High-resolution records of stable isotopes and Si X-ray strength in late Holocene paleo-tufa in Ehime Prefecture, Japan.

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Tufas are freshwater carbonates commonly developed in limestone areas and potential paleoclimatic recorders. As speleothems or ice-cores, tufas are expected to be applied for reconstructing Holocene paleoenvironments. Seasonal change in chemical and isotopic compositions was observed in the tufa-depositing water, and was inherited to the compositions of tufas. Since active soil-CO_2 production in summer increases dissolved $CaCO_3$ in groundwater, saturation index for calcite (SIC) of the river water increases in summer. This seasonal change in SIC results in annually lamination in tufas, which consists of dense summer layers and porous winter layers. Previous studies have revealed that the oxygen stable isotopes express water temperature and the carbon stable isotopes are controlled largely by CO_2 productivity in soil. The both isotopic records often show seasonal patterns corresponding to the annual lamination.

We have analyzed samples collected from the 150-cm-thick paleo-tufa outcrop located in Seiyo-City of Ehime Prefecture and measured the high-resolution stable isotopic and mineral records. The deposition age was estimated by radiocarbon isotopic composition using benzene-liquid scintillation counting. The measured value cannot be simply applied because the calcite of tufas contains unignorable proportion of dead carbon (DCP) originated from limestone bedrock. Measurement of the modern specimen developed in the paleo-tufa outcrop estimates that DCP is 14%. Assuming that this DCP value can be applied to paleo-tufa, the ages of the analyzed specimens are evaluated 4000 and 2500-2000 ^{14}C B.P.

We analyzed stable isotopes with 0.2 mm intervals vertically to the lamination. Growth rate was estimated by the results and used as proxy of humidity because it is largely controlled by amount of water mass flowing along the stream. Carbon stable isotopes partly indicate amount of rainfall, because they are influenced by pre-precipitation in underground. Furthermore, the Si-X ray strength appears clay contents in tufa, which were developed adhesion of detrital clay transported in flood condition after a heavy rain event. Based on these proxies, we would discus frequency of flood events and temporal distribution of rainy seasons in 2500-2000 ^{14}C B.P. Such information may provide insight to late Holocene paleoclimatology in Japan.