POSSIBLE PYROCLASTIC GLASSES ASSOCIATED WITH APOLLO 15 KREEP BASALT FRAGMENTS. Beth B. Holmberg, Center for Astrophysics, 60 Garden Street, Cambridge, MA. 02138; and Abhijit Basu, Department of Geological Sciences, Indiana University, Bloomington, IN. 47405

Pristine volcanic glasses from the moon represent primary magmas better than crystalline basalts. Although more than 25 pristine glasses have been identified [1], none may be related to KREEP basalts. KREEP basalts occur only as small fragments in our lunar sample collection; their small size prevents any adequately comprehensive investigation [cf. 2]. It is also not certain if any lunar glass with KREEP composition is truly volcanic. Hence, even the bulk composition of a possible primary KREEP basalt magma cannot be constrained with confidence. Therefore, a search for material that may constrain the compositional variability of KREEP basalt magmas is important.

We have surveyed several hundred KREEP basalt fragments in Apollo 15 soils. A characteristic yellow to reddish-yellow glass is present in some of these fragments. The glass occurs in mesostasis, as fracture fillings, and rarely as partial encrustation on some fragments. Optically the glass appears to be homogeneous although the hue may change from one part of a fragment to another. Back-scattered electron images show more variation in brightness; the variation is usually continuous but at places fairly sharp boundaries between adjacent regions may be seen. However, the boundaries are not curvilinear enough to suggest liquid immiscibility, a feature that is very common in Apollo 15 KREEP basalt mesostasis. Minute crystals of pyroxene occur sporadically in some glassy areas. These glass-laden KREEP basalt fragments could be (a) pyroclastic particles from a KREEP basalt eruption, or (b) clasts caught up in impact melts either on a KREEP basalt lava flow or on a KREEP basalt regolith. We have analyzed glasses in six such fragments with an electron microprobe to ascertain what these particles might represent, and to find if the glass-compositions may in any way constrain the origin, fractionation, and eruption of KREEP basalts. Depending on the size of glassy areas of the same color and hue, 12 to 25 analyses were performed on each to obtain average compositions of twelve domains (Table 1).

The glasses show considerable compositional variation within and between fragments. Impact melts are expected to be fairly uniform in composition regardless of scale, from large melt sheets to agglutinitic glass [3,4]. Therefore, these fragments are probably not clasts caught up in impact melts. In general, the glasses are low in Mg, moderately high in Ti, and fairly high in P and K (Table 1). KREEP glass of impact origin in polymict breccia 66055 is more magnesian and less titaniferous than these glasses [5]. The composition of the yellow glass clod from the Apollo 15 core 15010 is similar to some of the glasses that we have analyzed, but the clod is very homogeneous and represents an impact melt [6]. If igneous, the glasses that we have analyzed represent evolved compositions. Plots of the variation of weight percents of TiO_2, P_2O_5, K_2O, and Cr_2O_3 with respect to $MgO/(MgO+FeO)$ in our preliminary analyses appear to suggest that the compositions of these glasses represent a continuum compatible with igneous fractionation processes (Fig. 1).

We conclude that these particles are likely to be pyroclastic fragments of KREEP basalts. The glasses represent evolved compositions of KREEP basalt magmas. We envisage a scenario in which late stage KREEP basalt magmas erupted violently enough to fragment and incorporate previously crystallized basalts, and deposited pyroclastic material on the moon.

REFERENCES : [1] Delano, J.W. and Heiken, G.H., eds. (1990) *Workshop on Lunar Volcanic Glasses: Scientific and Resource Potential*, LPI Tech. Rpt. 90-02. Lunar Planet. Instt., Houston, 74 p. [2] Ryder, G. and Steele, A. (1988) PLPSC 18th, 273-282. [3] Phinney, W.C. et al. (1977) in *Impact and Explosion Cratering* (Roddy, D.J. and Merrill, R.B., eds), 771-790. [4] Basu, A, and McKay, D.S. (1985), PLPSC 16th, D87-D94. [5] Ryder, G. and Blair, E. (1982) PLPSC 13th, A147-A158. [6] Delano, J.W. et al., (1982) PLPSC 13th, A159-A170.

Table 1. Average composition of yellow/reddish-yellow glass in KREEP basalt fragments

No.	SiO_2	Al_2O_3	FeO	MgO	K_2O	P_2O_5	TiO_2	MnO	CaO	Na_2O	Cr_2O_3	Total
SA0988	51.37	13.69	11.49	6.82	0.69	1.22	3.28	0.14	10.01	0.62	0.27	99.60
SA0988	49.86	14.99	11.62	8.75	0.45	0.84	2.23	0.14	10.72	0.82	0.25	100.67
SA0423	48.92	12.32	13.91	7.01	0.63	1.83	4.09	0.19	10.56	0.80	0.26	100.52
SA0423	48.32	14.01	15.88	7.79	0.29	0.60	3.22	0.21	10.73	0.43	0.20	101.68
SA0423	48.20	9.51	18.75	4.37	1.24	1.91	3.39	0.25	9.70	0.50	0.13	97.93
SA0486	48.11	9.43	17.38	5.24	0.72	1.78	5.10	0.24	10.07	0.52	0.19	98.79
SA0486	47.77	8.91	19.23	5.71	0.63	1.78	5.65	0.25	10.85	0.41	0.26	101.45
SA0486	47.54	8.18	20.22	6.11	0.46	1.58	5.63	0.26	10.74	0.38	0.26	101.36
SA0486	47.28	6.84	21.47	6.07	0.40	1.61	6.00	0.27	10.68	0.36	0.27	101.25
SA0980	47.22	10.39	16.04	5.55	0.84	2.44	5.66	0.22	10.82	0.77	0.25	100.20
SA0469	44.86	9.14	20.77	4.97	0.31	2.09	5.93	0.25	11.02	0.53	0.16	100.03
SA0943	44.50	9.06	20.87	4.93	0.28	2.27	5.96	0.26	11.16	0.52	0.16	99.97

These fragments occur in : 15005,256; 15006,146; 15006,175; 15602; 15102; 15272.

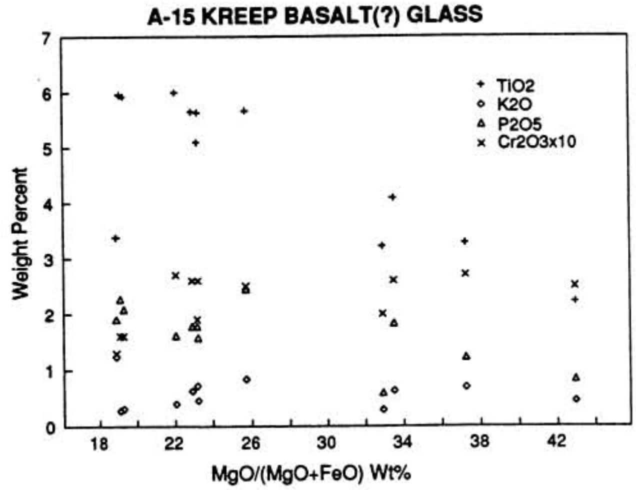

Figure 1. Oxide variation diagram of the average compositions of yellow and reddish-yellow glass associated with KREEP basalt fragments in Apollo 15 soils.