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ICE-BASED ALTITUDE DISTRIBUTION OF NATURAL RADIATION EFFECTIVE ENERGY AND ANNUAL EXPOSURE RATE IN THE ANTARCTIC ZONE (ABSTRACT)*

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Natural radiation measurments provide physical data such as effective energy and exposure rate. It has been reported that, from the viewpoint of earth physics, the relationship between the exposure rate and the effective energy of natural radiation can be expressed by a hyperbolic function. However, the maximum value of the effective energy and the exposure rate of natural radiation can only be guessed. The ice plateau in Antarctica is almost completely unaffected by radiation from ^{40}K, U, Th and other natural radionuclides found in the ocean and in the ground. The altitude dependence of the exposure rate and the effective energy of natural radiation in the ice plateau result from a long period of exposure to these radiations. These results will be reported.

Both ice-based altitude distributions of the exposure rate and the effective energy of natural radiation over Antarctica in the latitude range between 69°S and 77°S during approximately 500 days were measured using thermoluminescent dosimeters (TLD). The exposure rate and the effective energy of natural radiation over Antarctica were measured with an integrating TLD, and the following results were obtained.

1) The effective energy of natural radiation over the ice plateau in Antarctica is approximately 10 MeV. This value is not dependent on the altitude above sea level of the measuring point, and is considered to be the effective energy of the cosmic-rays.

2) In high-latitude regions, the empirical doubling with altitude rule cannot be applied to the correlation between altitude and the exposure rate of cosmic-rays, and the exposure rate is instead found to almost triple with altitude. This relationship can be affected by magnetic field variations with latitude at the monitoring points.

3) Based on these results, the natural radiation over Antarctica consists almost entirely of cosmic rays, and, in general, natural radiation in the region, covered with wide sheets of ice at least 10 m thick, is presumed to consist almost exclusively of cosmic-rays.

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