COMPOSITIONAL DIFFERENCES BETWEEN IMPACT-MELT BRECCIAS OF THE NORTH AND SOUTH MASSIFS AT APOLLO 17; *KAYLYNN M. ROCKOW, RANDY L. KOROTEV, BRADLEY L. JOLLIFF, and LARRY A. HASKIN,* Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130

Based on analysis of numerous 2–4 mm particles in the regolith [1,2], the average composition of impact-melt breccias from station 6 on the North Massif at Apollo 17 differs subtly from the average composition of impact-melt breccias from station 2 on the South Massif. The differences are not simply a result of the previously recognized differences in distribution of textural types between the massifs. About 23 of 172 (13%) melt-breccia particles studied from station-2 soils 72443 and 72503 are characterized by low ratios of Eu/Sm (average 0.8 times as great) compared to typical particles, whereas about 4 of 54 (8%) North Massif particles from 76503 have similarly low Eu/Sm ratios. Particles with low Eu/Sm also tend to have low Na/Sm (Fig. 1). The low-Eu samples appear to correspond to the aphanitic melts described in earlier studies [3,4] whereas the Eu-normal samples correspond to the poikilitic melts. The differences in Eu and Na must represent a significant difference in a plagioclase component of the two types of melt breccia (clasts or matrix components). The only significant compositional difference between the two types of melt breccia previously noted was in TiO_2 concentration [3,4]. However, even when only the most normal (presumably poikilitic) particles are considered (80% of North Massif and 70% of South Massif melt-breccia particles), the North Massif samples are distinct from the South Massif samples in having higher mean concentrations of Na and Eu (by a factor of 1.06–1.07) and lower mean concentrations of Sc and Cr (by 0.92–0.94) (Figs. 2,3). Another striking compositional difference is that among the Eu-normal particles, Ni concentrations are distinctly lower in the North Massif samples (mean and median: 200 and 95 μg/g) compared to the South Massif samples (mean and median: 297 and 270 μg/g) (Fig. 3). If the samples studied are representative of the melt breccias of the massifs, the results imply lateral variation in the composition of Serenitatis impact-melt breccia on the scale of the Apollo 17 site.

A number of samples, mostly from the South Massif are unusual compared to samples described in the literature in having high concentrations of ITEs (incompatible trace elements), e.g., >18 μg/g Sm (Fig. 2). However, most of these samples have low Eu/Sm ratios, similar to the aphanitic melt (Fig. 1), thus they may be ITE-rich variants of the aphanitic melt or samples with unusually ITE-rich clasts (we have not yet examined these particles petrographically).

The differences observed here probably do not result simply because the melt-breccia particles from a given massif derive primarily from a single boulder and the boulders differ in composition. Although for *aphanitic* melt breccias, compositional differences exist among samples from different boulders [3], no such compositional differences have been reported among samples of *poikilitic* melt from different boulders, and our results imply a subtle compositional difference between poikilitic melts of the two massifs. Note also that the North Massif particles studied here are from 76503, a sample collected 25 m from the station-6 boulder cluster, and that most (78%) of the Eu-normal particles from the South Massif studied here are from 72503, which was collected distant from the station-2 boulders. However, it is likely that the two massifs are stratified [5], in which case the particles may not be representative of the respective massifs because even if the two massifs are structurally identical, most of the melt-breccia particles studied here from the North Massif may derive from a different stratigraphic position than the melt-breccia particles of the South Massif. Thus, the differences may reflect vertical instead of lateral variation in a thick deposit of melt. In either case, the compositional variability noted here in what are presumably samples of poikilitic melt breccia diminish somewhat the arguments that compositional difference between the aphanitic and poikilitic breccias require that they were formed in separate impacts [3]. It is likely that the differences in lithophile-element concentrations relate to differences in clast abundance or distribution, but it is unlikely that this is the cause of the difference in Ni concentrations.

APOLLO 17 IMPACT MELT BRECCIAS: *Rockow K. M., Korotev R. L., Jolliff B. L. & Haskin L. A.*

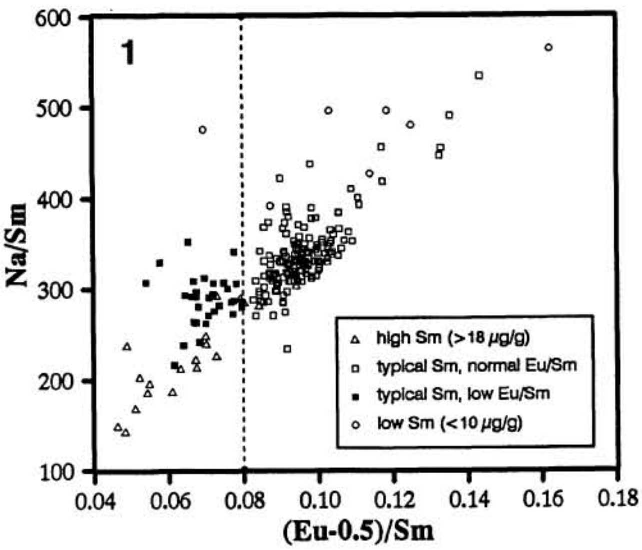


Fig. 1. "Low-Eu/Sm samples" are defined here (somewhat arbitrarily) as those for which the ratio $(C_{Eu}-0.5)/C_{Sm}$ (concentrations in µg/g) is less than 0.08 and $C_{Sm} < 18$ µg/g. The constant factor of 0.5 µg/g is applied because on a plot of Eu *vs.* Sm (Fig. 2), the trend extrapolates to ~0.5 µg/g Eu at 0 µg/g Sm.

Fig. 2. (a) The majority of melt-breccia samples analyzed here form a tight cluster corresponding to the poikilitic melts of previous studies; the low-Eu/Sm samples, however, fall mainly in the field of aphanitic melts [2]. The dashed diagonal line represents the same demarcation as the dashed vertical line of Fig. 1. **(b)** Within the field of poikilitic melts, samples from station 6 tend to have higher concentrations of Eu (and Na).

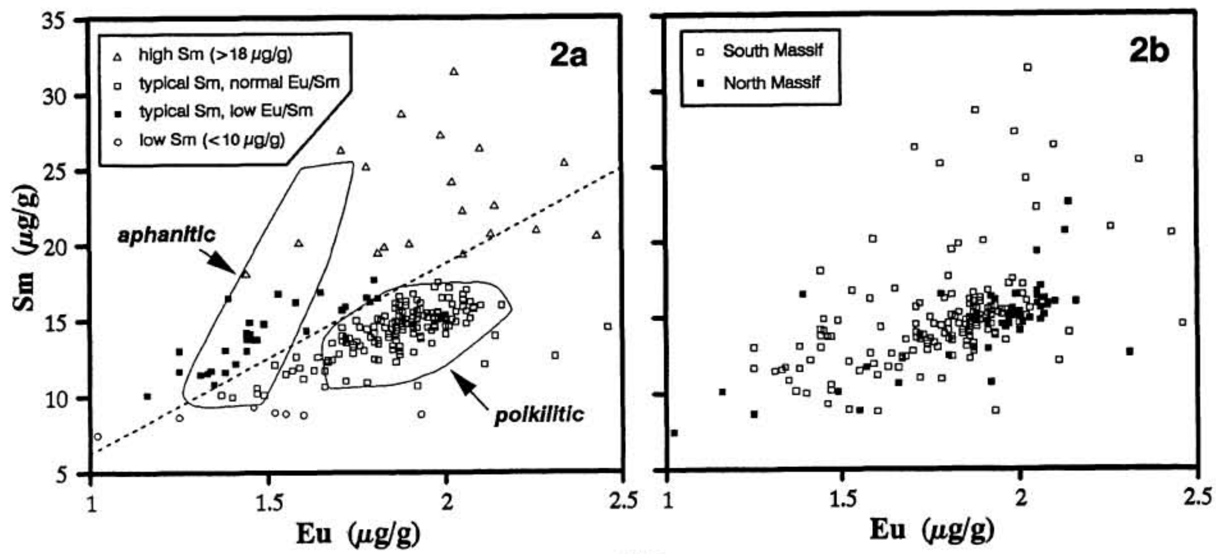
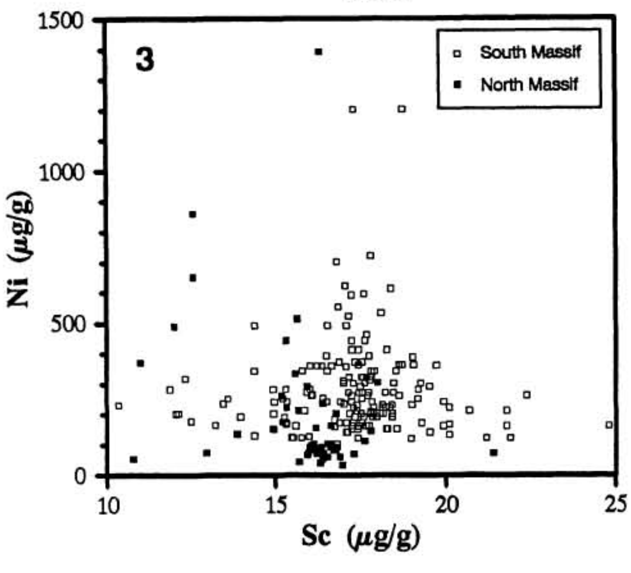


Fig. 3. Melt breccias (mostly Eu-normal) from the North Massif tend to also have lower concentrations of Sc, Cr (not shown), and Ni than those from the South Massif.



REFERENCES: [1] Jolliff B. L., Rockow K. M., Korotev R. L., & Haskin L. A. (this volume); [2] Rockow K. M., Jolliff B. L., Korotev R. L., & Haskin L. A. (this volume); [3] Spudis P. D. & Ryder G. (1981) *Multi-ring Basins*, (P. H. Schultz & R. B. Merrill, eds.), 133–148; [4] James O. B., Hedenquist J. W., Blanchard D. P., Budahn J. R., & Compston W. (1978) *PLPSC9*, 789–819; [5] Rhodes J. M., Rodgers K. V., Shih C., Bansal B. M., Nyquist L. E., Wiesmann H., & Hubbard N. J. (1974) *PLSC5*, 1097–1117.