

Evaluation of influence on the radiocarbon dating by the difference in chemical pretreatment protocols

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Mass movements (e.g., slope failure, landslide and debris flow) and fault movements are natural phenomena to change the local topography greatly. Reconstruction of the movement histories and evaluation of long-term stability of topographies are crucial to assess the geological environment in future. History reconstruction based on radiocarbon dating of plant material recovered from sediment deposited by the past movements requires the compilation and the comparison of existing data measured by different analysts with different methods.

We compared the results of radiocarbon ages measured at different laboratories with various chemical pretreatments (acid-base-acid method, cellulose extraction, acid-base-oxidation-stepped combustion), using plant material samples (charcoal, old tree-trunks and roots; estimated ages of 600-2200 BP or 45000 BP) recovered from sediment in Tsuwano, Shimane Pref.

For three younger samples (600-2200 BP) measured at different laboratories, concordant ages within measurement uncertainty are yielded as long as the experimental protocol of each laboratory is applied. For five older samples (43000-47000 BP) measured under various experimental conditions, dispersion in ages (2100 - 3500 years; approximately 5-8 % of the ages) is greater than measurement uncertainty (200 - 900 years; 0.5-1.7 %). However, the order of weighted mean ages for each sample agrees well with stratigraphic sequence at the sampling site, and such dispersion near the limit of radiocarbon dating method can be observed in previous works (e.g., Reimer et al., 2013, Radiocarbon, 55, 1869-1887). It is therefore thought that the influence of the systematic error due to a specific experimental conditions is small.

Keywords: radiocarbon dating, ABA method, ABOx method, cellulose extraction