Shielding and Size Corrected Exposure Ages of Chondrites. Th. Graf, P. Signer and R. Wieler. ETH-Zürich, 8092 Zürich, Switzerland.

To deduce reliable exposure ages from chondritic samples from unknown positions in meteorites of unknown size, the depth dependence of the production of cosmogenic nuclides should be well known. To this goal, we measured He, Ne, Ar and 10 Be in adjacent samples from the L3 chondrite Knyahinya as a function of sample position (1). With this data base we determined the free parameters in the production equation used to model the production of cosmogenic nuclides in iron meteorites (2). The validity of the model was tested by comparing the predictions with experimental data on Keyes (3), Nishiizumi (4), and also of common terrestrial contaminants (6). The nature of this component is not understood, but it is weakly bound by comparison with the putative implanted SWN. Calculation of Ne/Ar using the nitrogen concentration of the 900 °C step yields a value close to that derived from lunar studies (3).

In contrast to lunar breccias, over 60% of the total nitrogen inventory in Fayetteville is released below 500 °C. After allowing for atmospheric contaminants, the low temperature nitrogen is shown to have δ15N ca. −20 ± 10‰, much lighter than δ15N of meteoritic organic matter (4, 5), and also of common terrestrial contaminants (6). The nature of this component is not understood, but it is weakly bound by comparison with the putative implanted SWN. References: (1) Schultz and Kruse (1983) MIP (Mainz) Data Compilation. (2) Becker et al. (1976) JPLSPC 7th, 441-458. (3) Geiss and Bocherer (1982) GCA 46, 529-548. (4) Robert and Epstein (1982) GCA 46, 81-95. (5) Becker and Epstein (1982) GCA 4, 97-103. (6) Heaton (1986) Chem. Geol. 59, 87-102.

As in iron meteorites, the model does not allow deduction of meteoroid size and sample position from the noble gases in a given sample only (8). Because we also modeled the 10 Be production, this situation is remedied. Since the 3-isotope correlation between the ratios of the production rates of 10 Be/P(15Ne) and 22Ne/P(15Ne) is linear (8), it can be used to compute size and shielding corrected exposure ages in chondrites:

\[
1 - \exp(-4.33 \times 10^{-8}t) = \frac{10 \text{Be}/P(15 \text{Ne})(1.11) + (0.053 \pm 0.030)(22 \text{Ne}/21 \text{Ne} - 1.11)}{(10 \text{Be}/21 \text{Ne})(m)}
\]

The production rate ratio (10 Be/P(15 Ne)) is 1.11 is given in atoms/atom and for a 22Ne/21Ne ratio of 1.11 and the index (m) denotes the measured ratio. With an exposure age of Knyahinya of 40 Ma according to Nishiizumi et al. (7), we determined (10 Be/P(15 Ne))(1.11) = 0.141 ± 0.002.
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Last year, Hartmann, Tholen, Cruikshank, and Goguen (1) reported the unexpected discovery that Trojan asteroid lightcurves appear to contain more high amplitudes than among main belt asteroids. This result is important because it may imply information about Trojans' origins and histories. We hypothesized that because of the low collision rate, Trojans contain more high amplitudes than among main belt asteroids. This hypothesis has recently been published by Hartmann, Tholen, Goguen, Binzel, and Cruikshank (2).

Further observations are underway to attempt to confirm this result. Coordinated, complimentary work is being done by our group and by Linda French and co-workers. Figure 1 shows the status of our current set of data. This new figure includes recent three additional asteroids observed by Tholen, subsequent to our earlier work. More observations are needed to enlarge the sample, and they may have more irregular shapes. This work has now been published by Hartmann, Tholen, Goguen, Binzel, and Cruikshank (2).

Fig. 1. Comparison of distributions of maximum observed amplitudes among belt asteroids (top, center) and Trojans and Hildas (bottom). All samples are for the same diameter range, 42–188 km. Dotted lines repeat the distribution sketched in the top figure, for reference.

Comparison of Lightcurves of Belt and Trojan Asteroids. H. J. Greenberg, S. W. Hesstvedt, and R. D. Binzel. NASA GSFC, Greenbelt, Md. 20771 USA.

The lightcurves of belt asteroids have been studied extensively, and a wide variety of shapes have been found. The lightcurves of Trojans and the Hilda asteroids have not been studied as extensively. These asteroids are thought to be captured in the resonances with Jupiter and are more likely to have irregular shapes.

The authors have obtained lightcurves for four Trojans and two Hilda asteroids. The lightcurves of the Trojans are generally more irregular than those of the belt asteroids, and the amplitudes are generally larger. The lightcurves of the Hilda asteroids are more similar to those of the belt asteroids, but still more irregular than those of the belt asteroids.

Relative Abundance of Different Types of Meteorites and the Quality of the Antarctic Meteorite Sample. Ralph Harvey. Department of Geology and Planetary Science, University of Pittsburgh, Pittsburgh, PA 15260 USA.

Traditionally the relative abundances of different types of meteorites have been modeled from the Modern Falls. With the inclusion of the collection of meteorites from Antarctica, the concept of expected relative abundances changed.

The Antarctic finds are comparable to the Modern Falls because they are easily recognized as meteoritic, and have not been highly weathered. The collections differ in two important ways. On one hand, the Modern Falls represent a larger collection area; on the other, the Antarctic finds represent a longer collection time. Both collections are thus important, but in different ways, because they represent samples integrated over different variables: time and space. The Allan Hills Main Icefield is the only Antarctic meteorite collection site which has been thoroughly searched and from which all the meteorites have been systematically retrieved and examined. The Mascot also shows no strong evidence of being affected by single fall events (1). If we assume that these meteorites are a good sample of what has fallen onto the Antarctic icesheet, we can compare these directly to the Modern Falls. A good test of the similarity of the two samples is the relative abundance of different broad compositional classifications of the meteorites.

Two things must be done in order to compare the relative abundance of different types of meteorites between the Modern Falls and the Antarctic finds from the Allan Hills Main Icefield. First, we must compare masses, not numbers. There is a strong surplus in number of H chondrites in the Allan Hills population. In addition, this relieves us of the burden of estimating the number of falls represented by the Antarctic finds. Second, we must remove some of the extremely large meteorites from the Modern Falls collection. This is done because they are much larger specimens than would be expected to have fallen over the collection area and time represented by this collection.

When this comparison is made, the relative abundances of different types do not match within reasonable confidence levels, even at very broad classifications. Thus we have two distinct samples which can be used to model the meteoritic populations which come to the Earth.


Abstracts