CHEMISTRY OF THE APOLLO 15 APENNINE FRONT: HIGHLAND LITHOLOGIES;

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In a study of Apollo 11 and 12 highland components, Laul et al. (1) and Laul (2), reported several major highland groups on the basis of bulk chemistry. For example, in the Apollo 11 suite the dominant highland component was 2X to 10X (chondrite) REE abundances with a positive 10X to 14X Eu anomaly and there were three new chemical groups. In the Apollo 12 suite there were 11 highland groups reported and among them were four new chemical groups. The Apollo 11 highland component was dominated by low-K KREEP, while the Apollo 12 highland component was dominated by the high-K KREEP. These findings prompted us to extend our coordinated study of chemistry and petrology (Simon and Papike, 1987) to the Apollo 15 highland component and address the questions: 1) how do the chemical groups compare with the petrographic groups? and 2) how do the Apollo 15 highland fragments compare with the known moon-wide highland suite? In addition, the impact melt rocks comprise a very important component of the Apennine Front and their chemical characterization may reveal the history of impact events relating to the ejecta from the Imbrium Basin, and perhaps Serenitatis (4).

Fragments were hand-picked at JSC from coarse fines 15223, 15263, and 15303, (2-4 mm) and 15264, 15294, 15304, 15314, and 15434 (4-10 mm). Each of the fragments was split in half; one-half was used for the petrologic study (3) and the other for chemistry of about 30 elements by sequential INAA. Twenty-five fragments were analyzed and fall into four major petrographic groups. These are: poikilitic/granulitic rocks (3 samples); plutonic suite... anorthosite (2 samples) and anorthositic gabro (1 sample), anorthositic norite (2 samples); KREEP basalt (5 samples); and impact melt rocks (12 samples). Their chondrite normalized REE patterns are shown in Figures 1 to 3.

Consistent with earlier observations (1,2), bulk chemical variations are significant in each petrographic group and the variations are even greater in trace elements (Figs. 1 and 2). Thus, the highland chemical groups are represented by a range of petrographic types. Among the fragments studied (Figs. 1 and 2) there appears to be no new chemical groups recognized. All the fragments fall into the already recognized suite. The dominate highland suite appears to be medium-K KREEP and anorthosite at the Apollo 15 site.

The tweleve melt rocks show variations in REE elements by a factor of about 8 (Fig. 3). Ryder and Spudis (4) reported chemical data for fifteen melt rocks and classified them into five groups. Our melt rocks fall into their groups B, C, and D. In addition, there are two new groups; 30X La with a negative Eu anomaly and 20-30X La with a positive Eu anomaly (Fig. 4). With additional analyses, the discrete grouping may become a continum. The melt rocks range from medium-K KREEP to anorthositic gabbroic in composition. The chemical diversity observed in these melt rocks suggest several impact events, possibly including those related to the Imbrium and Serenitatis Basins.

References. (1) Laul, J. C., et al. (1983), PLSC 14th, 88, 139-149. (2) Laul, J. C. (1986), PLSC 16th, 91, 251-261. (3) Simon, S. B. and Papike, J. J. (1987), this volume. (4) Ryder, G. and Spudis, P. D. (1987), PLSC 17th, in press.

CHEM. OF THE APPOLO 15 HIGHLAND COMPO.

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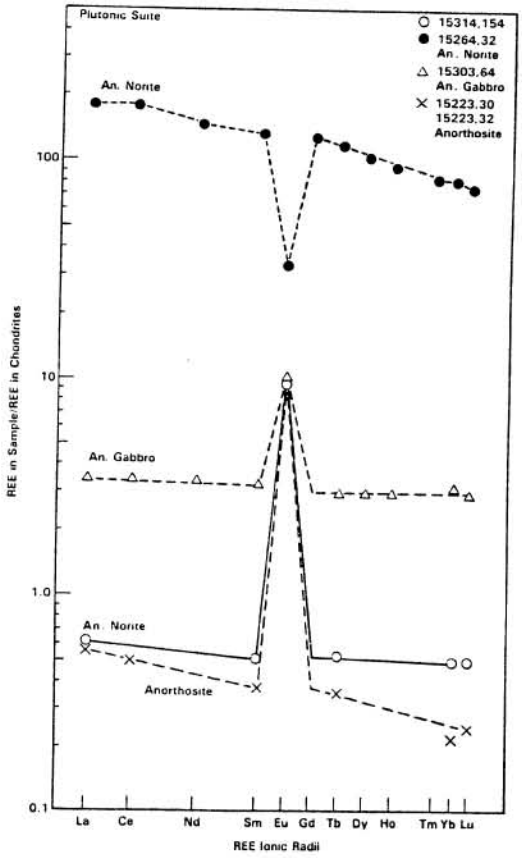

Figure 1

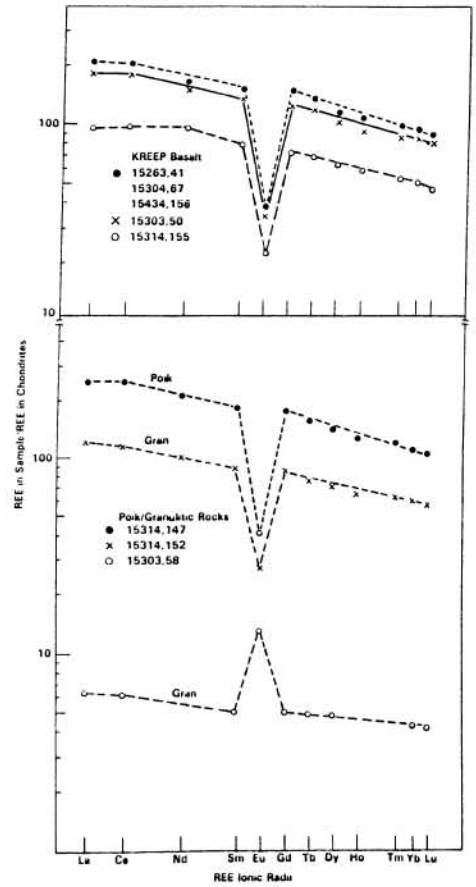

Figure 2

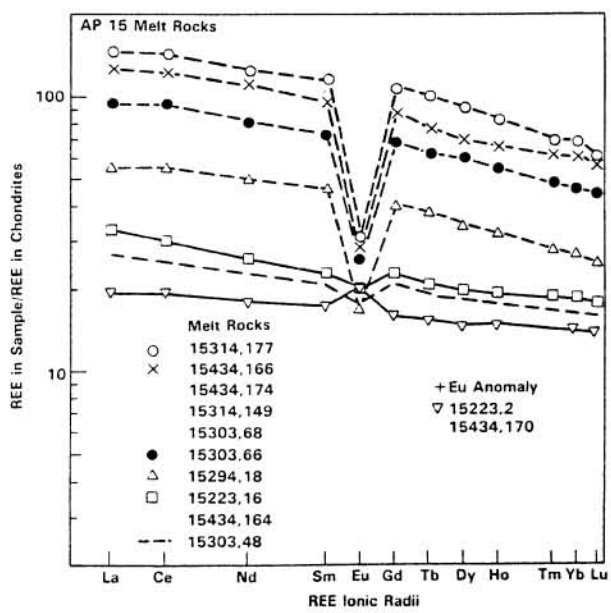

Figure 3

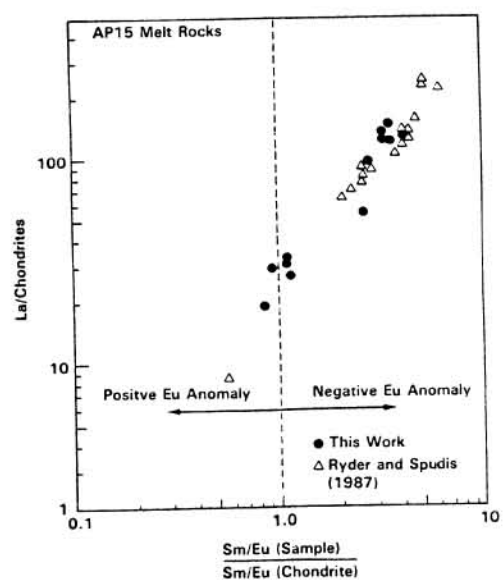

Figure 4