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木曽山脈の周氷河地形に適用した２つの年代測定法（宇宙線照射年代法、風化皮膜法）の比較
Comparison between two chronological methods - in situ TCN and WRT applied to periglacial landforms in Kiso Mountains

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A lot of types of chronological methods have been suggested in the field of earth science. Chronological methods are classified into absolute dating methods and relative dating methods. Absolute dating methods contain isotopic age or tree-ring chronology for example, and they provide the age as numerical values. Otherwise, relative dating methods are the methods which detect the time series of the formation of geomorphology or deposition. However, they cannot fix the age without the absolute age data (Watanabe, 1990).

Two chronological methods - in situ Terrestrial Cosmogenic Nuclides (TCN) and weathering-rind thickness (WRT) -are subjected. These two methods are especially effective in high mountain areas as it is difficult to find radiocarbon samples or key tephra layers (Aoki, 1994). These two methods were compared using terminal moraines in the cirques (Aoki, 2000). However, this comparison is not made in other mountainous terrains, and it is made in Kiso Mountain Range in this study.

In order to compare these two methods, samples were taken from multiple ridges in the eastern part of Mt Kisokomagatake, and Shirabidaira. Six samples were taken from 3 ridges and 2 depressions of triple ridges, and one sample from Shirabidaira. In order to obtain the exact formation age, we selected the bedrock or the oldest boulder filling the depression and collected their surface layer of 4 cm or less in thickness

Each sample is divided in two, one for TCN and the other for WRT.

10Be exposure dating method is subjected as TCN. The samples are chemically preprocessed and at MALT (Micro Analysis Laboratory, Tandem Accelerator), University of Tokyo. The exposure age is calculated by means of the formula as follows(∗)

$T=-1/\lambda \ln\{(1-\lambda N/P)\}$ (∗)

T: Exposure Age [yr] λ:Decay constant [1/yr] N: Number of isotopes [atoms/g] P: Production rate of isotopes [atoms/(g • yr)]

Weathering-rind is a discolored part of rocks. It is formed due to oxidation or hydration. Though the age is nearly in portion to WRT, its correlation depends on the rock type, sampling point and so on. In this study, samples were cut so that the weathering-rind can be observed as clearly as possible.

In 7 samples, radioactive ages are in either late Pleistocene or Holocene. Weathering-rind was observed and detected for 5 samples. There is a positive correlation between WRT and the exposure age. The primary regression equation is as follows : WRT [mm] = 0.367 × (Exposure age [kyr]) + 1.16. The correlation coefficient is about 0.85. This suggests that in order to get the exposure age of multiple ridges, WRT is also an effective method to a certain extent. Therefore, mean weathering rate (= 0.367 mm/kyr) can be gained by calculating a primary regression line that shows the relationship of the WRT and the exposure age. This weathering rate is the same in the order of magnitude as that (= 0.283 mm/kyr) estimated from Seki and Koizumi (1992).

Keywords: In-situ Terrestrial Cosmic Nuclides, Weathering-rind Thickness, Periglacial landforms, Kiso Mountain Range