DISPERSION OF THE RATIOS OF COSMOGENIC ISOTOPES OF NOBLE GASES IN CHONDRITES OF DIFFERENT COSMIC-RAY EXPOSURE AGES.

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The dispersion of ratios of (He-3/Ne-21)c and (Ne-22/Ne-21)c depending on the cosmic-ray exposure ages of meteorites is analysed. The dispersion is increased at decrease of age. This effect may be stipulated by presence of more significant portion of meteorites of small preatmospheric sizes among meteorites of small radiation ages in comparison to meteorites of higher exposure age.

We have analysed the distributions of the ratios of cosmogenic isotopes of (He-3/Ne-21)c and (Ne-22/Ne-21)c in about 600 non-Antarctic (falls and finds) and Antarctic H and L chondrites depending on the cosmic ray exposure ages of meteorites. The noble gas data are from [1]. Contents of cosmogenic components were calculated by conventional procedure. The exposure ages were calculated for production rates of He-3, Ne-21, and Ar-38 according to [2] with correction of Ar-38 production rate [3].

We can see (Fig 1) the increase of dispersion at decrease of exposure age of meteorites. This regularity is the most well--defined for Antarctic H chondrites.

For quantitative estimation of this effect we divided each group of N meteorites on several subgroups with identical numbers of meteorites of $n \geq 10$ (in Fig 1 n=11). For every subgroup it was calculated the dispersion of $S_i^2 = (\Sigma y_i^2 - (\Sigma y_i)^2/n)/(n-1)$, where $y_i$ are values of (He-3/Ne-21)c or (Ne-22/Ne-21)c ratios, $i = 1,2...n$. Then we calculated the dispersion of all points: $S^2 = (\Sigma y_i^2 - (\Sigma y_i)^2/N)/(N-1)$, $i = 1,2...N$, determined the values of $\alpha_i = S_i^2/S^2$ and consructed the dependence of $\lg\alpha_i$ vs. average logarithm of age of $(\lg T)av,i$ in subgroup. The values of the coefficient "b" in equation of line of $\lg\alpha = a + b(\lg T)av$ were determined according to [4]. Such dependence is shown in Fig 2 for distribution shown in Fig 1. The values of the coefficient of "b" are given in the Table for all investigated groups of chondrites. The "-" sign of "b" coefficient means the increase of dispersion at decrease of age; the magnitude of "b" defines the significance of this effect. We can see all values of "b" is less of zero for non-Antarctic falls and Antarctic meteorites and exceed in the most cases the values of standard deviations ($1\sigma$) especially for H chondrites. For non-Antarctic finds this effect is manifested not for all cases; it may be stipulated by superposition of process of weathering [3].

The considered effect may be understood in the framework of model according to which meteorites may be fragments of main-belt asteroids, derived by cratering collisions [5-7]. In this case dispersion of the velocities of fragments at collisions of asteroids stipulates the different times of the evolution of this fragment orbits to the earth-crossing orbits. Smaller fragments obtain higher velocities, whereby the time of transfer of this fragments to the earth-crossing orbits is decreased and therefore their exposure ages will be mainly small. Also, we know [8] the

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Table. Values of "b" coefficient in equation y = a + bx

| METEORITES | H | | L | |
|---|---|---|---|---|
| | He-3/Ne-21 | Ne-22/Ne-21 | He-3/Ne-21 | Ne-22/Ne-21 |
| Antarctic | -1.03+/-.34 | -1.06+/-.30 | -0.54+/-.66 | -0.58+/-.53 |
| Non-Ant.falls | -0.36+/-.13 | -0.32+/-.08 | -0.22+/-.16 | -0.40+/-.09 |
| Non-Ant.finds | -0.15+/-.25 | 0.12+/-.32 | 0.18+/-.23 | -0.56+/-.30 |

small meteorites have high ratios of (He-3/Ne-21)c and (Ne-22/Ne-21)c. Therefore discussed effect may be stipulated by presence of bigger portion of meteorites with small preatmospheric sizes among the meteorites with small exposure ages (in comparison to meteorites with high exposure ages). More significant manifistation of this effect in Antarctic H chondrites may be stipulated by presence of bigger portion of small meteorites among cosmic bodies which were falling on the Earth ~nx10,000 years ago (average terrestrial age of H chondrites [9]) in comparison to modern falls.

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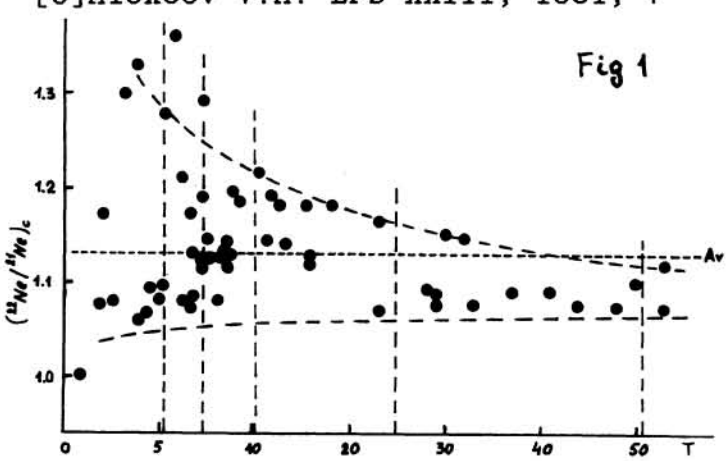


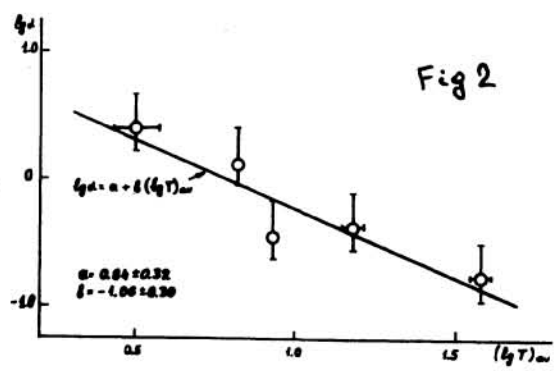


Figure captions

Fig 1 Distribution of the cosmogenic isotope ratios of (Ne-22/ /Ne-21)c in Antarctic H chondrites vs. exposure ages (T,My) The vertical dashed lines divides the data on subgroups with 11 points in everyone; Av is average value of (Ne-22/ /Ne-21)c ratio for all points.

Fig 2 Logarithm of relative dispersion vs. exposure age of meteorites