# RELATION OF 2–4-MM REGOLITH BRECCIAS TO THE LOCAL SOIL AT APOLLO 17;

*Randy L. Korotev, Kaylynn M. Rockow, and Bradley L. Jolliff,* Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130

We have studied >250 RBs (regolith breccias) from the 2-4-mm grain-size fraction of soils from the NM (North Massif) and SM (South Massif) at Apollo 17 [1,2]. About 20-40% of the particles in this size range are glassy breccias that appear to be partial melts of regolith fines. Several studies have addressed the relationship between RBs (and agglutinates) and the soils from which they form [3-6]. Our data suggest that approximately 28% (at station 6) and 29% (at stations 2 and 3) of the RBs in the 2-4-mm size range are sufficiently different in composition from the soil in which they were collected that they probably formed in soil such as that which presently exists 0.1-1 km or more away. This study relies on components and mass balance arguments described in Korotev and Kremser [7].

***North Massif.*** Soils (<1-mm fines, samples 7xxx1) from the NM differ from each other mainly in the ratio of mare components (MB+OG, mare basalt and orange glass) to highlands components (AN+NB, 'anorthositic norite' and noritic impact-melt breccia), which is reflected by variation in their Sc concentrations (Fig. 1; comparison of components to NM and SM soils in inset). Soils from station 6 have the lowest proportion of mare components and, thus, the lowest Sc concentrations among NM soils. Station-6 sample 76281, from the trench near boulder block 4, has a slightly greater abundance of mare components (32%) than sample 76501, taken ~25 m to the west (27%). RBs from 76503 and 76283 also vary mainly in their ratio of mare to highland components. Most are intermediate in composition to 76501 and 76281, consistent with formation in the vicinity of station 6. However, some RBs are richer in Sc (>33 µg/g) and are similar in composition to more MB-rich soils to the west (stations 7, 8, 9) and, presumably, to the south, away from the massif. These Sc-rich RBs may have formed in soils with greater abundances of mare material and have been transported to station 6 by impacts. Alternatively, some or all may have formed at station 6, but contain an anomalously high proportion of mare material because they contain one or a few large clasts of mare basalt. Similarly, the numerous RBs with Sc concentrations less than that of the main cluster (<27 µg/g Sc) were formed either (1) in a regolith with a lesser average concentration of mare basalt than that of station 6 or (2) at station 6, but they contain anomalously high abundances of clasts of Sc- and Sm-poor, feldspathic highlands material. A few RBs are enriched in Sm compared to the main cluster. These contain an anomalously high abundance of KREEP-bearing NB component, either as clasts or because they were formed in a regolith with a greater average abundance of noritic-melt breccia component (higher on the massif?).

Although analysis of the glassy matrix of these breccias (not yet initiated) should distinguish between the two possibilities, we suspect now, based on the compositions, that some, if not most, of the anomalous particles were produced elsewhere and are not sampling anomalies involving clasts. The composition of the most Sc-rich RB particle can be modeled as a 60:40 mixture of station-6 soil and mare basalt, consistent with either scenario. However, the most Sc-poor breccias correspond to mixtures having essentially 0% station-6 soil, thus they cannot be breccias of station-6 soil with large feldspathic clasts. Petrographically, the Sc-poor regolith breccias contain little or no mare basalt or noritic melt breccia. Thus, they were probably formed before the Serenitatis impact and mare volcanism [8].

***South Massif.*** Soils (7xxx1) from the South Massif/Light mantle area (stations 2 and 3) are nearly identical to each other in Sc concentration because they contain a low and constant abundance of mare material (5-9% [7]). Most of the compositional variation results from variation in the ratio of NB to AN components, with 72441 having the greatest NB component (49%) and 73241 having the least (40%); this variation is reflected in the Sm concentration (Fig. 2). Most RBs are similar in composition to the soils, but some are significantly enriched in Sc as a result of excess mare material. Because the amount of mare material at stations 2 and 3 is so low, these particles almost certainly formed in a soil that contained more mare basalt (e.g., closer to the edge of the light mantle) and were transported to stations 2 and 3 by impacts.

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***References:*** [1] Jolliff B.L., Rockow K.M., Korotev R.L., & Haskin L.A. (1994) *L&PS XXV*, p. 637-638. [2] Rockow K.M., Jolliff B.L., Korotev R.L., & Haskin L.A. (1994) *L&PS XXV*, p. 1149-1150. [3] Taylor G.J., Wentworth S., Warner R.D., & Keil K. (1978) *PLPSC9*, 1959-1967. [4] Laul J.C. and Papike J.J. (1980) *PLPSC11*, 1395-1413. [5] Laul J.C., Smith M.R., Papike J.J., & Simon S.B. (1984) *PLPSC15*, C161-C170. [6] Simon S.B., Papike J.J., Gosselin D.C., Laul J.C., Hughes S.S., & Schmitt R.A. (1990) *PLPSC20*, 219-230. [7] Korotev R.L. & Kremser D.T. (1992) *PLPS22*, 275-301. [8] Jolliff B.L. & Bishop K.M. (1993) *L&PS XIV*, p. 727-728.

**APOLLO 17 REGOLITH BRECCIAS:** *Korotev R. L., Rockow K. M., & Jolliff B. L.*