

Radiocarbon Dating Committee of Tohoku University No.16

著者	Radiocarbon Dating Committee of Tohoku University
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Radiocarbon Dating Reports of Tohoku University No. 16

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1. Procedure and equipment of radiocarbon dating

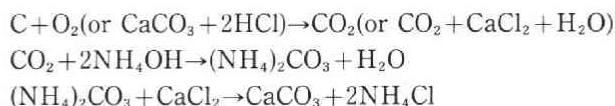
(1) Apparatus

Our laboratory uses a liquid scintillation system made by Aloka (LSC-LBIII). And we synthesized methanol for liquid material.

(2) Chemical Analysis

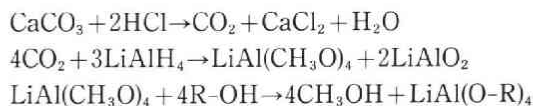
i) *Pre-treatment and calcium carbonate (CaCO₃) production*

The purpose of sample adjustment is to remove both modern and dead carbon from sample in pre-treatment, and to get pure calcium carbonate by chemical reactions. At first, all the samples, after handpicking of sand, gravel and other foreign materials. And then these samples are pre-treated based on the method which is reported by Omoto (1979). The chemical reactions are as follows ;



ii) *Stock and purification of methanol (CH₃OH)*

Sample methanol was synthesized from calcium carbonate, lithium aluminium hydride and diethyleneglycol monobutylether (butyl CARBITOL). Without interruption the solution was distilled by passing through a glass tube distiller, and methanol is stocked in 50 ml round bottom flask. The chemical reactions are as follows ;



where ; R-OH ; Butyl CARBITOL

* c/o Inst. Geogr., Fac. Sci., Tohoku Univ., Sendai 980-8578, Japan.

The editorial member of this list are T. Tamura, S. Hirano, Y. Otsuki, A. Sasaki, T. Furuta, and M. Narita.

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After three or four weeks for decaying of ^{222}Rn etc. in stocked methanol, it is purified by passing through a glass tube distiller. Afterwards, purity of all samples was checked by gas chromatography.

iii) *Sample adjustment and β -ray counting*

It was measured methanol around 8gr, and added equivalent volume of scintillator solution which was mixed butyl PBD 5gr and 500 ml toluene. The measurement is carried out in air-conditioned room. Total measuring time amounts 3,000 minutes for a sample.

iv) *Counting and age calculation*

The age of all samples were calculated based on the half life of 5,568 years for ^{14}C , and the errors were calculates based on one standard deviation ($\pm 1\sigma$).

2. Sample descriptions

Sample descriptions are based on the submitter's information in the following form.

Code No.	Name of sampling site	Radiocarbon age of sample (years B.P.)
1.	Locality (with latitude and longitude) of sampling site	
2.	Altitude (in meter a.s.l.) of sampling site and depth of sampling horizon	
3.	Materials of sample	
4.	Date of sample (submitter)	
5.	Date of dating (operator)	
6.	Chemical assay of pretreating	
7.	Comment and reference	

The committee wishes to express his appreciation to submitters for their informations on their samples.

Tsurui Hills series

TH-1706 Tsurui (1)	3,660 \pm 40
1.	Nakasetsuri, Tsurui, Hokkaido (43°15'39.2"N, 143°19'25.4"E)
2.	100 m a.s.l., 140 m below surface
3.	Organic soil
4.	July 18, 1992 (T. Yoshiki)
5.	Dec. 19, 1992 (T. Yoshiki and S. Hirano)
6.	Total carbon, treated with HCl

TH-1707 Tsurui (2) **29,930 ± 450 / - 420**

1. Mosetsuri, Tsurui, Hokkaido (43°22'12.2"N, 143°13'43.6"E)
2. 400 m a.s.l., 200 cm below surface
3. charred material
4. Aug. 17, 1992 (T. Yoshiki)
5. Dec. 12, 1992 (T. Yoshiki and S. Hirano)
6. Total carbon, treated with HCl

Shimokita series**TH-1741 Shimokita** **900 ± 30**

1. Sarugamori, Higashidori, Aomori Pref. (41°17'16.2"N, 141°24'30.0"E)
2. 20 m a.s.l.
3. Wood (*Thujaopsis dolabrata* var. *hondai* MAKINO)
4. Dec. 25, 1992 (K. Minoura)
5. May 1, 1993 (S. Hirano)
6. Treated with HCl, NaOH, and HCl

Yuda Basin series**TH-1726 Yuda (1)** **older than 43,360**

1. Saso, Yuda, Iwate Pref. (39°21'46.2"N, 140°43'02.2"E)
2. 305 m a.s.l., 2 m below surface
3. Wood
4. Oct. 22, 1992 (H. Nakura)
5. Jan. 7, 1993 (H. Nakura and S. Hirano)
6. Treated with HCl, NaOH, and HCl
7. Nakura (1993)

TH-1727 Yuda (2) **older than 43,490**

1. Shitamae, Yuda, Iwate Pref. (39°22'23.5"N, 140°44'22.8"E)
2. 289 m a.s.l., 2.5 m below surface
3. Charred material
4. Oct. 18, 1992 (H. Nakura)
5. Jan. 9, 1993 (H. Nakura and S. Hirano)
6. Total carbon, treated with HCl
7. Nakura (1993)

- TH-1728 Yuda (3)** **older than 42, 890**
1. Shitamae, Yuda, Iwate Pref. (39°22'24.4"N, 140°44'46.6"E)
 2. 290 m a.s.l., -8 m below surface
 3. Charred material
 4. Aug. 19, 1992 (H. Nakura)
 5. Jan. 11, 1993 (H. Nakura and S. Hirano)
 6. Total carbon, treated with HCl
 7. Nakura (1993)
- TH-1729 Sawauchi** **160 ± 30**
1. Oarasawa, Sawauchi, Iwate Pref. (39°31'28.7"N, 140°50'02.7"E)
 2. 382 m a.s.l., 1.2 m below surface
 3. Charred material
 4. Aug. 5, 1992 (H. Nakura)
 5. Jan. 16, 1993 (H. Nakura and S. Hirano)
 6. Total carbon, treated with HCl
 7. Nakura (1993)

Shonai Sedimentary Basin series

- TH-1768 Matsuyama (1)** **18,270 ± 110**
1. Yamadera, Matsuyama, Yamagata Pref. (38°50'06.4"N, 139°58'19.5"E)
 2. 37 m a.s.l., 600 cm below surface
 3. Wood
 4. Sep. 25, 1993 (T. Komatsubara)
 5. Apr. 28, 1994 (T. Komatsubara)
 6. Treated with HCl, NaOH, and HCl
 7. Komatsubara (1997)
- TH-1771 Matsuyama (2)** **30,790 + 560 / - 520**
1. Jimikouya, Matsuyama, Yamagata Pref. (38°48'22.9"N, 140°00'17.5"E)
 2. 50 m a.s.l., 650 cm below surface
 3. Wood
 4. Sep. 23, 1993 (T. Komatsubara)
 5. Mar. 22, 1994 (T. Komatsubara)
 6. Treated with HCl, NaOH, and HCl
 7. Komatsubara (1997)
- TH-1816 Matsuyama (3)** **21,260 ± 180**
1. Yamadera, Matsuyama, Yamagata Pref. (38°50'06.4"N, 139°58'19.5"E)
 2. 37 m a.s.l., 9.7 m below surface
 3. Wood

4. Sep. 25, 1993 (T. Komatsubara)
 5. Nov. 21, 1994 (T. Komatsubara)
 6. Treated with HCl, NaOH, and HCl
 7. Komatsubara (1997)
- TH-1847 Yuza** **2,060 ± 100**
1. Jyurizuka, Yuza, Yamagata Pref. (39°01'40.0"N, 139°52'12.0"E)
 2. 4 m a.s.l.
 3. Charred material
 4. Sep. 7, 1995 (W. Murakami)
 5. Mar. 11, 1997 (A. Ito)
 6. Total carbon, treated with HCl

Sendai Coastal Plain series

- TH-1740 Shimoiiida** **1,460 ± 30**
1. Shimoiiida, Sendai, Miyagi Pref. (38°12'43.8"N, 140°57'01.8"E)
 2. -0.5 m a.s.l.
 3. Wood
 4. Sep. 22, 1992 (H. Matsumoto)
 5. Mar. 9, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
 7. Matsumoto (1998)

Takadate Hills series

- TH-1827 Nakanosawa (1)** **430 ± 30**
1. Nakanosawa, Natori, Miyagi Pref. (38°09'31.0"N, 140°49'24.8"E)
 2. 120 m a.s.l., 2 m below surface
 3. Wood
 4. Nov. 5, 1994 (T. Tamura, T. Miyagi, and Y. Li)
 5. Feb. 6, 1996 (Y. Li and T. Yoshiki)
 6. Total carbon, treated with HCl
 7. Li *et al.* (1996)
- TH-1844 Nakanosawa (2)** **370 ± 30**
1. Nakanosawa, Natori, Miyagi Pref. (38°09'30.8"N, 140°49'24.9"E)
 2. 85 m a.s.l., 80 cm below surface
 3. Wood
 4. Apr. 8, 1995 (T. Tamura, Y. Li, D. Chatterjee, T. Matsubayashi, and D. Yamada)

5. Nov. 28, 1995 (S. Hirano)
6. Total carbon, treated with HCl
7. Li *et al.* (1996)

Kitsuregawa Hills series

- | | |
|--|---------------------|
| TH-1700 Ichigai (1) | 18,690 ± 200 |
| 1. Kariuta, Ichigai, Tochigi Pref. (36°35'21.1"N, 140°09'03.9"E) | |
| 2. 150 m a.s.l., 5 m below surface | |
| 3. Wood | |
| 4. Dec. 10, 1991 (T. Yoshiki) | |
| 5. Nov. 28, 1992 (T. Yoshiki and S. Hirano) | |
| 6. Treated with HCl, NaOH, and HCl | |
| TH-1701 Ichigai (2) | 1,270 ± 30 |
| 1. Takeuchihigashi, Ichigai, Tochigi Pref. (36°36'49.5"N, 140°08'30.8"E) | |
| 2. 120 m a.s.l., 70 cm below surface | |
| 3. Organic soil | |
| 4. Mar. 25, 1992 (T. Yoshiki) | |
| 5. Dec. 2, 1992 (T. Yoshiki and S. Hirano) | |
| 6. Total carbon, treated with HCl | |
| TH-1708 Ichigai (3) | 3,590 ± 30 |
| 1. Takeuchihigashi, Ichigai, Tochigi Pref. (36°36'23.2"N, 140°10'58.2"E) | |
| 2. 103 m a.s.l., 270 cm below surface | |
| 3. Buried soil | |
| 4. Apr. 8, 1992 (T. Yoshiki) | |
| 5. Mar. 1, 1994 (T. Yoshiki) | |
| 6. Total carbon, treated with HCl | |
| TH-1709 Ichigai (4) | 1,680 ± 20 |
| 1. Takeuchihigashi, Ichigai, Tochigi Pref. (36°36'23.2"N, 140°10'58.2"E) | |
| 2. 103 m a.s.l., 180 cm below surface | |
| 3. Organic soil | |
| 4. Apr. 8, 1992 (T. Yoshiki) | |
| 5. Mar. 2, 1994 (T. Yoshiki) | |
| 6. Total carbon, treated with HCl | |
| TH-1702 Motegi (1) | 4,770 ± 50 |
| 1. Yamane, Motegi, Tochigi Pref. (36°35'31.3"N, 140°09'02.2"E) | |
| 2. 140 m a.s.l., 1 m below surface | |
| 3. Organic soil | |
| 4. Mar. 17, 1992 (T. Yoshiki) | |

5. Dec. 7, 1992 (T. Yoshiki and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1703 Motegi (2)** **6,800 ± 40**
1. Hongo, Motegi, Tochigi Pref. (36°34'12.6"N, 140°10'09.7"E)
 2. 138 m a.s.l.
 3. Buried soil
 4. Dec. 7, 1991 (T. Yoshiki)
 5. Dec. 10, 1992 (T. Yoshiki and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1704 Motegi (3)** **7,400 ± 50**
1. Yamane, Motegi, Tochigi Pref. (36°35'31.3"N, 140°09'02.2"E)
 2. 140 m a.s.l., 2 m below surface
 3. Organic soil
 4. Mar. 17, 1992 (T. Yoshiki)
 5. Dec. 15, 1992 (T. Yoshiki and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1705 Karasuyama** **1,200 ± 60**
1. Nagate, Karasuyama, Tochigi Pref. (36°36'23.2"N, 140°10'58.2"E)
 2. 140 m a.s.l., 70 cm below surface
 3. Buried soil
 4. Sep. 2, 1991 (T. Yoshiki)
 5. Dec. 17, 1992 (T. Yoshiki and S. Hirano)
 6. Total carbon, treated with HCl
- Eastern part of Niigata Sedimentary Basin Series***
- TH-1769 Tochio** **2,960 ± 30**
1. Yamaya, Tochio, Niigata Pref. (37°29'32.5"N, 139°00'40.0"E)
 2. 62 m a.s.l., 51-68 cm below surface
 3. Organic soil
 4. Oct. 26, 1992 (T. Komatsubara)
 5. Mar. 12, 1994 (T. Komatsubara)
 6. Total carbon, treated with HCl
- TH-1770 Shitada** **modern**
1. Takayashiki, Shitada, Niigata Pref. (37°34'42.6"N, 139°01'15.5"E)
 2. 35 m a.s.l., 200-260 cm below surface
 3. Organic soil
 4. Apr. 15, 1993 (T. Komatsubara)
 5. Apr. 21, 1994 (T. Komatsubara)

6. Total carbon, treated with HCl

Kanmuriyama series

- TH-1720 Mutsumi (1)** **modern**
1. Sugadani, Mutsumi, Yamaguchi Pref. (34°28'14.2"N, 131°34'27.5"E)
 2. 425 m a.s.l., 105-115 cm below surface
 3. Peat
 4. Sep. 23, 1992 (J. Takenaka)
 5. Dec. 31, 1992 (J. Takenaka and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1271 Mutsumi (2)** **7,360±180**
1. Sugadani, Mutsumi, Yamaguchi Pref. (34°28'14.2"N, 131°34'27.5"E)
 2. 425 m a.s.l., 225-235 cm below surface
 3. Peat
 4. Sep. 23, 1992 (J. Takenaka)
 5. Jan. 22, 1993 (J. Takenaka and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1722 Mutsumi (3)** **12,240+210/-200**
1. Sugadani, Mutsumi, Yamaguchi Pref. (34°28'14.2"N, 131°34'27.5"E)
 2. 425 m a.s.l., 305-315 cm below surface
 3. Peat
 4. Sep. 23, 1992 (J. Takenaka)
 5. Jan. 2, 1993 (J. Takenaka and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1723 Tsuwano (1)** **310±50**
1. Nombara, Tsuwano, Shimane Pref. (34°27'16.2"N, 131°48'28.0"E)
 2. 515 m a.s.l., 105-115 cm below surface
 3. Peat
 4. Oct. 6, 1992 (J. Takenaka)
 5. Jan. 25, 1993 (J. Takenaka and S. Hirano)
 6. Total carbon, treated with HCl
- TH-1724 Tsuwano (2)** **7,990±90**
1. Nombara, Tsuwano, Shimane Pref. (34°27'16.2"N, 131°48'28.0"E)
 2. 515 m a.s.l., 295-305 cm below surface
 3. Peat
 4. Oct. 6, 1992 (J. Takenaka)
 5. Jan. 18, 1993 (J. Takenaka and S. Hirano)
 6. Total carbon, treated with HCl

TH-1725 Tsuwano (3) 7,720 ± 90

1. Nombara, Tsuwano, Shimane Pref. (34°27'16.2"N, 131°48'28.0"E)
2. 515 m a.s.l., 435-445 cm below surface
3. Peat
4. Oct. 6, 1992 (J. Takenaka)
5. Jan. 13, 1993 (J. Takenaka and S. Hirano)
6. Total carbon, treated with CHI

Republic of Korea series**TH-1710 Yongsang (1) 43,090 + 2,860 / - 2,100**

1. Sanji-Ri, Youngyang-Gun, Kyôngsangbuk-Do (36°40'13.1"N, 129°07'40.3"E)
2. 237 m a.s.l.
3. Peat
4. Feb. 22, 1992 (Jo, Wha-Ryong)
5. Feb. 21, 1993 (S. Hirano)
6. Total carbon, treated with HCl

TH-1711 Yongsang (2) 17,940 ± 140

1. Sanji-Ri, Youngyang-Gun, Kyôngsangbuk-Do (36°40'13.1"N, 129°07'40.3"E)
2. 240 m a.s.l.
3. Peat
4. Feb. 22, 1992 (Jo, Wha-Ryong)
5. Feb. 19, 1993 (S. Hirano)
6. Total carbon, treated with HCl

TH-1712 Youngsang (3) modern

1. Sanji-Ri, Yongyang-Gun, Kyônggangbuk-Do (36°40'13.1"N, 129°07'40.3"E)
2. 244 m a.s.l.
3. Peat
4. Feb. 22, 1992 (Jo, Wha-Ryong)
5. Apr. 20, 1993 (S. Hirano)
6. Total carbon, treated with HCl

TH-1713 Ulchin (1) 1,990 ± 30

1. Kusan-Ri, Ulchin-Gun, Kyôngsangbuk-Do (36°56'30"N, 129°22'00"E)
2. 30.4 m a.s.l.
3. Peat
4. Mar. 15, 1992 (Jo, Wha-Ryong)
5. Apr. 8, 1993 (S. Hirano)
6. Total carbon, treated with HCl

- TH-1714 Ulchin (2)** **2,340 ± 30**
1. Kusan-Ri, Ulchin-Gun, Kyôngsangbuk-Do (36°56'30"N, 129°22'00"E)
 2. 29.4 m a.s.l.
 3. Peat
 4. Mar. 15, 1992 (Jo, Wha-Ryong)
 5. Apr. 11, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1715 Pyungtaek (1)** **7,180 ± 50**
1. Ingang-Ri, Pyungtaek-Gun, Kyunggi-Do (36°57'23.0"N, 126°54'50.2"E)
 2. *ca.* 3 m a.s.l.
 3. Peat
 4. Oct. 15, 1991 (Jo, Wha-Ryong)
 5. Apr. 22, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1716 Pyungtaek (2)** **6,670 ± 40**
1. Ingang-Ri, Pyungtaek-Gun, Kyunggi-Do (36°57'08.1"N, 126°54'56.4"E)
 2. *ca.* 5 m a.s.l.
 3. Peat
 4. Oct. 15, 1991 (Jo, Wha-Ryong)
 5. Mar. 3, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1717 Pyungtaek (3)** **6,160 ± 40**
1. Ingang-Ri, Pyungtaek-Gun, Kyunggi-Do (36°57'08.1"N, 126°54'56.4"E)
 2. *ca.* 4 m a.s.l.
 3. Peat
 4. Oct. 15, 1991 (Jo, Wha-Ryong)
 5. Mar. 6, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1718 Yôngwol** **older than 41,530**
1. Pangchôl- Ri, Yôngwol-Gun, Kangwol-Do (37°11'17"N, 128°27'36"E)
 2. 193.8 m a.s.l.
 3. Peat
 4. Mar. 22, 1992 (Jo, Wha-Ryong)
 5. Apr. 15, 1993 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1719 Yôngdong** **older than 44,580**
1. Wonchôn-Ri, Yôngdong-Gun, Chungchôngbuk-Do (36°14'23"N, 127°53'10"E)
 2. 156.5 m a.s.l.
 3. Peat

4. Mar. 8, 1992 (Jo, Wha-Ryong)
5. Apr. 17, 1993 (S. Hirano)
6. Total carbon, treated with HCl

China serise (1) (Inner Mongolia)

TH-1845 Chifeng (1) 1,970 ± 40

1. Wulan-Audu, Chifeng, Inner Mongolia, China (43°18'04"N, 119°07'47"E)
2. 430 m a.s.l. 70 cm below surface
3. Shell
4. Sep. 15, 1994 (Nan, Yin hao)
5. Dec. 20, 1995 (T. Yoshiki)
6. Total carbon, treated with HCl

TH-1846 Chifeng (2) 6,940 ± 140

1. Wulan-Audu, Chifeng, Inner Mongolia, China (44°44'22"N, 119°42'30"E)
2. 460 m a.s.l.
3. Bone
4. Sep. 28, 1994 (Nan, Yin hao and K. Takeuchi)
5. Jan. 10, 1996 (T. Yoshiki)
6. Total carbon, treated with HCl

China series (2) (Yunnan)

TH-1774 Dali (1) 4,640 ± 30

1. Dali, Yunnan, China (No data)
2. (1.8-2.5 m below surface)
3. Peat
4. Nov. 7, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
5. Feb. 13, 1994 (T. Komatsubara)
6. Total carbon, treated with HCl
7. Miura *et al.* (1995)

TH-1775 Dali (2) 9,080 ± 40

1. Dali, Yunnan, China (No data)
2. (3.25-3.70 m below surface)
3. Peat
4. Nov. 7, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
5. Feb. 10, 1994 (T. Komatsubara and S. Hirano)
6. Total carbon, treated with HCl
7. Miura *et al.* (1995)

- TH-1776 Dali (3)** **5,760 ± 40**
1. Dali, Yunnan, China (No data)
 2. (2.1-2.4 m below surface)
 3. Peat
 4. Nov. 9, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
 5. Feb. 4, 1994 (S. Hirano)
 6. Total carbon, treated with HCl
 7. Miura *et al.* (1995)
- TH-1777 Dali (4)** **8,750 ± 70**
1. Dali, Yunnan, China (No. data)
 2. (4.2-4.5 m below surface)
 3. Peat
 4. Nov. 9, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
 5. Feb. 6, 1994 (H. Nakura)
 6. Total carbon, treated with HCl
 7. Miura *et al.* (1995)
- TH-1798 Xishuang Banna (1)** **3,420 ± 30**
1. Jinghong, Xishuang Banna, Yunnan, China (No data)
 2. No data
 3. Peat
 4. Nov. 24, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
 5. Apr. 3, 1994 (S. Hirano)
 6. Total carbon, treated with HCl
- TH-1799 Xishuang Banna (2)** **6,740 ± 50**
1. Jinghong, Xishuang Banna, Yunnan, China (No data)
 2. No data
 3. Peat
 4. Nov. 14, 1992 (H. Makita, S. Ishikawa, S. Iwata, T. Kikuchi, and O. Miura)
 5. Apr. 9, 1994 (S. Hirano)
 6. Total carbon, treated with HCl

Thailand series

- TH-1800 Doi In Thanon (1)** **modern**
1. Doi In Thanon, Thailand (18°35'17.3"N, 98°29'20.6"E)
 2. 2,530 m a.s.l., 52.5-67.5 cm below surface
 3. Peat
 4. Dec. 17, 1993 (T. Tamura, T. Miyagi, C. Yonebayashi, and T. Yoshiki)
 5. May 17, 1994 (T. Yoshiki)

6. Total carbon, treated with HCl
- TH-1801 Doi In Thanon (2)** **modern**
1. Doi In Thanon, Thailand (18°35'17.3"N, 98°29'20.6"E)
 2. 2,530 m a.s.l., 95-110 cm below surface
 3. Peat
 4. Dec. 17, 1993 (T. Tamura, T. Miyagi, C. Yonebayashi, and T. Yoshiki)
 5. May 15, 1994 (T. Yoshiki)
 6. Total carbon, treated with HCl
- TH-1802 Haha Sarakhan** **1,260 ± 40**
1. Haha Sarakhan, Thailand (16°13'05"N, 103°16'50"E)
 2. 140 m a.s.l., 1 m below surface
 3. Organic soil
 4. Dec. 14, 1993 (T. Tamura, T. Miyagi, C. Yonebayashi, and T. Yoshiki)
 5. Mar. 19, 1995 (S. Hirano)
 6. Total carbon, treated with HCl
 7. Tamura (1997)
- TH-1805 Kanchanaburi** **430 ± 30**
1. Changwat, Kanchanaburi, Thailand (14°18'34"N, 99°13'10"E)
 2. No data
 3. Organic soil
 4. Dec. 8, 1993 (T. Tamura, T. Miyagi, C. Yonebayashi, and T. Yoshiki)
 5. July 4, 1994 (T. Yoshiki)
 6. Total carbon, treated with HCl

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