

## Formation age and denudation rate of the Akiyoshi Karst: an approach from cosmogenic nuclides in relict fluvial sediments

# Yuki Matsushi[1]; Yuri Moriguchi[2]; Hiroyuki Matsuzaki[3]; Yukinori Matsukura[4]

[1] MALT, Univ. Tokyo; [2] Geoenvironmental Sciences, Tsukuba Univ.  
; [3] MALT, Univ. Tokyo; [4] Inst. Geosci., Univ. Tsukuba

This study attempts to estimate the age of the limestone plateau using in-situ-produced cosmogenic Al-26 ( $T_{1/2} = 7.05 \times 10^5$  yr) and Be-10 ( $T_{1/2} = 1.36 \times 10^6$  yr) in quartz in uncalcareous sediments that remain on the plateau surface or the abandoned lateral cave in Akiyoshi-dai, southeast Japan. These sediments contain rounded pebbles that document paleo fluvial processes on the karst, and sit presently at about 200 m above the bottom of poljes. Measurements of the cosmogenic nuclides were conducted for three types of sediment samples: 1) an on-plateau sand layer near Choja-ga-mine (Alt. = 330 m) at which the samples were collected for several depths from 5 to 135 cm below surface, 2) a cave deposit buried at 8.3 m deep in Kitayama-kita Cave (Alt. = 302 m), and 3) current fluvial sediments obtained from five longitudinal sites of modern river beds (Aokage River: Alt. = 84-115 m).

The highest nuclide concentrations were observed at the near-surface samples of the on-plateau sand layer ( $8 \times 10^5$  atoms  $g^{-1}$  for Al-26 and  $2 \times 10^5$  atoms  $g^{-1}$  for Be-10). However these concentrations are distinctly lower than those expected with the case of constant exposure of the sediment during the karst formation, and hence no longer retained the information about the exposure duration. A weighted least-square fitting of a model curve to the depth-decreasing exponential Al-26 or Be-10 profile indicated that the subsurface nuclide concentrations have almost attained to an equilibrium state with the denudation of 20-30 mm  $kyr^{-1}$ .

The cave deposit shows the lowest nuclide concentration ( $6.2 \times 10^4$  atoms  $g^{-1}$  for Al-26 and  $1.5 \times 10^4$  atoms  $g^{-1}$  for Be-10) and also the lowest Al-26/Be-10 ratio (4.1), indicating a long-time burial of the sediment. The nuclide concentrations of the current fluvial sediments were constant in spite of the distance from source area, around  $6 \times 10^5$  atoms  $g^{-1}$  for Al-26 and  $1 \times 10^5$  atoms  $g^{-1}$  for Be-10. By assuming that the nuclide concentrations of the current fluvial sediments represent the initial condition at the sediment supply into paleo cave system, the burial age of the cave deposit and the long-term denudation rate of the shielding limestone were calculated to be  $6-7 \times 10^6$  yr and about 40 mm  $kyr^{-1}$ , respectively. From these values, the thickness of the removed limestone was estimated to be 250-300 m, which is fairly consistent to the relative height between the upper surface of the Akiyoshi Karst (Alt. about 300 m) and the level of uplifted peneplain (Alt. about 600 m) developed during Miocene in this region.