RELATIONSHIPS AMONG BASALTIC LUNAR METEORITES; Marilyn M. Lindstrom, SN2 NASA Johnson Space Center, Houston TX 77058.

During the past two years four meteorites of dominantly mare basalt composition have been identified in the Japanese and US Antarctic collections. Basalts represent a much higher proportion of the lunar meteorites than is expected from photogeologic mapping of mare and highland regions. Furthermore, the basaltic lunar meteorites are all described as VLT mare basalt, which is a relatively uncommon type among returned lunar samples. The significance of the basaltic meteorites to our understanding of the lunar crust depends on the evaluation of possible relationships among the individual meteorites. None of the specimens are paired meteorites. They were collected in three different areas of Antarctica and differ from each other in petrography and composition. It is important to determine whether they might be paired ejecta which were ejected from the same mare region by the same impact.

The question of paired ejecta must be addressed using a combination of exposure histories and petrographic/compositional characteristics. For two meteorites to be paired ejecta it is necessary that they were ejected from the moon at the same time. To date exposure studies have been done only for EET87521 and Y793274, and are consistent with the two meteorites being paired ejecta (1). To demonstrate that any two meteorites came from the same region of the Moon, they should exhibit some petrologic relationship.

The four meteorites are easily distinguished from each other petrographically. Asuka-31 and Y793169 are coarse-grained mare gabbros, but Asuka-31 is distinctly coarser than Y793169 (2). EET87521 and Y793274 are breccias, but EET87521 is a fragmental breccia consisting almost entirely of mare basalt (3,4), while Y793274 is a regolith breccia containing 1/4-1/3 highland material (5,6). Could the mare gabbros represent the basaltic components of the mare breccias?

Major and trace element compositional data are incomplete for the two mare gabbros, but sufficient data are available to make some comparisons. EET87521, Asuka-31, and Y793169 are all Fe-rich VLT basalts similar to those from Luna 24, while Y793274 contains Mg-rich VLT basalt similar to those from Apollo 17 (5). Compatible trace elements are highly variable (7). Some of this variation may be attributed to modal heterogeneity, but magmatic differentiation of Mg-rich basalts like Y793274 can produce Fe-rich basalts like those in the other basaltic lunar meteorites (8).

Variations in incompatible trace element contents, such as the REE, seem to be dominated by a different process. REE patterns in the basaltic breccias are LREE-enriched similar to that of KREEP (4,8), while those of Asuka-31 (7) and clasts in EET87521 (9) are LREE-depleted as are typical mare basalts. The REE patterns of the breccias appear to reflect the addition of a small amount of KREEP component to these dominantly basaltic rocks (9).

It is possible that the basaltic lunar meteorites are paired ejecta from the same region of the Moon. However, the relationships among them are more complicated than the basaltic breccias being simply brecciated mare gabbros. Both magmatic differentiation and KREEP mixing are required. Further studies, especially exposure histories of the mare gabbros, are required to evaluate these complicated relationships, and may prove that the meteorites are unrelated.

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