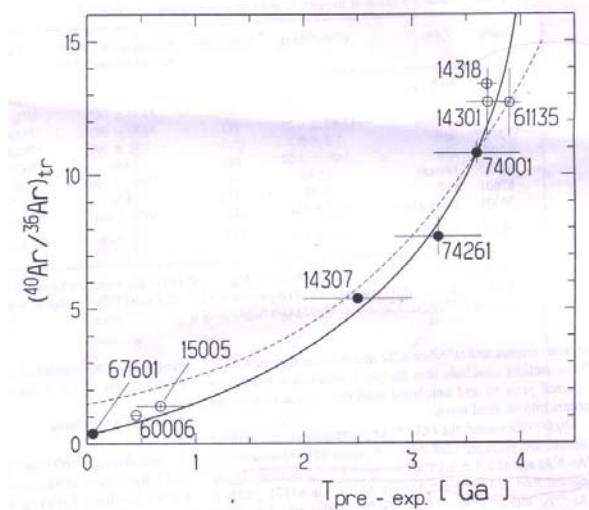


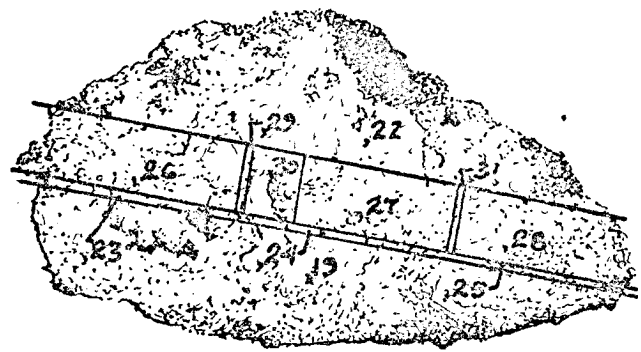
Figure 10: Excess ⁴⁰Ar diagram by Eugster et al. (2001).

Berdot et al. (1972) and Poupeau et al. (1972) determined the cosmic ray tracks and discussed the solar wind gas contents of 14307.

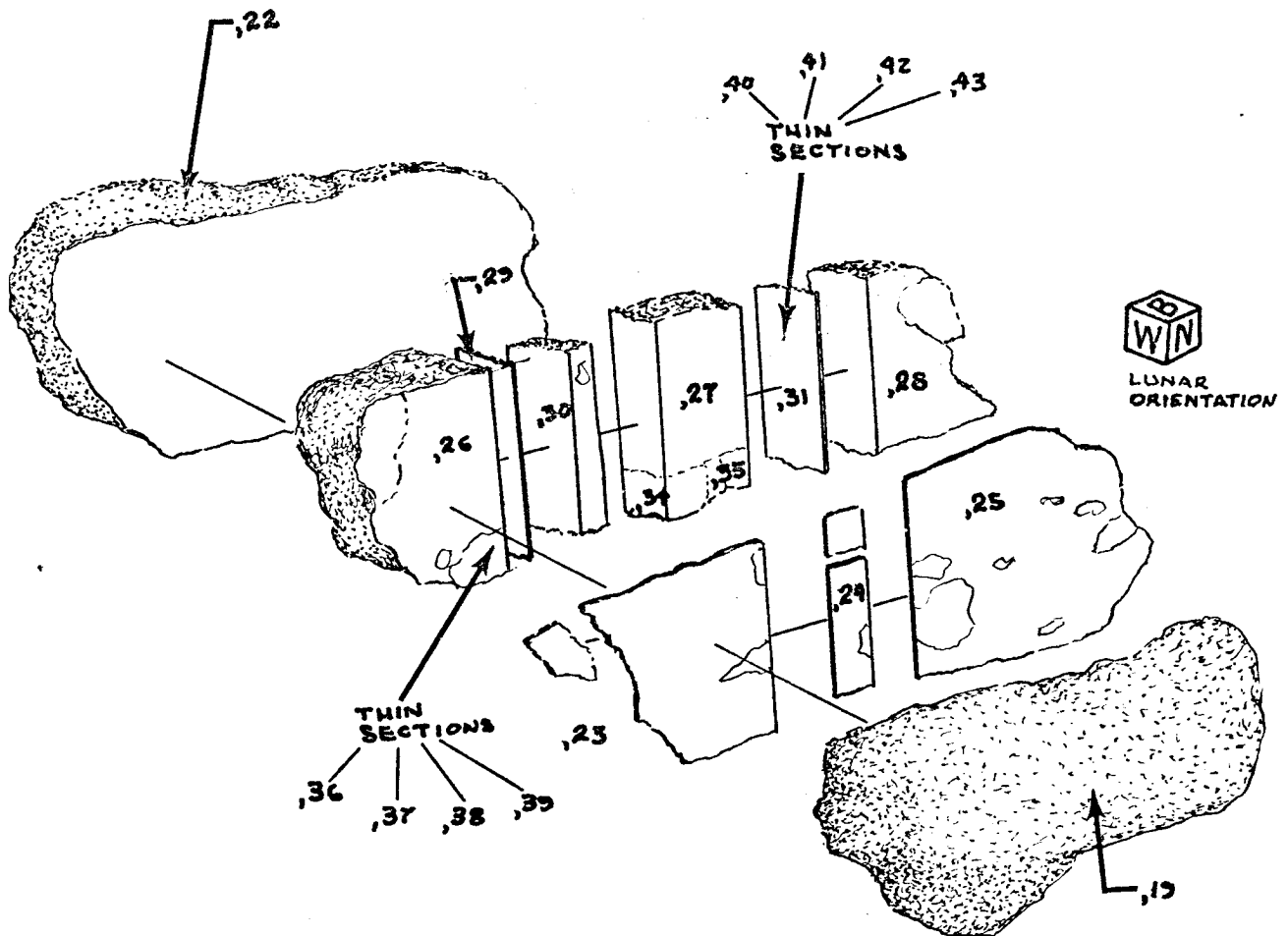
Processing

14307 was picked up at station G, placed in bag 25N and returned in weigh bag 1031. Two slabs were cut from the middle with the wire saw (figures 11 and 12).

For some reason or other there are 30 thin sections of 14307.



0 1 2 3 4 5 6 CM



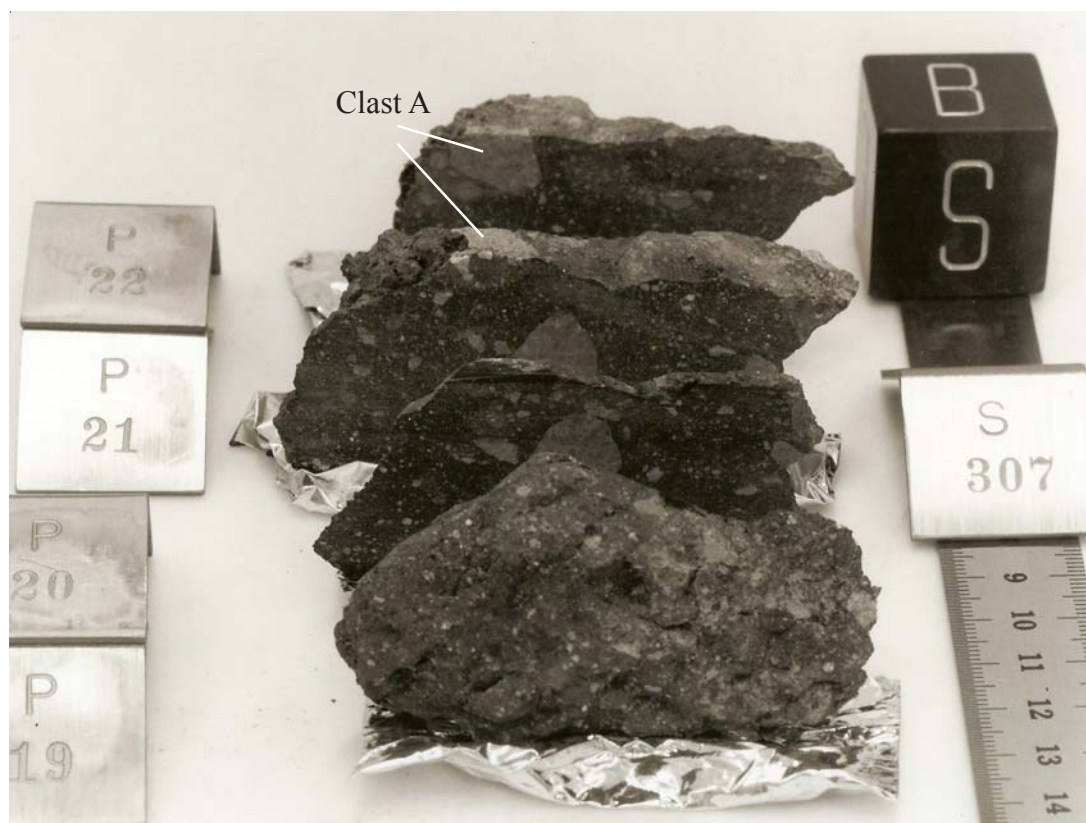


Figure 11: Two slabs cut from 14307. Cube is 1 inch. S71-30381

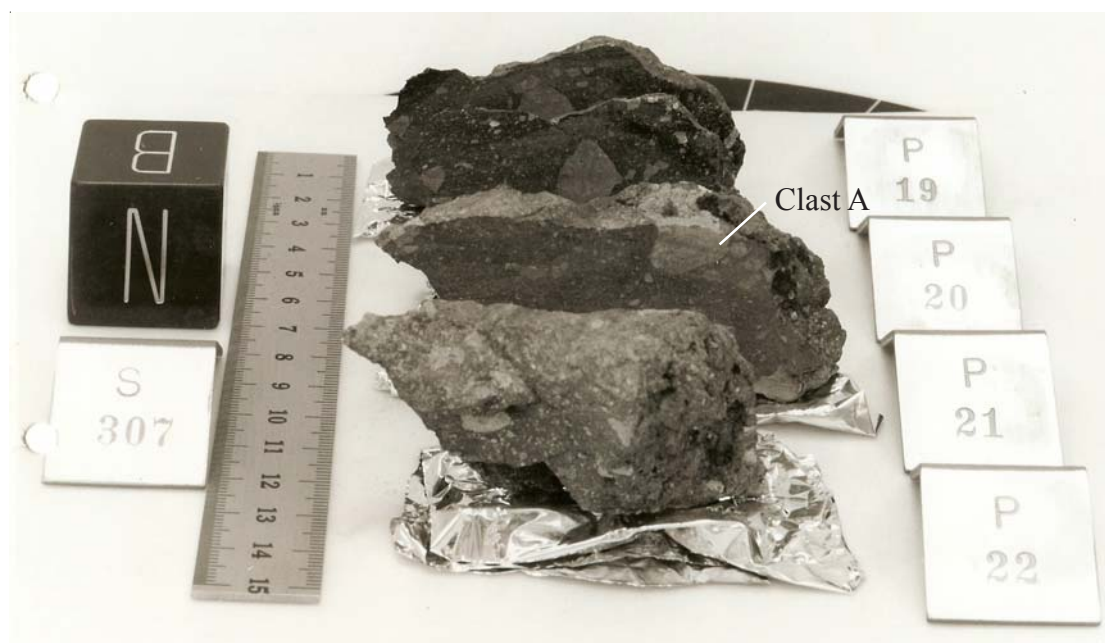
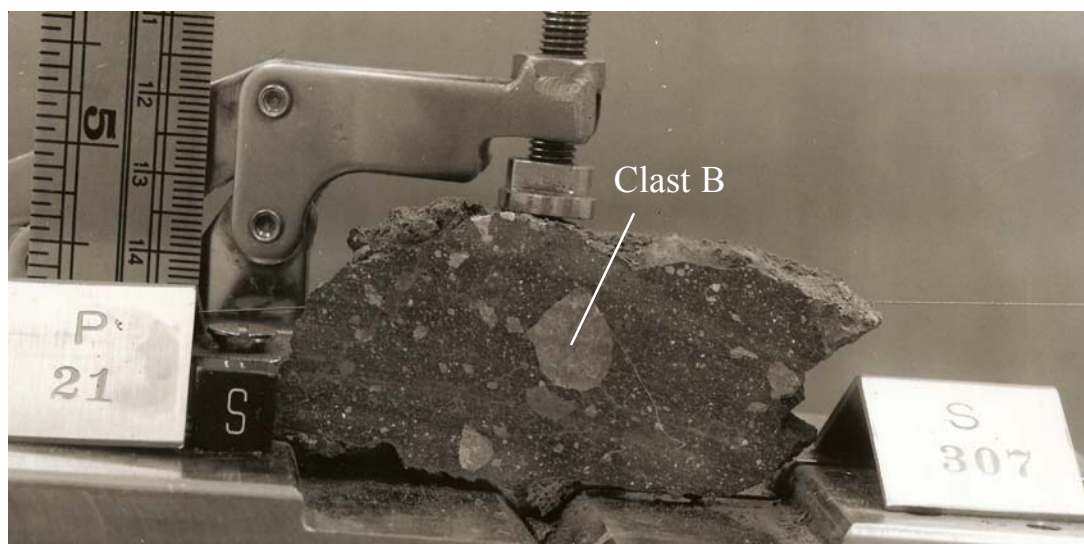


Figure 12: Two slabs cut from 14307. Cube is 1 inch. S71-30383



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