

GEOCHEMICAL AND PETROLOGIC STUDIES OF CLASTS IN APENNINE FRONT BRECCIA 15459. Marilyn M. Lindstrom (NASA, JSC, Houston, TX and Washington U, St. Louis, MO) and Ursula B. Marvin (Smithsonian Astrophysical Observatory, Boston, MA)

The nature of the lunar highlands crust at the Apennine Front remains an unsolved problem. Of the breccias collected at the front, only the impact melt breccias have been studied in detail. Although breccias 15445-15455 may contain clasts of deep-seated origin and may represent Imbrium impact melt [1], they do not have the overall composition of the Apennine Front [2]. In order to evaluate the highlands components of the Apennine Front, we undertook a detailed consortium study of 15459, a regolith breccia containing abundant light clasts, presumably of highlands origin, and relatively few KREEP and mare basalt clasts [3]. We report here on the petrology and composition of 20 clasts.

Highlands lithologies in 15459 range in composition from anorthosite to norite, and in texture from coarse-grained plutonic rocks to fine-grained impact melt rocks. Almost all of the clasts have been crushed and recrystallized to some degree, but a few exhibit relict plutonic textures. Anorthosite 274 (INAA sample)/337 (probe mount) is a cataclastic anorthosite consisting almost entirely of coarse (up to 1.5 mm), crushed plagioclase (An97). Its bulk composition is fairly typical of ferroan anorthosites with very low transition metal and REE concentrations (Fig 1). Anorthositic gabbro 279/339 consists of 70% plagioclase (An92) and 30% Al-rich pyroxene (En66Fs32Wo2, En52Fs23Wo25). The texture is cataclastic, with relict plagioclase grains up to 2-3 mm. The bulk composition is Ca-rich (13% CaO) and Fe-poor (7% FeO) and has moderately low REE concentrations. Gabbro 292/343 is a coarse-grained (1-2 mm), pyroxene-rich (65-70%) plutonic rock. Mineral compositions are uniform: Plagioclase is An91; pyroxene is En60Fs37Wo3 or En41Fs15Wo44. The minerals have been crushed and plagioclase partially recrystallized, but the relict igneous texture is preserved, and even is visible across a fault trace. The bulk composition is that of a mafic ferroan rock (11% FeO, 18 ppm Sc). Its REE pattern (Fig 1) shows the strong positive slope typical of pyroxene.

Granulitic and poikilitic textures are found in several of the other highland clasts. Sample 288/289 is a granulitic gabbroic anorthosite. It contains coarse-grained mineral and lithic clasts in a fine-grained granulitic matrix. Its bulk composition is similar to other Fe- and REE-poor granulitic rocks [4]. A total of five clasts with varying textures fall in the broad group of anorthositic gabbro impact melts. Clast 309/346 is a medium-grained poikilitic rock containing pyroxene chains to 0.7 mm and patches of plagioclase to 0.9 mm. The largest highland clast in 15459 (320/348), is a very inhomogeneous recrystallized impact melt containing large mineral and lithic clasts in a matrix of variable grain size. These two texturally distinct rocks and clasts 231, 301 and 308 have similar compositions with 5-8% FeO, 12-14% CaO and siderophile element concentrations below detection limits. Their REE concentrations at 20-30 X chondrites are intermediate between melt groups D and E [5].

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The eight samples of gabbroic impact melts have fine-to-medium grained melt textures. All show measureable siderophile element contamination, and have FeO 7-10% and CaO 10-14%, but REE concentrations vary by a factor of three. Clasts 286 and 317 fall in the D melt group with 15445-15455. Four clasts, 300, 303, 305, 329, are group B melts, while clasts 313 and 290 fall intermediate between groups B-C and A-B respectively [5]. Thus while there appears to be some clustering of impact melt compositions, the variability of REE concentrations is almost continuous.

Even the younger basaltic components of 15459 show evidence of crushing and some recrystallization. KREEP basalt 315/316 is a partially recrystallized gabbroic rock with a composition similar to other Apollo 15 KREEP basalts, but enriched in REE. Mare basalt 327/328 is a fibrous-textured partially recrystallized basalt with FeO and REE concentrations lower than other Apollo 15 mare basalts. Green glass clod 277/338 has a composition similar to typical Apollo 15 green glass, but with slightly higher REE.

Thus the textures and compositions of clasts in regolith breccia 15459 are highly variable. Most of the clasts have been extensively effected by melting and metamorphism so that composition and texture do not necessarily correlate. More work is required in order to place these samples in the context of the evolution of the highlands crust.

REFERENCES. [1] Ryder and Bower (1977) PLSC 8, 1895-1923. [2] Korotev (in press) PLPSC 17. [3] Lindstrom (1986) LPSCXVII, 486-487. [4] Lindstrom and Lindstrom (1986) PLPSC 16, D263-D276. [5] Ryder and Spudis (in press) PLPSC 17.

Fig. 1

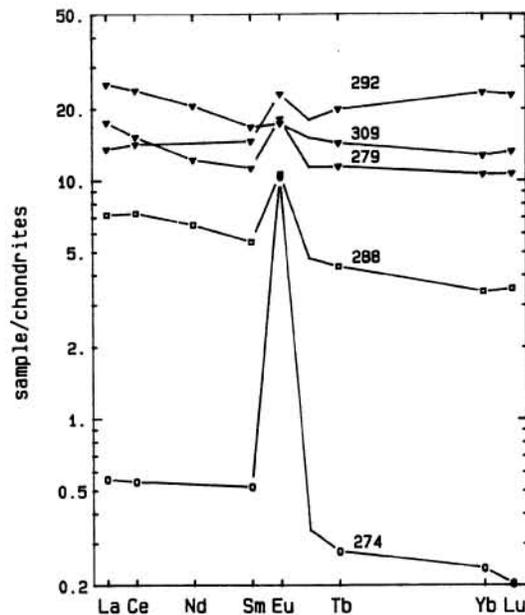


Fig 2

