ALUMINUM-26 MEASUREMENTS ON ANTARCTIC METEORITES

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The $^{26}\text{Al}$ survey of the Antarctic meteorite collection continued during the last year with a significant expansion of the available data base. A total of 220 samples have now been counted. The majority of the samples counted have been from the Allan Hills area; however at least a few samples from each of the other regions have now been examined with samples undersaturated in $^{26}\text{Al}$ found at several sites. To date, 149 samples from Allan Hills have been counted, 29 from Reckling Peak, 19 from Meteorite Hills, 3 from Bates Nunatak, 1 from Mount Baldr, 6 from Elephant Moraine, and 1 from Outpost Nunatak. In addition, we now have data on 12 Yamato samples from the Japanese collection.

Most of the samples included in this study were ordinary chondrites. A few achondrites were also counted including the now famous lunar meteorite, ALHA 81005, which did in fact contain an $^{26}\text{Al}$ content consistent with a lunar origin\(^{(1)}\). Two Antarctic shergottites (EETA 79001 and ALHA 77005) of possible martian origin\(^{(2)}\) were also counted. The other achondrites were all eucrites, including one polymict eucrite, ALHA 80102. Of the eight eucrites sampled, at least two of them, ALHA 78132, and EETA 79005 appear to be somewhat undersaturated in $^{26}\text{Al}$. Many of the meteorites studied have not yet been classified. One such case is META 78019 which is rather high in $^{26}\text{Al}$ relative to a typical chondritic value, suggesting that it probably is an achondrite as well. A meteorite found embedded in the ice (ALHA 82102) was found to be somewhat low in $^{26}\text{Al}$ (40 dpm/kg).

Twenty-one of the ordinary chondrites have $^{26}\text{Al}$ contents at least one standard deviation below 40 dpm/kg, a clear indication of undersaturation. This is about 10% of the chondrite samples counted. One sample deserving special attention is ALHA 78153 (22±1 dpm/kg $^{26}\text{Al}$), a rather heavily weathered LL6 chondrite. It will be necessary to have noble gas data and at least one other radioactive isotope such as $^{36}\text{Cl}$ or $^{53}\text{Mn}$ to determine if this is indeed another case with a long terrestrial age or simply one with a short or even a complex exposure in space as was the case with ALHA 76008 and YAMA 7301.

There does not appear to be any obvious correlation between low $^{26}\text{Al}$ and meteorite type within the ordinary chondrites. While there is no doubt somewhat of a shower component represented by the relatively large percentage of L3 chondrites low in $^{26}\text{Al}$, low values are also scattered through all of the other common classes. The same is true of weathering category which shows low values represented in all three categories.

Fig 1 is a histogram of the frequency distribution of $^{26}\text{Al}$ values for 180 Antarctic ordinary chondrites included in this study for which type information was available. A normalization factor of 1.08 was included to account for chemical differences between H and L or LL chondrites affecting the production rates. A bin width of 5 dpm/kg was used. The dashed line given on the plot is based on data taken from the literature on world-wide falls and finds. It is treated in the same manner for comparison. The data for the dashed curve have, however, also been renormalized to give the
same integrated area under the curve as the Antarctic data. When displayed in this manner it is fairly clear that the two distributions are in fact quite different with the Antarctic data shifted to lower \( {^{26}\text{Al}} \) levels. Thus while \( {^{26}\text{Al}} \) data alone cannot unambiguously prove the existence of long terrestrial ages on individual samples, it can demonstrate on a statistical basis that the collection as a whole contains many members with ages in excess of 500,000 years. At the same time, these data still show the total absence of any samples with great age, i.e., greater than one million years. If such samples exist at all, they are clearly quite rare. The available evidence at this time suggests that the upper limit for the survival time of meteorites in Antarctica as determined by ice movement is between 700,000 and 1,000,000 years.

REFERENCES.

FIGURE 1. Distribution of \( {^{26}\text{Al}} \) Contents of Ordinary Chondrites from Antarctica (solid line) Compared with Worldwide Falls and Finds (dashed line). Histogram of worldwide data has been adjusted to have same integrated area as Antarctic case. All data are normalized to an L chondrite composition.