GEOCHEMICAL COMPARISON OF FOUR CORES FROM THE MANSON IMPACT STRUCTURE;

RANDY L. KOROTEV, KAYLYNN M. ROCKOW, BRADLEY L. JOLLIFF, and LARRY A. HASKIN, Department of Earth & Planetary Sciences, Washington University, St. Louis, MO 63130 and *PETER MCCARVILLE and LAURA J. CROSSEY*, Department of Earth & Planetary Sciences, University of New Mexico, Albuquerque, NM 87131

Samples of impact melt breccia taken through the 130-foot-thick CCB-MM unit (crystalline-clast breccia, melt matrix) of the M-1 core of the Manson Impact Structure (MIS) are all similar in composition to each other and different from samples from the overlying SCB units (sedimentary-clast breccia) and underlying CCB-SM units (crystalline clast breccia, sandy matrix) [1]. Our new analyses indicate that samples from the CCB-MM units of the M-7, M-8, and M-10 cores are generally similar in composition to each other and to the CCB-MM samples of M-1 (Fig. 1); however, some striking, systematic differences exist. The CCB-MM unit of M-1 has Cs concentrations consistently 2.5 times that of the melt-breccia units of the other cores and has a slight relative enrichment in heavy REE (rare earth elements) compared to other units in the M-1 core and to CCB-MM units in the other cores (Fig. 2). Other minor differences exist among the melt-breccia units and, in detail, melt-breccia samples from the M-1 core are distinguishable from melt-breccia samples from the other cores. For example, the CCB-MM unit of the M-10 core is richer in Fe, Sc, and Co than the corresponding unit in M-1 and appears compositionally to contain a greater component of the biotite or hornblende gneiss of the central peak crystalline (CPC) rocks, such as the unit sampled at the bottom of the M-7 core (Fig. 1). These various differences may result from differences in abundance of some components of the melt mixtures, differences in clast distribution, or to some post-impact processes; in any case, we have not yet identified the components and/or processes. Among CCB-MM units, that from the M-1 core is texturally unique in having low porosity, few clasts, and a fine-grained matrix, thus some of the observed differences may simply result in variable clast content. Preliminary mass-balance calculations indicate that the CCB-MM *breccias* (melt plus clasts) contain more than 50% crystalline components (biotite/hornblende gneiss and a granitic component); this contrasts with estimates that the *melt* consists primarily of sedimentary components [3].

The units of sedimentary-clast breccia (SCB) are compositionally distinct, compared to other units, in having low concentrations of Na, K, Sc, Fe, and Ba, as well as high concentrations of Ca and, particularly, As and Sb. These differences reflect the high proportion of clastic limestone and shale.

The five samples analyzed from the CPC unit (central peak crystalline) of the M-7 core are remarkably uniform in composition and are compositionally most similar to clasts of biotite gneiss and hornblende-plagioclase gneiss or amphibolite extracted from the CCB-SM units of cores M-1 and M-7. The CPC rocks are more mafic than the CCB-MM units (melt breccia) and have distinctly different relative abundances of REE, particularly Eu (Fig. 2b). The CCB-SM units are not as compositionally uniform as are the CCB-MM units, and some particularly anomalous samples occur among samples from CCB-SM units. The SM breccias contain large clasts, appear more porous than the MM breccias (at least in M-1), and have been affected strongly by hydrothermal alteration [4]; any or all of these factors may lead to the compositional variability. Nevertheless, the mean compositions of the CCB-SM units in the three cores in which this unit was sampled are all similar. Compared to the CCB-MM units, the CCB-SM units are richer in elements associated with mafic silicates (Ca, Fe, Sc, Cr, Co, Ni) and have different relative REE abundances (Fig. 2b). The CCB-SM units appear to contain a component of CPC rocks in excess of that contained in the CCB-MM units.

REFERENCES. [1] Korotev R. L., Jolliff B. L., Rockow K. M., Haskin L. A., and Crossey L. J. (1993) *Meteoritics* **28**, 383-384 (abstr.); [2] Anderson R. R., Witzke B. J., Hartung J. B., Shoemaker E. M., & Roddy D. J. (1993) In *Lunar and Planetary Science XXIV*, pp. 35–36 (abstr.). [3] Anderson R. R. and Hartung J. B. (1992) *PLPSC22*, 101-110; [4] Crossey L. J. and McCarville P. (1993) In *Lunar and Planetary Science XXIV*, pp. 351–352 (abstr.).

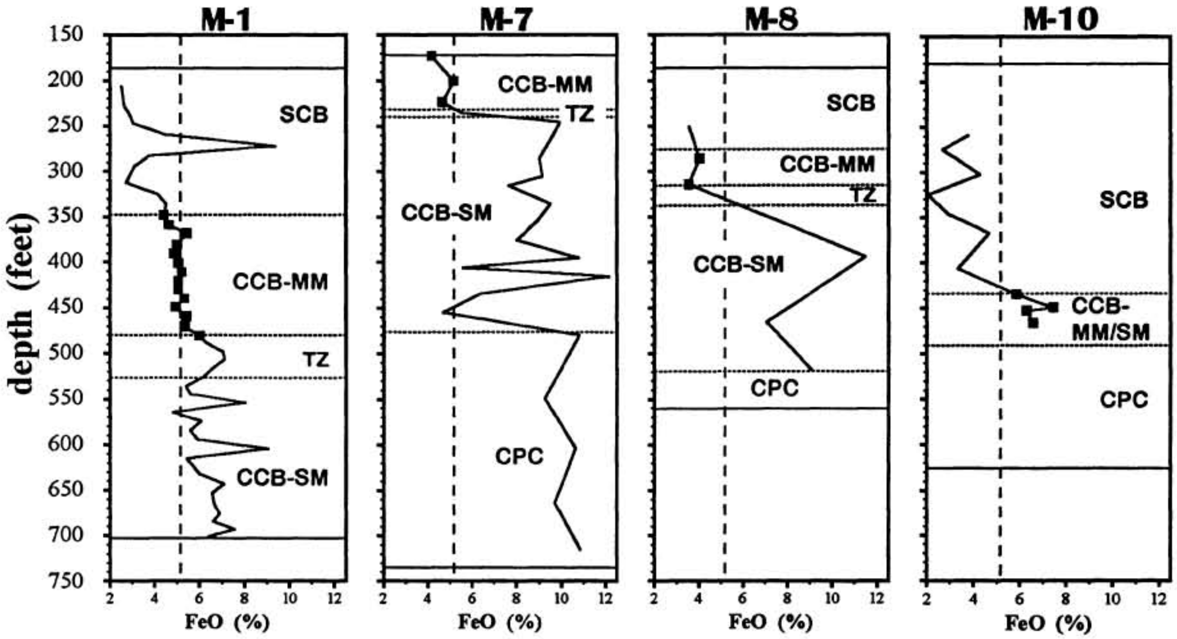

Fig. 1. Profile of Fe concentrations (total Fe as FeO) in four cores into the MIS. The solid points represent samples from units of impact melt breccia (CCB-MM = crystalline-clast breccia, melt matrix). For reference, the mean composition of melt breccia in core M-1 is reresented by the vertical dashed line in each profile. Other units are indicated: SCB = sedimentary-clast breccia, TZ = transition zone; CCB-SM = crystalline-clast breccia, sandy matrix, CPC = central peak crystalline. See [2].

Fig. 2. Mean concentrationsof rare earth elements in some MIS units normalized to the mean concentration of samples from the CCB-MM unit of the M-1 core.