PALEOMAGNETISM OF UNBRECCIATED EUCRITES Stanley M. Cisowski, University of California, Santa Barbara, CA, 93106.

Magnetic studies on unbrecciated eucrites may represent the best opportunity for determining the presence of magnetic fields in the early solar system, due to their relatively simple magnetic mineralogies, and crystallization ages of about 4.5 AE. Subsamples from four unbrecciated eucrites, Ibitira, Moore County, ALHA 81001, and PCA 82502, have been subjected to room temperature magnetic analyses, including acquisition and alternating field (AF) and DC demagnetization of their isothermal remanent magnetism (IRM). The acquisition curves for these kamacite-bearing meteorites are similar to those of lunar samples, with acquisition continuing in fields as high as 570 millitesla (5700 oersteds). Remanent coercive force (Hrc) ranges from less than 30 mT for Ibitira, to over 100 mT for ALHA 81001, and the symmetrical acquisition and AF demagnetization curves for three of the eucrites indicate that their remanence is carried by single domain magnetic grains (1). Moore County, the only cumulate in the group, displays more multidomain-like remanence behavior.

Figure 1 (a-d) shows the NRM vs. IRM (saturated) behavior for subsamples of these meteorites. The strong "normalized" NRM intensity for one Ibitira subsample, and its disparity with the second subsample, suggests that these specimens may have suffered stray magnetic field contamination. Both samples had been removed by sawing rather than chipping, and both may have been subjeted to SEM work by a previous investigator. The nearly total loss of NRM after AF demagnetization to 50 mT for the PCA 82502 subsample also suggests a non-thermal origin for this meteorite's remanence. Thermal demagnetization on a second subsample resulted in a near total loss of NRM by 220° C. In contrast, subsamples of the Moore County and ALHA 81001 eucrites display smaller NRM vs IRM ratios, in the range of 10E-3. A dual heating (KTT) paleointensity experiment on a subsample of Moore County was unsuccessful due to the production of additional magnetic carriers (from sulfides?) with heatings above 300° C.

In comparison to lunar basalts given thermal remanence (TRM) in a variety of laboratory fields (Fig. 1e), these weak NRM's suggest magnetizing fields of less than 0.01 mT (0.1 oersteds). This agrees with earlier estimates of the magnetizing fields for achondrites (2,3), but differs from the stronger paleofields implied by the NRM vs. IRM results for lunar samples with ages between 3.8 and 3.6 AE (Figure 1f - 4). These weak field results on unbrecciated eucrites thus make it less likely that the strongly magnetized lunar samples can be explained in terms of early solar system fields.

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4. Cisowski, S.M., and Fuller, M. (1986) in "Origin of the Moon", 411-424, Lunar and Planetary Institute, Houston.

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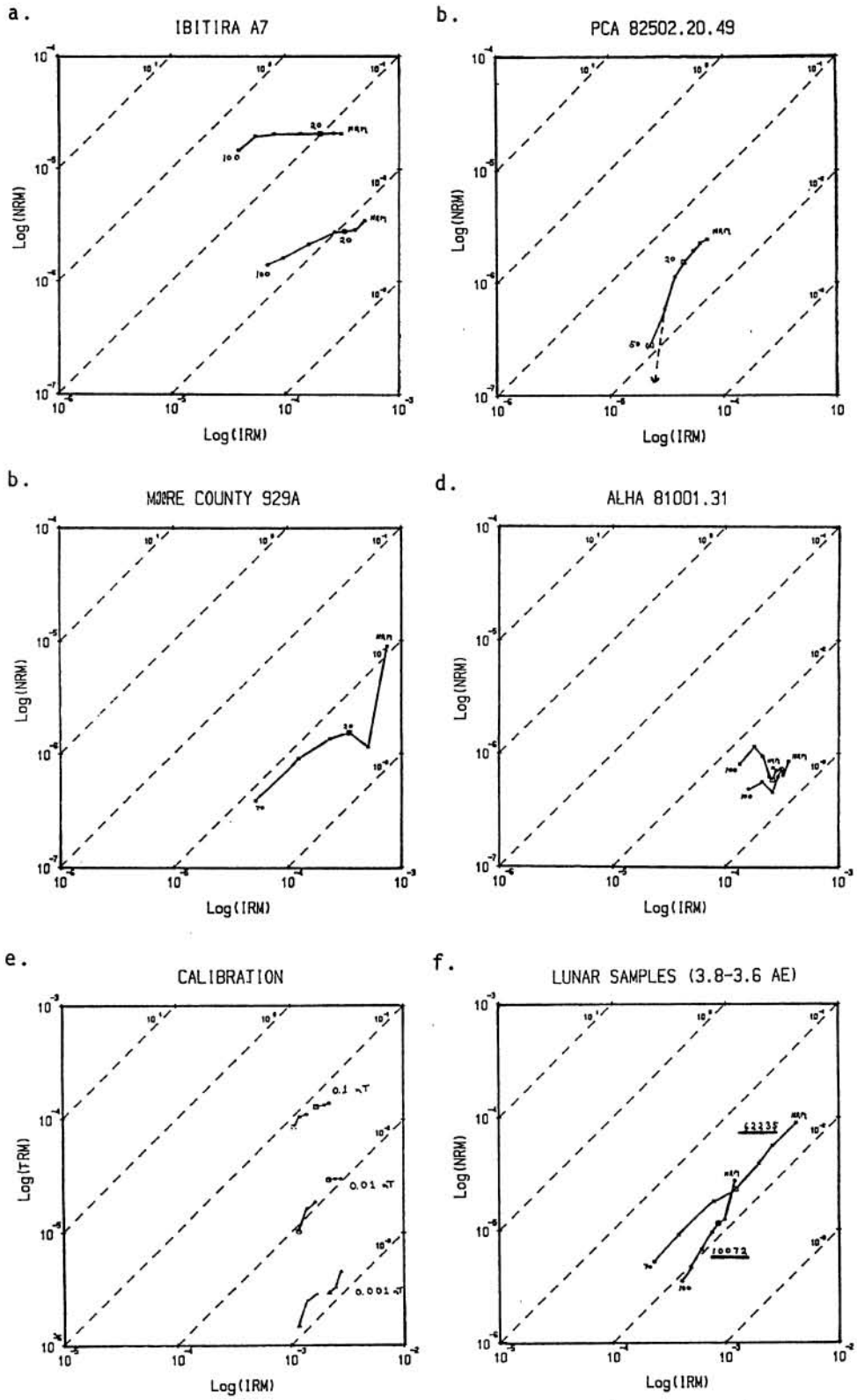

Figure 1. NRM vs IRM, as a function of AF demagnetization, for four unbrecciated eucrites, and lunar samples. Dashed lines represent constant NRM/IRM ratios.