CONSORTIUM 67915: AGES AND COMPOSITION OF TROCTOLITIC ANORTHOSITES AND SODIC FERROGABBRO CLASTS. U. Aeschlimann[1], P. Eberhardt[1], J. Geiss[1], N. Groegler[1], D. Jost[2], M. S. Ma[3], K. Marti[2], R. Schmitt[3], and J. Taylor[4]. Phys. Inst., Univ. of Bern, Switz., [2]B-017, Univ. of Calif., San Diego, La Jolla, Ca., [3]Oregon State Univ., Corvallis, Oregon, 97331, [4]Inst. for Meteoritics, Univ. of New Mexico, Albuquerque, 87106.

Breccia 67915 was taken from a boulder near the rim of the 50 My old North Ray Crater [1]. One of the two main lithologies is white and composed of rounded clasts of fine-grained anorthositic breccias, the other has a gray color and is clearly polymict [2]. Sodic ferrogabbros [3] and troctolitic anorthosites occur as clasts within the gray breccia. Glass veins cut all the lithologies and the shock event that produced them must have been the most recent that affected the rock. Descriptions and ages of some clasts of the major lithologies were reported earlier [4]. A minority of clasts in 67915 might represent pristine lunar rocks. Two clasts of troctolitic anorthosites and some sodic ferrogabbros were studied by the consortium.

Troctolitic anorthosites: Two main textural varieties are observed [2] and one member of each was studied. Type A (sample ,26) reveals a cumulate texture with large plagioclase ($\gtrsim$ 1mm) and intercumulus olivine and is severely shocked. The composition of a total rock sample is similar to that of the plagioclase separate (Table 1). Plagioclase was studied by the ^{39}Ar-^{40}Ar method, and the data for one aliquot are shown in Fig. 1. Aliquot ,26 Pl-1 shows a plateau age for 30% of the ^{39}Ar release corresponding to an age of 4.15 $\pm$ 0.07 Gy, while aliquot Pl-2 indicates a slightly lower plateau age of 4.04 $\pm$ 0.05 Gy. These results show that the shock event has not totally erased the plateau age information. Type B lithology (sample ,67) shows a granular, but not necessarily metamorphic texture; plagioclase grains are smaller and olivine appears to be homogeneous and has a composition of Fo_{75}. The relative abundances of the REE are similar in both types (except Eu), but the concentrations in type B are higher by factor of ~13, which shows that the two types are distinct. The ^{39}Ar-^{40}Ar age data of ,67 aliquot display a continuous rise, and the last 25% of the ^{39}Ar release data establish only a minimum age of > 3.5 Gy. Xe data in this clast (Table 2) show a significant fission component. Spectrum decomposition does not allow a clear separation into Pu and U-derived fission components. The ratio $^{136}Xe_F/^{126}Xe_S$ of fission to spallation components is about twice that in bulk samples of 67915 [4], and we obtain similar concentrations for the ^{238}U and ^{244}Pu derived fission components. This implies a fission xenon clast age $\gtrsim$ 4.0 Gy which is consistent with the ^{39}Ar-^{40}Ar plateau age of clast ,26.

Sodic ferrogabbros: This unique lithology is characterized by the presence of sodic plagioclase, iron-rich pyroxene and ilmenite with minor amounts of silica and K-feldspar [2]. All clasts are cataclastic, and it is difficult to determine the original texture. REE abundances (Table 1) are about one-fourth those in KREEP. Although our earlier attempt to obtain a ^{39}Ar-^{40}Ar plateau [4] was not successful, we studied two additional clasts of this type and prepared a plagioclase separate of sample ,163 for Ar-Ar dating. The release systematics (Fig. 2) show large Ar losses, but there are indications of plateaus in the low-temperature data and in the fractional releases between 85% and 97% of the ^{39}Ar release. The event required to generate the low-temperature plateau must have occurred more recently than 0.3 Gy ago and may well have been the North Ray Crater impact. A dip to similar low $^{40}Ar/^{39}Ar$ ratio is also observed in troctolitic anorthosite ,67. The indication of a short (4 step) plateau corresponding to an apparent age of about 3.1 Gy in both clasts may suggest a late time of formation of sodic ferrogabbros, a metamorphic event at time, or represent an artifact of the event that reset the clock.

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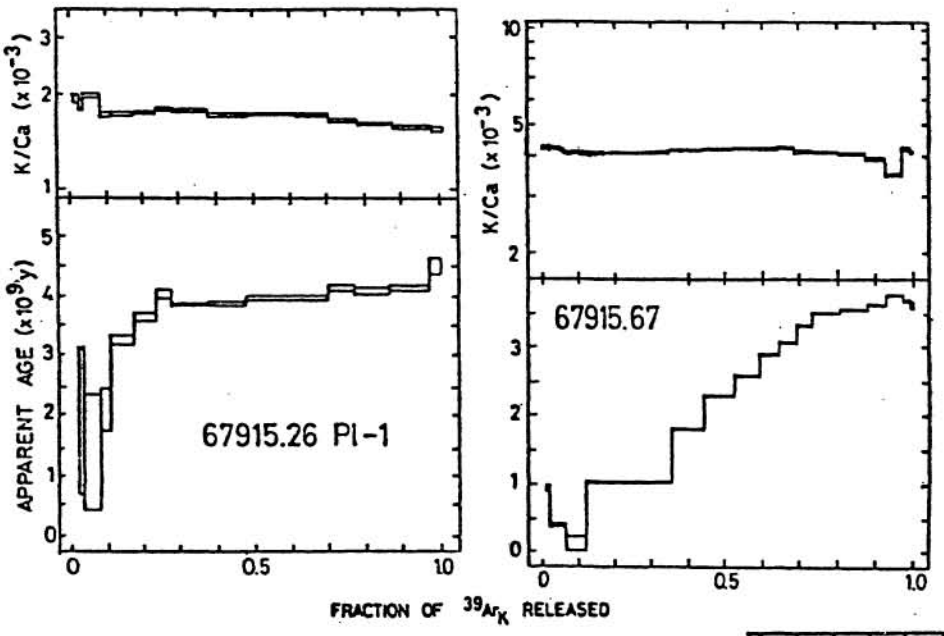

Fig. 1

Table 1. Element Abundances in Clasts From 67915[a]

	67915,26 plag. (9.8 mg)	67915.26 Troctolite (T.R.) (21.1 mg)	67915.67,03 Troctolite (T.R.) (16.5 mg)	67915,163,01 Sodic Ferrogabbro (T.R.) (4.13 mg)
TiO_2 (%)	<0.3	<0.2	<0.2	6.0
Al_2O_3	33.7	28.6	30.4	8.4
FeO	1.1	7.1	2.6	13.6
MgO	2.1	4.7	5.1	3.8
CaO	19.6	17.2	18.2	8.9
Na_2O	0.385	0.297	0.519	1.35
K_2O	0.031	0.026	0.067	0.46
MnO	0.014	0.077	0.027	0.199
Cr_2O_3	0.005	0.023	0.026	0.034
Sc (ppm)	0.7	1.9	1.2	34
V	<12	<12	<10	<10
Co	2.8	14.2	7.1	6.6
Zr	--	--	--	320
Ba	--	--	75	390
La	0.48	0.40	5.1	26.7
Ce	0.8	0.7	11	62
Nd	--	--	7	45
Sm	0.13	0.13	1.90	13.1
Eu	1.80	0.83	1.15	2.45
Tb	--	--	0.32	2.85
Dy	--	--	2	19
Yb	0.064	0.072	0.93	11.2
Lu	0.0068	0.010	0.13	1.58
Hf	--	--	1.2	9.6
Ta	--	--	0.5	2.9
Th	--	--	2.1	4.7
U	--	--	0.4	0.8
Au (ppb)	--	--	--	44

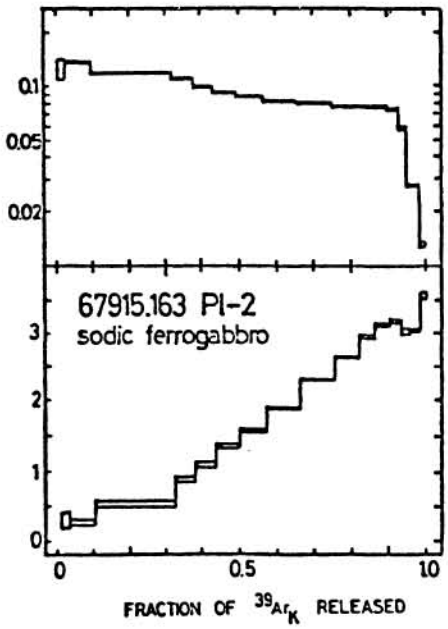

Fig. 2

Table 2: Xe in TROCTOLITIC ANORTHOSITE 67915,67.

	^{132}Xe $x10^{-12}$cc STP/g	124	126	128	129	130	131	132	134	136
750°	0.12	0.92 ± .17	1.70 .30	12.36 .63	156.7 7.0	17.34 .58	91.6 6.3	100	46.2 2.8	34.3 2.2
1100°	0.36	13.82 ± .37	23.68 .60	39.87 .99	101.2 4.9	32.51 1.14	133.6 4.2	100	42.45 1.56	38.58 .90
1400°	0.37	25.03 .67	40.59 .90	73.46 1.06	107.0 5.5	54.45 1.70	189.3 6.8	100	43.97 .60	40.62 .55
1700°	0.072	10.90 .77	19.64 1.02	38.6 3.3	101.1 15.7	31.6 1.0	127.6 7.4	100	35.1 1.4	31.2 1.2

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References:

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