Tohoku University Radiocarbon Measurements I

Tohoku University Radiocarbon Measurements I

Kasuke NISHIMURA*, Kunio OMOTO and Youko KOSEKI****

1 Introduction

The Carbon Dating Laboratory of Tohoku University was established to meet the requirements for dating materials on geomorphology and related sciences. Installations and testings of the apparatus as well as routine assays have been carried out by the authors. Management of the laboratory is undertaken based on the decision of the Institute of Geography. This report presents the radiocarbon age measurements made from April to June, 1972, together with a brief description of the measuring system.

2 Apparatus

Our laboratory uses a proportional counter made by Aloka (Japan Radiation & Medical Electronics, Inc.) with the actual volume of 2.4*l*. Carbon dioxide is used as counting gas at pressure 500–800 mmHg. The counting room is a cellar and the counter is shielded with 20 cm thick iron sheets and 2 cm lead, and by anti-

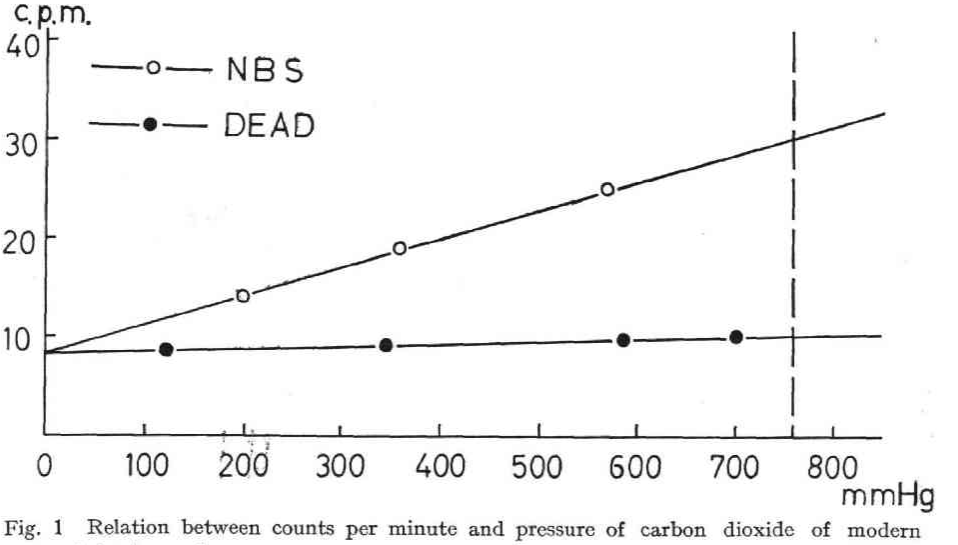

Fig. 1 Relation between counts per minute and pressure of carbon dioxide of modern and dead samples

* Chairman, Institute of Geography, Faculty of Science, Tohoku University
** Carbon Dating Laboratory, Institute of Geography, Faculty of Science, Tohoku University, Aobayama, Sendai, Japan

coincidence with 23 propane-flow proportional counters. A background of 10.61 c.p.m. at 1 atm has been attained with this counter arrangement. The NBS filled at 1 atm shows 30.87 c.p.m. (Fig. 1).

3 Chemical Analysis

All the samples, after handpicking of sand, gravel and other foreign materials, of wood and charcoal were treated with 1N NaOH solution to solubilize lignin and humic acid, and then treated with 1N HCl solution to remove carbonates before combusion in the oxygen stream. Shell samples were pretreated with 1N HCl solution to dissolve the surface layer, and crushed into small pieces. Then they were treated with 6N HCl solution to release CO_2.

Bituminous coal sample as the dead carbon was coked and combused in the oxygen stream. The NBS oxalic acid standard, modern carbon standard material, was treated by $KMnO_4$ in H_2SO_4 solution. The samples were converted into CO_2 as following; $CO_2 \rightarrow (NH_4)_2CO_3 \rightarrow CaCO_3 \rightarrow CO_2$.

4 Age Determination

Counting gas was purified with passing the hot silver and copper nets deoxidized with hydrogen at 500°C.

The plateau curves on the outside counters of propane-flow and the central counter of the samples were measured for each sample at the beginning and the end of the counting. The plateau ranged about 500V at least, and the slope was less than 2%/100V. The activity of each sample was counted for 1000 min., twice continually and once after several days.

Age calculations are based on the Libby half life of C–14, 5570±30 yr. Ages reported here are the average values of dates which agree with each other within 2σ. When the observed activities were less than 2σ above background, infinite dates were given with a limit corresponding to the activity of 3σ, and when they were greater than the activity of 95% of NBS oxalic acid standard minus 2σ, modern dates were given with the limit equal to 3σ below the 95% of NBS standard. The errors given include the standard deviation of the counting rate of sample, NBS and background.

The authors thank to Dr. and Mrs. T. HAMADA, Institute of Physical and Chemical Research for their kind guidance of this project. Special thanks are also due to Dr. K. KIGOSHI. Gakushuin University and Dr. T. KUBOZOE, College of Defence Academy who made several suggestions on these measurements. We are indebted to other staff of the Institute of Geography for their encourag-

ements. This project has been supported in part by Grant in Aid for Fundamental Scientific Research from the Ministry of Education.

5 Sample Descriptions

Geomorphic and Geological Samples

TH-001*. Toya (A) **9820±215**

Bark from deposits between Toya pyroclastic flow I and II, at road cutting near Osaru, Date-machi, Usu-gun, Hokkaido (42°29'28.3"N Lat., 140°49'33.8"E Long.). Coll. 1970 by K. OMOTO, one of the authors. Comment (K.O.); Charred wood of the same layer showed 13,900±250 yr. B.P. (Gak-521).

TH-002. Kutchan (A) **500±85**

Wood from deposits of the lowest river terrace of Kudosan river (one of the reach of Shiribetsu river), about 1.3 km NNW from Kutchan Railway Station, Kutchan, Hokkaido (42°54'35"N Lat., 140°44'35"E Long.). Coll. 1968 by K. OMOTO. Comment (K.O.); the same sample was dated 350±100 yr. B.P. (N-928**).

TH-003. Kawatabi **$25{,}580^{+1460}_{-1240}$**

Wood from Narugo lake deposits (K. OMOTO, 1966), at road cutting behind the Kawatabi Junior Highschool (38°44'06.5"N Lat., 140°46'04.6"E Long.), Narugo, Miyagi Pref. Coll. 1964 by K. OMOTO. Comment (K.O.); date is younger than expected. At Zasu, about 9 km northeast from the sampling site, wood from Hanayama lake deposits (K. OIDE, 1964) gave 27,900±1700 yr. B.P. (Gak-314).

TH-004. Kutchan (B) **10,330±230**

Wood from deposits of the third river terrace of Shiribetsu river, at the entrance of Kutchan Agricultural Highschool (42°53'47"N Lat., 140°44'51.1"E Long.), Kutchan, Hokkaido. Coll. 1971 by K. OMOTO. Comment (K.O.); age shows the beginning of the third terrace formation. In this terrace deposits, he observed fossil "Taschenboden" and "Ice wedge".

---

* The Code of "TH" is temporary one for this report.

** unpublished data (personal communication from Dr. and Mrs. T. HAMADA)

TH–005. Sakaida **15,750±420**

Peat from deposits of fan-terrace, at the road cutting about 700 m ESE from Sakaida Railway Station (38°43'48"N Lat., 140°37'16.4"E Long.), Yamagata Pref. Coll. 1965 by K. OMOTO. Comment (K.O.); date shows the age of stream piracy between the drainage basins of the Pacific and the Japan Sea (K. OMOTO, 1967).

TH–007. Narugo (A) **11,830±555**

Wood from altered tuff of the upper part of the Narugo lake deposits (K. OMOTO, 1966), WSW of Kata-numa, the creater lake of Narugo volcano (38° 43'49.6"N Lat., 140°43'12.6"E Long.), Narugo, Miyagi Pref. Coll. 1967 by K. OMOTO. Comment (K.O.); age shows the beginning of the volcanic activity of the Narugo Volcano.

Archaeological Sample

TH–006. Shiogama **5560±135**

Shells from shell mound, Yoshidahama, Shiogama, Miyagi Pref. (38°18'24.3"N Lat., 141°04'59.3"E Long.) Coll. 1971 by K. OMOTO et al. Comment (K.O.); age shows the early stage of Jomon pottery.

References

Kigoshi, K. et al (1964): Gakushuin Natural Radiocarbon Measurements III, Radiocarbon **6** 202

——— (1967): Gakushuin Natural Radiocarbon Measurements VI, Radiocarbon **9** 49

Minato, M. (1966): C–14 Age of the Toya Ash Flow II —— C–14 Age of the Quaternary Deposits in Japan XXVII —— Earth Science **82** 42~43

Oide, K. (1964): On the Würmian Lake Deposit at Hanayama Village, Miyagi Prefecture —— C–14 Age of the Quaternary Deposits in Japan VI —— Earth Science **71** 38

Omoto, K. (1966): Geomorphological Development of the Narugo Basin Miyagi Prefecture, Northeast Japan Geogr. Rev. Japan **39** 521~537

——— (1967): Geomorphology of the Nakayamadaira Basin, Miyagi Prefecture, Sci. Reps. Tohoku Univ. **7** (Geogr.) **16** 19~40