

Radiocarbon dating of buried tree trunks found in lake sediments in Kamiyahagi-cho, Gifu Prefecture

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Umi is located in the Kamiyahagi area of Gifu Prefecture. The name UMI means SEA or LARGE LAKE; however, there are no large lakes in Gifu, which is an inland prefecture. There is also no information about the origins of the name UMI in ancient documents.

In September 2000, an enormous storm (called TOKAI GOU-U) occurred in the Tokai Area. Rivers were flooded in the Kamiyahagi area, where embankments and roads near the rivers were destroyed. After the storm many buried trees were exposed on the banks of the Kamimura River, and sedimentary layers typical of a lake setting were found on the both river walls. This was the first evidence for the existence of a palaeo-lake in the area. A geological event such as an earthquake was probably responsible for creating a lake environment, and subsequent lateral degradation of area provided a source for the lake sediments. To determine when this geological event occurred, we measured the ages of tree trunks taken from the lake sediments.

Tree trunks that included bark were chosen and samples were taken from the outermost tree rings. After ultrasonic washing, each sample was treated with 1.2N HCl and 1.2N NaOH, rinsed with distilled water to completely remove the acid, and then dried in an oven. Each sample was then sealed in evacuated Vycor tubes with CuO wires and combusted to produce carbon dioxide, water and other trace substances. The carbon dioxide was extracted and purified, and then reduced with powdered iron and hydrogen gas to produce graphite. The graphite was then pressed into target holders and the carbon isotope ratio was measured with the Tandem Accelerator Mass Spectrometer at Nagoya University. The following age estimates of the tree fragments were calculated from the data obtained:

KMYHG-1: 380±25 BP
KMYHG-2: 620±25 BP
KMYHG-3: 300±25 BP
KMYHG-4: 335±25 BP
KMYHG-5: 345±25 BP

Calibrated ages were calculated with the Radiocarbon Calibration Program V 4.3 (based on Stuiver and Reimer, 1993), as below:

KMYHG-1: 1454-1495(0.57), 1498-1514(0.20), 1600-1615(0.23) cal AD
KMYHG-2: 1303-1326(0.43), 1348-1369(0.40), 1382-1391(0.17) cal AD
KMYHG-3: 1522-1569(0.74), 1627-1644(0.26) cal AD
KMYHG-4: 1494-1504(0.09), 1504-1526(0.21), 1556-1601(0.50), 1613-1631(0.20) cal AD
KMYHG-5: 1491-1523(0.36), 1566-1604(0.40), 1607-1682(0.24) cal AD

The trees grew shortly before the Tensho earthquake of 1586 A.D., a known large-scale geological event. We consider the Tensho earthquake and its effects to be responsible for the formation of a large lake and the deposition of lake sediments.