14315
Unusual Regolith Breccia
115 grams

Figure 1: Photo of 14315,0 after chipping and dusting. Sample is 5 cm across. NASA S86-36340.

Introduction

14315 was collected as a grab sample from the North Boulder Field (station H) about 100 meters northwest of the LM (Swann et al. 1977). It is described as a domical, blocky rock with one flat non-pitted side and the rest rounded and heavily pitted by Swann et al. (figure 1). A set of closely spaced fractures makes angles of 10 to 15 degrees with the flat surface of the rock. The rock is a coherent breccia in which light clasts are dominant. The estimated percentage of clasts is 40 percent. The matrix is medium gray and appears to have an unusual fabric.

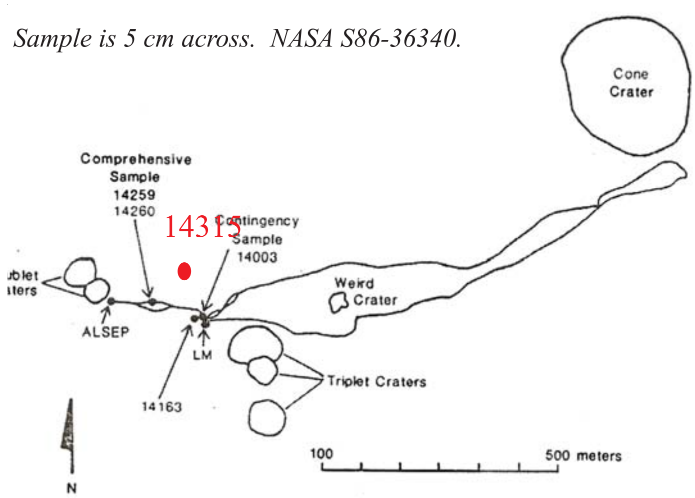


Figure 2: Map of Apollo 14 with location of 14315.

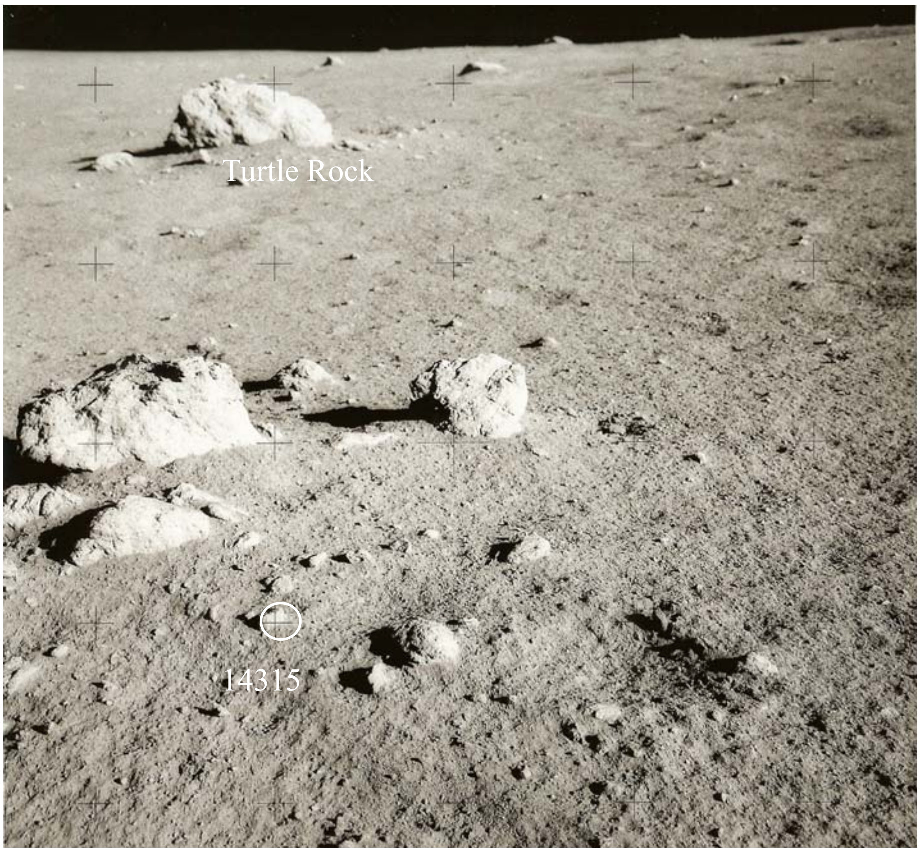


Figure 3: Photo of North Boulder Field with Turtle Rock in distance and showing location of 14315. NASA AS14-68-9469.

This aluminous breccia seems to be anomalous and may be exotic to the Apollo 14 site (Wentworth and McKay 1991). It has high Al content and relatively low REE. It also had an unusual brown stain or patina (figure 1).

Petrography

Fruland (1983) and Simon et al. (1989) included 14315 in the suite of regolith breccias. Jerde et al. (1987) studied the glass beads and concluded this rock is from a different regolith. They also modeled the bulk composition and concluded that the sample has about 45 % ferroan anorthosite as a component. However, the thin sections show an unusual matrix made up of numerous, close-packed, microbreccias (figure 4).

Simon et al. (1989) reported that 14315 had little or no agglutinates (figure 7).

Ramdohr (1972) reported on the discovery of lunar pentlandite and sulphidization reactions in 14315.

Mineralogical Mode for 14315

	Simonds et al. 1977	Simon et al. 1989
Matrix	66 %	43
Clasts		
Plagioclase	3.5	4.7
Mafic	0.5	3.4
Breccia	10.5	~25
Glass	5	16.2
Granulite	9.5	3.9
Mare basalt	3.5	1.3
Felds basalt	0.5	0.2
Agglutinate		0

Chemistry

Jerde et al. (1987) and Simon et al. (1989) noted that 14315 was considerably enriched in Al_2O_3, and depleted in REE (figures 5 and 8). They concluded that this was due to an added component of ferroan anorthosite, and that this regolith breccia was not derived from the local soil at Apollo 14.

The content of meteoritic siderophiles (Ni, Ir and Au) is high.

scale = 2.8 mm.

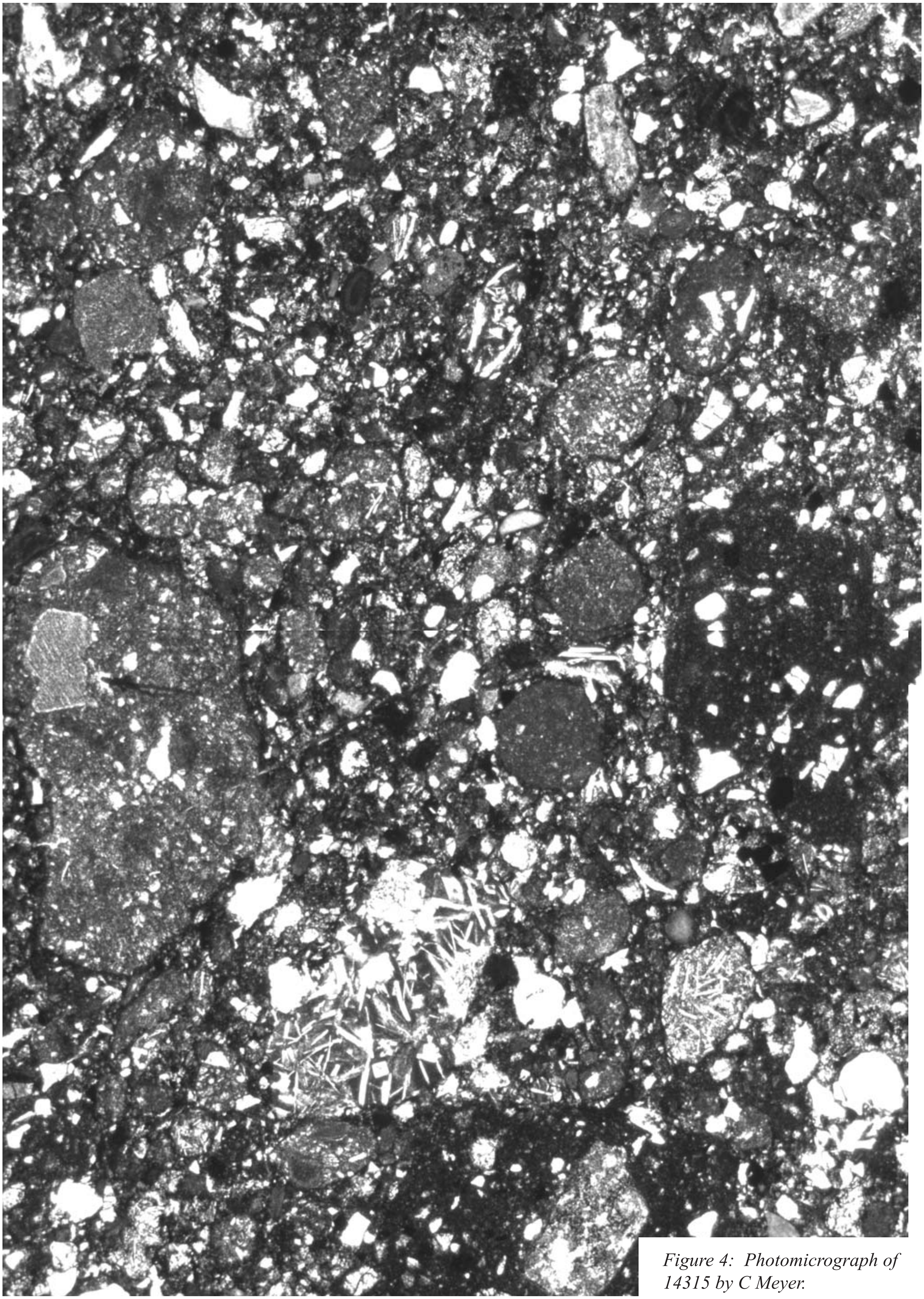


Figure 4: Photomicrograph of 14315 by C Meyer.

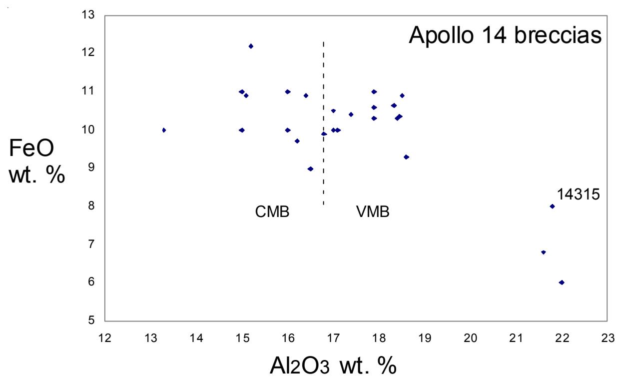


Figure 5: Composition of Apollo 14 breccia with 14315.

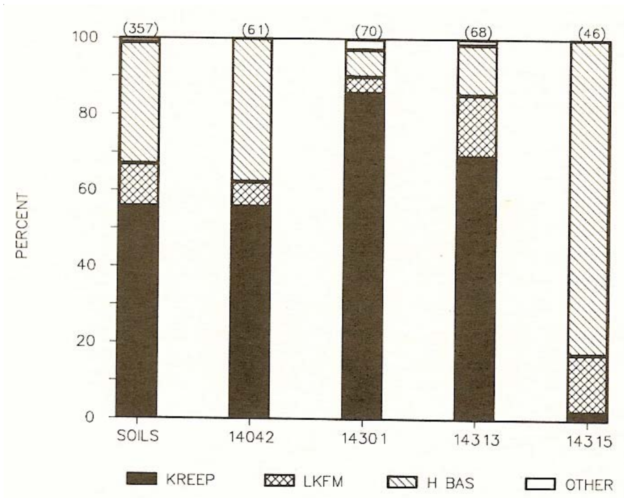


Figure 7: Comparison of glass types (based on composition) in soils and soil breccias from Apollo 14 (Wentworth and McKay 1991).

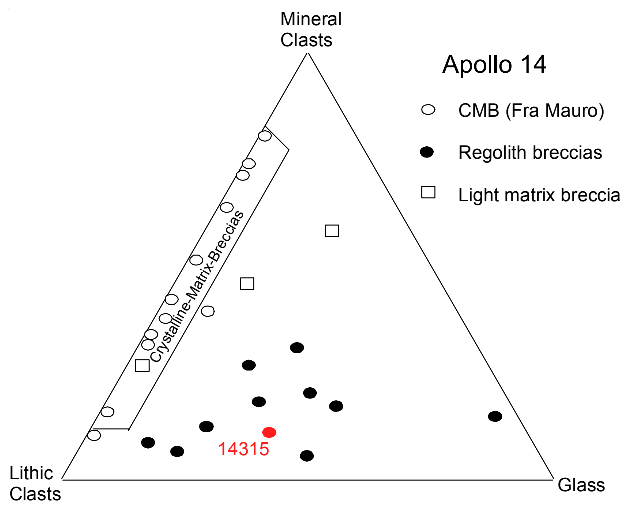


Figure 6: Modal makeup of 14315 (Simonds et al. 1977)

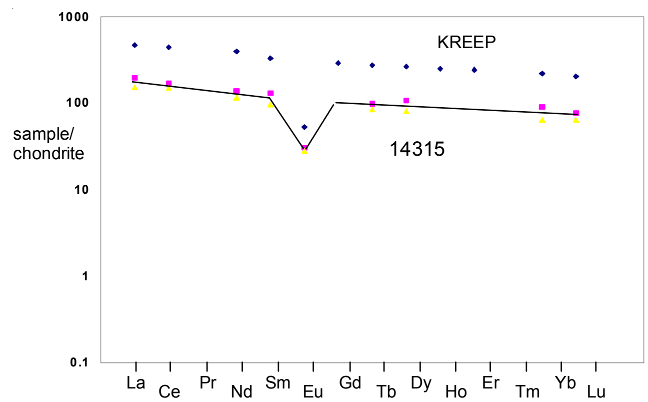


Figure 8: 14315 has relatively low REE.

Cosmogenic isotopes and exposure ages

Keith et al. (1972) determined a cosmic-ray-induced activity of ^{22}Na = 58 dpm/kg, ^{26}Al = 146 dpm/kg and ^{56}Co = 52 dpm/kg.

Processing

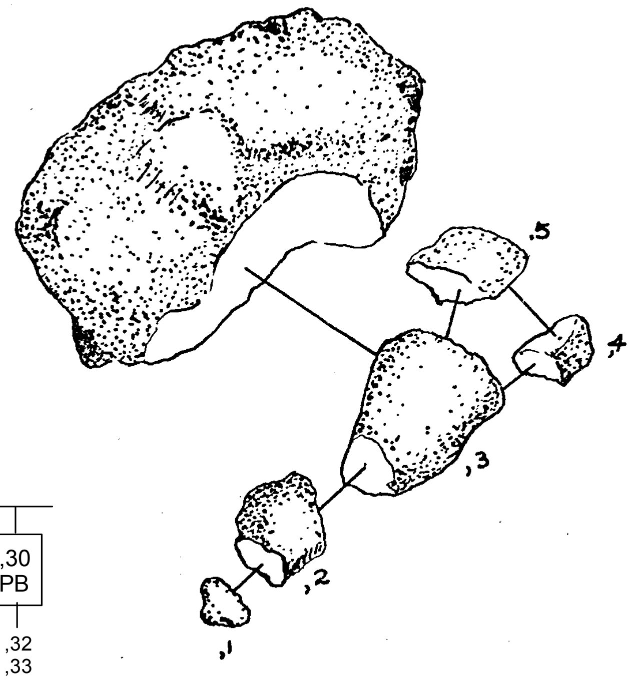
14315 was returned in weigh bag 1038 which was opened in the Crew Reception Area (figure 9) before the sample was entered into the NNPL for description. Thus 14315 was exposed to air in the LM, the CSM, the Pacific Ocean, and the Crew Reception Area for about a week before it was introduced to dry nitrogen.

The main mass was not cut by the messy wire saw (and is yet to be studied). There are 14 thin section of 14315.

Table 1. Chemical composition of 14315.

reference	Simon 89		Rose72		Jerde87		LSPET71		Keith72	
weight	158 mg						115 g		115	
SiO2 %			47.76	(c)	47	(b)				
TiO2	1.08	(b)	0.8	(c)	0.85	(b)				
Al2O3	21.8	(b)	21.31	(c)	22.1	(b)				
FeO	8.17	(b)	7.82	(c)	7.46	(b)				
MnO	0.12	(b)	0.11	(c)						
MgO	8.4	(b)	8.28	(c)	7.89	(b)				
CaO	12.9	(b)	12.77	(c)						
Na2O	0.63	(b)	0.76	(c)	0.57	(b)				
K2O	0.38	(b)	0.35	(c)	0.31	(b)	0.36	(a)	0.395	(a)
P2O5			0.23	(c)	13	(b)				
S %										
sum										
Sc ppm	16.3	(b)	18	(c)	15.6	(b)				
V	40	(b)	50	(c)						
Cr	1190	(b)			1240	(b)				
Co	31	(b)	30	(c)	33	(b)				
Ni	420	(b)	355	(c)	430	(b)				
Cu			10	(c)						
Zn			34	(c)						
Ga			5.2	(c)	6.6	(b)				
Ge ppb										
As										
Se										
Rb	12		10	(c)	10	(b)				
Sr	80		165	(c)	140	(b)				
Y			155	(c)						
Zr	450		400	(c)	520	(b)				
Nb			30	(c)						
Mo										
Ru										
Rh										
Pd ppb										
Ag ppb										
Cd ppb										
In ppb										
Sn ppb										
Sb ppb										
Te ppb										
Cs ppm	0.48	(b)			0.42	(b)				
Ba	520	(b)	410	(c)	380	(b)				
La	45.9	(b)	41	(c)	35.7	(b)				
Ce	103	(b)			91	(b)				
Pr										
Nd	63	(b)			53	(b)				
Sm	19.4	(b)			14.3	(b)				
Eu	1.72	(b)			1.56	(b)				
Gd										
Tb	3.6	(b)			3.1	(b)				
Dy	26	(b)			19.9	(b)				
Ho										
Er										
Tm										
Yb	14.8	(b)	11	(c)	10.4	(b)				
Lu	1.87	(b)			1.55	(b)				
Hf	12.7	(b)			11.3	(b)				
Ta	1.7	(b)			1.32	(b)				
W ppb										
Re ppb										
Os ppb										
Ir ppb	9	(b)			18.8	(b)				
Pt ppb										
Au ppb	13	(b)			12.7	(b)				
Th ppm	7.1	(b)			6.5	(b)	9.1	(a)	8.8	(a)
U ppm	2.1	(b)			1.6	(b)	2.5	(a)	2.14	(a)

technique: (a) radiation counting, (b) INAA, (c) "microchemical"



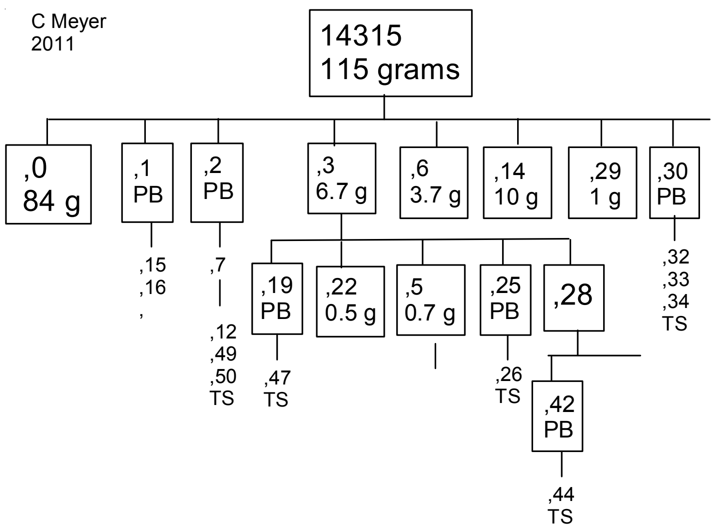


Figure 9: Crew Reception Area. On Apollo 14 (only) it proved necesary to get the rocks out while the astronauts could still remember where they had collected them!!

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