

Millennial changes recorded in a stalagmite from central Gifu, Japan

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A 13-cm-long stalagmite collected from Gujyo City (central Gifu Prefecture) was formed from Marine isotopic stage 3 (MIS-3) to mid-Holocene. The stalagmite is divided into the lower and upper parts by a long-time hiatus during the Last Glacial time. Textural difference appears between the homogenous and transparent upper part and the dark-colored lower part. Oxygen isotopic values are also different; the values of the lower part are 0.5-1.0 permil higher than the values of the upper part. This difference is comparable to one that has been reported from stalagmites in south China, revealing that the Gifu stalagmite was formed under the influence from East Asian summer monsoon.

The most prominent feature of this stalagmite is cyclic changes of ~1 cm intervals in the lower stalagmite. Assuming that the lower part had grown continuous with a uniform rate, it includes a period from 56-35 ka. Eight cyclic changes could coincide to the dark layers in deep-sea sediments from the Japan Sea, which are likely associated with Dansgaard-Oeschger (D-O) events. In each cycle, the stalagmite increases transparency to the upward, and suddenly becomes darker at the base of the upper cycle. Similarly, oxygen isotopic values gradually increase in each cycle and rapidly decrease at the base of the upper cycle.

Millennial changes in the Gifu stalagmite indicate D-O cycles, and further records regular intervals that cannot be seen in the Greenland ice sheet. Records of the lower stalagmite support the global extension of D-O events, and suggest that D-O cycles were not necessary originated from the phenomena in North Atlantic. Assuming that the oxygen isotopic values reflect precipitation intensity, it became dry during a gradual cooling period and shifted wet with an abrupt warming.

U-Th dating was performed in National Taiwan University under the guidance of Prof. C.C. Shen.

Keywords: stalagmite, oxygen isotope, late Pleistocene