Paleoclimate since 100 ka recorded in a stalagmite collected from eastern Shiga Prefecture, Japan

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Stalagmites have been subjected to paleoclimatic studies and provided a valuable source of Holocene and late Pleistocene records (Fairchild et al., 2006). For instance, Wang et al. (2005) indicated that insolation and strength of Again monsoon reflected on the oxygen isotopic values of the stalagmites from southern China. High-resolution record from the Chinese material is now evaluated as the global standard of late Quaternary paleoclimate, together with the ice-core record from Greenland. Despite of active researches in China and Taiwan, this attractive source has been seldom subjected to paleoclimatic analyses. This study would represent the results of high-resolution analyses of a 24-cm-long stalagmite collected from eastern Shiga Prefecture.

Depositional period of the stalagmite ranges from 103 ka to present, estimated by U-Th dating using MC-ICP-MS in National Taiwan University. A hiatus (26.2-10.1 ka) was recognized at 7.5cm below the top, where we defined the boundary between lower and upper stalagmite. This period broadly corresponds to the Last Glacial Maximum. Because the specimen contents some initial Th, the ages were estimated with the correlation of the initial Th isotopic ratio that was evaluated by in an isochron. High-resolution (0.2 mm interval) time series of carbon isotopic composition, fluorescence intensity (FL), and growth rate estimated by the dating result indicate the changes in rainfall.

General decreasing in the growth rate of the lower stalagmite estimate that amount of rainfall had been generally decreasing in a period of 103-26.2ka. This estimation was supported by the general increasing trend of both carbon isotopic value and FL. Rainfall intensity reflected on the drip rate of water for precipitating calcite. The decreasing rainfall enhanced carbon dioxide degassing that increased the isotopic value, and also contamination of organic acids (e.g., humic acid) into the stalagmite, which caused the fluorescence. Apart form these general trends, the results show some shorter-term changes. The most distinct feature is the peak of the two values around 60 ka when the Heinrich Event 6 had happened. FL increased substantially since 35 ka. Rainfall had been continuously decreasing and the drip-water supply stopped in 26.2 ka. These records appear a similar picture with the eolian grain content in sentiments recovered from the Lake Biwa, which likely represents the intensity of the winter Asian Monsoon (Xiao et al., 1997). The linkage with our records suggests that the decreased rainfall was induced by the decreased intensity of the summer Asian Monsoon.

The most distinct feature of the upper stalagmite is the reverse correlation between carbon isotope and growth rate, both of which are related with the drip rate. Assuming that rainfall reflected on these proxies, the most humid period corresponding the warmest period of Hypsithermal.

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