10-Beryllium-contents of sediments in mountainous catchments topographically constrained by shallow landslides

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Recently, it is being important to understand sediment dynamics in a river basin for a well-balanced sediment management in the entire basin at view points of the national flood control and water resources. However, it is still unclear how much sediment has been produced in a mountainous stream, which is a basic information of the sediment dynamics. In this study, 10-beryllium-contents have been analysed for sediment samples of mountainous catchments in Fukuoka, Japan in order to fundamentally examine the sediment dynamics in the river basin. Since the late 1980s, beryllium isotopes of quartz extracted from rock or river sediment have been analysed to estimate rock- or catchment-scale denudation rates [1].

A lot of slope collapses are observed in the study area, of which the geology mostly consists of Mesozoic granites. Most of those failures were explained as a shallow landslide under around 1m in depth, which accompanied with an infiltration of rains and an increase of a groundwater table in weathering granite [2]. The sediment samples have been collected at four riverbeds and one hillslope in two different sub-catchments (A and B).

The samples that originated from weathering granite are composed of quartz, feldspar, mica and some organic materials. Firstly, they were washed by pure water and sieved over 250 μm to avoid a contamination from aeolian deposits. Then, the quartz was purified with acids and beryllium oxide was produced based on the method of Kohl & Nishiizumi [3]. Finally, beryllium isotopes were analysed with the accelerator mass spectrometer equipped by JAEA (JAEA-AMS-TONO).

As a result, the sample of the catchment B shows a little bit higher value in 10-beryllium-content that is 8.7 ±1.9 (x 10^4 atoms/g), than those of catchment A that show similar values ranging from 3.1 ±0.5 to 5.5 ±0.9 (x 10^4 atoms/g). This result indicates that the river sediment in the catchment B includes quartz grains that have been exposed on a ground surface for a long time compared with the catchment A because topographical settings of these two catchments are similar. It is also possible to think that the river sediment in the catchments A contains more landslide materials because the landslide materials, which have come from a deeper part, might have a lower value in 10-beryllium-content. This result is consistent with distribution of the shallow landslides in 2003.

References:

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