61015 DILITHOLOGIC (CATACLASTIC ANORTHOSITE AND BASALTIC IMPACT MELT) BRECCIA, PARTLY GLASS-COATED 1789 g

INTRODUCTION: 61015 consists of ~75% dark basaltic impact melt and ~25% white anorthosite. The melt/anorthosite contacts are sharp and form an unusual texture (Fig. 1). A vesicular glass partially coats two sides. The sample is tough and subangular.

61015 was collected 10 m south of Plum Crater and its orientation is known. Zap pits on only half of its surface suggest a fairly simple exposure history.

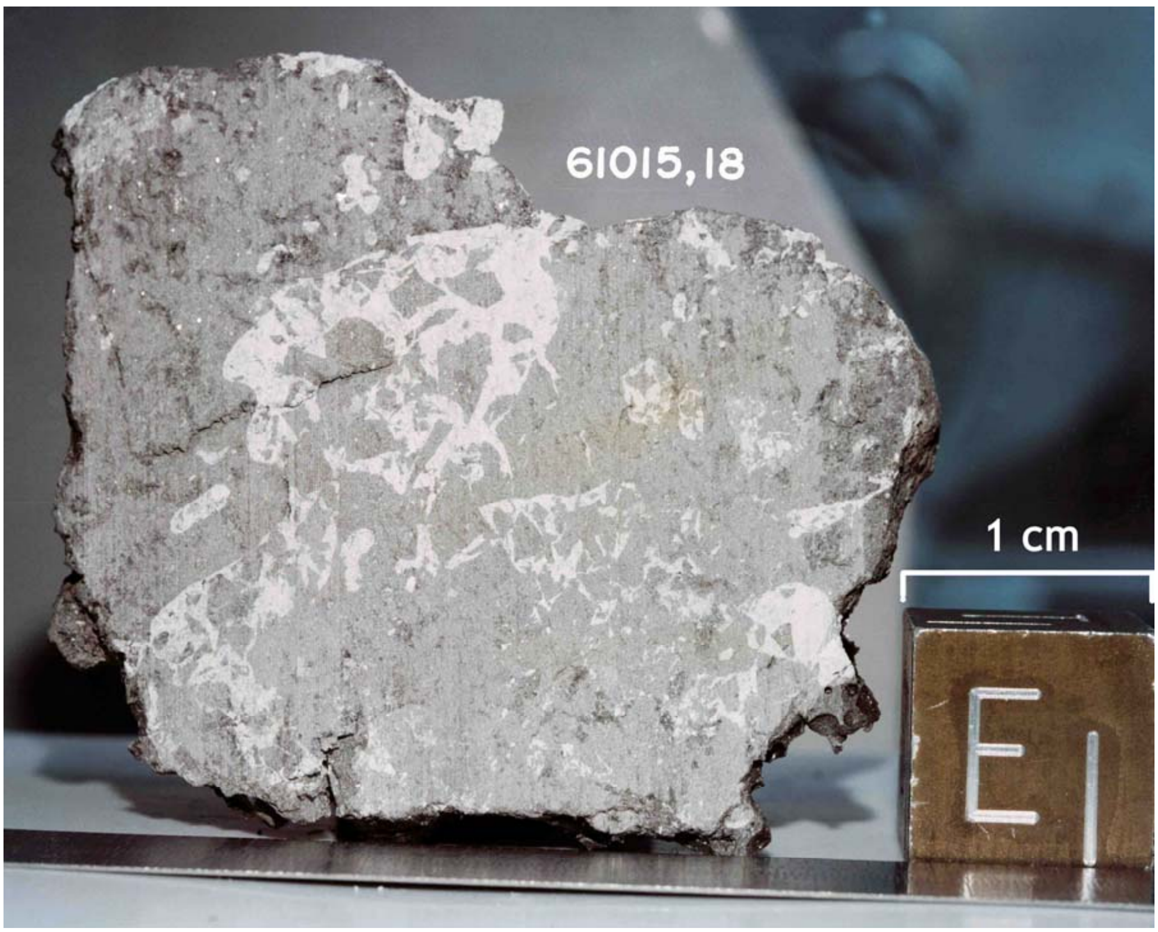

FIGURE 1. Sawcut face. S-75-20878.

PETROLOGY: A brief description is given by McGee et al. (1979) and 61015 is illustrated by LSPET (1973).

The basaltic impact melt (Fig. 2) is characterized by plagioclase laths less than 100 µm long subophitically embedded in small pyroxenes and abundant interstitial glass. Engelhardt (1978) lists it as poikilitic, but a poikilitic texture is only poorly developed. Clasts of shocked plagioclase are abundant. Individual fragments of the basalt have different grain sizes; a few are aphanitic and some glassy. No chilled margins are present.

The anorthosite is cataclastic and coarse—some plagioclases are 2 mm in diameter (Fig. 2). A few pyroxenes (up to 300 µm) are present; some have either exsolution or shock lamellae. Some opaques (chromite?), troilite, and Fe-metal are also present. Except for the distinct dark fragments, the anorthosite appears pure i.e. it is not intimately mixed on a small scale with extraneous material. The anorthosite probably intruded the basaltic impact melt in the rock-forming event. The saw-cut faces (e.g. Fig. 1) show zones of white material whose boundaries with the main dark masses are mainly smooth and curving; within the white zones, angular black fragments are prominent. In a few places the white forms small apophyses into the dark material. The anorthosite must have been fluid (e.g. hot gas charged debris) though not a silicate liquid during its injection. None the less, relationships between dark and white are not clearly established.

The glass coat (Fig. 2) is vesicular, brown-gray, and contains small metal blebs and plagioclase fragments. Its thermal effects on the impact basalt are optically visible for 300 µm into the rock. Thin (300 µm) veinlets of gray-brown, flow-banded glass penetrate the rock, apparently from the coat; these veinlets are opaque at their margins.

<u>CHEMISTRY</u>: Chemical analyses of the basaltic impact melt and an impure sample of the anorthosite are presented in Palme et al. (1978). Christian et al. (1976) present an analysis of the impact melt and of a mixed black-and-white split. The analyses of the melt and the impure anorthosite are summarized in Figure 3 and Table 1. The glass coat has not been analyzed.

The basaltic melt is aluminous, meteorite-contaminated and distinct from Apollo 16 soil compositions. The impure anorthosite sample is meteorite-contaminated and the analyzed sample probably contained some of the basaltic impact melt. The data indicate that the pure anorthosite is ferroan (FeO/MgO >1).

<u>MICROCRATERS</u>: Microcrater frequency distribution data for the surface of 61015 are reported by Neukum et al. (1973) and Morrison et al. (1973) (Fig. 4). Both papers note the rounded nature of the rock and that pits occur on only half of the surface, indicating a fairly simple exposure history. While Morrison et al. (1973) do not believe that this rock has a steady-state surface, Neukum et al. (lo73) consider that such equilibrium is likely.

<u>PROCESSING AND SUBDIVISIONS</u>: A few chips were removed from the rock prior to a saw cut being made to remove a butt end in 1973. Most of the sample remains as ,0 (1490 g). The butt end was split into ,18 (150 g); ,20 (93 g) and a number of other smaller pieces, some of which were further subdivided. Most of the allocations were from these latter chips.

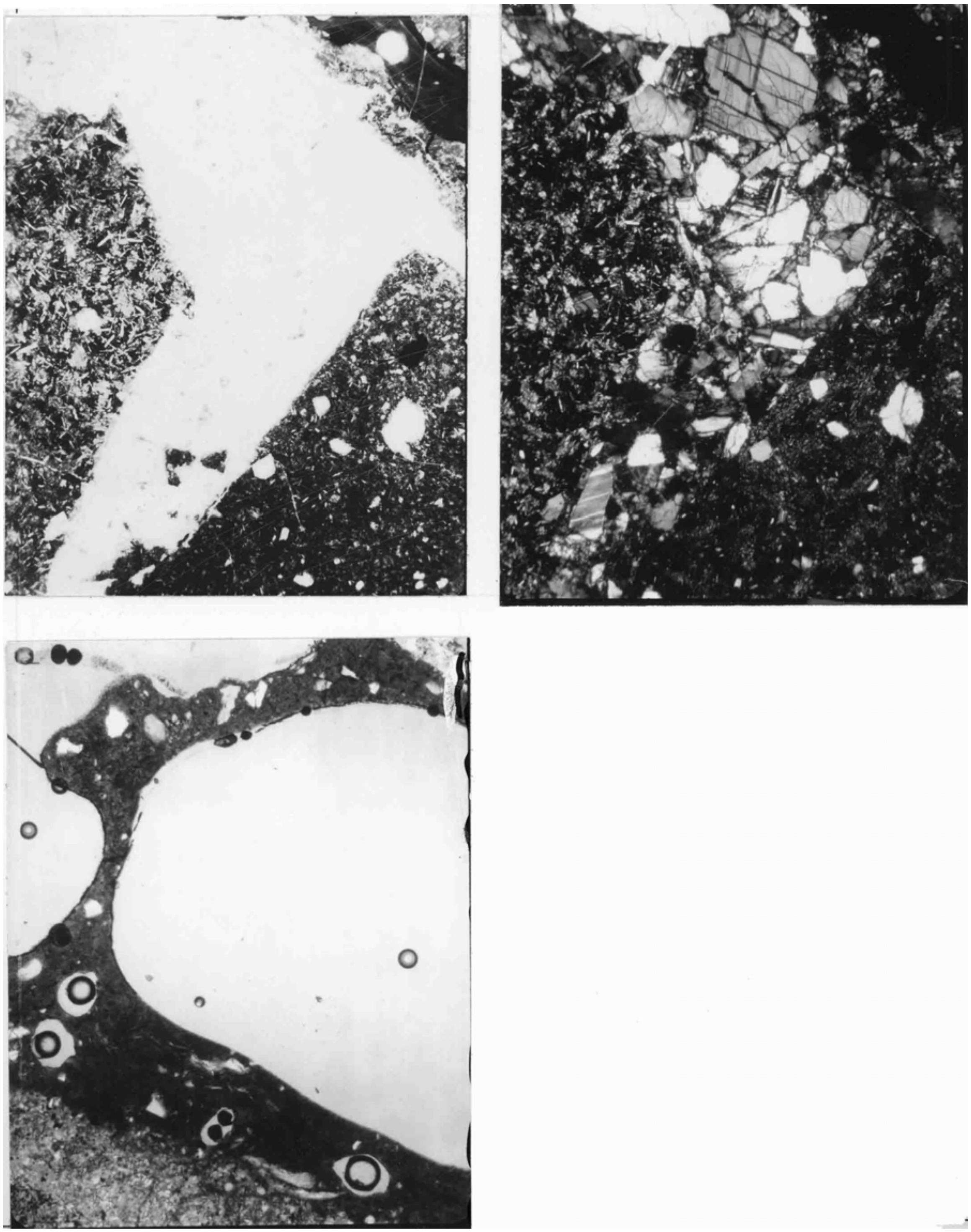

FIGURE 2.
a) 61015,14. Basaltic area, ppl. Width 2 mm.
b) 61015,14. Anorthosite, xpl. Width 2 mm.
c) 61015,40. Glass coat, ppl. Width 2 mm.

TABLE 1. Summary chemistry of basaltic impact melt and impure anorthosite in 61015.

	Basaltic Melt	Impure Anorthosite
SiO_2	45.4	45.5
TiO_2	0.70	0.27
Al_2O_3	23.	32.9
Cr_2O_3	0.14	0.05
FeO	6.6	3.0
MnO	0.09	0.03
MgO	9.7	2.9
CaO	13.5	17.8
N_2O	0.48	0.47
K_2O	~ 0.17	0.047
P_2O_5	0.19	0.087
Sr	~153	197
La	20.	7.6
Lu	0.9	0.32
Rb	4.0	
Sc	10.5	3.9
Ni	540-1160	690
Co	30-61	39.5
Ir ppb	29	13
Au ppb	20	14
C		
N		
S	2150	470
Zn		
Cu		

Oxides in wt%; others in ppm except as noted.

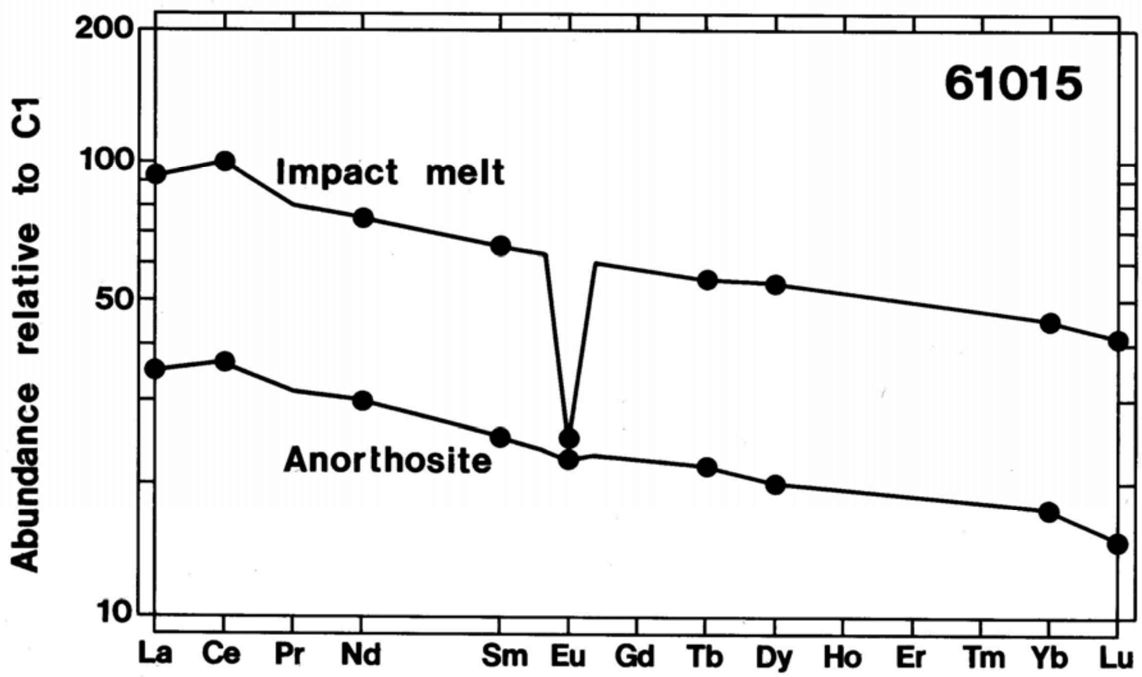

FIGURE 3. Rare earths; data from Palme et al. (1978).

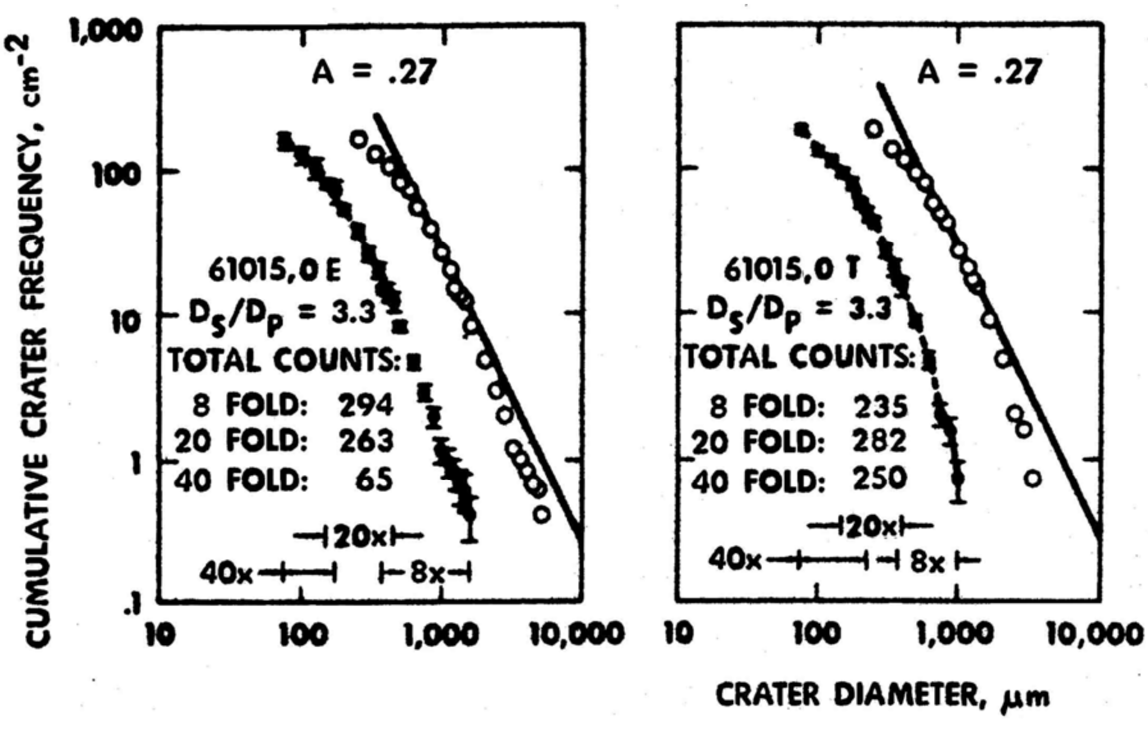

FIGURE 4. Microcraters; from Neukum et al (1973).