Paleoclimate during the deglaciation recorded in a stalagmite collected from Taishaku Gorge, Hiroshima Prefecture, Japan

Akihiro Kano[1]; Kyoko Fukumura[2]; Masako Hori[3]; Chuan-Chou SHEN[4]

[1] Earth and Planetary Sys. Sci., Hiroshima Univ; [2] Earth and Planetary Systems Sci., Hiroshima Univ.; [3] Earth and Planetary Systems Sci., Hiroshima Univ; [4] Geosciences,NTU

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 13-cm-long stalagmite collected from Maboroshi Cave in Hiroshima Prefecture.

Depositional period of the stalagmite ranges from 18120 years B.P. to 4530 years B.P., estimated by U-Th dating using MC-ICP-MS in National Taiwan University. A hiatus (10510-8030 years B.P.) was recognized at 5.5cm below the top, where we defined the boundary between lower and upper stalagmite. Because the specimen is very poor in initial Th contents, the estimated ages are highly reliable.

High-resolution (0.2 mm interval) time series of oxygen-carbon isotopic compositions and Mg/Ca ratio is expected to indicate the changes in air temperature and rainfall. Especially, the deglaciation changes reflect on the proxies in the lower stalagmite. The followings can be tentatively reconstructed from our results.

The lowermost 4.5 cm revealed a gradual decreasing trend in both carbon isotopic value and Mg/Ca ratio, and an increasing trend in the growth rate. This portion was deposited in a period of 18120-15000 years B.P. when the global climate was in warming phase. However, the warming trend contradicts to the decreasing Mg/Ca ratio, and is not seen in oxygen isotopic records. Our records most likely indicate increasing rainfall. In the earliest stage of this stalagmite, water increases both Mg/Ca ratio and carbon isotope of DIC due to significant calcite precipitation before it dropped on the stalagmite.

Distinct decrease of oxygen isotopic composition and increase of Mg/Ca ratio were recorded at 7.5 cm below the top. Estimated age of this level corresponds to Bolling warming period. Assuming that the oxygen isotopic values had been staying stable, amplitude of the warming is estimated 8 degrees.

The portion deposited during Younger Dryas reveals only a minor change in oxygen isotopic value. This is largely deferent from the Chinese records recording a substantial decrease that related to the weakened summer monsoon. Influence of Younger Dryas might be subtle in Japan. Alternatively, effect from the decreasing temperature was balanced with expected decreasing oxygen isotopic value of rainwater.