NOBLE GASES IN TWENTY YAMATO H-CHONDRITES:
COMPARISON WITH ALLAN HILLS CHONDRITES AND MODERN FALLS

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Concentration and isotopic composition of noble gases have been measured in 20 H-chondrites found on the Yamato Mountains ice fields in Antarctica. The distribution of exposure ages as well as of radiogenic ^{4}He contents is similar to that of H-chondrites collected at the Allan Hills site. Furthermore, a comparison of the noble gas record of Antarctic H-chondrites and finds or falls from non-Antarctic areas gives no support to the suggestion that Antarctic H-chondrites and modern falls derive from differing interplanetary meteorite populations.

On the basis of statistically significant differences in the concentration of a number of trace elements, it has been suggested that H-chondrites found on blue ice fields of Antarctica and those falling in non-Antarctic areas represent members of different extraterrestrial populations which have had different thermal histories during formation of their parent material [1]. In addition, it was concluded that Antarctic H-chondrites found in Victoria Land (Allan Hills) differ from those found in Queen Maud Land (Yamato Mountains) [2]. Takaoka et al. [3] noted the similarity of exposure age distributions of Yamato L- and H-chondrites with those of non-Antarctic ones and Schultz et al. [4] have shown that the noble gas record of Antarctic Allan Hills H-chondrites and that of modern falls is very similar. Both distributions show a characteristic clustering of cosmic ray exposure ages around 7 Ma. Also the distribution of radiogenic gases yields no evidence that H-chondrites derive not from the same population. In this paper we report noble gas measurements of 20 Yamato chondrites which seem to contain no paired samples. The full data set and the experimental details will be given elsewhere.

Exposure ages are calculated from cosmogenic ^{21}Ne using the production rate and shielding correction procedures as described by Eugster [5]. Fig.1 shows the exposure ages of the Yamato H-chondrites and of all Antarctic H-chondrites (this paper and [3]). For comparison, the exposure ages of non-Antarctic H-chondrites, calculated from literature values [6], are given. To prevent additional uncertainties due to extreme shielding corrections only measurements with cosmogenic ^{22}Ne/^{21}Ne between 1.08 and 1.18 are considered. All three distributions of Fig.1 show the prominent exposure age cluster of H-chondrites at about 7 Ma which indicates that about 40% of the Antarctic and non-Antarctic H-chondrites were excavated from their parent body at the same time.

Also the radiogenic ^{4}He in Yamato H-chondrites and modern falls is very similar (Fig.2). Both groups have a maximum between 1250 and 1500 10^{-8}ccSTP/g indicating that their thermal history is similar. For ^{40}Ar an apparent difference to measurements reported in the literature was noted [4]. This, however, is attributed to an experimental artefact in measurements carried out more than twenty years ago. The Yamato H-chondrites, however, show a very similar distribution to that of Allan Hills chondrites [4] and also to modern falls

measured recently [7]. We conclude from these observations that the noble gas record of chondrites from two Antarctic find locations show no evidence for different interplanetary populations of H-chondrites.

[1] Dennison J.E. et al. (1986) Nature 319, 390-393. [2] Wolf S.F. and Lipschutz M.E. (1992) Lunar Planet Sci. XIII, 1545-1546. [3] Takaoka N. et al. (1981) Mem. Natl. Polar inst. (Tokyo), Spec. Issue No. 20, 264-275. [4] Schultz L. et al.(1991) Geochim.Cosmochim.Acta 55, 59-66. [5] Eugster O. (1988) Geochim.Cosmochim.Acta 52, 1649-1662. [6] Schultz L. and Kruse H. (1989) Meteoritics 24, 155-172. [7] Weber H. et al. (1989) Meteoritics 24, 338.

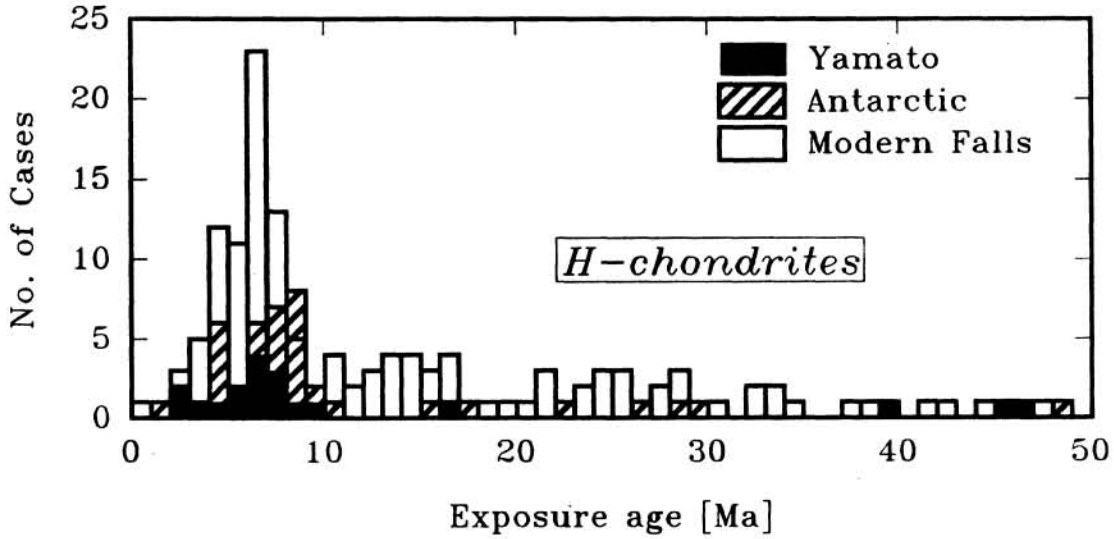

Fig. 1: Distribution of cosmic ray exposure ages.

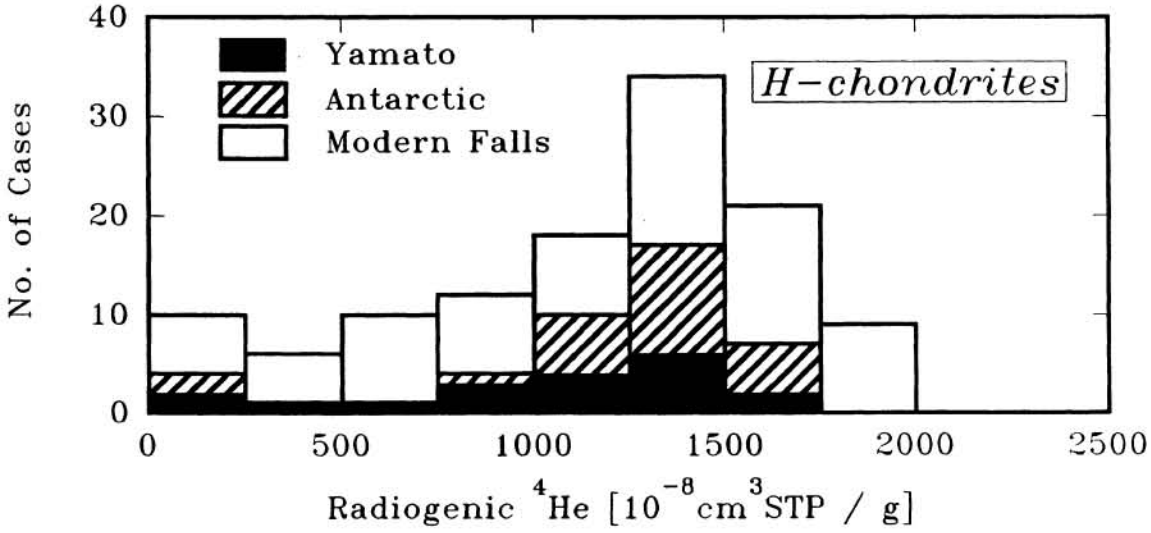

Fig. 2: Concentrations of radiogenic ^{4}He.