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GEOLOGICAL SURVEY OF JAPAN RADIOCARBON DATES I

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This radiocarbon laboratory began operation in 1980 using the benzene scintillation method. The benzene synthesizer is essentially identical with that of Ikeda (1976). A liquid scintillation counter is Aloca LSC-LB1. Samples dated are wood, charcoal, shell, and coral.

Pretreatment of wood and charcoal is a standard acid-alkali procedure, using 2% HCl and 2% NaOH at elevated temperatures. Charcoal is further heated in concentrated HNO_3 for one hour, diluted in water, stands one night, and is washed and dried. Pretreated wood and charcoal are carbonized before combustion. The combustion products are passed over CuO, and are collected in an ammonium hydroxide bubbler system, and precipitated with calcium chloride.

Carbonate samples such as shell and coral are washed in diluted HCl and, subsequently, organic matter in carbonate is carbonized before conversion to CO_2.

Standard oxalic acid is oxidized by the wet method of Valastro, Land, and Varela (1977). CO_2 is converted to benzene through lithium carbide and acetylene basically by the methods of Noakes, Kim, and Stipp (1965) and Kim, Ikeda, and Ruch (1969). The catalyst used to synthesize benzene can be easily made in the laboratory. The silica alumina catalyst base is activated by boiled ammonium metavanadate solution, allowed to stand one night, and is washed and dried.

Memory effect in the stainless steel reaction vessel can be removed by using an exchangeable inner vessel and by baking it in the air.

Counting efficiency is 65% and background rate is 0.9cpm for a mixture of 4ml benzene and 2ml scintillator in a low potassium glass vial and 1.8cpm for a mixture of 15ml benzene and 5ml scintillator in a teflon vial. Each sample including background and sealed reference standard is placed in the counter and counted sequentially for 50 min. The cycle is repeated as often as desired with a minimum of 20 cycles, 1000 min/sample, for each series of determinations.

Quenching is corrected, especially for young samples, because it varies the counting efficiency range of $\pm 1.5\%$.

Dates are calculated based on 0.95 of the activity of NBS oxalic acid (SRM-4990) and the Libby half-life for ^{14}C of 5570 $\pm$ 30 years. Errors quoted are 2σ statistical error. The maximum measurable age under routine condition of 3ml benzene sample and 1000 minute counting is 40,000 years.

The activity of the NBS standard (SRM 4990) is measured to be 13.99 $\pm$ 0.30 (2σ) dpm/gC and that of the New NBS standard (RM 49) is measured to be 18.34 $\pm$ 0.25 (2σ) dpm/gC. Paleozoic limestone is measured for a blank test to be >39,500 years BP under the routine condition of 2.2g carbon and 1000 minute counting.

Samples previously measured in other laboratories were dated in our laboratory. The results of this cross checking are given in table 1 which shows that obtained dates are in good agreement with reported dates.

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SAMPLE DESCRIPTIONS

GEOLOGIC SAMPLES

Japan

Asama Volcano series

Charcoal from tree in First Pumice Flow deposit of Asama Volcano, central Japan. Coll 1981 by S Togashi.

JGS-16. Asama **13,500 ± 500**

Charcoal from river cut at Manza-kazawaguchi, Gumma (36° 31′ 40″ N, 138° 31′ 15″ E), 30m below surface.

JGS-36. Asama **13,700 ± 400**

Same sample as JGS-16.

JGS-37. Asama **13,600 ± 400**

Charcoal from Komoro, Nagano (36° 21′ 05″ N, 138° 27′ 15″ E), 4m below surface.

TABLE 1
Cross-check samples

Sample no.		JGS no.	JGS date	Other lab no.	Other dates	Difference between dates	Submitter
1*	Wood	JGS-24	940 ± 200	GaK- 9229	950 ± 110	10	Yamazaki
2	Charcoal	-48	1170 ± 170	-10046	1090 ± 100	80	Hayakawa
3	Wood	-20	2360 ± 170	- 9312	2430 ± 110	70	Kigoshi
3′	Wood	-26	2470 ± 170	- 9312	2430 ± 110	40	Kigoshi
4	Wood	-49	13,040 ± 410	-10043	12,460 ± 520	580	Hayakawa
5	Wood	-57	21,350 ± 710	- 8745	21,810 ± 150	460	Kigoshi
6	Charcoal	-89	34,000 + 2500 − 1900	- 1589	30,900 + 700 − 700	3100	Isshiki
7**	Charcoal	JGS-50	>37,200	GaK-10048	>28,070	—	Hayakawa
8	Shell	-61	5800 ± 220	N-2942	5800 ± 110	0	Maeda
9	Shell	-59	6040 ± 220	N-1305	5960 ± 120	80	Maeda
10	Shell	-60	6990 ± 220	GaK- 3757	6600 ± 150	390†	Maeda
11	Shell	-11	7300 ± 220	N-3085	7330 ± 120	30	Maeda

* Samples 1-6 are the same as GaK samples under "Other lab no."

** Samples 7-11 are different but from the same formations and outcrops as those under "Other lab no."

† The large difference in the dates of sample 10 may be attributed to the difference in samples. However, both dates are consistent with the stratigraphy.

JGS-40. Asama **13,600 ± 400**

Same sample as JGS-37.

O-shima Volcano series

Wood in volcaniclastic flow deposit of older edifice of pre-caldera stratovolcano of O-shima Volcano, Izu Is. Coll 1983 by N Isshiki and H Matsuura, Geol Survey Japan.

JGS-99. O-shima, NI83042401 **>41,600**

Wood from sea cliff W of Okata, O-shima (34° 47′ 11″ N, 139° 23′ 13″ E).

JGS-100. O-shima, NI83042402 **39,000 +5500 −3200**

Wood from same deposit as JGS-99.

Hachijo-jima Volcano

Charcoal in pumice flow deposit of pre-caldera stratovolcano of Higashi-yama Volcano in Hachijo-jima, Izu Is. Coll 1967 by N Isshiki.

JGS-89. Hachijo, NI67091703 **34,000 +2500 −1900**

Charcoal from near N mouth of Osaka Tunnel, S of Osato, Hachijo-machi (33° 05′ 50″ N, 139° 47′ 15″ E).

Miyake-jima Volcano

Charcoal in spatter deposit formed along fissure system, which was generated just before caldera formation of Miyake-jima Volcano, Izu Is. Coll 1982 by N Isshiki.

JGS-46. Miyake-jima, NI82052702 **3030 ± 310**

Charcoal from W flank of Miyake-jima Volcano (34° 05′ 10″ N, 139° 29′ 35″).

JGS-85. Miyake-jima, NI82052702 **2880 ± 180**

Same sample as JGS-46.

Sakura River deposit series

Wood from deposit by Sakura R, Tsukuba, Ibaraki. Coll 1980 and 1981 by S Togashi, and H Ikeda and F Iseya, Tsukuba Univ. Sample measured to date route change of Sakura R.

JGS-27. **2460 ± 180**

Wood from Yasumori, Tsukuba (36° 11′ 0″ N, 140° 04′ 25″ E), 2m below surface, middle part of deposit of Sakura R.

JGS-72. **21,740 ± 730**

Wood from Tanaka, Tsukuba (36° 10′ 25″ N, 140° 04′ 30″ E), 2m below surface, bottom of deposit of Sakura R.

Pacific Ocean

Tinian Island, southern Mariana Islands series

Coral from E coast of Tinian I. (15° 00′ N, 145° 40′ E). Coll 1982 by H Kayane, N Yonekura, and Y Ida, Tokyo Univ. Samples measured to date sea-level change along S Mariana Is. coast.

JGS-75. TINIAN-3.82 $32{,}700^{+2400}_{-1800}$

Coral from 2.9m above msl. Sample is aragonite.

JGS-76. TINIAN-5.82 $37{,}800^{+5900}_{-3400}$

Coral from 2.2m above msl. Sample is aragonite.

Rota Island, southern Mariana Islands series

Coral from W coast of Rota I. (14° 03′ N, 145° 10′ E). Coll 1982 by H Kayane, N Yonekura, and Y Ida. Samples measured to date sea-level change along S Mariana Is. coast.

JGS-77. ROTA D-1.82 **16,500 ± 400**

Coral from 5m above msl. Sample is aragonite, including 3% Mg–calcite.

JGS-78. ROTA D-2.82 **4070 ± 190**

Coral from 3.3m above msl. Sample is aragonite, including 1% Mg–calcite.

JGS-79. ROTA D-3.82 $31{,}300^{+2280}_{-1770}$

Coral from 4.7m above msl. Sample is aragonite, including 1% calcite.

JGS-80. ROTA D-4.82 **4040 ± 190**

Coral from 3.1m above msl. Sample is 99% aragonite.

JGS-81. ROTA D-5.82 **3780 ± 200**

Coral from 1.6m above msl. Sample is aragonite.

JGS-82. ROTA D-6.82 **5010 ± 200**

Coral from 1.2m above msl. Sample is aragonite.

Mangaia Island, southern Cook Islands series

Coral from drill hole at W coast of Mangaia I. (22° 00′ S, 157° 40′ W). Height of drilled coral surface is recent sea level. Coll 1982 by N Yonekura and Y Matsushima, Kanagawa Pref Mus, and Y Maeda, Kobe Educ Inst. Samples measured to date sea-level change along Cook Is.

JGS-63. MANGAIA 20.21 **2290 ± 160**

Coral from 0.8m below msl.

JGS-64. MANGAIA 37 **2770 ± 170**

Coral from 1.8m below msl.

JGS-65. MANGAIA 63.64 **2410 ± 170**

Coral from 3.8m below msl. Sample is aragonite, including 6% calcite.

Mangaia Island, southern Cook Islands series

Coral from coast at NW coast of Mangaia I. (22° 00′ S, 157° 40′ W). Coll 1982 by N Yonekura, Y Matsushima, and Y Maeda. Samples measured to date sea-level change along Cook Is.

JGS-62. MANGAIA 4.82 **5020 ± 190**

Coral from 1.1 to 1.3m above msl. Sample is aragonite, including 1% calcite.

JGS-96. MAN 3.82 **3410 ± 170**

Coral from 1.8m above msl.

JGS-97. MAN 1.82 **40,800 $^{+8200}_{-4000}$**

Coral from 1.8 to 2.3m above msl.

Aitutaki Island, southern Cook Islands series

Coral from drill hole at N coast of Aitutaki I. (18° 40′ S, 160° 02′ W). Height of drilled coral surface is recent sea level. Coll 1982 by N Yonekura, Y Matsushima, and Y Maeda. Samples measured to date sea-level change along Cook Is.

JGS-66. AUTITAKI-16 **4690 ± 190**

Coral from 0.7m below msl.

JGS-67. AUTITAKI-48.49 **5320 ± 190**

Coral from 2m below msl.

Rarotonga Island, southern Cook Islands series

Coral from drill hole at N coast of Rarotonga I. (21° 00′ S, 160° 00′ W). Height of drilled coral surface is recent sea level. Coll 1982 by N Yonekura, Y Matsushima, and Y Maeda. Samples measured to date sea-level change along Cook Is.

JGS-73. RAROTONGA 24 **6010 ± 200**

Coral from 1.4m below msl.

JGS-74. RAROTONGA 36.37 **6090 ± 200**

Coral from 1.9m below msl.

Viti Levu, Fiji Islands series

Shell and wood from drill holes at S coast of Viti Levu, Fiji. Coll 1982 by A Sugimura, Kobe Univ, Y Matsushima, E Matsumoto, Y Maeda, K Berryman, New Zealand Geol Survey, and T Ishii and N Yonekura, Tokyo Univ.

JGS-51. FIJI St I **2640 ± 330**

Shell from 2.25 to 2.5m below msl at drill hole St I (18° 10′ S, 178° 20′ E).

JGS-55. FIJI St III **4400 ± 200**

Shell from 1 to 1.25m below msl at drill hole St III (18° 10′ S, 178° 20′ E).

JGS-98. FIJI St III **1630 ± 250**

Wood from 1.75m above msl at drill hole St III (18° 10′ S, 178° 20′ E).

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