CHEMISTRY OF THE APOLLO 11 HIGHLAND COMPONENT. J.C. Laul[1], J.J. Papike[2], S.B. Simon[2] and C.K. Shearer[2]. 1) Radiological Sciences Department, Battelle, Richland, Washington 99352, 2) Institute for the Study of Mineral Deposits, South Dakota School of Mines and Technology, Rapid City, SD 57701.

It has been known since 1969, shortly after the Apollo 11 mission, that exotic aluminous material was included in the regolith at the Apollo 11 site. Petrologic studies have documented rock textures and mineral chemistry. However, several problems remain concerning this important suite of rocks: 1) How much highland material is mixed into the Apollo 11 soils and regolith breccias? 2) How do the Apollo 11 highland lithics fit petrographically into the now well defined highland melt rock and cumulate suites? and 3) How do the Apollo 11 highland fragments fit chemically (major, minor and trace element) into the highland suite? Companion papers by our group (1,2) address questions 1 and 2; this paper addresses question 3. In order to conduct this study, 38 highland fragments were hand-picked under a binocular microscope at JSC from coarse fines sample 10085,104. Each of the fragments was split in half. One half was used for preparation of a polished thin section for petrologic studies at SDSM&T; the other was used for chemical determination of ~30 major, minor and trace elements by sequential INAA. In this manner, we were able to effectively correlate the chemistry and petrology of each coarse fines fragment. The petrographic classification and modal petrology of the framents are presented in a companion paper (2). In this paper we present chemical data for the suite of samples for TiO_2, Al_2O_3, MgO, MnO, CaO, Na_2O, K_2O, La, Sm, Dy. Figure 1 displays these data in the form of a series of bar histograms. To simplify the data display we combined the petrographic groups (2) into RNB/POIK = recrystallized noritic breccia plus pyroxene/olivine poikilitic rocks; ANT = anorthosite, norite, troctolite; glass; and miscellaneous. The glass and miscellaneous groups, as would be expected, show a considerable compositional range. The RNB/POIK and ANT groups also show some dispersion in the chemical data but, nevertheless, form two distinct compositional clusters. Some of the chemical dispersion is probably the result of small sample size which for certain samples is less than 1 mg. Using Fig. 1 and the textural/petrographic classification (2) we calculated an average ANT and RNB/POIK composition for comparison with other well documented members of the highland suite. We also include in this comparison a single fragment (RNB 1187) which is unique in our suite of 38 samples. Fig. 2 presents data for "average ANT," "average RNB/POIK," RNB 1187, gabbroic anorthosite 67075, high-An and low-An anorthositic gabbros 68415 and 60335, the average composition of two Luna 20 fragments (22007,1 and 22006,1), and low-K Fra Mauro rocks 60315 and 77135. The data comparisons show that: 1) Our average ANT group corresponds closely to gabbroic anorthosite 67075, 2) Average RNB/POIK corresponds to the anorthositic gabbro group and more specifically to high-An anorthositic gabbro 68415, 3) RNB 1187 corresponds to the low-K Fra Mauro group and most closely to 77135 but is also similar to 60315. Thus our preliminary interpretation of the chemical data for the Apollo 11 highland suite leads to the following conclusions: (1) Gabbroic anorthosite chemically similar to 67075 and a component of the anorthositic gabbro group chemically similar to 68415 are present in the coarse fines population. (2) A small component of low-K Fra Mauro (e.g. 77135, 60315) is present in the coarse fines population. (3) Overall, the Apollo 11 highland suite is quite similar to that from Apollo 16. (4) The Apollo 11 highland suite is very low in potassium (non-KREEPy).

References. (1) Papike et al. (1983) Lunar and Planetary Science XIV, this volume. (2) Simon et al. (1983) Lunar and Planetary Science XIV, this volume.

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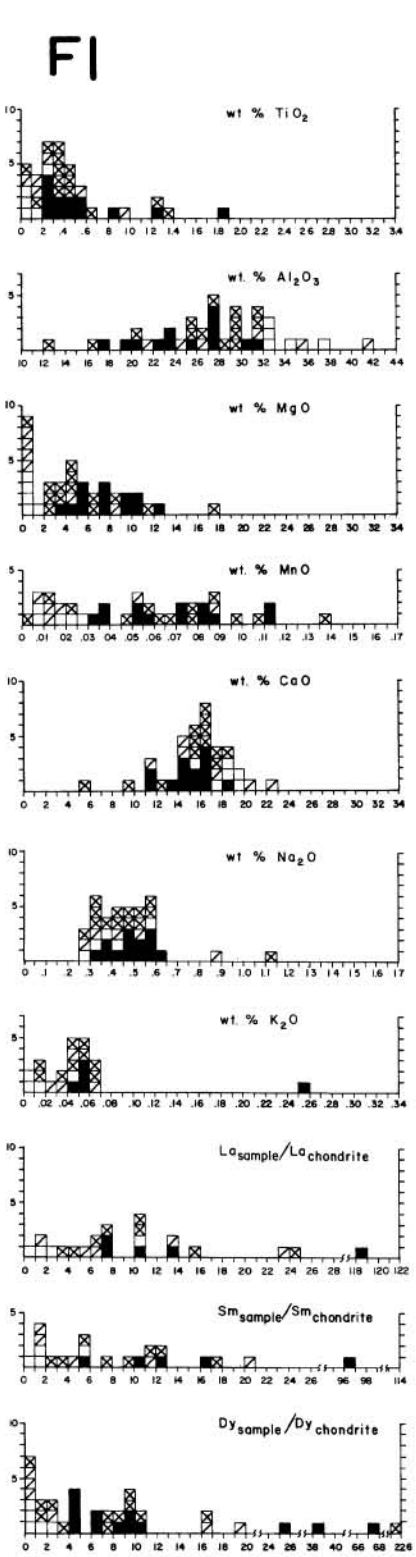
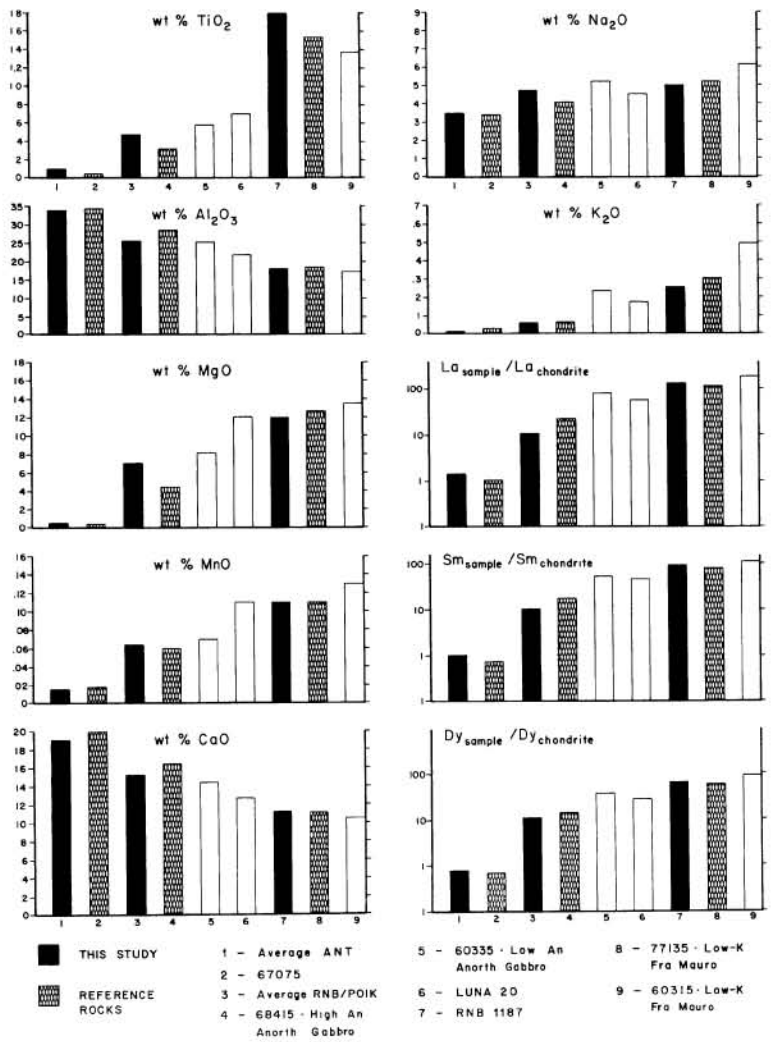
F1



LEGEND

- RNB/POIK
- ANT
- GLASS
- MISC.

F2



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