THERMOLUMINESCENCE EVIDENCE FOR A TERRESTRIAL AGE DIFFERENCE BETWEEN ALLAN HILLS AND LEWIS CLIFF METEORITES. Fouad A. Hasan and Derek W.G. Sears. Cosmochemistry Group, Department of Chemistry and Biochemistry, University of Arkansas, Fayetteville, AR 72701.

Measurement of terrestrial age in a large number of Antarctic meteorites from a given location could enable further insight into the concentration mechanisms and overall movement and history of the Antarctic ice sheets. All models and mechanisms (1-3) involve the entrapment of meteorites and their transport in the ice until interaction with mountain barriers. The density of meteorites in Allan Hills (ALH) and Lewis Cliff (LEW) areas is extremely high compared to the meteorite density of the other locations, and Nishio et al. (4) suggested that the meteorite density may reflect an expansion of the accumulation area during the last ice age. If this is so, the maximum terrestrial ages of the meteorites are comparable with the time at which the ice began to recede. It has been shown by comparison with radiometrically determined terrestrial ages that the ratio of the level of low temperature natural TL to the TL produced at high temperature (LT/HT) provides an indication of terrestrial age (5,6). A recent comparison of natural TL with ^{26}Al data suggested that exceptions to this may be meteorites with LT/HT < 0.8 which have apparently experienced a reheating within the last 10^6 years (e.g. close solar passage, shock heating, etc.) (7).

Natural thermoluminescence measurements have been made on samples of 172 Antarctic meteorites from the 1985 field season, 86 each from the ALH and LEW regions. The apparatus and other experimental techniques are as described in (7).

Figure 1 shows a histogram of natural TL levels for ALH and LEW meteorites compared with non-Antarctic chondrites. There is an indication that LT/HT data skew to lower values as one proceeds along the series non Antarctic-ALH-LEW (Table 1). For instance, the proportion in each geographical group with LT/HT > 2 decreases along the non Antarctic-ALH-LEW sequence, while for LT/HT < 2 the proportion of meteorites in each geographical group increases along the same sequence. The differences are most marked at the upper end of the LT/HT range. This suggests that the meteorite fragments recovered during the 1985 field season from LEW tend to have larger terrestrial ages than those recovered during the same field season from ALH. Different accumulation-transportation mechanisms may account for this difference in terrestrial ages.

Two meteorites in the present study were found to have especially high natural TL values, ALH 85033 (LT/HT=9.7+/-0.1) and LEW 85448 (LT/HT=8.2+/-0.2), and in this respect resemble the Kirin (Jilin) meteorite (LT/HT=13.2 (8)). Because of the range of natural TL values shown by non-Antarctic meteorites (which are observed falls) it is doubtful that these high values reflect especially short terrestrial ages. Rather, we suggest they reflect particularly heavy shielding (the recovered mass for Kirin is 2700 kg) or an unusual radiation history (9).

References: (1) Annexstad (1986) LPI Tech. Rpt., 86-01, 23. (2) Cassidy (1986) LPI Tech. Rpt., 86-01, 26. (3) DeLisle et al. (1986) LPI Tech. Rpt., 86-01, 30. (4) Nishio et al. (1982) Ann. Glac., 3, 222. (5) Sears and

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Table 1. Distribution of natural TL values for Lewis Cliff, Allan Hills and non-Antarctic meteorites (percentages).

	Natural TL (LT/HT)				
	No.	<0.8	0.8-2	2-4	>4
LEW	86	32	35	30	4.6
ALH	86	27	21	35	13
non-Ant.	40	20	18	40	20

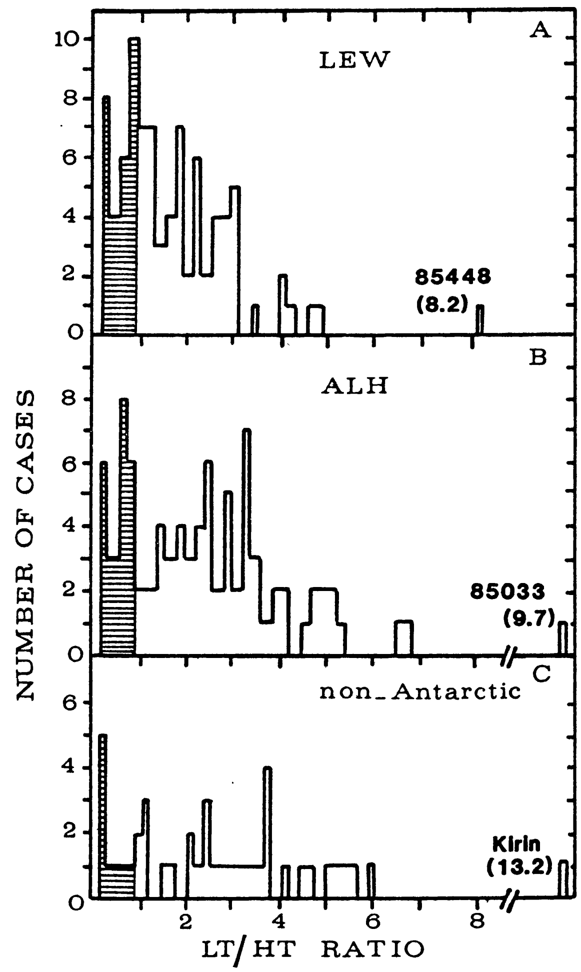

Figure 1. Histograms of natural TL data (LT/HT) for 172 Allan Hills and Lewis Cliff meteorites collected during the 1985 field season. Non-Antarctic chondrites are also shown for comparison (ref. 6). The shaded area, LT/HT < 0.8, represents meteorites which may have suffered recent reheating. Kirin, ALH 85033 and LEW 85448, with LT/HT= 13.2, 9.7 and 8.2, respectively, are notable for their especially high natural TL.