Chapter 10

Effectiveness for Determination of Depositional Age by Detrital Zircon U–Pb Age in the Cretaceous Shimanto Accretionary Complex of Japan

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Additional information is available at the end of the chapter

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Abstract

Detrital zircon U–Pb ages indicate the crystallization age. Therefore, it is necessary to evaluate the effectiveness of determining the age of deposition using zircon age data. We carried out U–Pb dating of detrital zircons from sandstone at eight sites in the Cretaceous Shimanto accretionary complex on Kii Peninsula, Japan, with the aim of evaluating the accuracy of U–Pb zircon ages as indicators of the depositional age of sedimentary rocks by comparing zircon ages with radiolarian ages. Our results reveal zircons of late Cretaceous age, and the youngest peak ages are in good agreement with depositional ages inferred from radiolarian fossils. In addition, the youngest peak ages become younger as tectono-structurally downwards, and this tendency is clearer for the zircon ages than for the radiolarian ages. These results indicate that newly crystalized zircons were continuously supplied to the sediment by constant igneous activity during the late Cretaceous and that zircon ages provide remarkably useful information for determining the age of deposition in the Cretaceous Shimanto accretionary complex.

Keywords: detrital zircon, U–Pb age, accretionary complex, Shimanto, Cretaceous

1. Introduction

Determination of the depositional age of sedimentary rocks is essential for understanding tectonic processes, and microfossils have generally been used for this purpose. In particular, radiolarian ages have been played an important role in understanding accretionary tectonics, because the order of accretion of strata is inferred from radiolarian ages (for example, see Refs. [1, 2]). However, it is very difficult to determine the depositional age of coarse-grained sedimentary rocks such as sandstone and conglomerate, because radiolarian fossils are rare in such rocks, whereas they are commonly found in fine-grained rocks such as mudstone and chert. In addition, it is impossible to identify the species of radiolarian fossils in metamorphosed sedimentary rocks.

Recent progress in analytical techniques has enabled rapid and accurate U–Pb isotopic age determination of zircons using inductively coupled plasma–mass spectrometry with laser ablation sampling (LA–ICP–MS) (for example, see Refs. [3, 4]). This method has been widely used to determine zircon ages in coarse-grained and weakly metamorphosed sedimentary rock (for example, see Refs. [5–7]). However, zircon ages do not directly indicate the depositional age; instead, they indicate the crystallization age. Thus, it is possible that a large age gap exists between the depositional ages and zircon ages. Therefore, to determine the depositional age from detrital zircon U–Pb ages, it is necessary to evaluate the effectiveness of this method; e.g., by comparing detrital zircon ages with fossil ages.

In this study, we performed U–Pb dating on detrital zircons from sandstone in the Cretaceous Shimanto accretionary complex on Kii Peninsula, Japan, and we clarify the relationship between the detrital zircon ages and radiolarian ages in order to develop the zircon dating method to obtain accurate depositional ages.

2. Geological setting

The Shimanto accretionary complex is a well-studied ancient accretionary complex exposed along the Pacific side of Southwest Japan (for example, see Ref. [1]). The Shimanto accretionary complex in the Kii Peninsula is divided into the Kouyasan Sub-belt (Cretaceous), the Hidakagawa Sub-belt (Cretaceous) and the Hikigawa Sub-belt (Paleogene) (**Figure 1**; [8]). This study considers the Yukawa complex (Albian–Cenomanian), Miyama complex (Turonian–Campanian) and Ryujin complex (Campanian–Maastrichtian) in the Hidakagawa Sub-belt. These complexes are further subdivided into several units, and these complexes and units are in thrust contact with each other [8]. The unit names are shown in **Figure 2**. Many radiolarian studies have been carried out in this study area [9–17], and the results indicate that the depositional ages have a tendency to become younger as tectono-structurally downwards (north to south).

3. Samples

Sandstone samples for U–Pb dating were collected from eight sites. The sites were named Site 1 to Site 8 from tectono-structurally upwards to downwards (north to south), and the relationship between sampling sites and geological units is shown in **Figure 2**.

Site 1 (sample no. 150503-06): This sample was collected from a medium-grained massive sandstone of the Yanase unit (Yu1), Yukawa complex (GPS: N34°6′13.28″, E135°30′32.82″) (**Figures 3a** and **4a**). The sandstone is composed of quartz (23.3%), plagioclase (27.3%), K-feldspar (8.6%), rock fragments (15.9%), matrix (17.1%) and the others (7.8%) (**Figure 5**).

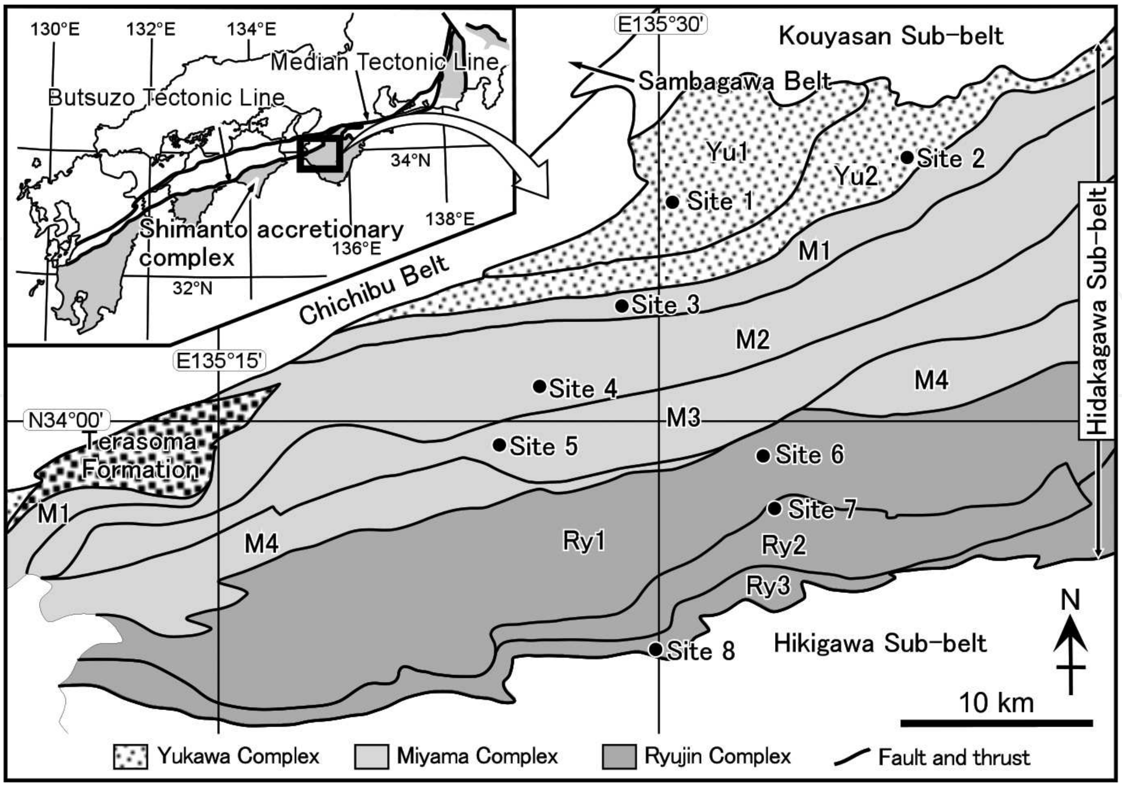

Figure 1. Geological distribution of the Shimanto accretionary complex, Kii Peninsula, southwest Japan. (Modified form Kishu Shimanto Research Group [8].) Sampling sites for zircon U–Pb dating are shown in this figure. Yu1: Yanase Unit, Yu2: Kitamata Unit, M1: Chikai Unit, M2: Gomadanzan Unit, M3: Hattomaki Unit, M4: Ubuyukawa Unit, Ry1: Sohgawa Unit, Ry2: Komatagawa Unit, and Ry3: Yunohara Unit.

Tectono–stratigraphic division			Sampling site	Sample no.
Hidakagawa Sub–belt	Yukawa Complex	Yanase Unit (Yu1)	Site 1	150503–06
		Kitamata Unit (Yu2)	Site 2	151014–02
	Miyama Complex	Chikai Unit (M1)	Site 3	160705–06
		Gomadanzan Unit (M2)	Site 4	160705–02
		Hattomaki Unit (M3)	Site 5	160705–01
		Ubuyukawa Unit (M4)	–	–
	Ryujin Complex	Sohgawa Unit (Ry1)	Site 6	160704–05
		Komatagawa Unit (Ry2)	Site 7	160704–04
		Yunohara Unit (Ry3)	Site 8	160704–03

Tectono–structurally upward
northward
southward
Tectono–structurally downward

Figure 2. Relationship between tectono-structural division and sampling site. (Division is modified form the Kishu Shimanto Research Group [8]).

Site 2 (sample no. 151014-02): This sample was collected from a medium-grained massive sandstone of the Kitamata unit (Yu2), Yukawa complex (GPS: N34°7′32.36″, E135°38′32.48″).

Figure 3. Photographs showing the occurrence of the sandstone at the Site 1 in the Yu1 of the Yukawa Complex (a), Site 3 in the M1 of the Miyama Complex (b), and Site 7 in the Ry2 of the Ryujin Complex (c).

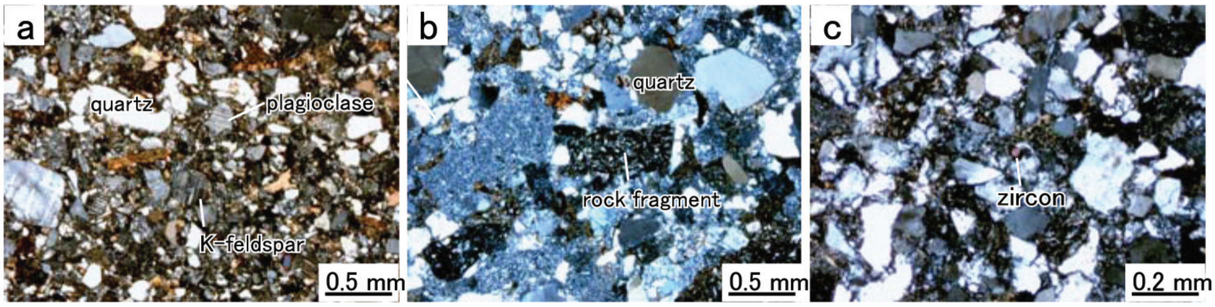

Figure 4. Photomicrograph of the sandstone at the Site 1 in the Yu1 of the Yukawa Complex (a), Site 3 in the M1 of the Miyama Complex (b), and Site 7 in the Ry2 of the Ryujin Complex (c). Sandstone under crossed polarized light.

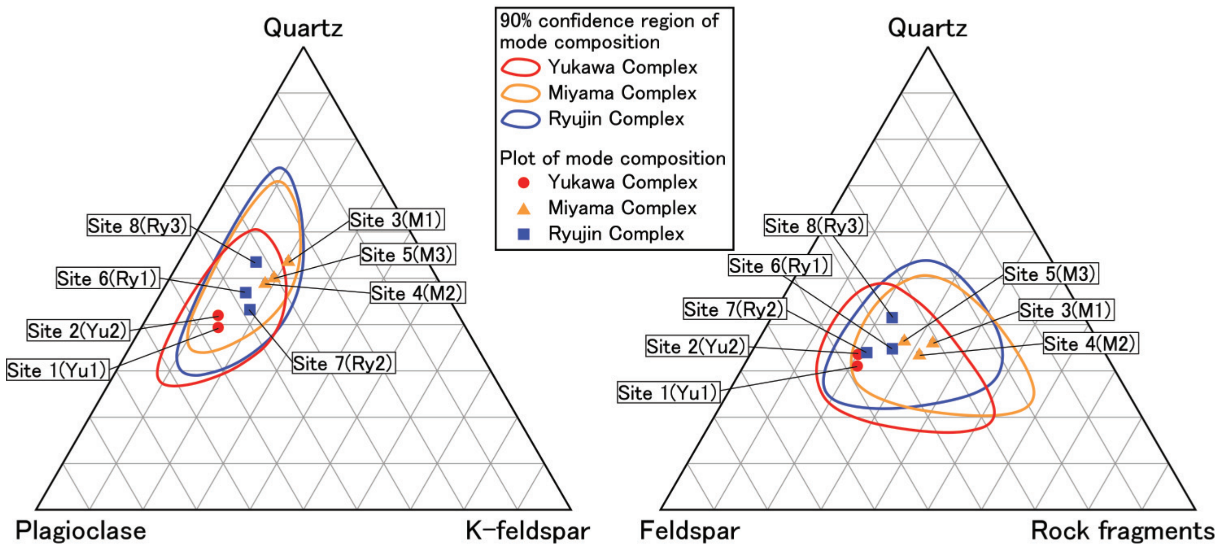

Figure 5. Modal composition of sandstones in the each site. Closed lines show the confidence regions of 90% in each of the complexes. (Modified form Kumon et al. [18].)

The sandstone is composed of quartz (29.9%), plagioclase (32.1%), K-feldspar (9.4%), rock fragments (17.9%), matrix (10.3%) and the others (0.4%).

Site 3 (sample no. 160705-06): This sample was collected from a medium-grained massive sandstone of the Chikai unit (M1), Miyama complex (GPS: N34°3′22.37″, E135°28′47.3″)

(**Figures 3b** and **4b**). The sandstone is composed of quartz (29.1%), plagioclase (13.9%), K-feldspar (11.0%), rock fragments (26.2%), matrix (16.5%) and the others (3.3%).

Site 4 (sample no.160705-02): This sample was collected from a medium-grained massive sandstone of the Gomadanzan unit (M2), Miyama complex (GPS: N34°1′8.81″, E135°25′41.19″). The sandstone is composed of quartz (25.3%), plagioclase (16.7%), K-feldspar (9.4%), rock fragments (23.6%), matrix (23.2%) and the others (1.8%).

Site 5 (sample no.160705-01): This sample was collected from a medium-grained massive sandstone in the Hattomaki unit of (M3), Miyama complex (GPS: N33°59′4.15″, E135°24′40.99″). The sandstone is composed of quartz (28.9%), plagioclase (17.3%), K-feldspar (11.1%), rock fragments (21.3%), matrix (18.2%) and the others (3.2%).

Site 6 (sample no.160704-05): This sample was collected from a medium-grained sandstone of the alternating beds of sandstone and mudstone in the Sohgawa unit (Ry1), Ryujin complex (GPS: N33°59′3.65″, E135°33′23.67″). The sandstone is composed of quartz (25.0%), plagioclase (19.9%), K-feldspar (8.5%), rock fragments (18.6%), matrix (19.9%) and the others (8.1%).

Site 7 (sample no. 160704-04): This sample was collected from a medium-grained sandstone of the alternating beds of sandstone and mudstone in the Komatagawa unit (Ry2), Ryujin complex (GPS: N33°57′35.99″, E135°33′50.36″) (**Figures 3c** and **4c**). The sandstone is composed of quartz (25.9%), plagioclase (23.0%), K-feldspar (11.1%), rock fragments (16.5%), matrix (19.3%) and the others (4.2%).

Site 8 (sample no. 160704-03): This sample was collected from a medium-grained sandstone of the alternating beds of sandstone and mudstone in the Yunohara unit (Ry3), Ryujin complex (GPS: N33°53′42.86″, E135°29′40.63″). The sandstone is composed of quartz (29.7%), plagioclase (17.8%), K-feldspar (8.1%), rock fragments (16.1%), matrix (19.5%) and the others (8.8%).

On ternary composition diagrams, the compositions of all the sandstones samples, within the 90% confidence region of the modal composition of each complex (**Figure 5**; [18]).

4. Analytical techniques

Zircons were separated by conventional techniques including crushing, sieving, water-based panning and magnetic separation. Zircons were randomly handpicked under a stereoscopic microscope, mounted in epoxy resin on a glass slide, and polished to approximately half of their original thickness. In order to investigate the internal structure and zonation patterns of zircons, cathodoluminescence (CL) images were obtained using a scanning electron microscope (SEM) JSM-6510 (JOEL Ltd) at Shinshu University of Japan. Target spots for U–Pb dating analyses were identified from the CL images (**Figure 6**).

The U–Pb zircon dating analyses carried out using a laser ablation–inductively coupled plasma mass spectrometer (LA–ICP–MS) at Nagoya University of Japan. The ICP–MS part is Agilent 7700x (Agilent Technologies), and the LA part is NWR213 (Electro Scientific Industries). Nancy zircon 91500 [19] was utilized for normalization of NIST SRM 610, and the latter was used as the external standard for age determinations. Analyses were carried out with an

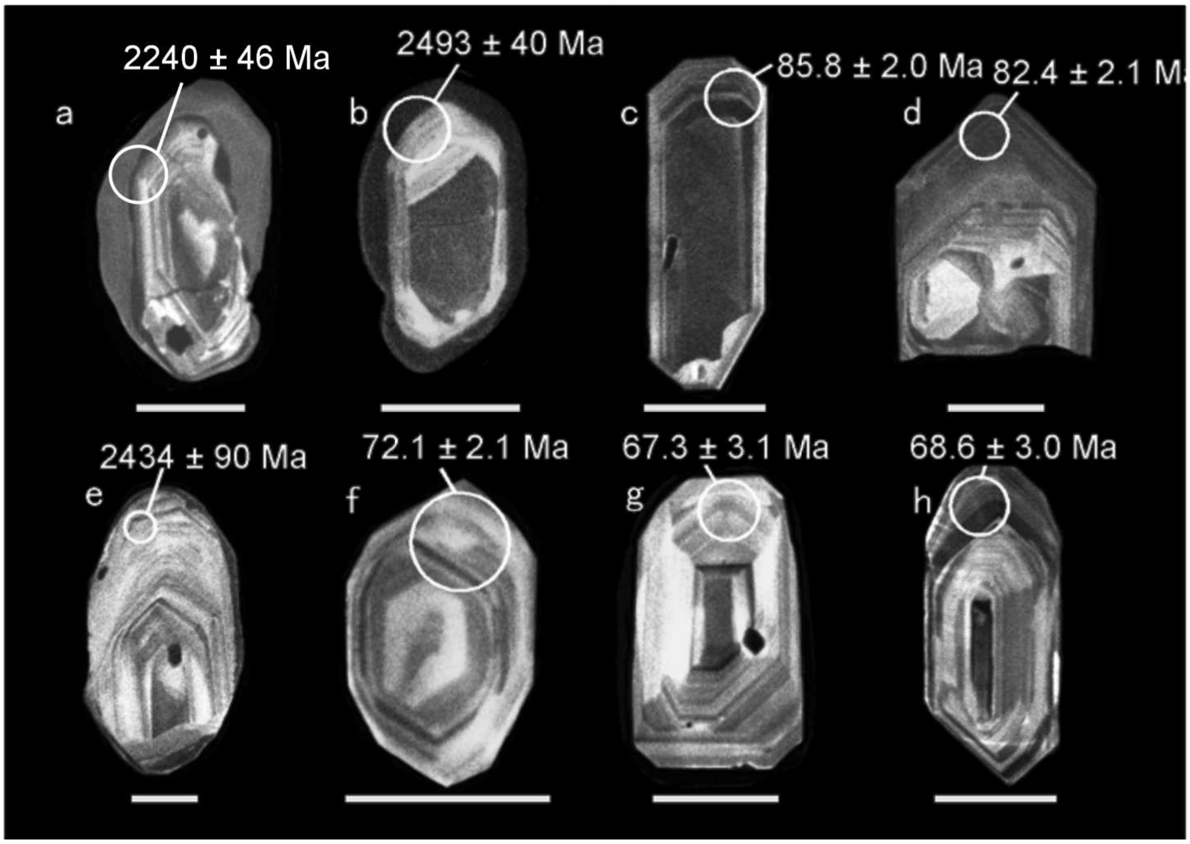

Figure 6. Cathodoluminescence images of selected zircon grains. (a) Site 1 in the Yu1, grain no. Yu-041. (b) Site 2 in the Yu2, grain no. Yu2-095. (c) Site 3 in the M1, grain no. M1-046. (d) Site 4 in the M2, grain no. M2-003. (e) Site 5 in the M3, grain no. M3-018. (f) Site 6 in the Ry1, grain no. Ry1-022. (g) Site 7 in the Ry2, grain no. Ry2-037. (h) Site 8 in the Ry3, grain no. Ry3-021. Scale bars are 50 μm. Ages indicate $^{238}U–^{206}Pb$ ages in Ma.

ablation pit size of 25 μm, energy density of 11.7 J/cm^2 and pulse repetition rate of 10 Hz. Detailed descriptions of the LA–ICP–MS analysis are provided by Orihashi et al. [20] and Kouchi et al. [21].

In order to obtain accurate age data, we deleted the missed shot spot that is indicative of an anomalous value. In addition, based on the judgment of discordance showed by the many previous studies (for example, see Refs. [22–24]), the U–Pb zircon ages with discordances of >10% were rejected in data interpretation in this paper. Age calculations were performed using Isoplot/Ex 4.15 [25]. All ages indicate the $^{238}U–^{206}Pb$ ages, and uncertainties are given at the 2σ level.

5. Zircon U–Pb ages

Analyses were carried out on more than 160 spots in each sample. Results are shown in histograms and probability density plots (**Figures 7** and **8**). The probability density plots show the cumulative Gaussian probability curve for a collection of single-valued data and errors [25]. All data are shown in the Appendix.

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Site 1 (sample no. 150503-06): 200 spots on 200 zircon grains were analysed, and 142 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of two age groups; ca. 90–320 Ma (66%) and ca. 1500–2600 Ma (31%). The youngest age is 98.8 ± 2.5 Ma, and the highest peak age on the probability density plot is at ca. 190 Ma. The zircons that yield ages of ca. 1500–2600 Ma are rounded and they show distinct cores and rims in the CL images (**Figure 6a**). The other zircons are euhedral and exhibit clear oscillatory zoning.

Site 2 (sample no. 151014-02): 200 spots on 200 zircon grains were analysed, and 140 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of two age groups: ca. 100–310 Ma (62%) and ca. 1500–2500 Ma (36%). The youngest age is 100.1 ± 2.8 Ma and the highest peak age on the probability density plot is at ca. 178 Ma. The zircons that yield ages of ca. 1500–2500 Ma are rounded and they show distinct cores and rims in the CL images (**Figure 6b**). The other zircons are euhedral and show clear oscillatory zoning.

Site 3 (sample no. 160705-06): 180 spots on 180 zircon grains were analysed, and 86 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of one age group at ca. 80–140 Ma (91%). The youngest age is 85.6 ± 3.4 Ma and the highest peak age on the probability density plot is at ca. 100 Ma. Most of the zircons are euhedral and display clear oscillatory zoning (**Figure 6c**).

Site 4 (sample no. 160705-02): 180 spots on 180 zircon grains were analysed, and 78 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of one age group at ca. 70–130 Ma (88%). The youngest age is 75 ± 2.9 Ma and the highest peak age on the probability density plot is at ca. 98 Ma. Most of the zircons are euhedral and exhibit clear oscillatory zoning (**Figure 6d**).

Site 5 (sample no.160705-01): 180 spots on 174 zircon grains were analysed, and 119 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of three age groups at ca. 70–110 Ma (7%), ca. 160–240 Ma (17%), and ca. 1300–2600 Ma (74%). The youngest age is 77.3 ± 2.1 Ma and the highest peak age on the probability density plot is at ca. 184 Ma. The zircons that yield ages of ca. 1300–2600 Ma are rounded and show cores and rims (**Figure 6e**). The other zircons are euhedral and display clear oscillatory zoning.

Site 6 (sample no.160704-05): 180 spots on 180 zircon grains were analysed, and 42 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of one age group at ca. 60–120 Ma (79%). The youngest age is 62.9 ± 5.7 Ma and the highest peak age on the probability density plot is at ca. 86 Ma. Most of the zircons are euhedral and indicate show clear oscillatory zoning (**Figure 6f**).

Site 7 (sample no. 160704-04): 180 spots on 180 zircon grains were analysed, and 58 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of one age group at ca. 60–120 Ma (78%). The youngest age is 62 ± 8.4 Ma and the highest peak age on the probability density plot is at ca. 67 Ma. Most of the zircons are euhedral and exhibit clear oscillatory zoning (**Figure 6g**).

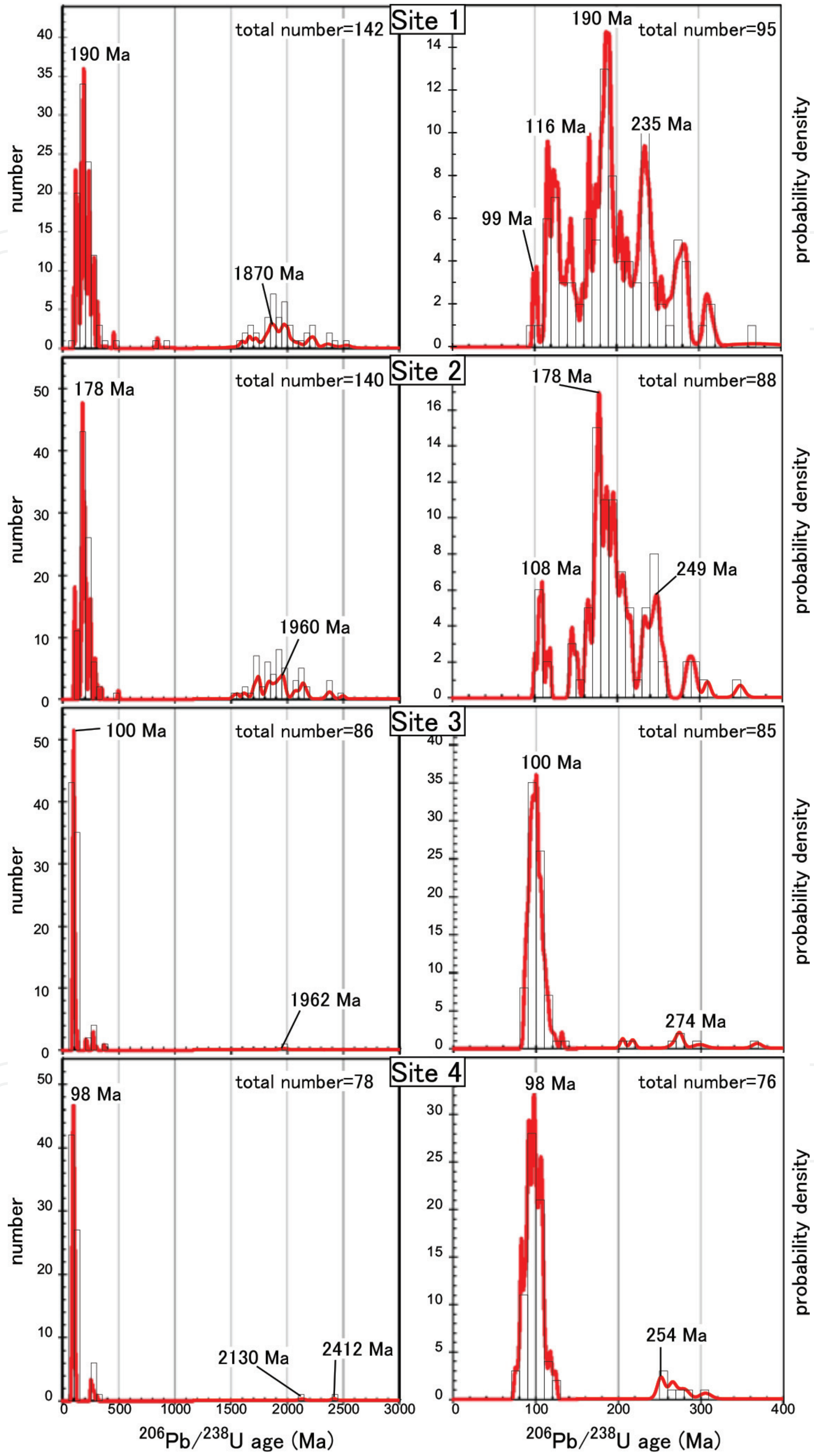

Figure 7. Histogram and probability density plot of Site 1 to Site 4. Left side and right side diagrams show all data and 0–400 Ma data, respectively.

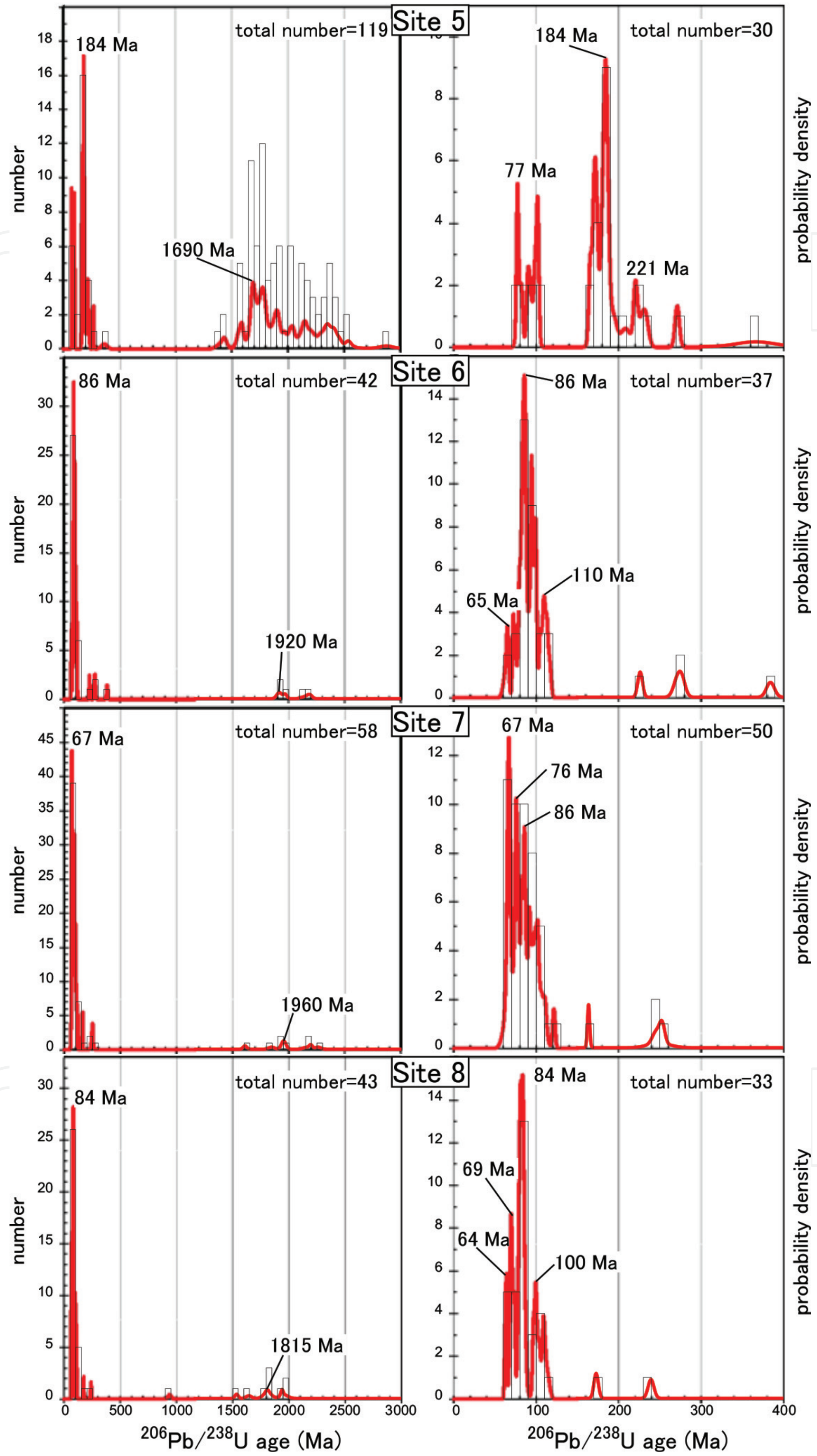

Figure 8. Histogram and probability density plot of Site 5 to Site 8. Left side and right side diagrams show all data and 0–400 Ma data, respectively.

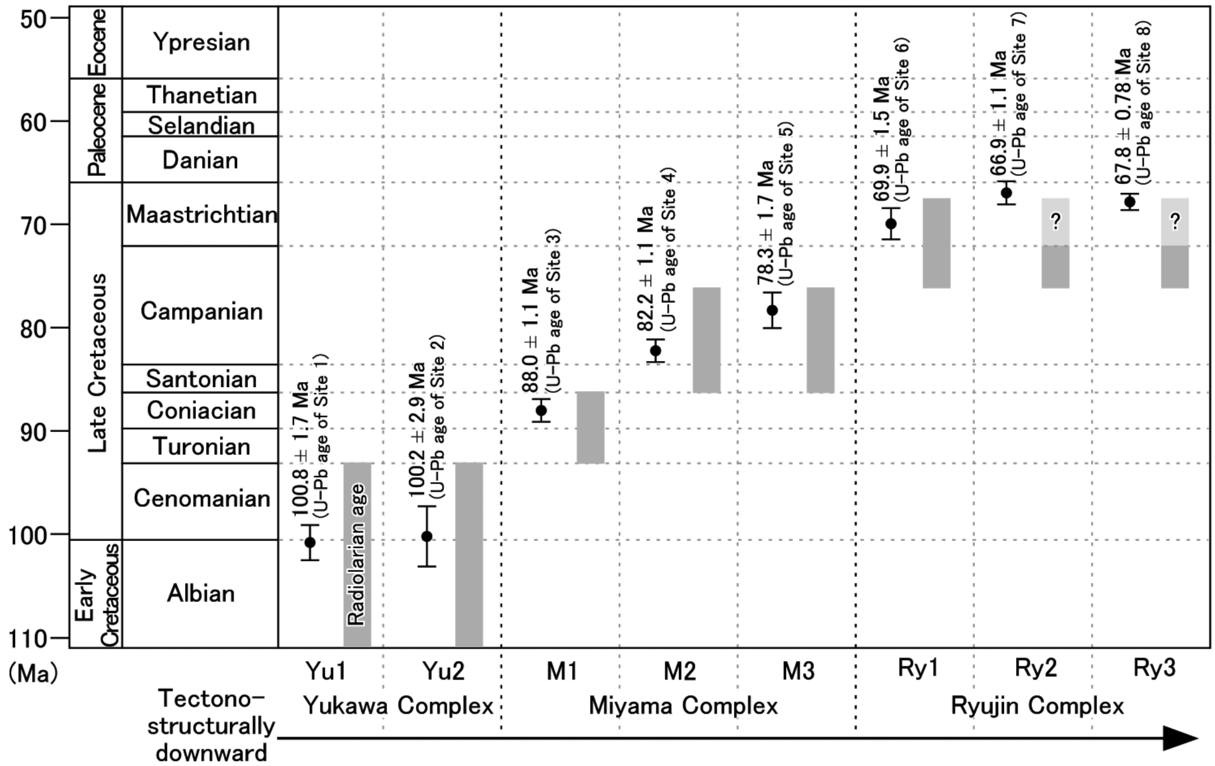

Figure 9. Summary of age distribution of U–Pb zircon ages and radiolarian ages. See text for the radiolarian ages of the each unit.

Site 8 (sample no. 160704-03): 180 spots on 180 zircon grains were analysed, and 43 spots (discordances of <10%) were selected for statistical interpretations. The zircon U–Pb ages consist mainly of one age group at ca. 60–120 Ma (72%). The youngest age is 62.7 ± 2.1 Ma and the highest peak age on the probability density plot is at ca. 84 Ma. Most of the zircons are euhedral and display clear oscillatory zoning (**Figure 6h**).

6. Relationship between detrital zircon U–Pb age and radiolarian fossil age

In this paper, we have not used the youngest single age but the youngest peak age in comparing detrital zircon U–Pb ages with radiolarian fossil ages because it is possible that the zircon U–Pb ages indicate younger than the crystallization age as a result of lead loss [26]. We applied the 'mixture modelling' proposed by Sambridge and Compston [27] to determine the youngest peak age. The 'mixture modelling' is in common usage in estimating the youngest peak age (for example, see Refs. [28–30]). The results indicate that the youngest peak ages are 100.8 ± 1.7 Ma (fraction = 0.09) at Site 1 (Yu1), 100.2 ± 2.9 Ma (fraction = 0.13) at Site 2 (Yu2), 88.0 ± 1.1 Ma (fraction = 0.13) at Site 3 (M1), 82.2 ± 1.1 Ma (fraction = 0.15) at Site 4 (M2), 78.3 ± 1.7 Ma (fraction = 0.37) at Site 5 (M3), 69.9 ± 1.5 Ma (fraction = 0.12) at Site 6 (Ry1), 66.9 ± 1.1 Ma (fraction = 0.27) at Site 7 Ry2) and 67.8 ± 0.78 Ma (fraction = 0.26) at Site 8 (Ry3).

Radiolarian fossils indicate Albian to Cenomanian ages for Yu1 and Yu2 [9, 11], Turonian to Coniacian ages for M1 [9, 11], Santonian to early Campanian ages for M2 and M3 [9], late

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Campanian to middle Maastrichtian ages for Ry1 (**Figure 9**; [10, 13, 14, 16, 17]). In Ry2 and Ry3, the radiolarian fossils indicate a late Campanian age [15]; however, a previous study point out the possibility that Ry2 and Ry3 contain radiolarian fossils of middle Maastrichtian age [12].

Detrital zircon U–Pb ages are in good agreement with depositional ages inferred from radiolarian fossils (**Figure 9**). In addition, the youngest peak ages become younger as tectono-structurally downwards; this trend is clearer in the U–Pb ages than in the radiolarian ages. In general, the detrital zircon U–Pb ages do not directly indicate the depositional age, because the ages indicate their crystallization ages. However, igneous activity occurred continuously during the late Cretaceous along the Eastern Asian continental margin where the proto-Japan arc was situated (for example, see Refs. [31–33]). In addition, it is reported that the sandstone compositions of the Cretaceous Shimanto accretionary complex provide evidence for the igneous activity (for example, see Refs. [18, 34, 35]). Most of detrital zircons of Cretaceous age from this study exhibit clear oscillatory zonings. Such zoning reflects crystal growth in a magma chamber, and the zoning is commonly altered to other structure such as core–rim textures and homogeneous textures as the result of metamorphism-induced recrystallization and hydrothermal alteration [36]. Therefore, these detrital Cretaceous zircons in this study are of igneous origin. Thus, it is considered that newly crystallized zircons were continuously supplied by constant igneous activity during the late Cretaceous period, which led to the concordance between the depositional age and zircon age.

From above, we can conclude that detrital zircon U–Pb ages can provide remarkably useful information for determining of the depositional age in the Cretaceous Shimanto accretionary complex.

7. Conclusions

Detrital zircons from sandstone in the Cretaceous Shimanto accretionary complex were subjected to U–Pb dating. The youngest peak ages in the samples from tectono-structurally upwards to downwards were 100.8 ± 1.7 Ma, 100.2 ± 2.9 Ma, 88.0 ± 1.1 Ma, 82.2 ± 1.1 Ma, 78.3 ± 1.7 Ma, 69.9 ± 1.5 Ma, 66.9 ± 1.1 Ma and 67.8 ± 0.78 Ma. These youngest peak ages are in good agreement with the depositional ages inferred from radiolarian fossils. In addition, the youngest peak ages become younger as tectono-structurally downwards. This trend is clearer in the U–Pb age data than in the radiolarian age data and is typical of an accretionary complex. Therefore, U–Pb dating of detrital zircons in sandstone is an effective way to determine the depositional age of strata in the Cretaceous Shimanto accretionary complex.

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Appendix 1. LA-ICP-MS U–Pb isotopic data.

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Site 1 (Sample 150503-06) in Yanase Unit (Yu1) of Yukawa Complex					
Yu1-001	0.29308 ± 0.00675	4.5101 ± 0.1505	1656.9 ± 38.2	1732.8 ± 57.8	0.22
Yu1-002	0.34581 ± 0.00893	5.2821 ± 0.2485	1914.6 ± 49.5	1865.9 ± 87.8	1.32
Yu1-003	0.30564 ± 0.00692	4.7023 ± 0.1446	1719.2 ± 38.9	1767.6 ± 54.3	0.24
Yu1-004	0.03773 ± 0.00095	0.2675 ± 0.0163	238.8 ± 6.0	240.7 ± 14.7	0.55
Yu1-005	0.01834 ± 0.00053	0.1319 ± 0.0119	117.2 ± 3.4	125.8 ± 11.3	0.37
Yu1-006	0.37125 ± 0.00840	6.5750 ± 0.1993	2035.3 ± 46.1	2055.9 ± 62.3	0.10
Yu1-007	0.04174 ± 0.00112	0.3220 ± 0.0224	263.6 ± 7.1	283.5 ± 19.7	0.38
Yu1-008	0.03643 ± 0.00094	0.2475 ± 0.0143	230.7 ± 6.0	224.6 ± 13.0	0.78
Yu1-009	0.01851 ± 0.00067	0.1359 ± 0.0178	118.2 ± 4.3	129.4 ± 16.9	0.43
Yu1-010	0.35598 ± 0.00883	5.5068 ± 0.2313	1963.1 ± 48.7	1901.6 ± 79.9	0.17
Yu1-011	0.03426 ± 0.00117	0.2247 ± 0.0274	217.2 ± 7.4	205.8 ± 25.1	0.65
Yu1-012	0.31714 ± 0.00871	4.9983 ± 0.2712	1775.8 ± 48.8	1819.0 ± 98.7	0.63
Yu1-013	0.03570 ± 0.00120	0.2509 ± 0.0286	226.1 ± 7.6	227.3 ± 25.9	0.29
Yu1-014	0.01836 ± 0.00258	0.1258 ± 0.0272	117.3 ± 16.5	120.3 ± 26.0	0.51
Yu1-015	0.33863 ± 0.04701	5.4033 ± 1.0076	1880.1 ± 261.0	1885.3 ± 351.6	0.27
Yu1-016	0.04315 ± 0.00602	0.3141 ± 0.0619	272.3 ± 38.0	277.3 ± 54.6	0.36
Yu1-017	0.28236 ± 0.03921	4.4232 ± 0.8256	1603.2 ± 222.6	1716.6 ± 320.4	0.13
Yu1-018	0.46045 ± 0.06404	10.6060 ± 1.9925	2441.5 ± 339.6	2489.1 ± 467.6	0.40
Yu1-019	0.29075 ± 0.04040	4.6481 ± 0.8710	1645.3 ± 228.6	1757.9 ± 329.4	0.30
Yu1-020	0.03105 ± 0.00435	0.2244 ± 0.0468	197.1 ± 27.6	205.6 ± 42.9	0.48
Yu1-021	0.02130 ± 0.00055	0.1329 ± 0.0094	135.8 ± 3.5	126.7 ± 8.9	0.82
Yu1-022	0.03934 ± 0.00117	0.2624 ± 0.0263	248.7 ± 7.4	236.6 ± 23.8	0.42
Yu1-023	0.28086 ± 0.00648	4.2625 ± 0.1459	1595.7 ± 36.8	1686.1 ± 57.7	0.61
Yu1-086	0.02259 ± 0.00044	0.1524 ± 0.0095	144.0 ± 2.8	144.0 ± 9.0	1.46
Yu1-087	0.35608 ± 0.00588	5.6450 ± 0.1725	1963.6 ± 32.4	1922.9 ± 58.7	0.43
Yu1-088	0.03080 ± 0.00070	0.2042 ± 0.0170	195.6 ± 4.4	188.6 ± 15.7	0.52
Yu1-089	0.03006 ± 0.00054	0.2074 ± 0.0101	190.9 ± 3.4	191.4 ± 9.3	0.22
Yu1-090	0.04459 ± 0.00127	0.3274 ± 0.0171	281.2 ± 8.0	287.6 ± 15.0	0.55
Yu1-091	0.40599 ± 0.01116	8.2032 ± 0.2864	2196.6 ± 60.4	2253.6 ± 78.7	1.06
Yu1-092	0.33660 ± 0.01008	5.2328 ± 0.2733	1870.3 ± 56.0	1857.9 ± 97.0	0.78
Yu1-093	0.01801 ± 0.00057	0.1327 ± 0.0111	115.1 ± 3.7	126.5 ± 10.6	1.23
Yu1-094	0.04283 ± 0.00128	0.3119 ± 0.0206	270.3 ± 8.1	275.7 ± 18.2	0.70
Yu1-095	0.02943 ± 0.00532	0.2034 ± 0.0387	187.0 ± 33.8	188.0 ± 35.8	0.40
Yu1-096	0.15109 ± 0.02729	1.6411 ± 0.3016	907.1 ± 163.9	986.1 ± 181.2	0.25
Yu1-097	0.02644 ± 0.00478	0.1850 ± 0.0350	168.2 ± 30.4	172.3 ± 32.6	0.21
Yu1-098	0.02783 ± 0.00504	0.2003 ± 0.0383	176.9 ± 32.0	185.4 ± 35.4	0.91
Yu1-099	0.03132 ± 0.00567	0.2146 ± 0.0408	198.8 ± 36.0	197.4 ± 37.6	0.39
Yu1-100	0.02617 ± 0.00474	0.1800 ± 0.0347	166.5 ± 30.1	168.0 ± 32.4	0.57
Yu1-101	0.05890 ± 0.01065	0.4458 ± 0.0830	368.9 ± 66.7	374.3 ± 69.7	0.55
Yu1-102	0.02856 ± 0.00092	0.1962 ± 0.0110	181.5 ± 5.8	181.9 ± 10.2	0.33
Yu1-103	0.32550 ± 0.01024	5.6463 ± 0.2400	1816.6 ± 57.2	1923.1 ± 81.7	0.14
Yu1-104	0.36460 ± 0.01144	5.6560 ± 0.2381	2003.9 ± 62.9	1924.6 ± 81.0	0.21
Yu1-105	0.01937 ± 0.00075	0.1425 ± 0.0162	123.7 ± 4.8	135.2 ± 15.3	0.89
Yu1-106	0.02620 ± 0.00083	0.1786 ± 0.0091	166.7 ± 5.3	166.8 ± 8.5	0.79
Yu1-107	0.41387 ± 0.00921	7.7769 ± 0.2551	2232.6 ± 49.7	2205.5 ± 72.4	0.71
Yu1-108	0.02493 ± 0.00060	0.1770 ± 0.0093	158.7 ± 3.8	165.5 ± 8.7	0.42
Yu1-109	0.02608 ± 0.00076	0.1816 ± 0.0156	166.0 ± 4.8	169.4 ± 14.5	0.71

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu1-024	0.32488 ± 0.00732	5.1435 ± 0.1535	1813.5 ± 40.8	1843.3 ± 55.0	0.14	Yu1-110	0.04332 ± 0.00124	0.3020 ± 0.0248	273.4 ± 7.8	268.0 ± 22.0	1.64
Yu1-025	0.01912 ± 0.00056	0.1386 ± 0.0131	122.1 ± 3.6	131.8 ± 12.5	0.55	Yu1-111	0.01928 ± 0.00054	0.1380 ± 0.0103	123.1 ± 3.4	131.2 ± 9.8	0.84
Yu1-026	0.34328 ± 0.00775	6.8643 ± 0.2042	1902.4 ± 42.9	2094.0 ± 62.3	0.30	Yu1-112	0.48029 ± 0.01290	10.6520 ± 0.3390	2528.5 ± 67.9	2493.2 ± 79.4	0.71
Yu1-027	0.02191 ± 0.00048	0.1451 ± 0.0123	139.7 ± 3.0	137.6 ± 11.7	0.65	Yu1-113	0.40824 ± 0.01088	8.6211 ± 0.2664	2206.9 ± 58.8	2298.7 ± 71.0	0.15
Yu1-028	0.14017 ± 0.00262	1.3545 ± 0.0770	845.6 ± 15.8	869.5 ± 49.4	0.26	Yu1-114	0.02075 ± 0.00067	0.1535 ± 0.0138	132.4 ± 4.3	145.0 ± 13.0	0.53
Yu1-029	0.04021 ± 0.00062	0.2900 ± 0.0117	254.1 ± 3.9	258.5 ± 10.4	0.81	Yu1-115	0.40300 ± 0.01105	7.2154 ± 0.2565	2182.8 ± 59.8	2138.3 ± 76.0	0.72
Yu1-030	0.03881 ± 0.00063	0.2780 ± 0.0131	245.4 ± 4.0	249.0 ± 11.8	0.70	Yu1-116	0.04410 ± 0.00157	0.3287 ± 0.0262	278.2 ± 9.9	288.5 ± 23.0	0.47
Yu1-031	0.03343 ± 0.00064	0.2430 ± 0.0161	212.0 ± 4.1	220.9 ± 14.6	0.43	Yu1-117	0.02962 ± 0.00079	0.2079 ± 0.0121	188.2 ± 5.0	191.8 ± 11.2	0.24
Yu1-032	0.03529 ± 0.00103	0.2489 ± 0.0303	223.6 ± 6.5	225.7 ± 27.5	0.44	Yu1-118	0.02726 ± 0.00079	0.1952 ± 0.0127	173.4 ± 5.0	181.0 ± 11.7	0.34
Yu1-033	0.04460 ± 0.00109	0.3061 ± 0.0266	281.3 ± 6.9	271.1 ± 23.5	0.46	Yu1-119	0.03759 ± 0.00142	0.2654 ± 0.0227	237.9 ± 9.0	239.0 ± 20.4	1.30
Yu1-034	0.04953 ± 0.00169	0.3975 ± 0.0542	311.6 ± 10.6	339.9 ± 46.4	0.40	Yu1-120	0.29430 ± 0.00647	4.4864 ± 0.1474	1663.0 ± 36.5	1728.4 ± 56.8	0.11
Yu1-035	0.01817 ± 0.00056	0.1126 ± 0.0150	116.1 ± 3.6	108.4 ± 14.4	0.47	Yu1-121	0.01976 ± 0.00098	0.1302 ± 0.0138	126.2 ± 6.3	124.3 ± 13.1	0.45
Yu1-036	0.04902 ± 0.00107	0.3934 ± 0.0257	308.5 ± 6.7	336.8 ± 22.0	0.24	Yu1-122	0.45026 ± 0.02077	9.0129 ± 0.4866	2396.4 ± 110.5	2339.2 ± 126.3	0.46
Yu1-037	0.03767 ± 0.00092	0.2814 ± 0.0235	238.4 ± 5.8	251.8 ± 21.1	0.63	Yu1-123	0.36066 ± 0.01660	5.8082 ± 0.3114	1985.3 ± 91.4	1947.6 ± 104.4	0.18
Yu1-038	0.33022 ± 0.01275	5.8938 ± 0.3428	1839.5 ± 71.0	1960.3 ± 114.0	0.12	Yu1-124	0.04334 ± 0.00133	0.3122 ± 0.0254	273.5 ± 8.4	275.9 ± 22.4	0.67
Yu1-039	0.29209 ± 0.01966	4.6595 ± 0.4578	1651.9 ± 111.2	1759.9 ± 172.9	0.42	Yu1-125	0.38653 ± 0.01040	6.0288 ± 0.2674	2106.7 ± 56.7	1979.9 ± 87.8	0.20
Yu1-040	0.03799 ± 0.00081	0.2703 ± 0.0138	240.3 ± 5.1	242.9 ± 12.4	0.82	Yu1-126	0.37922 ± 0.01092	6.0652 ± 0.3330	2072.6 ± 59.7	1985.2 ± 109.0	0.67
Yu1-041	0.41540 ± 0.00843	7.6183 ± 0.2621	2239.6 ± 45.5	2186.9 ± 75.2	0.53	Yu1-127	0.30472 ± 0.00817	4.9258 ± 0.2157	1714.7 ± 46.0	1806.6 ± 79.1	0.19
Yu1-042	0.02020 ± 0.00053	0.1384 ± 0.0120	128.9 ± 3.4	131.6 ± 11.4	0.55	Yu1-128	0.02287 ± 0.00087	0.1675 ± 0.0223	145.8 ± 5.6	157.2 ± 21.0	0.77
Yu1-043	0.33439 ± 0.00682	5.8951 ± 0.2073	1859.6 ± 37.9	1960.4 ± 68.9	0.85	Yu1-129	0.44038 ± 0.01189	9.4131 ± 0.4175	2352.3 ± 63.5	2379.0 ± 105.5	0.81
Yu1-044	0.35117 ± 0.00690	5.4899 ± 0.1716	1940.2 ± 38.1	1898.9 ± 59.4	0.39	Yu1-130	0.03684 ± 0.00111	0.2702 ± 0.0210	233.2 ± 7.0	242.8 ± 18.9	0.54
Yu1-045	0.03749 ± 0.00124	0.2875 ± 0.0353	237.3 ± 7.9	256.6 ± 31.5	0.53	Yu1-131	0.03704 ± 0.00056	0.2709 ± 0.0139	234.4 ± 3.6	243.4 ± 12.5	1.21
Yu1-046	0.02987 ± 0.00128	0.2137 ± 0.0140	189.8 ± 8.1	196.7 ± 12.9	0.16	Yu1-132	0.03232 ± 0.00051	0.2238 ± 0.0124	205.1 ± 3.2	205.1 ± 11.4	0.47
Yu1-047	0.03435 ± 0.00147	0.2399 ± 0.0162	217.7 ± 9.3	218.3 ± 14.7	0.51	Yu1-133	0.02941 ± 0.00045	0.2089 ± 0.0110	186.9 ± 2.9	192.7 ± 10.1	0.25
Yu1-048	0.02971 ± 0.00130	0.2194 ± 0.0174	188.7 ± 8.3	201.4 ± 15.9	0.26	Yu1-134	0.01604 ± 0.00036	0.1128 ± 0.0105	102.6 ± 2.3	108.5 ± 10.1	1.39

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu1-049	0.03771 ± 0.00164	0.2595 ± 0.0197	238.6 ± 10.4	234.2 ± 17.8	0.62	Yu1-135	0.36392 ± 0.00439	5.7826 ± 0.1354	2000.7 ± 24.1	1943.7 ± 45.5	0.21
Yu1-050	0.02956 ± 0.00149	0.2023 ± 0.0291	187.8 ± 9.5	187.0 ± 26.9	0.49	Yu1-136	0.02008 ± 0.00058	0.1388 ± 0.0177	128.2 ± 3.7	132.0 ± 16.9	1.32
Yu1-051	0.02731 ± 0.00052	0.1961 ± 0.0115	173.7 ± 3.3	181.8 ± 10.6	0.72	Yu1-137	0.02618 ± 0.00034	0.1794 ± 0.0069	166.6 ± 2.2	167.5 ± 6.4	0.36
Yu1-052	0.02997 ± 0.00075	0.2045 ± 0.0196	190.4 ± 4.8	188.9 ± 18.1	0.53	Yu1-138	0.33782 ± 0.01119	5.1525 ± 0.3154	1876.2 ± 62.2	1844.7 ± 112.9	0.21
Yu1-053	0.33314 ± 0.00526	5.3443 ± 0.1403	1853.6 ± 29.3	1875.9 ± 49.2	0.25	Yu1-139	0.04484 ± 0.00161	0.3597 ± 0.0313	282.7 ± 10.1	312.0 ± 27.1	0.60
Yu1-054	0.01974 ± 0.00058	0.1343 ± 0.0160	126.0 ± 3.7	127.9 ± 15.3	0.85	Yu1-140	0.03036 ± 0.00111	0.2023 ± 0.0200	192.8 ± 7.1	187.1 ± 18.5	0.28
Yu1-055	0.03344 ± 0.00085	0.2207 ± 0.0219	212.0 ± 5.4	202.5 ± 20.1	0.57	Yu1-141	0.02922 ± 0.00099	0.1980 ± 0.0146	185.7 ± 6.3	183.4 ± 13.5	0.31
Yu1-056	0.33998 ± 0.00557	5.3254 ± 0.1553	1886.6 ± 30.9	1872.9 ± 54.6	0.24	Yu1-142	0.03201 ± 0.00128	0.2190 ± 0.0273	203.1 ± 8.1	201.1 ± 25.1	0.31
Yu1-057	0.02363 ± 0.00083	0.1679 ± 0.0189	150.6 ± 5.3	157.6 ± 17.8	1.57	Site 2 (Sample 151014-02) in Kitamata Unit (Yu2) of Yukawa Complex					
Yu1-058	0.04092 ± 0.00125	0.2635 ± 0.0216	258.5 ± 7.9	237.5 ± 19.5	0.72	Yu2-001	0.33832 ± 0.00590	5.2966 ± 0.1520	1878.6 ± 32.8	1868.3 ± 53.6	0.20
Yu1-059	0.03644 ± 0.00105	0.2855 ± 0.0171	230.7 ± 6.6	255.0 ± 15.3	0.40	Yu2-002	0.35570 ± 0.00620	5.5867 ± 0.1598	1961.7 ± 34.2	1914.0 ± 54.7	0.57
Yu1-060	0.36254 ± 0.00967	5.7486 ± 0.1897	1994.2 ± 53.2	1938.6 ± 64.0	0.34	Yu2-003	0.03432 ± 0.00082	0.2325 ± 0.0194	217.5 ± 5.2	212.2 ± 17.7	0.34
Yu1-061	0.03201 ± 0.00111	0.2158 ± 0.0247	203.1 ± 7.1	198.4 ± 22.7	0.84	Yu2-004	0.03113 ± 0.00082	0.2276 ± 0.0218	197.6 ± 5.2	208.2 ± 19.9	0.39
Yu1-062	0.02243 ± 0.00082	0.1583 ± 0.0197	143.0 ± 5.2	149.3 ± 18.6	1.35	Yu2-005	0.03666 ± 0.00078	0.2574 ± 0.0164	232.1 ± 5.0	232.5 ± 14.8	0.30
Yu1-063	0.02852 ± 0.00061	0.2017 ± 0.0109	181.3 ± 3.9	186.5 ± 10.1	0.37	Yu2-006	0.03179 ± 0.00091	0.2020 ± 0.0231	201.7 ± 5.8	186.8 ± 21.4	0.91
Yu1-064	0.01544 ± 0.00038	0.1101 ± 0.0087	98.8 ± 2.5	106.0 ± 8.4	1.55	Yu2-007	0.01798 ± 0.00042	0.1218 ± 0.0096	114.8 ± 2.7	116.7 ± 9.2	0.39
Yu1-065	0.02914 ± 0.00059	0.2053 ± 0.0090	185.2 ± 3.8	189.6 ± 8.3	0.40	Yu2-008	0.30263 ± 0.00564	4.6860 ± 0.1588	1704.3 ± 31.8	1764.7 ± 59.8	0.54
Yu1-066	0.03651 ± 0.00089	0.2677 ± 0.0200	231.2 ± 5.6	240.9 ± 18.0	0.63	Yu2-009	0.02842 ± 0.00058	0.1942 ± 0.0112	180.6 ± 3.7	180.2 ± 10.4	0.18
Yu1-067	0.01792 ± 0.00056	0.1253 ± 0.0147	114.5 ± 3.6	119.9 ± 14.1	0.90	Yu2-010	0.03316 ± 0.00093	0.2142 ± 0.0235	210.3 ± 5.9	197.0 ± 21.6	0.60
Yu1-068	0.03020 ± 0.00066	0.2118 ± 0.0122	191.8 ± 4.2	195.1 ± 11.2	0.41	Yu2-011	0.32489 ± 0.00576	5.0978 ± 0.1488	1813.6 ± 32.1	1835.7 ± 53.6	0.16
Yu1-069	0.02882 ± 0.00086	0.2142 ± 0.0165	183.1 ± 5.4	197.1 ± 15.2	0.44	Yu2-012	0.39869 ± 0.00743	8.1638 ± 0.2640	2163.0 ± 40.3	2249.3 ± 72.7	0.59
Yu1-070	0.02803 ± 0.00076	0.1966 ± 0.0107	178.2 ± 4.9	182.2 ± 9.9	0.12	Yu2-013	0.02781 ± 0.00057	0.1894 ± 0.0109	176.8 ± 3.6	176.1 ± 10.1	0.11
Yu1-071	0.34981 ± 0.00907	6.6285 ± 0.2377	1933.7 ± 50.2	2063.1 ± 74.0	0.17	Yu2-014	0.03043 ± 0.00084	0.2118 ± 0.0217	193.2 ± 5.3	195.0 ± 20.0	0.39
Yu1-072	0.03185 ± 0.00091	0.2468 ± 0.0164	202.1 ± 5.8	223.9 ± 14.9	0.64	Yu2-015	0.03922 ± 0.00160	0.2920 ± 0.0329	248.0 ± 10.1	260.1 ± 29.3	0.62
Yu1-073	0.35782 ± 0.00945	5.6855 ± 0.2238	1971.8 ± 52.1	1929.1 ± 75.9	0.36	Yu2-016	0.34878 ± 0.01190	6.6032 ± 0.2986	1928.8 ± 65.8	2059.7 ± 93.1	0.41

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu1-074	0.03027 ± 0.00084	0.2128 ± 0.0129	192.2 ± 5.4	195.9 ± 11.9	0.19	Yu2-017	0.35085 ± 0.01194	6.5776 ± 0.2944	1938.7 ± 66.0	2056.3 ± 92.0	0.34
Yu1-075	0.33721 ± 0.00885	5.9032 ± 0.2239	1873.2 ± 49.2	1961.6 ± 74.4	0.47	Yu2-018	0.02964 ± 0.00105	0.1987 ± 0.0131	188.3 ± 6.7	184.0 ± 12.1	0.20
Yu1-076	0.03619 ± 0.00110	0.2845 ± 0.0241	229.2 ± 7.0	254.3 ± 21.5	0.56	Yu2-019	0.02811 ± 0.00106	0.1926 ± 0.0171	178.7 ± 6.7	178.8 ± 15.9	0.46
Yu1-077	0.02847 ± 0.00078	0.1858 ± 0.0120	180.9 ± 5.0	173.0 ± 11.1	0.24	Yu2-020	0.03045 ± 0.00088	0.1953 ± 0.0234	193.4 ± 5.6	181.1 ± 21.7	0.80
Yu1-078	0.05002 ± 0.00165	0.3717 ± 0.0387	314.6 ± 10.4	320.9 ± 33.4	0.42	Yu2-021	0.33004 ± 0.00591	5.1093 ± 0.1858	1838.6 ± 32.9	1837.6 ± 66.8	0.19
Yu1-079	0.32841 ± 0.00834	5.0641 ± 0.2009	1830.7 ± 46.5	1830.0 ± 72.6	0.14	Yu2-022	0.01857 ± 0.00039	0.1307 ± 0.0085	118.6 ± 2.5	124.7 ± 8.1	0.76
Yu1-080	0.02611 ± 0.00071	0.1719 ± 0.0106	166.2 ± 4.5	161.1 ± 9.9	0.27	Yu2-023	0.03348 ± 0.00096	0.2360 ± 0.0269	212.3 ± 6.1	215.1 ± 24.5	0.85
Yu1-081	0.02959 ± 0.00083	0.2063 ± 0.0145	188.0 ± 5.3	190.5 ± 13.3	0.59	Yu2-024	0.30775 ± 0.00699	4.7734 ± 0.1655	1729.6 ± 39.3	1780.2 ± 61.7	0.15
Yu1-082	0.02760 ± 0.00057	0.1854 ± 0.0128	175.5 ± 3.6	172.7 ± 11.9	0.58	Yu2-025	0.34762 ± 0.00903	5.5670 ± 0.2948	1923.2 ± 49.9	1910.9 ± 101.2	1.02
Yu1-083	0.35905 ± 0.00580	6.9546 ± 0.1954	1977.7 ± 32.0	2105.6 ± 59.2	0.15	Yu2-026	0.39270 ± 0.00930	7.3412 ± 0.2909	2135.3 ± 50.6	2153.8 ± 85.3	0.28
Yu1-084	0.04527 ± 0.00086	0.3571 ± 0.0191	285.4 ± 5.4	310.1 ± 16.6	0.68	Yu2-027	0.02803 ± 0.00072	0.1874 ± 0.0130	178.2 ± 4.6	174.4 ± 12.1	0.20
Yu1-085	0.07313 ± 0.00159	0.5711 ± 0.0411	455.0 ± 9.9	458.7 ± 33.0	0.68	Yu2-028	0.08018 ± 0.00221	0.5913 ± 0.0481	497.2 ± 13.7	471.7 ± 38.3	0.76

Appendix 2.

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu2-029	0.02707 ± 0.00072	0.2032 ± 0.0151	172.2 ± 4.6	187.9 ± 14.0	0.40	Yu2-115	0.33730 ± 0.00709	5.2624 ± 0.1937	1873.7 ± 39.4	1862.7 ± 68.6	0.36
Yu2-030	0.02598 ± 0.00071	0.1866 ± 0.0149	165.3 ± 4.5	173.7 ± 13.9	0.64	Yu2-116	0.03074 ± 0.00057	0.2235 ± 0.0100	195.2 ± 3.6	204.8 ± 9.2	0.39
Yu2-031	0.03135 ± 0.00087	0.2396 ± 0.0193	199.0 ± 5.5	218.1 ± 17.6	0.58	Yu2-117	0.02859 ± 0.00056	0.1962 ± 0.0107	181.7 ± 3.6	181.9 ± 9.9	0.54
Yu2-032	0.34609 ± 0.00630	5.4136 ± 0.1610	1915.9 ± 34.9	1886.9 ± 56.1	0.09	Yu2-118	0.02263 ± 0.00058	0.1416 ± 0.0139	144.2 ± 3.7	134.5 ± 13.2	1.25
Yu2-033	0.02281 ± 0.00066	0.1722 ± 0.0185	145.4 ± 4.2	161.3 ± 17.3	0.80	Yu2-119	0.02817 ± 0.00055	0.1920 ± 0.0102	179.1 ± 3.5	178.3 ± 9.5	0.22
Yu2-034	0.03945 ± 0.00096	0.2761 ± 0.0225	249.4 ± 6.0	247.5 ± 20.2	0.38	Yu2-120	0.44076 ± 0.00782	9.2948 ± 0.2490	2354.1 ± 41.8	2367.4 ± 63.4	0.41
Yu2-035	0.02933 ± 0.00064	0.1961 ± 0.0127	186.4 ± 4.0	181.8 ± 11.8	0.38	Yu2-121	0.05568 ± 0.00164	0.4115 ± 0.0460	349.3 ± 10.3	349.9 ± 39.1	0.47
Yu2-036	0.44876 ± 0.00839	9.8060 ± 0.3082	2389.7 ± 44.7	2416.6 ± 76.0	0.74	Yu2-122	0.44581 ± 0.00792	9.7228 ± 0.2274	2376.6 ± 42.2	2408.8 ± 56.3	2.01
Yu2-037	0.03227 ± 0.00070	0.2225 ± 0.0143	204.7 ± 4.4	204.0 ± 13.1	0.50	Yu2-123	0.03261 ± 0.00072	0.2525 ± 0.0739	206.9 ± 4.5	228.6 ± 66.9	0.81
Yu2-038	0.01707 ± 0.00037	0.1116 ± 0.0074	109.1 ± 2.4	107.4 ± 7.1	0.79	Yu2-124	0.39375 ± 0.00745	6.9113 ± 0.2252	2140.2 ± 40.5	2100.0 ± 68.4	0.17
Yu2-039	0.30182 ± 0.00578	4.7164 ± 0.1742	1700.3 ± 32.5	1770.1 ± 65.4	0.16	Yu2-125	0.34194 ± 0.00856	5.2821 ± 0.1963	1896.0 ± 47.5	1865.9 ± 69.3	0.93
Yu2-040	0.31219 ± 0.00632	4.8866 ± 0.2077	1751.5 ± 35.4	1799.9 ± 76.5	0.61	Yu2-126	0.02890 ± 0.00075	0.2057 ± 0.0108	183.6 ± 4.8	190.0 ± 10.0	0.34
Yu2-041	0.34474 ± 0.00859	5.6217 ± 0.3504	1909.4 ± 47.6	1919.4 ± 119.6	1.37	Yu2-127	0.03037 ± 0.00080	0.2107 ± 0.0122	192.9 ± 5.1	194.1 ± 11.2	0.60
Yu2-042	0.27325 ± 0.00543	4.2696 ± 0.1744	1557.3 ± 31.0	1687.5 ± 68.9	0.66	Yu2-128	0.01636 ± 0.00046	0.1065 ± 0.0082	104.6 ± 2.9	102.7 ± 7.9	0.72
Yu2-043	0.39994 ± 0.00800	8.0902 ± 0.3250	2168.8 ± 43.4	2241.1 ± 90.0	1.31	Yu2-129	0.03593 ± 0.00102	0.2394 ± 0.0186	227.5 ± 6.5	217.9 ± 16.9	0.69
Yu2-044	0.02641 ± 0.00072	0.1787 ± 0.0187	168.0 ± 4.6	166.9 ± 17.5	0.54	Yu2-130	0.03702 ± 0.00073	0.2573 ± 0.0155	234.3 ± 4.6	232.5 ± 14.0	0.45
Yu2-045	0.03908 ± 0.00093	0.2979 ± 0.0233	247.1 ± 5.9	264.8 ± 20.7	0.24	Yu2-131	0.02595 ± 0.00058	0.1789 ± 0.0145	165.2 ± 3.7	167.1 ± 13.6	0.35
Yu2-046	0.02794 ± 0.00056	0.1864 ± 0.0105	177.6 ± 3.6	173.6 ± 9.8	0.20	Yu2-132	0.02711 ± 0.00058	0.1890 ± 0.0138	172.4 ± 3.7	175.8 ± 12.9	0.61
Yu2-047	0.02973 ± 0.00057	0.2126 ± 0.0099	188.8 ± 3.6	195.7 ± 9.1	0.31	Yu2-133	0.01659 ± 0.00043	0.1211 ± 0.0122	106.1 ± 2.7	116.0 ± 11.7	0.39
Yu2-048	0.30971 ± 0.00546	4.7676 ± 0.1320	1739.3 ± 30.6	1779.1 ± 49.3	0.42	Yu2-134	0.03081 ± 0.00094	0.2306 ± 0.0308	195.6 ± 6.0	210.7 ± 28.1	0.49
Yu2-049	0.30912 ± 0.00546	4.8220 ± 0.1345	1736.4 ± 30.7	1788.7 ± 49.9	0.17	Yu2-135	0.01711 ± 0.00045	0.1138 ± 0.0093	109.4 ± 2.9	109.4 ± 9.0	0.41
Yu2-050	0.03933 ± 0.00145	0.2908 ± 0.0169	248.7 ± 9.2	259.2 ± 15.1	0.74	Yu2-136	0.01566 ± 0.00044	0.1106 ± 0.0100	100.1 ± 2.8	106.5 ± 9.7	0.37
Yu2-051	0.30009 ± 0.01089	4.6834 ± 0.2219	1691.8 ± 61.4	1764.2 ± 83.6	0.12	Yu2-137	0.02376 ± 0.00061	0.1585 ± 0.0124	151.4 ± 3.9	149.4 ± 11.7	0.36

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu2-052	0.02328 ± 0.00090	0.1589 ± 0.0129	148.3 ± 5.8	149.7 ± 12.2	1.52	Yu2-138	0.02929 ± 0.00070	0.2223 ± 0.0132	186.1 ± 4.4	203.8 ± 12.1	0.19
Yu2-053	0.34617 ± 0.01257	5.4714 ± 0.2605	1916.3 ± 69.6	1896.1 ± 90.3	0.65	Yu2-139	0.03119 ± 0.00074	0.2229 ± 0.0132	198.0 ± 4.7	204.4 ± 12.1	0.40
Yu2-054	0.32788 ± 0.01187	5.2129 ± 0.2439	1828.1 ± 66.2	1854.7 ± 86.8	0.11	Yu2-140	0.03850 ± 0.00115	0.2541 ± 0.0272	243.5 ± 7.3	229.9 ± 24.6	0.10
Yu2-055	0.03070 ± 0.00123	0.2291 ± 0.0208	194.9 ± 7.8	209.5 ± 19.0	0.57	Site 3 (Sample 160705-06) in Chikai Unit (M1) of Miyama Complex					
Yu2-056	0.03823 ± 0.00113	0.2984 ± 0.0335	241.9 ± 7.1	265.2 ± 29.8	1.19	M1-001	0.01528 ± 0.00068	0.1127 ± 0.0163	97.8 ± 4.4	108.4 ± 15.7	0.50
Yu2-057	0.35667 ± 0.00688	5.7215 ± 0.2771	1966.4 ± 37.9	1934.5 ± 93.7	0.39	M1-002	0.01605 ± 0.00068	0.1162 ± 0.0153	102.7 ± 4.4	111.6 ± 14.7	0.45
Yu2-058	0.02911 ± 0.00060	0.1904 ± 0.0121	185.0 ± 3.8	176.9 ± 11.2	0.33	M1-003	0.01457 ± 0.00062	0.1042 ± 0.0138	93.2 ± 4.0	100.7 ± 13.3	0.96
Yu2-059	0.39177 ± 0.00742	6.7510 ± 0.3166	2131.0 ± 40.3	2079.3 ± 97.5	0.25	M1-004	0.01337 ± 0.00054	0.0970 ± 0.0108	85.6 ± 3.4	94.0 ± 10.5	0.50
Yu2-060	0.38692 ± 0.00727	6.7445 ± 0.3125	2108.5 ± 39.6	2078.4 ± 96.3	0.20	M1-005	0.01512 ± 0.00064	0.1065 ± 0.0136	96.7 ± 4.1	102.7 ± 13.1	0.40
Yu2-061	0.04515 ± 0.00120	0.3293 ± 0.0324	284.7 ± 7.6	289.0 ± 28.4	0.65	M1-006	0.01854 ± 0.00069	0.1256 ± 0.0096	118.4 ± 4.4	120.1 ± 9.2	0.25
Yu2-062	0.03751 ± 0.00095	0.2706 ± 0.0248	237.4 ± 6.0	243.2 ± 22.3	0.68	M1-007	0.01505 ± 0.00067	0.1097 ± 0.0146	96.3 ± 4.3	105.7 ± 14.1	0.44
Yu2-063	0.35662 ± 0.01148	5.6792 ± 0.2601	1966.1 ± 63.3	1928.1 ± 88.3	0.36	M1-008	0.01472 ± 0.00066	0.1057 ± 0.0147	94.2 ± 4.2	102.0 ± 14.2	0.61
Yu2-064	0.01673 ± 0.00067	0.1218 ± 0.0147	107.0 ± 4.3	116.7 ± 14.1	0.25	M1-009	0.01400 ± 0.00063	0.0870 ± 0.0130	89.6 ± 4.0	84.7 ± 12.6	0.58
Yu2-065	0.02961 ± 0.00053	0.2053 ± 0.0115	188.1 ± 3.4	189.6 ± 10.6	0.21	M1-010	0.01486 ± 0.00060	0.0996 ± 0.0141	95.1 ± 3.9	96.4 ± 13.7	0.42
Yu2-066	0.03410 ± 0.00064	0.2298 ± 0.0144	216.1 ± 4.1	210.0 ± 13.1	0.41	M1-011	0.01554 ± 0.00060	0.0992 ± 0.0130	99.4 ± 3.8	96.1 ± 12.5	0.49
Yu2-067	0.35519 ± 0.00583	5.5668 ± 0.2050	1959.3 ± 32.1	1910.9 ± 70.4	0.36	M1-012	0.01573 ± 0.00061	0.1008 ± 0.0132	100.6 ± 3.9	97.5 ± 12.7	0.83
Yu2-068	0.31045 ± 0.00501	5.4161 ± 0.1927	1742.9 ± 28.1	1887.3 ± 67.2	0.14	M1-013	0.01406 ± 0.00060	0.0875 ± 0.0141	90.0 ± 3.9	85.1 ± 13.7	0.55
Yu2-069	0.30484 ± 0.00584	4.9608 ± 0.1395	1715.3 ± 32.9	1812.6 ± 51.0	0.39	M1-014	0.01668 ± 0.00050	0.1135 ± 0.0107	106.6 ± 3.2	109.1 ± 10.3	0.34
Yu2-070	0.03304 ± 0.00077	0.2387 ± 0.0167	209.5 ± 4.9	217.3 ± 15.2	0.75	M1-015	0.04354 ± 0.00130	0.3058 ± 0.0291	274.7 ± 8.2	270.9 ± 25.7	0.91
Yu2-071	0.28792 ± 0.00562	4.3254 ± 0.1344	1631.1 ± 31.9	1698.2 ± 52.8	0.93	M1-016	0.05879 ± 0.00182	0.4456 ± 0.0441	368.3 ± 11.4	374.2 ± 37.0	0.72
Yu2-072	0.02802 ± 0.00065	0.1938 ± 0.0137	178.1 ± 4.1	179.8 ± 12.8	0.32	M1-017	0.01503 ± 0.00042	0.1015 ± 0.0084	96.1 ± 2.7	98.1 ± 8.1	0.29
Yu2-073	0.02954 ± 0.00060	0.2093 ± 0.0099	187.6 ± 3.8	192.9 ± 9.1	0.40	M1-018	0.01674 ± 0.00083	0.1120 ± 0.0199	107.0 ± 5.3	107.8 ± 19.2	0.47
Yu2-074	0.04916 ± 0.00127	0.3650 ± 0.0296	309.4 ± 8.0	315.9 ± 25.7	0.68	M1-019	0.01680 ± 0.00075	0.1124 ± 0.0163	107.4 ± 4.8	108.2 ± 15.7	0.56
Yu2-075	0.38176 ± 0.00812	6.0917 ± 0.2339	2084.5 ± 44.3	1989.0 ± 76.4	0.34	M1-020	0.01422 ± 0.00058	0.0914 ± 0.0107	91.0 ± 3.7	88.8 ± 10.4	0.70
Yu2-076	0.33106 ± 0.00688	5.0870 ± 0.1829	1843.5 ± 38.3	1833.9 ± 65.9	0.30	M1-021	0.01605 ± 0.00079	0.0990 ± 0.0176	102.6 ± 5.0	95.9 ± 17.1	0.53

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Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Yu2-077	0.02569 ± 0.00060	0.1703 ± 0.0114	163.5 ± 3.8	159.7 ± 10.7	0.53	M1-022	0.01376 ± 0.00062	0.0937 ± 0.0133	88.1 ± 3.9	91.0 ± 12.9	0.55
Yu2-078	0.03186 ± 0.00108	0.2241 ± 0.0303	202.2 ± 6.9	205.3 ± 27.7	0.70	M1-023	0.01612 ± 0.00068	0.1043 ± 0.0131	103.1 ± 4.3	100.8 ± 12.7	0.32
Yu2-079	0.35789 ± 0.00740	5.6833 ± 0.1997	1972.2 ± 40.8	1928.8 ± 67.8	0.36	M1-024	0.01588 ± 0.00074	0.0984 ± 0.0185	101.6 ± 4.7	95.3 ± 18.0	0.47
Yu2-080	0.02532 ± 0.00054	0.1745 ± 0.0083	161.2 ± 3.4	163.3 ± 7.8	0.70	M1-025	0.35579 ± 0.01026	5.7542 ± 0.2561	1962.2 ± 56.6	1939.5 ± 86.3	0.31
Yu2-081	0.03225 ± 0.00100	0.2416 ± 0.0245	204.6 ± 6.3	219.7 ± 22.3	0.75	M1-026	0.04741 ± 0.00238	0.3672 ± 0.0699	298.6 ± 15.0	317.6 ± 60.4	0.32
Yu2-082	0.02796 ± 0.00069	0.1935 ± 0.0115	177.7 ± 4.4	179.6 ± 10.7	0.24	M1-027	0.01367 ± 0.00051	0.0952 ± 0.0116	87.5 ± 3.3	92.3 ± 11.2	0.78
Yu2-083	0.02793 ± 0.00069	0.1866 ± 0.0113	177.6 ± 4.4	173.7 ± 10.5	0.55	M1-028	0.01493 ± 0.00074	0.0903 ± 0.0189	95.5 ± 4.7	87.8 ± 18.4	0.88
Yu2-084	0.02743 ± 0.00071	0.1972 ± 0.0134	174.4 ± 4.5	182.8 ± 12.5	0.47	M1-029	0.01507 ± 0.00064	0.1000 ± 0.0157	96.4 ± 4.1	96.7 ± 15.2	0.70
Yu2-085	0.03023 ± 0.00103	0.1985 ± 0.0595	192.0 ± 6.5	183.9 ± 55.1	0.85	M1-030	0.01461 ± 0.00060	0.1018 ± 0.0148	93.5 ± 3.8	98.5 ± 14.3	0.73
Yu2-086	0.04627 ± 0.00144	0.3125 ± 0.0712	291.6 ± 9.1	276.1 ± 62.9	0.71	M1-031	0.01648 ± 0.00081	0.1134 ± 0.0171	105.4 ± 5.2	109.0 ± 16.5	0.51
Yu2-087	0.35058 ± 0.00705	5.9553 ± 0.1568	1937.3 ± 38.9	1969.3 ± 51.9	0.19	M1-032	0.01451 ± 0.00071	0.1010 ± 0.0150	92.9 ± 4.6	97.7 ± 14.5	0.58
Yu2-088	0.32438 ± 0.00669	5.0844 ± 0.1573	1811.1 ± 37.3	1833.4 ± 56.7	0.38	M1-033	0.01597 ± 0.00086	0.1084 ± 0.0198	102.1 ± 5.5	104.5 ± 19.1	0.38
Yu2-089	0.31279 ± 0.00644	4.8634 ± 0.1492	1754.4 ± 36.1	1795.9 ± 55.1	0.28	M1-034	0.01503 ± 0.00065	0.0998 ± 0.0103	96.1 ± 4.1	96.6 ± 10.0	0.42
Yu2-090	0.37777 ± 0.00752	7.0900 ± 0.1734	2065.9 ± 41.1	2122.7 ± 51.9	0.41	M1-035	0.01432 ± 0.00071	0.0956 ± 0.0153	91.6 ± 4.6	92.7 ± 14.9	1.02
Yu2-091	0.03764 ± 0.00095	0.2643 ± 0.0298	238.2 ± 6.0	238.1 ± 26.9	0.64	M1-036	0.01681 ± 0.00073	0.1188 ± 0.0123	107.5 ± 4.6	114.0 ± 11.8	0.39
Yu2-092	0.02742 ± 0.00050	0.1945 ± 0.0115	174.4 ± 3.2	180.5 ± 10.7	0.41	M1-037	0.01671 ± 0.00079	0.1084 ± 0.0151	106.9 ± 5.0	104.5 ± 14.6	0.64
Yu2-093	0.28256 ± 0.00480	4.4734 ± 0.1485	1604.3 ± 27.3	1726.0 ± 57.3	0.32	M1-038	0.01441 ± 0.00052	0.1021 ± 0.0130	92.2 ± 3.3	98.7 ± 12.6	0.83
Yu2-094	0.03651 ± 0.00079	0.2808 ± 0.0269	231.2 ± 5.0	251.3 ± 24.1	0.77	M1-039	0.01794 ± 0.00068	0.1090 ± 0.0158	114.6 ± 4.3	105.0 ± 15.2	0.34
Yu2-095	0.47224 ± 0.00750	11.3142 ± 0.2912	2493.4 ± 39.6	2549.3 ± 65.6	0.55	M1-040	0.01518 ± 0.00064	0.1022 ± 0.0167	97.1 ± 4.1	98.8 ± 16.2	0.57
Yu2-096	0.03953 ± 0.00081	0.2800 ± 0.0246	249.9 ± 5.1	250.7 ± 22.0	0.82	M1-041	0.01594 ± 0.00074	0.1161 ± 0.0212	101.9 ± 4.7	111.5 ± 20.4	0.69
Yu2-097	0.02792 ± 0.00074	0.1864 ± 0.0133	177.5 ± 4.7	173.6 ± 12.4	0.38	M1-042	0.01482 ± 0.00058	0.1037 ± 0.0145	94.8 ± 3.7	100.1 ± 14.0	0.47
Yu2-098	0.04652 ± 0.00124	0.3448 ± 0.0240	293.1 ± 7.8	300.8 ± 20.9	0.33	M1-043	0.01729 ± 0.00037	0.1155 ± 0.0088	110.5 ± 2.4	111.0 ± 8.4	0.28
Yu2-099	0.03378 ± 0.00091	0.2571 ± 0.0181	214.2 ± 5.8	232.3 ± 16.4	0.67	M1-044	0.01640 ± 0.00048	0.1156 ± 0.0138	104.9 ± 3.1	111.1 ± 13.3	0.75
Yu2-100	0.33284 ± 0.00778	5.1492 ± 0.1856	1852.1 ± 43.3	1844.2 ± 66.5	0.40	M1-045	0.02058 ± 0.00051	0.1400 ± 0.0133	131.3 ± 3.2	133.1 ± 12.6	0.24
Yu2-101	0.26696 ± 0.00627	4.1236 ± 0.1520	1525.3 ± 35.9	1658.9 ± 61.2	0.35	M1-046	0.01339 ± 0.00031	0.0928 ± 0.0079	85.8 ± 2.0	90.1 ± 7.7	0.52

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U
Yu2-102	0.35245 ± 0.00847	5.4469 ± 0.2191	1946.3 ± 46.8	1892.2 ± 76.1	0.31	M1-047	0.04340 ± 0.00133	0.2916 ± 0.0267	273.9 ± 8.4	259.8 ± 23.8	0.44
Yu2-103	0.02911 ± 0.00058	0.2069 ± 0.0143	185.0 ± 3.7	191.0 ± 13.2	0.17	M1-048	0.01450 ± 0.00057	0.0956 ± 0.0145	92.8 ± 3.7	92.7 ± 14.1	0.68
Yu2-104	0.04057 ± 0.00090	0.2868 ± 0.0237	256.4 ± 5.7	256.0 ± 21.2	0.74	M1-049	0.01918 ± 0.00071	0.1406 ± 0.0184	122.5 ± 4.6	133.6 ± 17.5	0.39
Yu2-105	0.02726 ± 0.00048	0.1807 ± 0.0102	173.4 ± 3.1	168.7 ± 9.5	0.49	M1-050	0.01590 ± 0.00063	0.1132 ± 0.0167	101.7 ± 4.0	108.9 ± 16.1	0.53
Yu2-106	0.04062 ± 0.00113	0.2842 ± 0.0327	256.7 ± 7.2	253.9 ± 29.2	0.32	M1-051	0.01541 ± 0.00050	0.1096 ± 0.0112	98.6 ± 3.2	105.6 ± 10.8	0.74
Yu2-107	0.39297 ± 0.00559	8.6158 ± 0.2025	2136.6 ± 30.4	2298.1 ± 54.0	0.16	M1-052	0.01589 ± 0.00047	0.1152 ± 0.0094	101.6 ± 3.0	110.7 ± 9.1	0.39
Yu2-108	0.03068 ± 0.00063	0.2249 ± 0.0162	194.8 ± 4.0	206.0 ± 14.8	0.28	M1-053	0.01580 ± 0.00056	0.1078 ± 0.0156	101.1 ± 3.6	103.9 ± 15.0	0.49
Yu2-109	0.03265 ± 0.00087	0.2174 ± 0.0239	207.1 ± 5.5	199.7 ± 22.0	0.20	M1-054	0.03423 ± 0.00101	0.2325 ± 0.0256	217.0 ± 6.4	212.2 ± 23.3	0.40
Yu2-110	0.32934 ± 0.00663	5.1880 ± 0.1623	1835.2 ± 36.9	1850.6 ± 57.9	0.12	M1-055	0.01704 ± 0.00057	0.1243 ± 0.0161	108.9 ± 3.7	119.0 ± 15.4	0.28
Yu2-111	0.37595 ± 0.00777	5.8510 ± 0.2030	2057.3 ± 42.5	1953.9 ± 67.8	0.37	M1-056	0.01728 ± 0.00076	0.1130 ± 0.0216	110.4 ± 4.8	108.7 ± 20.8	0.48
Yu2-112	0.02800 ± 0.00063	0.1950 ± 0.0111	178.0 ± 4.0	180.9 ± 10.3	0.40	M1-057	0.01556 ± 0.00083	0.1014 ± 0.0244	99.5 ± 5.3	98.0 ± 23.6	0.59
Yu2-113	0.04555 ± 0.00134	0.3024 ± 0.0326	287.1 ± 8.4	268.2 ± 28.9	0.69	M1-058	0.01577 ± 0.00043	0.0992 ± 0.0110	100.9 ± 2.7	96.0 ± 10.7	0.29
Yu2-114	0.03858 ± 0.00097	0.2926 ± 0.0219	244.0 ± 6.1	260.6 ± 19.5	0.12	M1-059	0.01564 ± 0.00051	0.0991 ± 0.0139	100.0 ± 3.2	95.9 ± 13.5	0.70

Appendix 3.

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U
M1-060	0.01614 ± 0.00062	0.1054 ± 0.0181	103.2 ± 4.0	101.7 ± 17.4	0.74	M2-059	0.01816 ± 0.00078	0.1139 ± 0.0158	116.0 ± 5.0	109.5 ± 15.2	0.56
M1-061	0.01477 ± 0.00051	0.0957 ± 0.0144	94.5 ± 3.3	92.8 ± 13.9	0.84	M2-060	0.01481 ± 0.00062	0.1093 ± 0.0133	94.8 ± 3.9	105.3 ± 12.8	0.36
M1-062	0.01528 ± 0.00053	0.1009 ± 0.0142	97.8 ± 3.4	97.6 ± 13.7	0.70	M2-061	0.04857 ± 0.00221	0.3552 ± 0.0521	305.7 ± 13.9	308.6 ± 45.3	0.31
M1-063	0.01783 ± 0.00061	0.1186 ± 0.0162	113.9 ± 3.9	113.8 ± 15.5	0.32	M2-062	0.01883 ± 0.00066	0.1221 ± 0.0161	120.3 ± 4.2	116.9 ± 15.4	0.41
M1-064	0.01550 ± 0.00065	0.1107 ± 0.0194	99.1 ± 4.2	106.6 ± 18.7	0.50	M2-063	0.01665 ± 0.00049	0.1124 ± 0.0105	106.5 ± 3.1	108.1 ± 10.1	0.38
M1-065	0.01562 ± 0.00051	0.1152 ± 0.0143	99.9 ± 3.3	110.7 ± 13.8	0.41	M2-064	0.01611 ± 0.00064	0.0987 ± 0.0163	103.0 ± 4.1	95.6 ± 15.8	0.52
M1-066	0.01399 ± 0.00035	0.0970 ± 0.0076	89.6 ± 2.2	94.0 ± 7.4	0.46	M2-065	0.03960 ± 0.00147	0.2868 ± 0.0392	250.3 ± 9.3	256.0 ± 35.0	0.72
M1-067	0.01580 ± 0.00042	0.1120 ± 0.0103	101.1 ± 2.7	107.8 ± 9.9	0.28	M2-066	0.01632 ± 0.00054	0.1093 ± 0.0129	104.4 ± 3.5	105.3 ± 12.5	0.53
M1-068	0.01511 ± 0.00038	0.0971 ± 0.0080	96.7 ± 2.4	94.1 ± 7.8	0.88	M2-067	0.01412 ± 0.00059	0.0873 ± 0.0110	90.4 ± 3.8	85.0 ± 10.7	0.55
M1-069	0.01458 ± 0.00051	0.1032 ± 0.0136	93.3 ± 3.3	99.7 ± 13.2	0.47	M2-068	0.01603 ± 0.00067	0.1142 ± 0.0141	102.5 ± 4.3	109.8 ± 13.5	0.27
M1-070	0.01556 ± 0.00062	0.0950 ± 0.0163	99.6 ± 4.0	92.2 ± 15.8	0.46	M2-069	0.01575 ± 0.00070	0.1070 ± 0.0124	100.7 ± 4.5	103.2 ± 12.0	0.63
M1-071	0.01631 ± 0.00064	0.1193 ± 0.0185	104.3 ± 4.1	114.5 ± 17.8	0.48	M2-070	0.04096 ± 0.00211	0.2765 ± 0.0472	258.8 ± 13.3	247.8 ± 42.3	0.73
M1-072	0.01700 ± 0.00070	0.1138 ± 0.0196	108.7 ± 4.5	109.4 ± 18.8	0.67	M2-071	0.01293 ± 0.00056	0.0850 ± 0.0094	82.8 ± 3.6	82.8 ± 9.1	0.49
M1-073	0.01532 ± 0.00049	0.1060 ± 0.0124	98.0 ± 3.2	102.3 ± 11.9	0.39	M2-072	0.01539 ± 0.00079	0.1034 ± 0.0179	98.5 ± 5.1	99.9 ± 17.3	0.38
M1-074	0.01751 ± 0.00051	0.1202 ± 0.0119	111.9 ± 3.3	115.3 ± 11.4	0.23	M2-073	0.01686 ± 0.00075	0.1158 ± 0.0134	107.8 ± 4.8	111.3 ± 12.9	0.60
M1-075	0.04256 ± 0.00187	0.3201 ± 0.0614	268.7 ± 11.8	282.0 ± 54.1	0.50	M2-074	0.01598 ± 0.00084	0.1102 ± 0.0196	102.2 ± 5.4	106.1 ± 18.9	0.46
M1-076	0.01655 ± 0.00044	0.1190 ± 0.0136	105.8 ± 2.8	114.2 ± 13.0	0.75	M2-075	0.01455 ± 0.00051	0.1057 ± 0.0138	93.1 ± 3.2	102.0 ± 13.3	0.65
M1-077	0.01563 ± 0.00047	0.1055 ± 0.0142	100.0 ± 3.0	101.8 ± 13.7	0.66	M2-076	0.01504 ± 0.00065	0.1070 ± 0.0191	96.2 ± 4.2	103.2 ± 18.4	0.79
M1-078	0.01784 ± 0.00052	0.1138 ± 0.0152	114.0 ± 3.3	109.4 ± 14.7	0.47	M2-077	0.01365 ± 0.00052	0.0873 ± 0.0136	87.4 ± 3.3	84.9 ± 13.3	1.00
M1-079	0.01652 ± 0.00041	0.1187 ± 0.0124	105.6 ± 2.6	113.9 ± 11.9	0.35	M2-078	0.01698 ± 0.00060	0.1112 ± 0.0154	108.5 ± 3.8	107.1 ± 14.8	0.33
M1-080	0.01382 ± 0.00043	0.1011 ± 0.0135	88.5 ± 2.7	97.8 ± 13.1	0.56	Site 5 (Sample 160705-01) in Hattomaki Unit (M3) of Miyama Complex					
M1-081	0.01453 ± 0.00045	0.0897 ± 0.0093	93.0 ± 2.9	87.2 ± 9.0	0.39	M3-001	0.05850 ± 0.00729	0.4754 ± 0.1341	366.5 ± 45.7	394.9 ± 111.4	0.92
M1-082	0.01468 ± 0.00061	0.0966 ± 0.0160	93.9 ± 3.9	93.7 ± 15.5	0.76	M3-002	0.24019 ± 0.00998	3.5519 ± 0.2226	1387.7 ± 57.6	1538.8 ± 96.4	0.47

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M1-083	0.01424 ± 0.00046	0.0996 ± 0.0107	91.2 ± 3.0	96.4 ± 10.3	0.74	M3-003	0.33403 ± 0.01341	5.8980 ± 0.3195	1857.9 ± 74.6	1960.9 ± 106.2	0.35
M1-084	0.03231 ± 0.00089	0.2323 ± 0.0161	205.0 ± 5.6	212.1 ± 14.7	0.54	M3-004	0.43957 ± 0.01787	9.5363 ± 0.5276	2348.7 ± 95.5	2391.0 ± 132.3	0.89
M1-085	0.01482 ± 0.00055	0.0912 ± 0.0130	94.9 ± 3.5	88.6 ± 12.7	0.57	M3-005	0.48244 ± 0.01937	11.2839 ± 0.4946	2537.9 ± 101.9	2546.8 ± 111.6	0.45
M1-086	0.01370 ± 0.00039	0.0953 ± 0.0073	87.7 ± 2.5	92.5 ± 7.1	0.61	M3-006	0.03281 ± 0.00184	0.2115 ± 0.0305	208.1 ± 11.7	194.8 ± 28.1	0.84
Site 4 (Sample 160705-02) in Gomadanzan Unit (M2) of Miyama Complex						M3-007	0.30011 ± 0.00706	4.6679 ± 0.1602	1691.9 ± 39.8	1761.4 ± 60.5	0.22
M2-001	0.01512 ± 0.00055	0.0922 ± 0.0142	96.7 ± 3.5	89.6 ± 13.8	0.56	M3-008	0.02922 ± 0.00082	0.1880 ± 0.0159	185.7 ± 5.2	174.9 ± 14.8	0.39
M2-002	0.04319 ± 0.00196	0.2801 ± 0.0544	272.6 ± 12.4	250.8 ± 48.7	0.42	M3-009	0.41899 ± 0.01069	8.5583 ± 0.3539	2255.9 ± 57.5	2292.1 ± 94.8	0.24
M2-003	0.01287 ± 0.00033	0.0869 ± 0.0068	82.4 ± 2.1	84.6 ± 6.7	0.39	M3-010	0.44011 ± 0.01046	8.1774 ± 0.2802	2351.1 ± 55.9	2250.8 ± 77.1	0.26
M2-004	0.04466 ± 0.00173	0.2934 ± 0.0436	281.6 ± 10.9	261.3 ± 38.8	0.51	M3-011	0.33916 ± 0.00888	5.1873 ± 0.2493	1882.6 ± 49.3	1850.5 ± 88.9	0.81
M2-005	0.01645 ± 0.00061	0.1174 ± 0.0161	105.2 ± 3.9	112.7 ± 15.4	0.35	M3-012	0.56269 ± 0.02040	13.7939 ± 1.1389	2877.7 ± 104.3	2735.6 ± 225.9	0.58
M2-006	0.01394 ± 0.00065	0.0932 ± 0.0181	89.3 ± 4.2	90.5 ± 17.5	0.59	M3-013	0.43205 ± 0.01588	9.3971 ± 0.7960	2314.9 ± 85.1	2377.5 ± 201.4	0.67
M2-007	0.01506 ± 0.00086	0.0910 ± 0.0168	96.3 ± 5.5	88.4 ± 16.3	0.51	M3-014	0.34000 ± 0.01231	5.5575 ± 0.4671	1886.7 ± 68.3	1909.5 ± 160.5	0.30
M2-008	0.01654 ± 0.00082	0.1066 ± 0.0238	105.7 ± 5.2	102.9 ± 23.0	0.79	M3-015	0.34359 ± 0.01245	5.4157 ± 0.4563	1903.9 ± 69.0	1887.3 ± 159.0	0.14
M2-009	0.01523 ± 0.00039	0.0963 ± 0.0080	97.4 ± 2.5	93.4 ± 7.8	0.33	M3-016	0.32813 ± 0.01185	5.6375 ± 0.4706	1829.3 ± 66.1	1921.8 ± 160.4	0.51
M2-010	0.01836 ± 0.00047	0.1168 ± 0.0097	117.3 ± 3.0	112.2 ± 9.3	0.29	M3-017	0.01212 ± 0.00059	0.0839 ± 0.0147	77.6 ± 3.8	81.8 ± 14.3	0.42
M2-011	0.01342 ± 0.00036	0.0858 ± 0.0078	85.9 ± 2.3	83.6 ± 7.6	0.32	M3-018	0.45878 ± 0.01704	10.9825 ± 0.9386	2434.2 ± 90.4	2521.6 ± 215.5	0.56
M2-012	0.01419 ± 0.00047	0.0948 ± 0.0123	90.8 ± 3.0	92.0 ± 12.0	0.53	M3-019	0.34373 ± 0.01266	6.1176 ± 0.5269	1904.6 ± 70.2	1992.7 ± 171.6	0.15
M2-013	0.01515 ± 0.00043	0.1041 ± 0.0103	97.0 ± 2.7	100.6 ± 10.0	0.31	M3-020	0.44305 ± 0.01588	8.8143 ± 0.7212	2364.3 ± 84.7	2318.9 ± 189.7	0.40
M2-014	0.01669 ± 0.00053	0.1140 ± 0.0135	106.7 ± 3.4	109.6 ± 13.0	0.60	M3-021	0.38735 ± 0.00861	7.1727 ± 0.2522	2110.5 ± 46.9	2133.0 ± 75.0	0.14
M2-015	0.01443 ± 0.00066	0.0874 ± 0.0174	92.3 ± 4.2	85.1 ± 16.9	0.47	M3-022	0.02723 ± 0.00083	0.2026 ± 0.0212	173.2 ± 5.3	187.4 ± 19.6	0.53
M2-016	0.01537 ± 0.00046	0.1075 ± 0.0097	98.3 ± 2.9	103.7 ± 9.3	0.35	M3-023	0.44212 ± 0.01106	10.0244 ± 0.4656	2360.1 ± 59.0	2436.9 ± 113.2	0.45
M2-017	0.01666 ± 0.00050	0.1137 ± 0.0104	106.5 ± 3.2	109.3 ± 10.0	0.29	M3-024	0.31680 ± 0.00691	5.0013 ± 0.1666	1774.1 ± 38.7	1819.5 ± 60.6	0.20
M2-018	0.01608 ± 0.00055	0.1074 ± 0.0132	102.9 ± 3.5	103.6 ± 12.7	0.30	M3-025	0.32397 ± 0.00708	5.6488 ± 0.1872	1809.1 ± 39.5	1923.5 ± 63.8	0.12
M2-019	0.01440 ± 0.00045	0.1040 ± 0.0089	92.2 ± 2.9	100.4 ± 8.6	0.32	M3-026	0.33157 ± 0.00721	5.6222 ± 0.1835	1846.0 ± 40.1	1919.4 ± 62.6	0.30
M2-020	0.01676 ± 0.00071	0.1231 ± 0.0179	107.1 ± 4.5	117.9 ± 17.2	0.57	M3-027	0.31506 ± 0.00997	5.0267 ± 0.2449	1765.6 ± 55.9	1823.8 ± 88.9	0.38

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M2-021	0.01749 ± 0.00069	0.1130 ± 0.0146	111.8 ± 4.4	108.7 ± 14.0	0.38	M3-028	0.35280 ± 0.01140	5.6616 ± 0.2991	1948.0 ± 63.0	1925.5 ± 101.7	0.31
M2-022	0.01507 ± 0.00057	0.1074 ± 0.0117	96.4 ± 3.6	103.6 ± 11.3	0.33	M3-029	0.30026 ± 0.00966	4.7000 ± 0.2452	1692.6 ± 54.5	1767.2 ± 92.2	0.60
M2-023	0.01289 ± 0.00043	0.0881 ± 0.0062	82.6 ± 2.8	85.7 ± 6.0	0.28	M3-030	0.39751 ± 0.01278	8.6305 ± 0.4336	2157.6 ± 69.4	2299.7 ± 115.5	0.51
M2-024	0.01580 ± 0.00057	0.1023 ± 0.0100	101.0 ± 3.6	98.9 ± 9.7	0.36	M3-031	0.29785 ± 0.00968	4.8453 ± 0.2609	1680.6 ± 54.6	1792.7 ± 96.5	0.31
M2-025	0.01943 ± 0.00052	0.1320 ± 0.0148	124.0 ± 3.3	125.9 ± 14.1	0.45	M3-032	0.31148 ± 0.00991	4.8101 ± 0.2401	1748.0 ± 55.6	1786.6 ± 89.2	0.24
M2-026	0.45382 ± 0.00845	9.6216 ± 0.5603	2412.2 ± 44.9	2399.2 ± 139.7	0.28	M3-033	0.27492 ± 0.00864	4.4461 ± 0.2092	1565.7 ± 49.2	1720.9 ± 81.0	0.10
M2-027	0.01682 ± 0.00043	0.1182 ± 0.0124	107.5 ± 2.8	113.4 ± 11.9	0.37	M3-034	0.31298 ± 0.00415	4.8704 ± 0.1568	1755.3 ± 23.3	1797.1 ± 57.9	0.18
M2-028	0.01303 ± 0.00042	0.0847 ± 0.0119	83.4 ± 2.7	82.5 ± 11.6	0.44	M3-035	0.29957 ± 0.00424	4.8954 ± 0.1722	1689.2 ± 23.9	1801.4 ± 63.3	0.13
M2-029	0.01429 ± 0.00050	0.0912 ± 0.0144	91.5 ± 3.2	88.6 ± 14.0	0.92	M3-036	0.31724 ± 0.00543	4.9510 ± 0.2228	1776.2 ± 30.4	1810.9 ± 81.5	0.35
M2-030	0.01565 ± 0.00050	0.1055 ± 0.0145	100.1 ± 3.2	101.8 ± 14.0	0.47	M3-037	0.32048 ± 0.00462	5.0713 ± 0.1827	1792.1 ± 25.8	1831.2 ± 66.0	0.13
M2-031	0.01623 ± 0.00049	0.1079 ± 0.0140	103.8 ± 3.1	104.1 ± 13.5	0.51	M3-038	0.30604 ± 0.00495	4.8184 ± 0.2018	1721.2 ± 27.8	1788.1 ± 74.9	0.12
M2-032	0.01468 ± 0.00072	0.0885 ± 0.0160	93.9 ± 4.6	86.1 ± 15.6	0.56	M3-039	0.34634 ± 0.00556	5.7967 ± 0.1821	1917.1 ± 30.8	1945.8 ± 61.1	0.41
M2-033	0.01541 ± 0.00066	0.1054 ± 0.0137	98.6 ± 4.2	101.7 ± 13.2	0.74	M3-040	0.03477 ± 0.00068	0.2394 ± 0.0172	220.3 ± 4.3	217.9 ± 15.7	0.58
M2-034	0.01249 ± 0.00067	0.0753 ± 0.0158	80.0 ± 4.3	73.7 ± 15.5	1.50	M3-041	0.42758 ± 0.00795	8.7703 ± 0.3758	2294.8 ± 42.7	2314.3 ± 99.2	0.64
M2-035	0.01171 ± 0.00046	0.0850 ± 0.0085	75.0 ± 2.9	82.8 ± 8.3	1.17	M3-042	0.04292 ± 0.00084	0.3018 ± 0.0175	270.9 ± 5.3	267.8 ± 15.5	0.31
M2-036	0.01409 ± 0.00050	0.0924 ± 0.0130	90.2 ± 3.2	89.7 ± 12.6	0.77	M3-043	0.01543 ± 0.00056	0.1129 ± 0.0172	98.7 ± 3.6	108.6 ± 16.5	0.32
M2-037	0.01651 ± 0.00045	0.1223 ± 0.0104	105.6 ± 2.8	117.2 ± 10.0	0.39	M3-044	0.45494 ± 0.00826	9.8946 ± 0.4103	2417.2 ± 43.9	2424.9 ± 100.6	1.32
M2-038	0.01730 ± 0.00076	0.1203 ± 0.0222	110.6 ± 4.9	115.4 ± 21.3	0.48	M3-045	0.29874 ± 0.00526	4.8806 ± 0.1988	1685.1 ± 29.7	1798.9 ± 73.3	0.15
M2-039	0.01692 ± 0.00057	0.1053 ± 0.0142	108.1 ± 3.6	101.6 ± 13.7	0.40	M3-046	0.02860 ± 0.00137	0.2062 ± 0.0225	181.8 ± 8.7	190.3 ± 20.8	0.48
M2-040	0.04208 ± 0.00124	0.3021 ± 0.0308	265.7 ± 7.8	268.0 ± 27.4	0.44	M3-047	0.38733 ± 0.01758	7.8829 ± 0.5714	2110.5 ± 95.8	2217.7 ± 160.7	0.71
M2-041	0.01446 ± 0.00066	0.0903 ± 0.0182	92.6 ± 4.2	87.8 ± 17.7	0.55	M3-048	0.36623 ± 0.01640	7.1120 ± 0.4951	2011.6 ± 90.1	2125.5 ± 148.0	0.34
M2-042	0.01532 ± 0.00046	0.1080 ± 0.0115	98.0 ± 2.9	104.2 ± 11.1	0.27	M3-049	0.31207 ± 0.01382	4.8847 ± 0.3307	1750.9 ± 77.6	1799.6 ± 121.8	0.32
M2-043	0.01441 ± 0.00079	0.0959 ± 0.0222	92.2 ± 5.0	93.0 ± 21.5	0.52	M3-050	0.32301 ± 0.00981	5.1919 ± 0.2393	1804.4 ± 54.8	1851.2 ± 85.3	0.12
M2-044	0.01567 ± 0.00064	0.1094 ± 0.0167	100.3 ± 4.1	105.4 ± 16.1	0.39	M3-051	0.30477 ± 0.00990	4.6026 ± 0.2744	1714.9 ± 55.7	1749.7 ± 104.3	0.31
M2-045	0.01434 ± 0.00052	0.0871 ± 0.0113	91.8 ± 3.3	84.8 ± 11.0	0.47	M3-052	0.03053 ± 0.00125	0.2168 ± 0.0303	193.9 ± 7.9	199.2 ± 27.8	0.59

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M2-046	0.01546 ± 0.00047	0.1050 ± 0.0089	98.9 ± 3.0	101.4 ± 8.6	0.31	M3-053	0.01582 ± 0.00066	0.1058 ± 0.0156	101.2 ± 4.2	102.1 ± 15.1	0.37
M2-047	0.01498 ± 0.00054	0.0960 ± 0.0122	95.9 ± 3.4	93.0 ± 11.8	0.50	M3-054	0.29973 ± 0.00894	4.6933 ± 0.1990	1690.0 ± 50.4	1766.0 ± 74.9	0.13
M2-048	0.01279 ± 0.00045	0.0914 ± 0.0099	81.9 ± 2.9	88.8 ± 9.7	2.02	M3-055	0.29581 ± 0.00954	4.6026 ± 0.2665	1670.5 ± 53.9	1749.7 ± 101.3	0.76
M2-049	0.01367 ± 0.00050	0.0976 ± 0.0127	87.5 ± 3.2	94.6 ± 12.3	0.59	M3-056	0.40681 ± 0.01124	7.5780 ± 0.3069	2200.3 ± 60.8	2182.2 ± 88.4	0.50
M2-050	0.01415 ± 0.00044	0.1004 ± 0.0092	90.6 ± 2.8	97.2 ± 8.9	0.60	M3-057	0.37011 ± 0.00991	7.6708 ± 0.2655	2029.9 ± 54.3	2193.1 ± 75.9	0.36
M2-051	0.03984 ± 0.00121	0.2941 ± 0.0255	251.9 ± 7.7	261.8 ± 22.7	0.53	M3-058	0.40937 ± 0.01147	8.6387 ± 0.3599	2212.0 ± 62.0	2300.6 ± 95.8	0.36
M2-052	0.01488 ± 0.00063	0.0896 ± 0.0159	95.2 ± 4.1	87.1 ± 15.5	0.43	M3-059	0.02851 ± 0.00091	0.2096 ± 0.0189	181.2 ± 5.8	193.2 ± 17.4	0.23
M2-053	0.39156 ± 0.01032	7.4980 ± 0.3398	2130.1 ± 56.2	2172.7 ± 98.5	0.29	M3-060	0.30442 ± 0.00827	4.9979 ± 0.1931	1713.2 ± 46.5	1818.9 ± 70.3	0.10
M2-054	0.01326 ± 0.00077	0.0896 ± 0.0250	84.9 ± 4.9	87.1 ± 24.4	0.31	M3-061	0.02895 ± 0.00155	0.2070 ± 0.0452	183.9 ± 9.8	191.0 ± 41.7	1.07
M2-055	0.01356 ± 0.00057	0.0867 ± 0.0075	86.8 ± 3.7	84.4 ± 7.3	0.55	M3-062	0.32053 ± 0.00915	4.9799 ± 0.2392	1792.3 ± 51.2	1815.8 ± 87.2	0.47
M2-056	0.01234 ± 0.00065	0.0844 ± 0.0146	79.0 ± 4.2	82.2 ± 14.3	1.18	M3-063	0.02883 ± 0.00087	0.2162 ± 0.0165	183.2 ± 5.5	198.8 ± 15.2	0.36
M2-057	0.01554 ± 0.00058	0.1080 ± 0.0099	99.4 ± 3.7	104.1 ± 9.5	0.27	M3-064	0.43490 ± 0.01188	9.1731 ± 0.5270	2327.8 ± 63.6	2355.3 ± 135.3	0.95
M2-058	0.01422 ± 0.00053	0.0996 ± 0.0089	91.1 ± 3.4	96.4 ± 8.6	0.34	M3-065	0.36458 ± 0.00819	6.5059 ± 0.2484	2003.8 ± 45.0	2046.6 ± 78.1	0.55

Appendix 4.

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M3-066	0.44954 ± 0.00976	9.7085 ± 0.3250	2393.2 ± 52.0	2407.4 ± 80.6	0.22	Ry1-032	0.01637 ± 0.00043	0.1131 ± 0.0086	104.7 ± 2.7	108.8 ± 8.3	0.38
M3-067	0.02680 ± 0.00070	0.1844 ± 0.0147	170.5 ± 4.5	171.8 ± 13.7	0.32	Ry1-033	0.01476 ± 0.00044	0.1080 ± 0.0107	94.5 ± 2.8	104.1 ± 10.3	0.67
M3-068	0.27836 ± 0.00739	4.3495 ± 0.2610	1583.1 ± 42.0	1702.7 ± 102.2	0.29	Ry1-034	0.01354 ± 0.00059	0.0956 ± 0.0163	86.7 ± 3.8	92.7 ± 15.8	1.82
M3-069	0.30093 ± 0.00711	4.6220 ± 0.2114	1695.9 ± 40.1	1753.2 ± 80.2	0.11	Ry1-035	0.01480 ± 0.00043	0.1039 ± 0.0100	94.7 ± 2.8	100.4 ± 9.7	0.39
M3-070	0.37189 ± 0.00831	5.9032 ± 0.2256	2038.3 ± 45.5	1961.6 ± 75.0	0.44	Ry1-036	0.01440 ± 0.00052	0.0929 ± 0.0134	92.2 ± 3.3	90.2 ± 13.0	0.61
M3-071	0.27481 ± 0.00748	4.2010 ± 0.1892	1565.2 ± 42.6	1674.2 ± 75.4	0.44	Ry1-037	0.01287 ± 0.00039	0.0874 ± 0.0090	82.5 ± 2.5	85.0 ± 8.8	0.55
M3-072	0.01279 ± 0.00058	0.0859 ± 0.0160	81.9 ± 3.7	83.7 ± 15.6	0.65	Ry1-038	0.01293 ± 0.00120	0.0828 ± 0.0140	82.8 ± 7.7	80.8 ± 13.7	0.54
M3-073	0.03551 ± 0.00160	0.2404 ± 0.0436	225.0 ± 10.1	218.8 ± 39.7	0.50	Ry1-039	0.00981 ± 0.00089	0.0648 ± 0.0091	62.9 ± 5.7	63.8 ± 9.0	0.54
M3-074	0.34292 ± 0.00940	5.5050 ± 0.2515	1900.7 ± 52.1	1901.3 ± 86.9	0.13	Ry1-040	0.01336 ± 0.00124	0.0953 ± 0.0163	85.5 ± 8.0	92.5 ± 15.8	1.12
M3-075	0.24853 ± 0.00697	3.7852 ± 0.1902	1430.9 ± 40.1	1589.6 ± 79.9	0.49	Ry1-041	0.01319 ± 0.00039	0.0948 ± 0.0116	84.4 ± 2.5	92.0 ± 11.3	0.61
M3-076	0.31811 ± 0.00879	4.9171 ± 0.2330	1780.5 ± 49.2	1805.1 ± 85.5	0.39	Ry1-042	0.01312 ± 0.00063	0.0898 ± 0.0201	84.0 ± 4.0	87.3 ± 19.6	0.75
M3-077	0.02889 ± 0.00135	0.2111 ± 0.0193	183.6 ± 8.6	194.5 ± 17.8	0.12	Site 7 (Sample 160704-04) in Komatagawa Unit (Ry2) of Ryujin Complex					
M3-078	0.41717 ± 0.01858	8.9603 ± 0.5355	2247.6 ± 100.1	2333.9 ± 139.5	0.57	Ry2-001	0.01056 ± 0.00058	0.0658 ± 0.0174	67.7 ± 3.7	64.7 ± 17.1	0.52
M3-079	0.39475 ± 0.01757	7.3516 ± 0.4406	2144.8 ± 95.5	2155.0 ± 129.2	0.49	Ry2-002	0.01024 ± 0.00064	0.0703 ± 0.0204	65.7 ± 4.1	69.0 ± 20.0	0.74
M3-080	0.27689 ± 0.01243	4.4336 ± 0.2805	1575.7 ± 70.8	1718.6 ± 108.7	0.61	Ry2-003	0.01430 ± 0.00032	0.0973 ± 0.0072	91.6 ± 2.0	94.3 ± 7.0	0.81
M3-081	0.40293 ± 0.01797	8.0274 ± 0.4846	2182.5 ± 97.4	2234.0 ± 134.9	0.35	Ry2-004	0.01205 ± 0.00051	0.0820 ± 0.0154	77.2 ± 3.3	80.0 ± 15.0	0.59
M3-082	0.34039 ± 0.00796	5.1557 ± 0.2514	1888.5 ± 44.2	1845.3 ± 90.0	0.34	Ry2-005	0.01312 ± 0.00048	0.0961 ± 0.0145	84.0 ± 3.1	93.2 ± 14.0	0.69
M3-083	0.02869 ± 0.00091	0.2033 ± 0.0238	182.3 ± 5.8	187.9 ± 22.0	1.04	Ry2-006	0.35260 ± 0.00759	5.4637 ± 0.2551	1947.0 ± 41.9	1894.8 ± 88.5	0.18
M3-084	0.30129 ± 0.00635	4.7291 ± 0.1693	1697.7 ± 35.8	1772.3 ± 63.5	0.37	Ry2-007	0.01029 ± 0.00052	0.0676 ± 0.0143	66.0 ± 3.3	66.4 ± 14.1	0.62
M3-085	0.39364 ± 0.01455	7.5405 ± 0.4093	2139.7 ± 79.1	2177.7 ± 118.2	0.32	Ry2-008	0.01731 ± 0.00055	0.1248 ± 0.0110	110.6 ± 3.5	119.4 ± 10.5	0.44
M3-086	0.37331 ± 0.01382	6.1409 ± 0.3377	2045.0 ± 75.7	1996.0 ± 109.8	0.18	Ry2-009	0.01217 ± 0.00048	0.0823 ± 0.0106	78.0 ± 3.1	80.3 ± 10.3	0.51
M3-087	0.31720 ± 0.01210	5.1176 ± 0.3196	1776.1 ± 67.8	1839.0 ± 114.8	0.74	Ry2-010	0.01024 ± 0.00054	0.0712 ± 0.0151	65.7 ± 3.5	69.9 ± 14.8	0.48
M3-088	0.29584 ± 0.01113	4.6848 ± 0.2774	1670.6 ± 62.8	1764.5 ± 104.5	0.72	Ry2-011	0.01551 ± 0.00058	0.0988 ± 0.0111	99.2 ± 3.7	95.6 ± 10.8	0.35

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M3-089	0.30734 ± 0.01186	4.8209 ± 0.3154	1727.6 ± 66.7	1788.5 ± 117.0	0.93	Ry2-012	0.01100 ± 0.00058	0.0656 ± 0.0152	70.5 ± 3.7	64.5 ± 14.9	0.82
M3-090	0.28392 ± 0.01097	4.5500 ± 0.2978	1611.1 ± 62.2	1740.1 ± 113.9	0.45	Ry2-013	0.03942 ± 0.00440	0.2833 ± 0.0457	249.2 ± 27.8	253.3 ± 40.9	0.44
M3-091	0.01459 ± 0.00072	0.0889 ± 0.0154	93.4 ± 4.6	86.4 ± 15.0	0.47	Ry2-014	0.01025 ± 0.00120	0.0627 ± 0.0147	65.8 ± 7.7	61.7 ± 14.5	0.61
M3-092	0.02902 ± 0.00057	0.2068 ± 0.0135	184.4 ± 3.6	190.8 ± 12.4	0.47	Ry2-015	0.01190 ± 0.00142	0.0749 ± 0.0197	76.2 ± 9.1	73.3 ± 19.3	0.76
M3-093	0.31623 ± 0.00499	4.9435 ± 0.1415	1771.3 ± 28.0	1809.7 ± 51.8	0.34	Ry2-016	0.00967 ± 0.00131	0.0637 ± 0.0178	62.0 ± 8.4	62.7 ± 17.5	0.93
M3-094	0.35706 ± 0.00549	5.8265 ± 0.1532	1968.2 ± 30.3	1950.3 ± 51.3	0.45	Ry2-017	0.01902 ± 0.00047	0.1293 ± 0.0092	121.5 ± 3.0	123.5 ± 8.8	0.44
M3-095	0.27993 ± 0.00433	4.2977 ± 0.1007	1591.0 ± 24.6	1692.9 ± 39.7	0.27	Ry2-018	0.01036 ± 0.00114	0.0742 ± 0.0172	66.4 ± 7.3	72.6 ± 16.8	0.64
M3-096	0.40651 ± 0.01377	8.3635 ± 0.4154	2198.9 ± 74.5	2271.2 ± 112.8	0.37	Ry2-019	0.01307 ± 0.00115	0.0945 ± 0.0184	83.7 ± 7.3	91.7 ± 17.9	0.54
M3-097	0.25072 ± 0.00854	3.7948 ± 0.1979	1442.2 ± 49.2	1591.6 ± 83.0	0.25	Ry2-020	0.01441 ± 0.00113	0.0973 ± 0.0179	92.2 ± 7.2	94.3 ± 17.3	0.38
M3-098	0.31836 ± 0.01143	5.3902 ± 0.3254	1781.7 ± 64.0	1883.2 ± 113.7	0.22	Ry2-021	0.01159 ± 0.00046	0.0799 ± 0.0113	74.3 ± 2.9	78.1 ± 11.1	0.62
M3-099	0.34825 ± 0.01189	5.6094 ± 0.2915	1926.2 ± 65.8	1917.5 ± 99.6	0.27	Ry2-022	0.01050 ± 0.00049	0.0626 ± 0.0123	67.3 ± 3.1	61.6 ± 12.1	0.74
M3-100	0.02659 ± 0.00115	0.1756 ± 0.0231	169.2 ± 7.3	164.3 ± 21.6	0.91	Ry2-023	0.01454 ± 0.00058	0.1005 ± 0.0145	93.1 ± 3.7	97.3 ± 14.0	0.66
M3-101	0.31664 ± 0.01077	5.0037 ± 0.2574	1773.3 ± 60.3	1819.9 ± 93.6	0.31	Ry2-024	0.33110 ± 0.00930	5.4844 ± 0.2161	1843.7 ± 51.8	1898.1 ± 74.8	0.37
M3-102	0.01405 ± 0.00055	0.0982 ± 0.0102	90.0 ± 3.5	95.1 ± 9.9	0.41	Ry2-025	0.01285 ± 0.00067	0.0939 ± 0.0186	82.3 ± 4.3	91.2 ± 18.1	0.56
M3-103	0.29647 ± 0.00521	4.7116 ± 0.1299	1673.8 ± 29.4	1769.2 ± 48.8	0.17	Ry2-026	0.01718 ± 0.00119	0.1056 ± 0.0312	109.8 ± 7.6	101.9 ± 30.1	0.39
M3-104	0.48278 ± 0.00896	11.4133 ± 0.3620	2539.4 ± 47.1	2557.4 ± 81.1	1.16	Ry2-027	0.03886 ± 0.00151	0.2803 ± 0.0361	245.8 ± 9.5	250.9 ± 32.3	0.79
M3-105	0.45489 ± 0.00849	10.3393 ± 0.3377	2417.0 ± 45.1	2465.5 ± 80.5	1.04	Ry2-028	0.01669 ± 0.00053	0.1073 ± 0.0091	106.7 ± 3.4	103.5 ± 8.8	0.44
M3-106	0.34227 ± 0.00614	6.8732 ± 0.1994	1897.6 ± 34.0	2095.1 ± 60.8	0.12	Ry2-029	0.01353 ± 0.00053	0.0895 ± 0.0123	86.6 ± 3.4	87.0 ± 11.9	0.44
M3-107	0.37280 ± 0.00674	7.1919 ± 0.2165	2042.6 ± 36.9	2135.4 ± 64.3	0.14	Ry2-030	0.01623 ± 0.00051	0.1066 ± 0.0089	103.8 ± 3.3	102.9 ± 8.5	0.58
M3-108	0.39657 ± 0.00721	8.7743 ± 0.2626	2153.2 ± 39.1	2314.7 ± 69.3	0.57	Ry2-031	0.01217 ± 0.00045	0.0759 ± 0.0098	78.0 ± 2.9	74.2 ± 9.6	0.61
M3-109	0.46478 ± 0.00776	10.1766 ± 0.2958	2460.6 ± 41.1	2450.9 ± 71.2	0.79	Ry2-032	0.01210 ± 0.00048	0.0753 ± 0.0112	77.6 ± 3.1	73.7 ± 10.9	1.10
M3-110	0.39449 ± 0.00645	7.0356 ± 0.2012	2143.6 ± 35.0	2115.9 ± 60.5	0.46	Ry2-033	0.01035 ± 0.00041	0.0700 ± 0.0102	66.4 ± 2.6	68.7 ± 10.0	0.96
M3-111	0.02597 ± 0.00052	0.1965 ± 0.0123	165.2 ± 3.3	182.2 ± 11.4	0.51	Ry2-034	0.01453 ± 0.00067	0.0958 ± 0.0192	93.0 ± 4.3	92.9 ± 18.6	0.43
M3-112	0.30986 ± 0.00486	4.9552 ± 0.1265	1740.0 ± 27.3	1811.6 ± 46.3	0.28	Ry2-035	0.01150 ± 0.00047	0.0805 ± 0.0136	73.7 ± 3.0	78.6 ± 13.3	0.76
M3-113	0.03669 ± 0.00119	0.2772 ± 0.0371	232.3 ± 7.5	248.4 ± 33.3	0.51	Ry2-036	0.41908 ± 0.00963	8.0401 ± 0.3381	2256.3 ± 51.8	2235.5 ± 94.0	0.26

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
M3-114	0.02673 ± 0.00061	0.2000 ± 0.0161	170.0 ± 3.9	185.1 ± 14.9	0.57	Ry2-037	0.01049 ± 0.00048	0.0667 ± 0.0137	67.3 ± 3.1	65.6 ± 13.5	1.20
M3-115	0.01207 ± 0.00034	0.0874 ± 0.0097	77.3 ± 2.1	85.1 ± 9.5	0.98	Ry2-038	0.01497 ± 0.00046	0.0921 ± 0.0104	95.8 ± 2.9	89.5 ± 10.1	0.77
M3-116	0.44019 ± 0.00887	9.4339 ± 0.3910	2351.5 ± 47.4	2381.1 ± 98.7	0.72	Ry2-039	0.01335 ± 0.00032	0.0909 ± 0.0082	85.5 ± 2.0	88.4 ± 8.0	0.26
M3-117	0.02934 ± 0.00071	0.2106 ± 0.0172	186.4 ± 4.5	194.1 ± 15.9	0.76	Ry2-040	0.01286 ± 0.00045	0.0913 ± 0.0215	82.3 ± 2.9	88.7 ± 20.9	0.82
M3-118	0.01595 ± 0.00039	0.1125 ± 0.0096	102.0 ± 2.5	108.2 ± 9.2	0.51	Ry2-041	0.01185 ± 0.00035	0.0728 ± 0.0123	75.9 ± 2.2	71.3 ± 12.1	0.53
M3-119	0.02722 ± 0.00058	0.2023 ± 0.0129	173.1 ± 3.7	187.0 ± 11.9	0.43	Ry2-042	0.35483 ± 0.00746	6.1989 ± 0.3038	1957.6 ± 41.2	2004.2 ± 98.2	0.29
Site 6 (Sample 160704-05) in Sohgawa Unit (Ry1) of Ryujin Complex						Ry2-043	0.01398 ± 0.00114	0.0879 ± 0.0210	89.5 ± 7.3	85.5 ± 20.4	0.81
Ry1-001	0.01688 ± 0.00068	0.1121 ± 0.0225	107.9 ± 4.3	107.9 ± 21.6	0.56	Ry2-044	0.01530 ± 0.00064	0.0959 ± 0.0152	97.9 ± 4.1	92.9 ± 14.7	0.80
Ry1-002	0.01499 ± 0.00077	0.0939 ± 0.0226	95.9 ± 4.9	91.1 ± 21.9	0.68	Ry2-045	0.01051 ± 0.00044	0.0686 ± 0.0107	67.4 ± 2.8	67.4 ± 10.5	0.87
Ry1-003	0.01331 ± 0.00047	0.0964 ± 0.0134	85.2 ± 3.0	93.4 ± 13.0	0.59	Ry2-046	0.39638 ± 0.01101	7.8925 ± 0.2777	2152.4 ± 59.8	2218.7 ± 78.1	0.11
Ry1-004	0.04290 ± 0.00147	0.3194 ± 0.0417	270.8 ± 9.3	281.4 ± 36.8	0.59	Ry2-047	0.01545 ± 0.00044	0.0990 ± 0.0132	98.9 ± 2.8	95.9 ± 12.8	0.25
Ry1-005	0.06143 ± 0.00155	0.4831 ± 0.0372	384.3 ± 9.7	400.2 ± 30.8	0.82	Ry2-048	0.40526 ± 0.00568	7.9106 ± 0.2542	2193.2 ± 30.7	2220.8 ± 71.4	0.65
Ry1-006	0.01350 ± 0.00045	0.0974 ± 0.0158	86.5 ± 2.9	94.4 ± 15.3	0.61	Ry2-049	0.02567 ± 0.00043	0.1825 ± 0.0113	163.4 ± 2.8	170.2 ± 10.6	0.41
Ry1-007	0.01817 ± 0.00059	0.1213 ± 0.0157	116.1 ± 3.8	116.3 ± 15.0	0.47	Ry2-050	0.01587 ± 0.00048	0.1110 ± 0.0150	101.5 ± 3.1	106.9 ± 14.5	0.40
Ry1-008	0.01728 ± 0.00050	0.1235 ± 0.0102	110.4 ± 3.2	118.2 ± 9.8	0.38	Ry2-051	0.01343 ± 0.00028	0.0885 ± 0.0076	86.0 ± 1.8	86.1 ± 7.4	0.54
Ry1-009	0.01557 ± 0.00050	0.1133 ± 0.0152	99.6 ± 3.2	109.0 ± 14.6	0.49	Ry2-052	0.04000 ± 0.00102	0.2721 ± 0.0254	252.8 ± 6.5	244.4 ± 22.8	0.41
Ry1-010	0.01404 ± 0.00060	0.1014 ± 0.0191	89.9 ± 3.9	98.1 ± 18.4	0.69	Ry2-053	0.01286 ± 0.00038	0.0909 ± 0.0110	82.4 ± 2.4	88.4 ± 10.7	0.91
Ry1-011	0.01258 ± 0.00055	0.0772 ± 0.0161	80.6 ± 3.6	75.5 ± 15.7	0.54	Ry2-054	0.35297 ± 0.00690	5.7242 ± 0.2042	1948.8 ± 38.1	1935.0 ± 69.0	0.56
Ry1-012	0.35684 ± 0.00588	5.5728 ± 0.2525	1967.2 ± 32.4	1911.8 ± 86.6	0.22	Ry2-055	0.01380 ± 0.00050	0.0944 ± 0.0148	88.3 ± 3.2	91.6 ± 14.3	0.55
Ry1-013	0.01472 ± 0.00028	0.0999 ± 0.0069	94.2 ± 1.8	96.7 ± 6.7	0.97	Ry2-056	0.01180 ± 0.00026	0.0774 ± 0.0060	75.6 ± 1.7	75.7 ± 5.9	0.41
Ry1-014	0.01769 ± 0.00041	0.1214 ± 0.0110	113.1 ± 2.6	116.3 ± 10.6	0.58	Ry2-057	0.01594 ± 0.00038	0.1019 ± 0.0091	102.0 ± 2.4	98.5 ± 8.8	0.29
Ry1-015	0.01539 ± 0.00043	0.0997 ± 0.0132	98.5 ± 2.8	96.5 ± 12.8	0.44	Ry2-058	0.28300 ± 0.00600	4.4133 ± 0.2232	1606.4 ± 34.1	1714.8 ± 86.7	0.52
Ry1-016	0.01704 ± 0.00057	0.1116 ± 0.0076	108.9 ± 3.7	107.4 ± 7.4	0.46	Site 8 (Sample 160704-03) in Yunohara Unit (Ry3) of Ryujin Complex					
Ry1-017	0.39488 ± 0.01271	7.1334 ± 0.2958	2145.4 ± 69.0	2128.1 ± 88.3	0.35	Ry3-001	0.32395 ± 0.01490	5.1223 ± 0.3477	1809.0 ± 83.2	1839.7 ± 124.9	0.19
Ry1-018	0.01345 ± 0.00061	0.0806 ± 0.0159	86.2 ± 3.9	78.7 ± 15.6	0.57	Ry3-002	0.35419 ± 0.01676	5.9175 ± 0.4121	1954.6 ± 92.5	1963.7 ± 136.7	0.14

Grain No.	^{206}Pb/^{238}U	^{207}Pb/^{235}U	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U	Grain No.	^{206}Pb/^{238}U	^{207}Pb/^{235}U	^{238}U–^{206}Pb age (Ma)	^{235}U–^{207}Pb age (Ma)	Th/U
Ry1-019	0.40363 ± 0.00797	6.8531 ± 0.3226	2185.7 ± 43.1	2092.5 ± 98.5	0.18	Ry3-003	0.01150 ± 0.00033	0.0752 ± 0.0070	73.7 ± 2.1	73.7 ± 6.8	0.42
Ry1-020	0.01017 ± 0.00042	0.0610 ± 0.0112	65.2 ± 2.7	60.1 ± 11.1	0.99	Ry3-004	0.01349 ± 0.00052	0.0894 ± 0.0141	86.4 ± 3.3	86.9 ± 13.7	0.69
Ry1-021	0.01240 ± 0.00036	0.0786 ± 0.0089	79.5 ± 2.3	76.8 ± 8.7	0.83	Ry3-005	0.32864 ± 0.00851	5.2744 ± 0.2519	1831.8 ± 47.4	1864.7 ± 89.1	0.35
Ry1-022	0.01124 ± 0.00033	0.0777 ± 0.0088	72.1 ± 2.1	76.0 ± 8.6	1.28	Ry3-006	0.01104 ± 0.00040	0.0736 ± 0.0097	70.8 ± 2.6	72.1 ± 9.5	0.58
Ry1-023	0.01557 ± 0.00034	0.1065 ± 0.0074	99.6 ± 2.2	102.8 ± 7.2	0.28	Ry3-007	0.01700 ± 0.00046	0.1243 ± 0.0079	108.6 ± 2.9	119.0 ± 7.5	0.37
Ry1-024	0.03569 ± 0.00090	0.2687 ± 0.0192	226.1 ± 5.7	241.7 ± 17.3	0.30	Ry3-008	0.01077 ± 0.00033	0.0678 ± 0.0065	69.1 ± 2.1	66.6 ± 6.4	0.55
Ry1-025	0.34481 ± 0.00849	5.5609 ± 0.3004	1909.8 ± 47.0	1910.0 ± 103.2	0.87	Ry3-009	0.01718 ± 0.00060	0.1235 ± 0.0149	109.8 ± 3.8	118.2 ± 14.2	0.37
Ry1-026	0.01163 ± 0.00052	0.0795 ± 0.0151	74.5 ± 3.3	77.7 ± 14.7	0.55	Ry3-010	0.01251 ± 0.00043	0.0812 ± 0.0099	80.1 ± 2.7	79.3 ± 9.7	0.32
Ry1-027	0.01514 ± 0.00062	0.1113 ± 0.0182	96.9 ± 4.0	107.2 ± 17.5	0.69	Ry3-011	0.01318 ± 0.00049	0.0821 ± 0.0105	84.4 ± 3.2	80.1 ± 10.2	0.63
Ry1-028	0.04386 ± 0.00136	0.2904 ± 0.0324	276.7 ± 8.6	258.9 ± 28.9	0.46	Ry3-012	0.01276 ± 0.00051	0.0864 ± 0.0123	81.7 ± 3.3	84.1 ± 12.0	0.28
Ry1-029	0.01323 ± 0.00060	0.0908 ± 0.0173	84.7 ± 3.8	88.2 ± 16.9	0.48	Ry3-013	0.35532 ± 0.01016	5.8872 ± 0.2474	1959.9 ± 56.0	1959.3 ± 82.3	0.32
Ry1-030	0.34661 ± 0.00789	5.6171 ± 0.2204	1918.4 ± 43.7	1918.7 ± 75.3	0.25	Ry3-014	0.01230 ± 0.00040	0.0813 ± 0.0068	78.8 ± 2.5	79.4 ± 6.7	0.36
Ry1-031	0.01358 ± 0.00036	0.0987 ± 0.0101	86.9 ± 2.3	95.6 ± 9.8	0.63	Ry3-015	0.01626 ± 0.00057	0.1144 ± 0.0114	104.0 ± 3.7	109.9 ± 10.9	0.36

Appendix 5.

Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U	Grain No.	$^{206}Pb/^{238}U$	$^{207}Pb/^{235}U$	$^{238}U–^{206}Pb$ age (Ma)	$^{235}U–^{207}Pb$ age (Ma)	Th/U
Ry3-016	0.01320 ± 0.00057	0.0801 ± 0.0105	84.5 ± 3.6	78.2 ± 10.2	0.43	Ry3-030	0.01264 ± 0.00030	0.0856 ± 0.0096	81.0 ± 1.9	83.4 ± 9.4	0.62
Ry3-017	0.03781 ± 0.00113	0.2906 ± 0.0200	239.2 ± 7.1	259.0 ± 17.8	0.60	Ry3-031	0.15669 ± 0.00467	1.7004 ± 0.1571	938.4 ± 28.0	1008.7 ± 93.2	1.35
Ry3-018	0.01577 ± 0.00083	0.0995 ± 0.0228	100.9 ± 5.3	96.3 ± 22.1	0.74	Ry3-032	0.01299 ± 0.00149	0.0850 ± 0.0196	83.2 ± 9.6	82.8 ± 19.1	0.49
Ry3-019	0.00998 ± 0.00023	0.0671 ± 0.0053	64.0 ± 1.5	65.9 ± 5.3	0.43	Ry3-033	0.26867 ± 0.00523	4.2498 ± 0.1477	1534.0 ± 29.9	1683.6 ± 58.5	0.26
Ry3-020	0.01294 ± 0.00044	0.0941 ± 0.0126	82.9 ± 2.8	91.3 ± 12.3	0.57	Ry3-034	0.01264 ± 0.00073	0.0816 ± 0.0112	81.0 ± 4.7	79.6 ± 11.0	0.56
Ry3-021	0.01070 ± 0.00046	0.0715 ± 0.0112	68.6 ± 3.0	70.1 ± 11.0	1.04	Ry3-035	0.01129 ± 0.00049	0.0765 ± 0.0083	72.4 ± 3.1	74.8 ± 8.1	0.34
Ry3-022	0.01778 ± 0.00084	0.1218 ± 0.0138	113.6 ± 5.4	116.7 ± 13.2	0.31	Ry3-036	0.32362 ± 0.00570	5.1530 ± 0.1371	1807.4 ± 31.8	1844.8 ± 49.1	0.10
Ry3-023	0.31903 ± 0.00911	5.2675 ± 0.2267	1785.0 ± 51.0	1863.5 ± 80.2	0.19	Ry3-037	0.01240 ± 0.00039	0.0790 ± 0.0086	79.5 ± 2.5	77.2 ± 8.4	0.51
Ry3-024	0.29031 ± 0.00838	4.7035 ± 0.2101	1643.1 ± 47.4	1767.8 ± 79.0	0.41	Ry3-038	0.02713 ± 0.00085	0.2053 ± 0.0207	172.6 ± 5.4	189.6 ± 19.1	0.18
Ry3-025	0.01553 ± 0.00078	0.1050 ± 0.0101	99.4 ± 5.0	101.4 ± 9.8	0.29	Ry3-039	0.00978 ± 0.00033	0.0673 ± 0.0084	62.7 ± 2.1	66.1 ± 8.3	1.51
Ry3-026	0.01314 ± 0.00036	0.0896 ± 0.0054	84.1 ± 2.3	87.1 ± 5.3	0.36	Ry3-040	0.01301 ± 0.00042	0.0828 ± 0.0098	83.3 ± 2.7	80.8 ± 9.6	0.84
Ry3-027	0.01554 ± 0.00033	0.0998 ± 0.0101	99.4 ± 2.1	96.6 ± 9.8	0.56	Ry3-041	0.01274 ± 0.00042	0.0882 ± 0.0101	81.6 ± 2.7	85.9 ± 9.8	0.48
Ry3-028	0.35079 ± 0.00385	5.8962 ± 0.2697	1938.4 ± 21.2	1960.6 ± 89.7	0.25	Ry3-042	0.01322 ± 0.00058	0.0892 ± 0.0165	84.7 ± 3.7	86.8 ± 16.1	0.66
Ry3-029	0.01510 ± 0.00036	0.0995 ± 0.0114	96.6 ± 2.3	96.3 ± 11.0	0.75	Ry3-043	0.01090 ± 0.00041	0.0784 ± 0.0110	69.9 ± 2.6	76.7 ± 10.8	1.25

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