AMS ^{14}C CHRONOLOGICAL STUDY ON HOLOCENE ACTIVITIES OF ACTIVE FAULTS IN JAPAN

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Slipping of active faults generates earthquakes. If we can detect traces of ancient slips of active faults, we can correlate them with earthquakes that occurred in the past. The scale of a slip correlates with the time interval between the slip and the previous one during which strain accumulated in the fault system. Thus it is very important to examine the history of fault activities in the late Quaternary, to provide a risk estimation of the next slip time for prevention of disasters. To establish chronology of past slips of active faults, AMS ^{14}C dating of macro fossil, charcoal and soil organic material samples collected around the fault is very promising, because the method requires carbon samples of very small size.

Some active faults were discovered in a shallow sea area. They provided us an ideal field to study behavior of a fault during the Holocene, because sea sediments deposited continuously, by recording seismic events of the faults in them. The following procedures are applied to two submarine active fault systems located in the northwestern part of Beppu Bay, eastern Kyushu and off the coast of the town of Futami in the northwestern Shikoku, Japan: 1) surveying an exact line of a submarine fault and continuation of sediment layers on both sides of it by using a high-resolution single-channel seismic profiler; 2) collecting sediment samples on both sides of the fault by using a piston core sampler; 3) analyzing core samples for magnetic susceptibility, micropaleontology and lithology; 4) correlating exactly each sediment layer of the cores on both sides of the fault to recognize several seismic events by relative vertical displacements of relevant layers between the two core sediments; 5) establishing chronology of the events by AMS ^{14}C dating of mainly shell fossil samples selected from the sediments.

We also applied AMS ^{14}C dating to establish the chronology of the Nojima fault, located in Awajishima, Hyogo Prefecture, which is one of the faults that generated the 1995 Hyogoken Nanbu Earthquake that occurred on 17 January 1995 and destroyed the city of Kobe. Preliminary chronological results are: 1) the Nojima fault has repeated the displacements a few times in the last 2000 yr; 2) a slip definitely occurred along the Nojima fault *ca.* 2000 yr ago; 3) several types of deformation, including an open crack, were likely to be formed close to the fault, associated with an earthquake that occurred 400 yr ago, that is probably assigned as the 1596 Keicho Earthquake.

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ENVIRONMENTAL ^{90}Sr MEASUREMENTS

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^{90}Sr (T=28.5 yr) is a long-lived anthropogenic radionuclide produced in fission. The current and historical distribution of ^{90}Sr in the environment is useful for the prediction of the behavior of this nuclide released into the environment. The rapid radiochemical detection of ^{90}Sr in environmental

samples poses non-trivial problems mainly because its pure beta activity is masked by a shorter-lived strontium isotope ^{89}Sr, also a fission product. AMS offers a direct, fast and sensitive measurement of ^{90}Sr concentration by atom counting, the major detection problem being in this case the interference of stable isobaric ^{90}Zr impurities. The ^{90}Y isobaric daughter reaches secular equilibrium where $^{90}Y/^{90}Sr = 2 \times 10^{-4}$ and is insignificant in atom counting. AMS measurements of ^{90}Sr were performed with the Rehovot 14UD Pelletron accelerator at a terminal voltage of 11 MV using our standard detection system. Samples of SrH_2 were prepared by reduction of SrO to Sr and conversion to hydride in a hydrogen chamber at 400 deg C. SrH_3^- are the preferred ions owing to high beam intensity and low Coulomb explosion effects. The ions were identified by measuring time-of-flight, total energy and three independent energy loss signals in an ionization chamber filled with 15.7 torr of isobutane. The measurements are normalized to a known standard of $^{90}Sr/Sr = 4.3 \times 10^{-11}$. For this standard 400 $^{90}Sr^{11+}$ ions were counted in 13 min. A ratio of $^{90}Sr/Sr = 2 \times 10^{-13}$ was measured for a blank sample (3 counts in 33 min), probably due to the vicinity of the intense group of ^{90}Zr ions in the spectra. This sensitivity corresponds in practice to a ^{90}Sr specific activity of 0.2 pCi/L in environmental samples, a factor of *ca.* 5 better than typically achieved in standard beta counting methods. Environmental samples are being prepared and studied with our AMS system.

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EXPANDED SMALL SAMPLE CAPABILITIES AT NOSAMS: PREPARATION AND ANALYSIS OF CONVENTIONAL GRAPHITE TARGETS CONTAINING ≤0.15 μg CARBON

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Eighty small AMS samples containing between 15 and 150 μg carbon were prepared by reduction of CO_2 over cobalt metal at 625 ± 25°C in the presence of excess H_2. Analysis of the graphitization procedure shows that optimal reduction conditions favor temperatures below 608°C, and success rates improve with larger sample sizes. AMS results for the 41 OxI and OxII standards found that 84% of targets containing ≥ 20 μg carbon had "good" (accurate to within 2% of "true" and imprecision of ~2%) performance, while only 20% of targets containing <20 μg carbon were classified "good". Mean fm results are 1.051 ± 0.015 (HOxI) and 1.364 ± 0.015 (HOxII), for an overall imprecision of ±15‰. The graphitization blank is insignificant—equivalent to ~0.01 mmol modern carbon.

Detailed analysis of the raw AMS data suggests that machine efficiency issues are critical below the 100 μg threshold and must be addressed to achieve high quality results on small samples. Sample ^{12}C current output (I12) scales linearly with sample size. The low currents associated with small samples in turn affect the isotopic ratios $^{14}C/^{12}C$ and $\delta^{13}C$. The depression in $^{14}C/^{12}C$ ratio is especially significant and is not believed to be the result of an unquantified "dead" carbon blank. While application of a size-calibrated model correction factor to all calculations is possible, the use of size-matching standards is recommended as the preferable option for analysis of sub-milligram samples.