

Oxygen isotopic records of stalagmite OT02 collected Gujo City, Gifu Prefecture

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A 13-cm-long stalagmite OT02 from Gujo City (central Gifu Prefecture) recorded climatic information of two separated periods of Marine isotopic stage 3 (MIS-3) and Holocene. Oxygen Upper and lower parts of the stalagmite differ in oxygen isotopic values; the lower MIS-3 part are 0.5-1.0 permil higher than the upper Holocene 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 (case 1). However, meteoric water samples collected at a reference site (Ogaki City) clearly indicate seasonality in the oxygen isotope values. Meteoric waters in winter generally record low isotopic values, and the records of OT02 can be the change in the winter proportion of meteoric water (case 2). OT02 is unique in terms of different periodicity recorded in the oxygen isotopic composition; ~650-yr cycles in the Holocene interval and millennial-scale changes in the lower MIS-3 interval. The Holocene cycle are most likely responded to the swell of solar activity that affected to proportion of winter rainfall (case 2). In contrast, the millennial-scale changes in the lower OT02 are likely associated with Dansgaard-Oeschger (D-O) events. Eight bands of low oxygen isotope during a period of 55-35 ka follow the spacing of the dark layers in deep-sea sediments from the Japan Sea. 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. Although some of millennial changes in the Gifu stalagmite indicate D-O cycles cannot be seen in the Greenland ice sheet, our records suggest that the central Japan was under the influences of D-O cycles. Oxygen isotope records of the lower OT02 are consistent to case 1 interpretation rather than case 2. Assuming this, it became dry during a gradual cooling period and shifted wet with an abrupt warming.