Introduction to Boulder at Station 7
Samples 77075, 77076, 77077, 77115, 77135, and 77215

The boulder at Station 7 is about 3 meters in size and is thought to have tumbled downslope from high on the North Massif (Wolfe and others, 1981). Fig. 1 is a map of the location of samples at Station 7. Although the Station 7 Boulder has nearly the same exposure age as the larger boulder at Station 6 (28 m.y. instead of 22 m.y.), the Station 7 Boulder has no boulder track that would allow us to know where exactly it came from on the North Massif.

Field observations of the boulder by the astronauts showed that it was composed of four main lithologies: large white norite clast (represented by sample 77215), cut by dark dikelets (77075, 77076, and 77077), enclosed in a blue-grey breccia (77115), which is in turn surrounded by a vesicular, green-grey breccia (77135). Fig. 2 is a photo of the southeast side of the boulder showing the locations of 77115 and 77135. The contact between the vesicular and nonvesicular lithologies is apparent. Fig. 3 is a sketch of the north side of the boulder showing the large (0.5 x 1.5 m) clast of norite with penetrating black veins. While the norite clast appeared off-white (light grey) in surface photography, the fresh surfaces of the samples (i.e., 77215) are pure white in the laboratory. At the time of sampling, Schmitt (in Schmitt and Cernan, 1973) observed that the dike material was continuous with the "blue-grey matrix-rich breccia" (represented by 77115) that surrounds the off-white norite clast that the dike cuts.

The Station 7 Boulder has a chemical composition that is distinctly different from the local soil on which it rests (Fig. 4). The composition of the matrix of the Station 7 Boulder (both 77115 and 77135) is similar to the composition of the matrix of the Station 6 Boulder, as well as that of several of the boulders from the South Massif (Fig. 5). In addition, the trace element data for siderophile and volatile elements by the Anders group show that these boulders are related (e.g., Hertogen et al., 1977). These similarities have led various authors to conclude that these boulders represent ejecta from the Serenitatus impact event (e.g., Winzer et al., 1975; Spudis and Ryder, 1981). James (1994) has reviewed the siderophile and volatile element composition.

CONSORTIUM

The boulder at Station 7 was systematically studied by the international consortium led by E.C.T. Chao (see the final report by Minkin et al., 1978). The original distribution of samples is recorded in Butler and Dealing (1974). Several interesting clasts have been identified (Fig. 6).

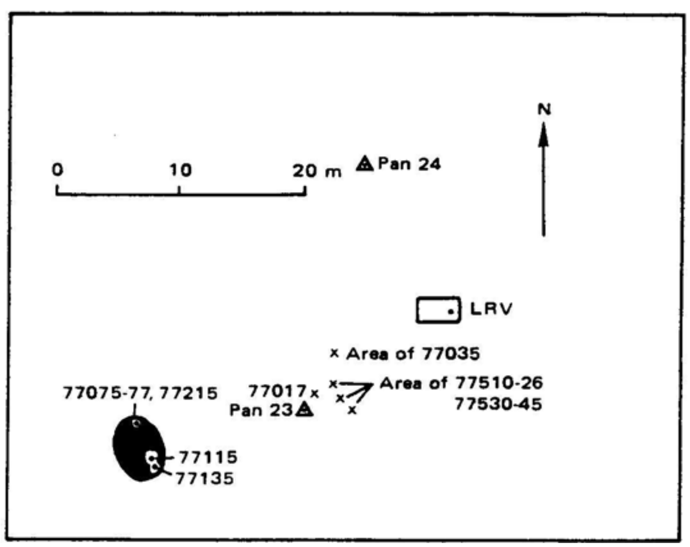

Figure 1: Planimetric map of Station 7. Map from Wolfe and others (1981).

HISTORY

The history of the Station 7 Boulder is discussed by Winzer et al. (1977), Nakamura and Tatsumoto (1977), Stettler et al. (1978), and Minkin et al. (1978). A summary of the age data for samples of the Station 7 Boulder is given in Table 1, taken from Minkin et al. (1978). Measured ^{39}Ar-^{40}Ar ages are generally consistent with the apparent stratigraphic sequence (Fig. 7). The large white norite clast, represented by sample 77215, has been dated by Rb-Sr and Sm-Nd at about 4.4 b.y. (Nakamura et al., 1976), while the plagioclase in a norite clast within 77215 gave an ^{39}Ar-^{40}Ar plateau age of 3.98 (Stettler et al., 1978).

The dike through the clast (77075) was dated at 4.07 b.y. by Nakamura and Tatsumoto and at 3.97 b.y. by Stettler et al. The matrix of the breccia (77115 and 77135) has a Rb -Sr age of - 3.75 b.y. by Nakamura and Tatsumoto, while Stettler et al. determined about 3.9 b.y. (see the age discussion of individual samples). It is worth noting that the different ages for the dike (77075, age 3.97 ± 0.04 b.y.) and the surrounding breccia (77115, age 3.90 ± 0.03 b.y.) are not in agreement, which is surprising; because of Schmitt's observation that the dike was continuous with the breccia matrix (see discussion in 77075).

According to Arvidson et al. (1975), the final emplacement of the Station 7 Boulder is one of only a few well-dated events on the Moon. The ^{81}Kr-Kr exposure age is 28.6 m.y. (Crozaz et al., 1974), while its Ar spallation age is reported as 27.5 m.y. (Stettler et al., 1974). The apparently discrepant young cosmic ray track ages (5.4 m.y.) are explained by loss of a few centimeters of boulder surface about 5 m.y. ago (Arvidson et al., 1975).

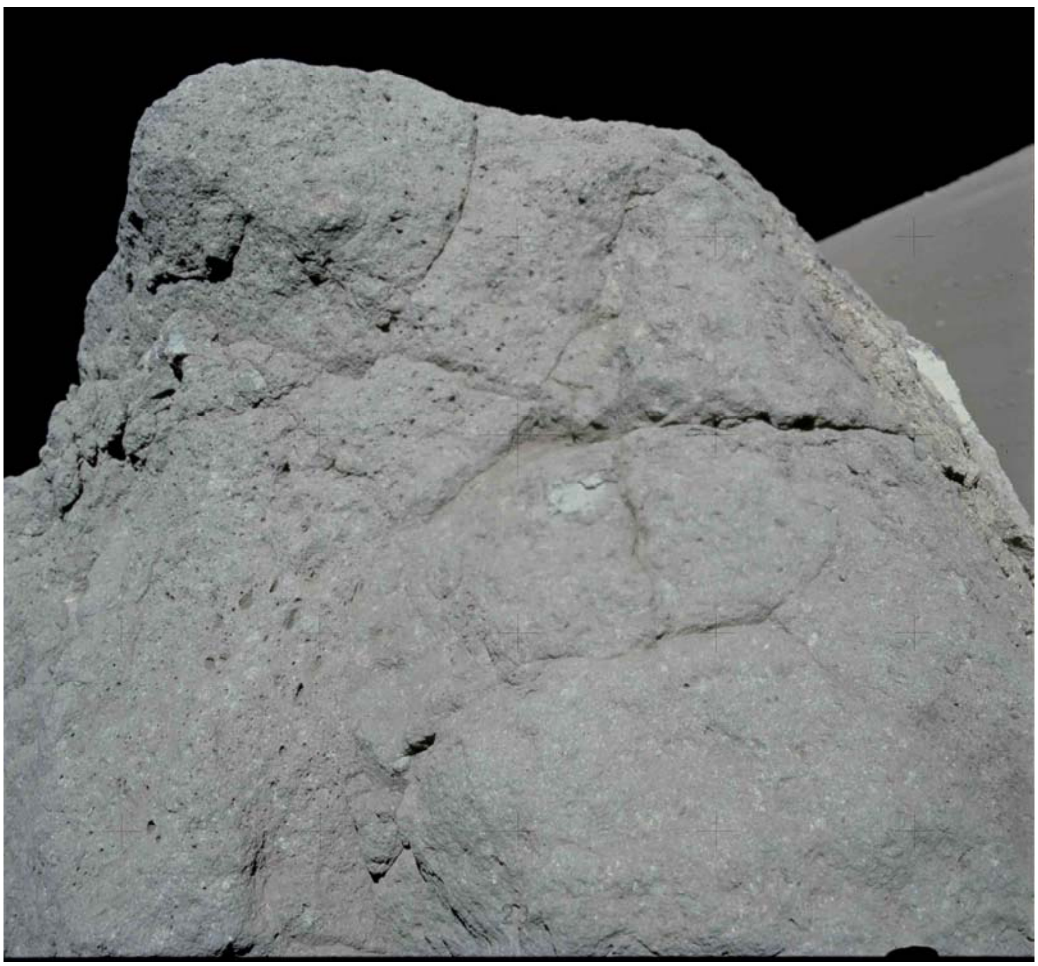

Figure 2: Photo of southeast side of 3-meter boulder al Station 7 showing location of samples taken. AS17-146-22336.

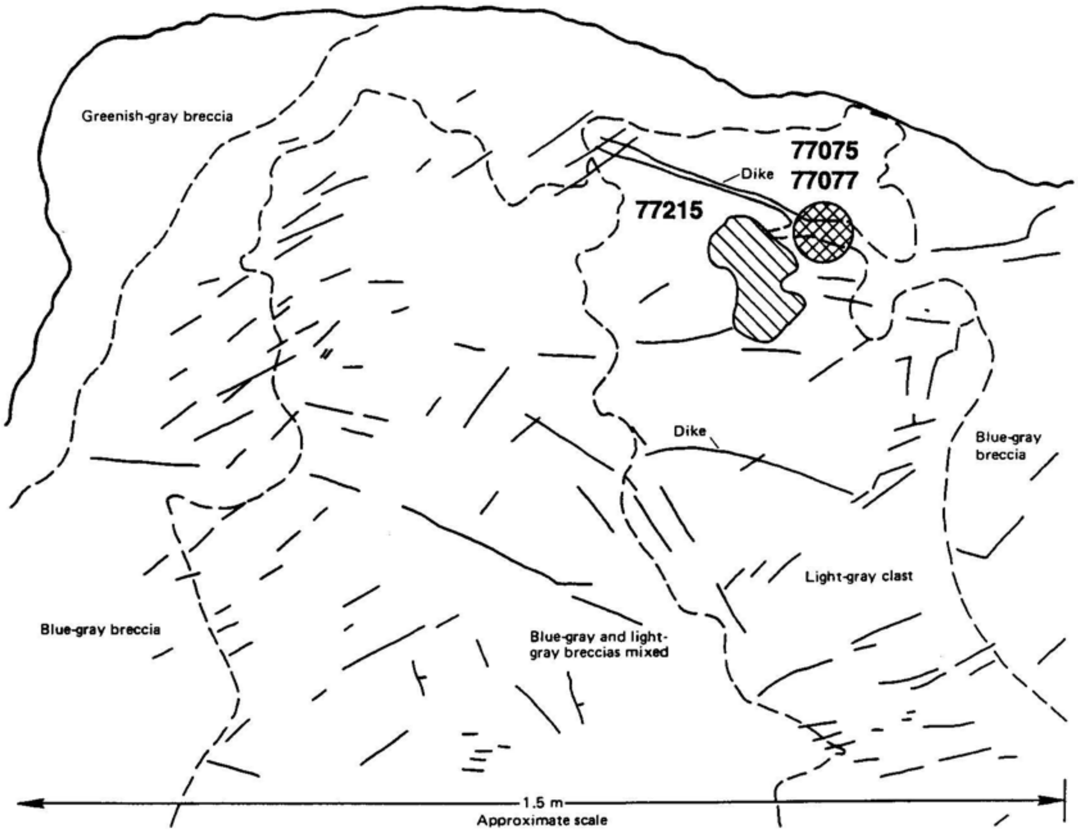

Figure 3: Sketch of north side of Station 7 Boulder, showing large norite clast (light grey clast) with penetrating veins and the location of the samples taken (from Wolfe and others, 1981).

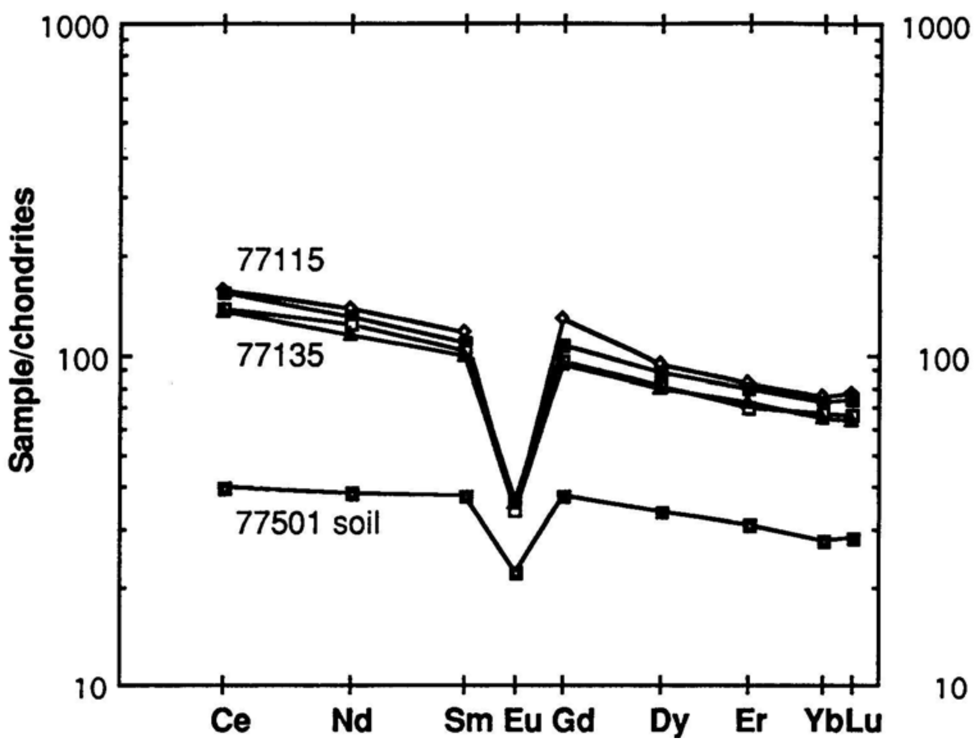

Figure 4: Normalized rare earth element data for Station 7 matrix samples compared with Station 7 soil sample (77501). Data from Wiesmann and Hubbard (1975).

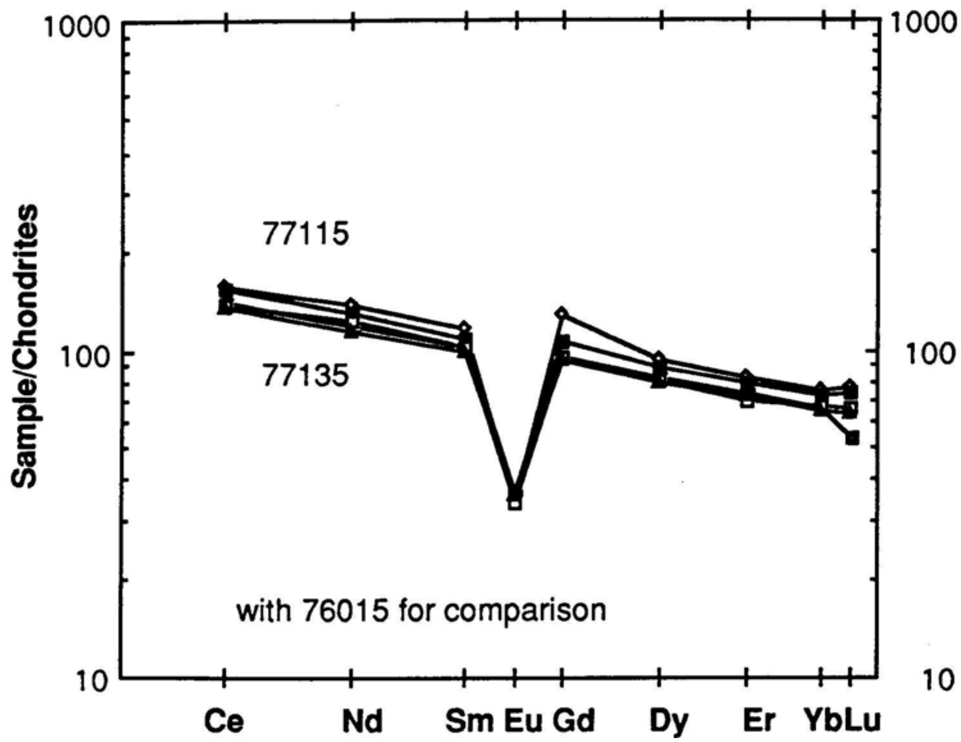

Figure 5: Normalized rare earth element data for Station 7 matrix samples compared with Station 6 Boulder sample (76015). Data from Wiesmann and Hubbard (1975).

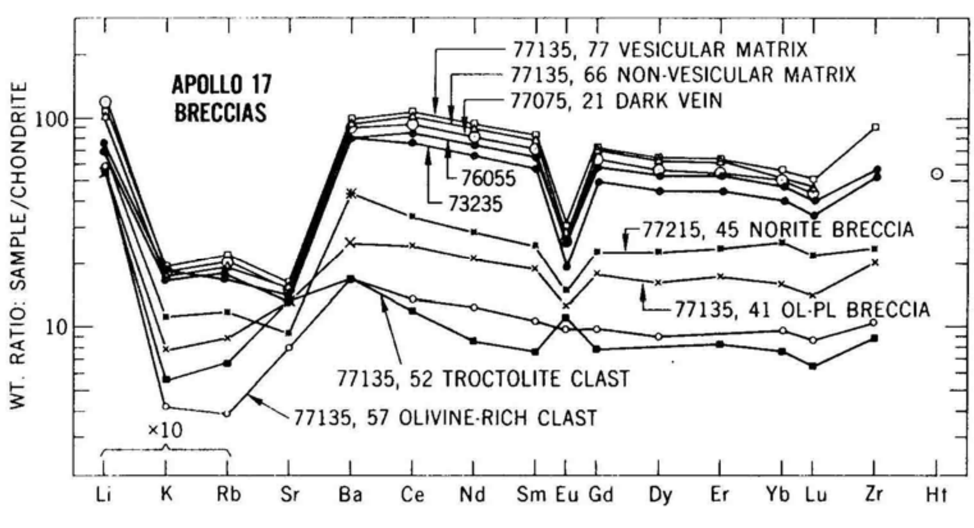

Figure 6: Normalized rare earth diagram from Philpotts et al. (1974) comparing compositions of Apollo 17 breccias and clasts in Station 7 Boulder.

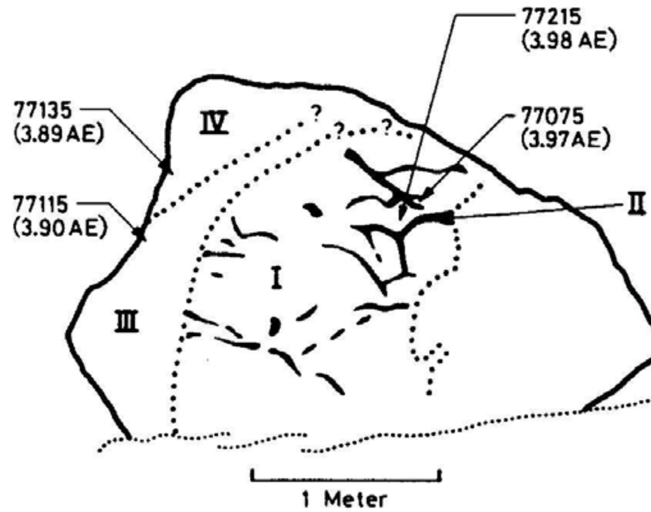

Figure 7: Summary of Ar plateau of different lithologies in Boulder 7. From Stettler et al. (1978).

Table 1: Summary of ages of Station 7 Boulder samples (b.y.).
From Minkin et al. (1978).

Sample	$^{40}Ar/^{39}Ar$	Rb/Sr	Sm/Nd	U-Pb	$^{207}Pb/^{206}Pb$
77075					
Dikelet	3.97 ± .04(2)	4.07 ± .09(3)			4.48(6)
77115					
Matrix	3.90 ± .03(2)	3.8 ± .2(5)			4.45(6)
77135					
Matrix	3.90 ± .04(4)	~3.75(5)			4.40(6)
Clast type 1	3.88 ± .05(2)	3.89 ± .08(6)			4.37(6)
Clast type 2	3.99 ± .02(1)				
77215	3.98 ± .03(2)	4.42 ± .04(5)	4.37 ± .07(5)	3.8 ± .2(6)	4.49(6)

(1)Stettler et al. (1974)
(2)Stettler et al. (1978)
(3)Nakamura and Tatsumoto (1977)
(4)Stettler et al. (1975)
(5)Nakamura et al. (1976)
(6)Nunes et al. (1974a)