Zircon U-Pb SHRIMP Ages For A Selection Of Granites From Myanmar

South East Asia Granite Geochronology Report

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CONTENTS

1. EXECUTIVE SUMMARY

Darbyshire and Swainbank (1988) undertook a Rb-Sr dataing program as part of the Southeast Asia Granite Project. Analyses of samples from the Central Valley, Shan Scarp region, and the Tenasserim and Mergui Archipelago in Myanmar produced Rb/Sr ages with large errors for some samples. Zircons were extracted from 7 of these samples, including a sample from Mandalay Hill, for further geochronological study. The Sensitive High Resolution Ion Microprobe (SHRIMP II), at Curtin University of Technology in Western Australia, was used and the new dates derived are summarised in Table 1.

Table 1. Summary of Rb/Sr and new zircon U-Pb SHRIMP ages ($^{87}Rb/^{86}Sr$ data Darbyshire and Swainbank, 1988).

Unit/ association	Sample No.	Mount No. (UWA)	Rock Type	$^{87}Rb/^{86}Sr$ Age (Ma)	$^{206}Pb/^{238}U$ Age (Ma)
Khanza Chaung	UB 041D	96-22C	leucocratic biotite-hornblende granite	90 ± 78	94.3 ± 1.0
Shangalon	UB 043D	96-23B	granodiorite	110 ± 63	38.5 ± 0.6
Mandalay Hill	UB 055A	96-22A	monzonite	-	43.8 ± 1.0*
Yebokson	UB 065B	96-23C	hornblende-biotite granodiorite	149 ± 21	118.8 ± 1.7*
Yesin Dam	UB 069D	96-22B	fine-grained equigranular biotite granite	-	22.3 ± 0.3
Auk Bok	UB 038I	96-23A	K-feldspar megacrystic biotite granodiorite	35 ± 34	49.7 ± 0.5*
Hermyingyi	LB 040B	96-24A	aplogranite	59 ± 2	61.7 ± 1.3
Kawsong	LB 032A	96-24B	leucocratic megacrystic biotite granite	-	82.0 ± 1.4

*Samples where CL and BSEI were necessary before further analysis on the SHRIMP.

Moulmein 71·32

In Upper Myanmar, granite emplacement in the Central Valley ranges from the Late Cretaceous to the Eocene, whereas granite samples from Shan Scarp region have both the oldest age (Early Cretaceous) and the youngest (Miocene). Although Khanza Chaung and the Shangalon granites are located at the same batholith, the Shangalon granite was emplaced 55 My after the Khanza Chuang granite. Granites comprising the Mergui Archielago suite of Lower Myanmar, are Late Cretaceous to Middle Tertiary in age.

Bilin 48·5 ± 2·7

2. INTRODUCTION

In mid-1996, zircons from 8 granites from Myanmar, originally sampled by Darbyshire and Swainbank (1988), were dated using U-Pb SHRIMP techniques. The samples came from both Upper and Lower Myanmar.

Two regions were sampled in Upper Myanmar, the Central Valley and Shan Scarp. The Central Valley terrain lies to the west of the N-S striking Shan Boundary Fault, comprising mainly Tertiary and Quaternary fluviatile deposits with I-type, calc-alkaline quartz diorites and granodiorites intruding basic volcanic rocks along the axis of the valley. These granitoids are petrographically, geologically and compositionally distinct. Northwest of the Central Valley, two units in the Wuntho Massif (Figure 2.1a), the Khanza Chaung and the Shangalon units, show low initial $^{87}Sr/^{86}Sr$ ratios (0.7047 $\pm$ 0.0006 and 0.7055 $\pm$ 0.0004, respectively) which are compatible with their primitive metaluminous I-type geochemical characteristics (Darbyshire and Swainbank, 1988).

South of Mandalay, a chain of plutons and batholiths composed of I-type to S-type granodiorites and monzogranites intrude Permian and Carboniferous sediments, and undifferentiated metamorphic rocks in the Shan Scarp Region (Figure 2.1a). Of the units sampled, the Yebokson granodiorite suite is strongly metaluminous and plots within the field of volcanic arc and post collisional I-type granites. Its initial $^{87}Sr/^{86}Sr$ ratio (0.7099 $\pm$ 0.0005) suggests substantial crustal involvement. The Yesin Dam granitoid has distinct S-type characteristics (Darbyshire and Swainbank 1988).

Granites of the Mergui Archipelago in Lower Myanmar (Figure 2.1b) are emplaced in pebbly mudstones of the Phuket Group. Strontium ratios of these granites, especially the Heryingyi aplogranite, may be compared to those for granites associated with major tin deposites from Kho-Phuket and Khao Daen in Thailand's Western Province (Darbyshire and Swainbank 1988). The granites of the Shan Scarp region south of Mandalay and the Mergui Archipelago are considered to be a single tectonic terrain, an extension of the Western Granite Province of Thailand. However, Lower Myanmar is separated from the Shan Plateau by the Three Pagodas and Moei-Uthai Thani fault system.

2.1 SAMPLE LOCATIONS

Sample locations are shown in Figure 2.1a for Upper Myanmar and Figure 2.1b for Lower Myanmar. Two samples were analysed from the Central Valley Province, which come from the Khanza Chaung unit (UB 041D), a Au-mineralised leucocratic biotite-hornblende granite in the southwest region of the Wuntho batholith, and the comparatively more mafic Shangalon granodiorite (UB 043D) in the southeastern region of the same batholith. Three samples were analysed from east of the Shan Boundary Fault. One is from a non-mineralised monzonite at Mandalay Hill (UB 055A), south from Thazi, the second is a hornblende-biotite granodiorite unit (unit B) from Yebokson (UB 065B) and the third a fine-grained equigranular S-type biotite granite from Yesin Dam (UB 069D). In Lower Myanmar, a sample from the K-feldspar megacrystic biotite granodiorite, designated the Auk

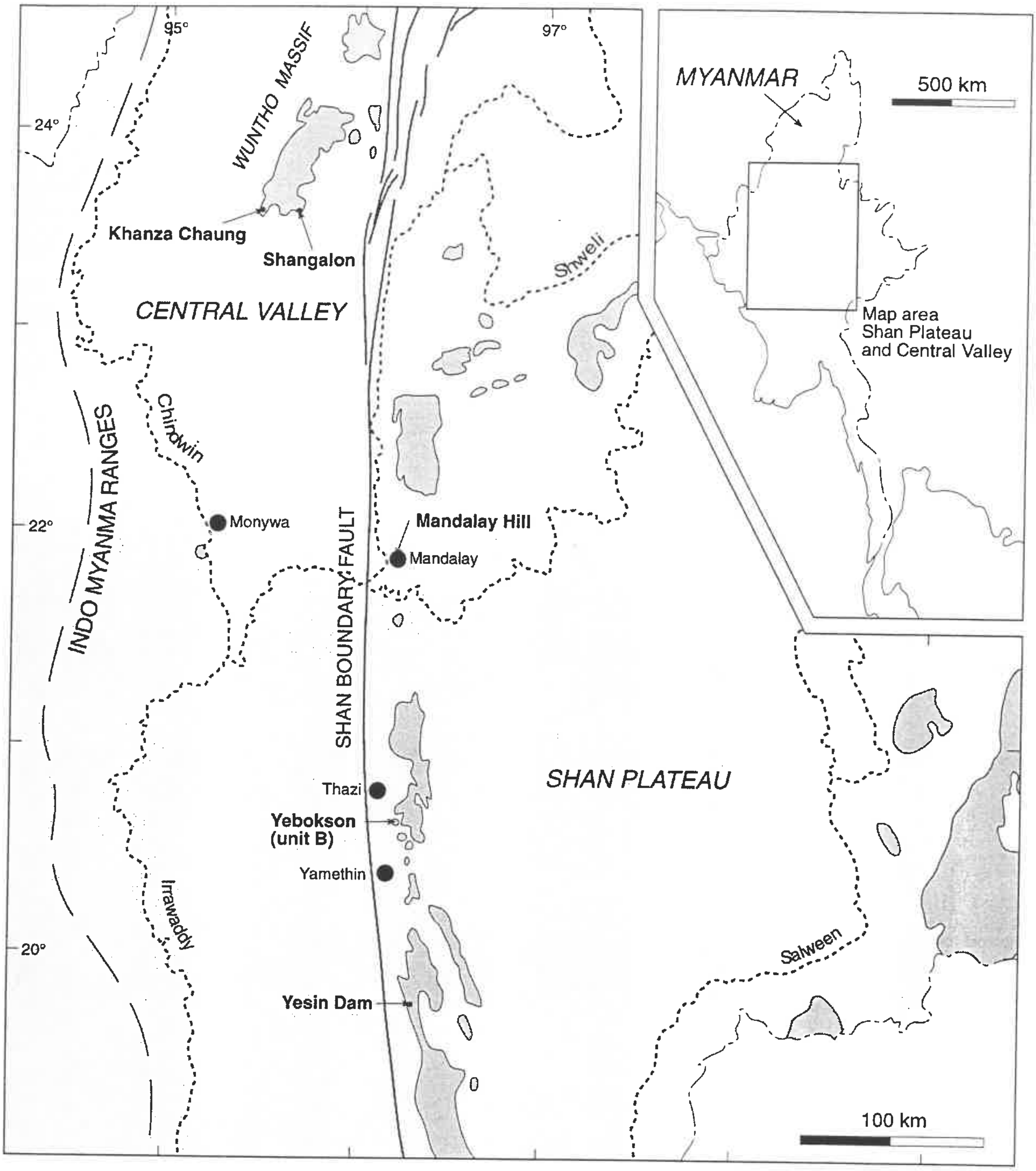


Figure 2.1a. Map of Upper Myanmar, showing sample locations. Dark grey regions represent granitic plutons. Adapted from Darbyshire and Swainbank, 1988.

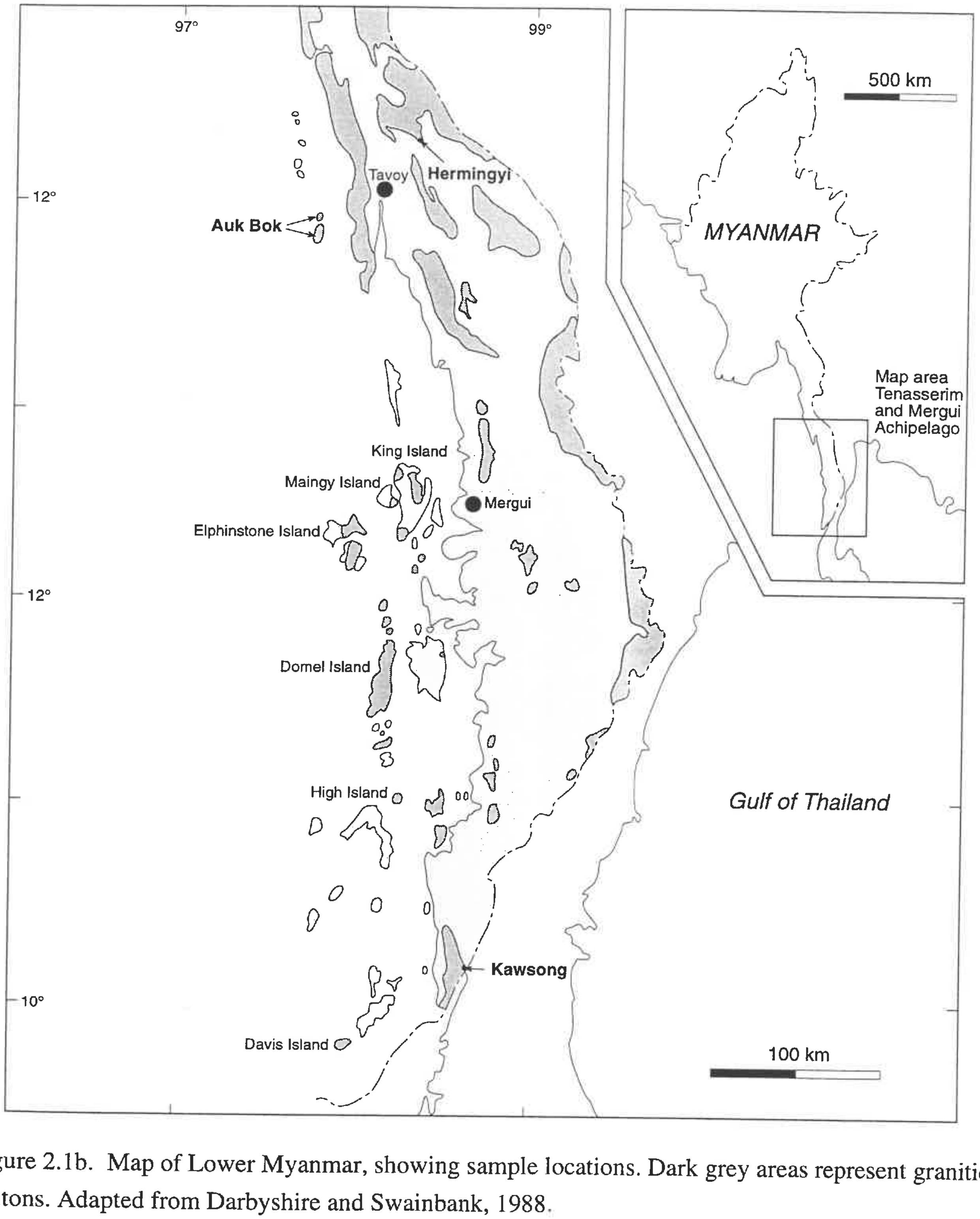


Figure 2.1b. Map of Lower Myanmar, showing sample locations. Dark grey areas represent granitic plutons. Adapted from Darbyshire and Swainbank, 1988.

Bok unit, was collected from South Moscos island. Samples from the Hermyingyi aplogranite (LB 040B) of the Mergui Archipelago suite that is traversed by N-S trending swarm of Sn-W-Sb-Pb-Bi-Cu mineralised quartz veins, and a leucocratic megacrystic biotite granite from the Kawsong pluton (LB 032A) were also analysed.

2.2 ANALYTICAL TECHNIQUES

Sample Preperation

Purified concentrates of zircons were supplied. The zircon samples and fragments of the CZ3 standard were placed on double-sided sticky tape on a glass slide, and encased in epoxy at UWA. The mounts were then polished to remove approximately half of each grain thus providing a section from core to rim. Finally the mounts were photographed in transmitted and reflected light, and coated in >99.999% purity gold for SHRIMP analysis.

Sensitive High Resolution Ion Microprobe (SHRIMP)

Ion microprobes are specialised mass spectrometers that allow for *in situ* isotopic analysis of chemically complex minerals. The Sensitive High Resolution Ion Microprobe (SHRIMP), because of its large turning radius for secondary ions, has high resolution and sensitivity. The main application of SHRIMP analysis is in zircon U-Pb geochronology.

Zircons extracted from the samples were analysed with the SHRIMP II mass spectrometer in Perth using established methods (Smith *et al.*, submitted). Data was collected using 6 scans of 8 isotopic species and one background position, with a counter dead time of 32 nanoseconds (Table A1). Rastering of the gold coating with the primary ion beam for 2 to 3 minutes prior to analysis was undertaken to reduce or eliminate common Pb contamination. The CZ3 zircon standard was used (564 Ma; $^{206}Pb^*/^{238}U = 0.0914$), with precision (calibration error) for all analyses better than 2% (1σ). Initial Pb correction for total Pb in each analysis, using the computer program Wallead, removed initial ^{206}Pb, ^{207}Pb and ^{208}Pb using observed ^{204}Pb and assuming Pb of the Broken Hill isotopic composition. Data presented are shown on a concordia plot with errors expressed at a 1σ confidence level and ages in Ma marked on the curve. Standard calibration data for repeated analyses of the CZ3 zircon standard, and explainations for the terms and methology used are presented in APPENDIX 1.

Cathodoluminescence (CL) and Backscattered Electron Imagery (BSEI)

Zircons typically exhibit complex growth patterns. This complexity is best evaluated by a combination of Scanning Electron Microscopy (SEM) and ion microprobe analysis. SEM analysis involves using the CL and BSE detectors that produce black and white images that can be captured digitally. CL spectra are determined by concentrations of trace constituents such as Dy^{3+}, whereas BSE reveals contrasts in the average atomic number of elements present (Hanchar and Miller, 1993). However, elements controlling CL are probably present at concentrations below the detection of an electron microprobe, whereas elements determining BSE intensity are easily detectable. Both techniques reflect compositional variations within a mineral. Although igneous cores and metamorphic overgrowths of zircons commonly have distinct CL emission spectra and trace-element concentrations, the spectra can only be used to qualify compositional differences (Hanchar and Rudnick, 1995). The advantages and importance for the application of cathodoluminescence and backscattered electron imaging techniques in conjunction with *in situ* ion microprobe analyses of zircons with complex growth histories have been discussed by Hanchar and Miller (1993), Hanchar and Rudnick (1995) and Vavra (1990).

In this study CL and BSE imaging was undertaken on three samples where original SHRIMP data were difficult to interpret, at the Centre for Microscopy and Microanalysis (University of Western Australia) using the Jeol 6400 SEM. In all cases, the zircons are internally homogeneous in transmitted light. However, CL and BSEI revealed complex internal patterns that reflect distinct growth events. These techniques showed otherwise invisible structures delineating different age zones in zircons, thus aiding the interpretation of SHRIMP analyses.

3. SAMPLE DESCRIPTIONS AND SHRIMP DATA

3.1 KHANZA CHAUNG, SAMPLE UB 041D

Analytical Details

Sample UB 041D and UB 069D (Yesin Dam) were analysed during a 24 hour session. Twenty-two standard analyses were made with 29 unknowns from sample UB 041D. The primary ion beam was very stable, and the Pb*/U calibration constant. Calibration error for the 22 standards was 1.20%.

Zircon Morphology and Geochemistry

A range of zircon morphologies are present in this sample. Type-1a zircons are colourless, clear (with inclusions), subrounded elongate grains (2:1) with remnant faceting. Type-1b have the same morphology but are euhedral with distinct terminations and faceting. Type-2a zircons are the equant variety of Type-1a, and Type-2b zircons are the equant variety of Type-1b zircons. The Th/U ratios for the zircons are similar for all types, ranging from 0.38 to 0.88. U contents was variable (51 to 674 ppm).

Results

A total of 29 spots from 28 zircons yielded a wide range of ages. However, the data cluster into four distinct groups. The oldest group gave an age of 247 ± 2 Ma (for n = 2); two intermediate groups gave 177 ± 9 and 138 ± 10 (n = 6 and n = 8 respectively), and the youngest population gave an age of 94.3 ± 1.0 Ma (n = 12). The chi-square value for both the youngest and oldest populations is < 1 (0.78 and 0.55, respectively), whereas the intermediate groups both have very large chi-square values suggesting mixing of more than one age population during analysis. Analyses are plotted on a U-Pb concordia plot in Figure 3.1, and data listed in APPENDIX 2A.

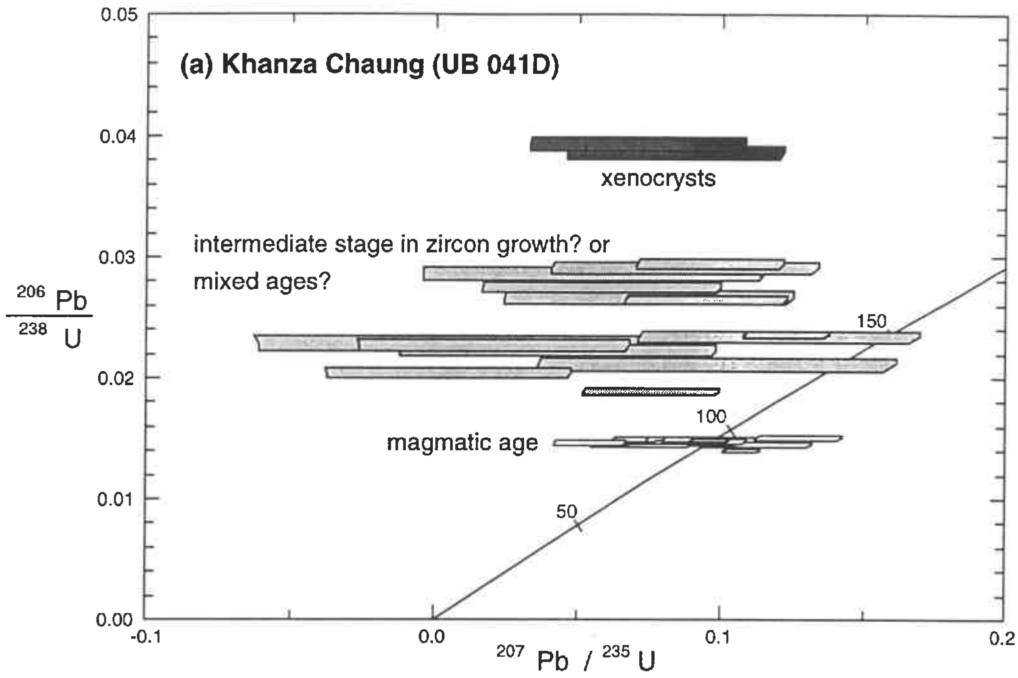
Interpretations

The mean magmatic age is interpreted as **94.3 ± 1.0 Ma**, the age of the youngest population. Older cores (and xenocrysts) up to 247 Ma also occur. The intermediate zircon populations have large chi-square values either as a result of mixing between magmatic and xenocrystic zircon populations within a single spot analysis, or as a result of intermediate stages of zircon growth.

3.2 SHANGALON, SAMPLE UB 043D

Analytical Details

This sample was analysed over a period of three days. Problems were encountered with primary ion beam stability, requiring two standard calibration averages for the sample (19 standard analyses for 21 unknowns and 7 standard analyses for 3 unknowns). However, the Pb*/U calibration remained relatively constant for both: the σ for 19 standards was 1.43% and 1.05% for 7 standards.



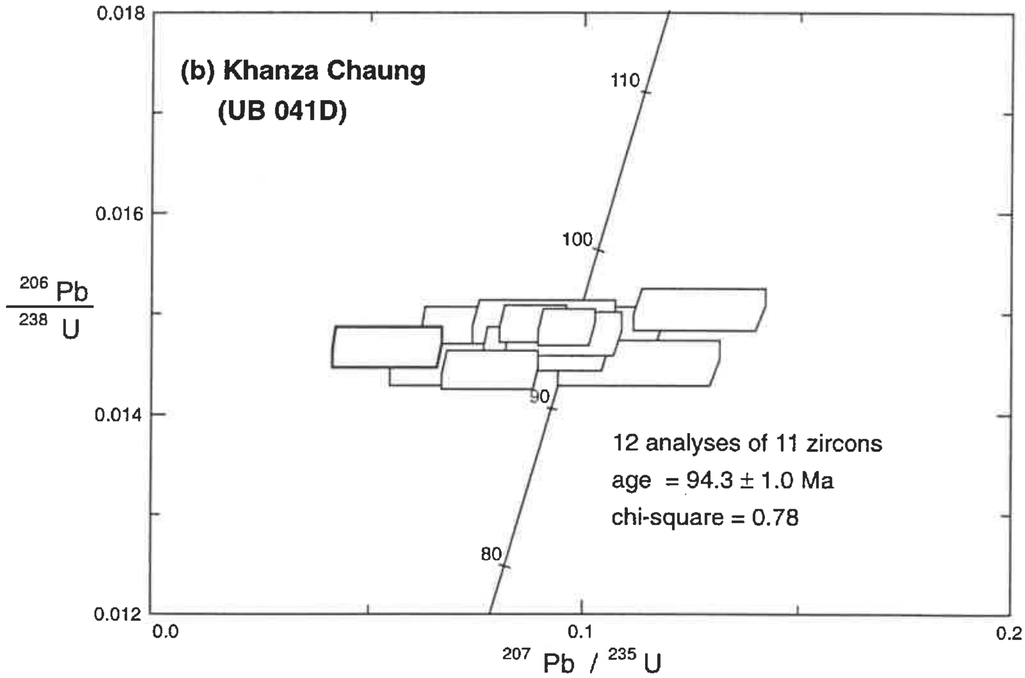


Figure 3.1. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Khanza Chaung. (a) The four zircon populations, (b) magmatic zircon population. Spot analysis 12-1 is excluded as the analysis was on a fracture and yielded a statistically younger age.

Zircon Morphology and Geochemistry

Zircons from this sample form one population of colourless, clear (with minor inclusions), euhedral faceted grains showing distinct terminations. Some grains have distinct cores. Th/U ratios for this zircon population are relatively high, ranging from 0.91 to 2.57. U contents range from 174 to 2498 ppm, and common Pb is low except for analysis spot 8-1.

Results

From 20 zircon grains, a total of 24 spots were analysed. One core analysis that was distinctly older (48.4 ± 1.2 Ma) and 5 outlying "mixed age" analyses were removed from the data set, leaving 18 concordant analyses with a mean age of 38.5 ± 0.6 Ma and a chi-square value of 2.65. Analyses are plotted on U-Pb concordia plot in Figure 3.2, and data listed in APPENDIX 2B.

Interpretations

Though the chi-square value for this magmatic zircon population is >1, the concordia plot shows only one distinct population, with older spot analyses of grain cores. The population between the xenocrystic cores and magmatic zircons may be the result of spots placed overlapping both magmatic rims and older cores, or it could represent an intermediate stage of zircon growth or Pb-loss. The best estimate of the magmatic age is **38.5 ± 0.6 Ma.**

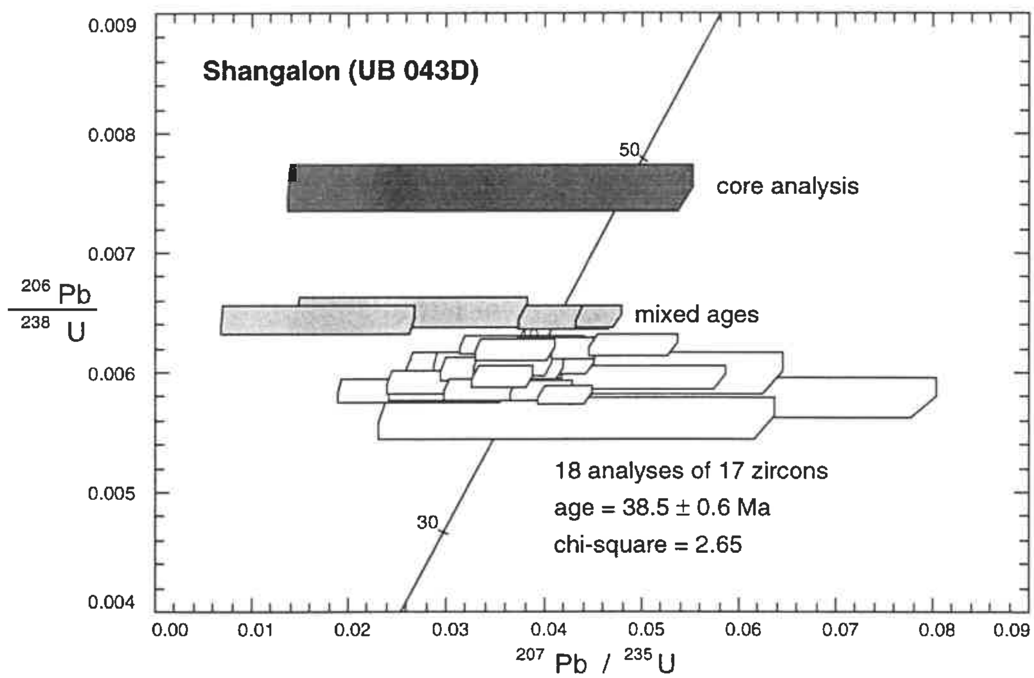


Figure 3.2. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Shangalon.

3.3 MANDALAY HILL, SAMPLE UB 055A

Analytical Details

Sample UB 055A was initially analysed during a 24 hour session, during which 12 standard and 34 unknown analyses were produced. The primary ion beam was very stable, the Pb*/U calibration was constant and the calibration error for 12 standards was 1.18% (1σ). After CL and BSE imagery were carried out, a further session on the SHRIMP produced 18 standard and 24 spot analyses. Although the primary ion beam was noisier for the latter session, the Pb*/U calibration was stationary during the analysis time with an error of 1.57%.

Zircon Morphology and Geochemistry

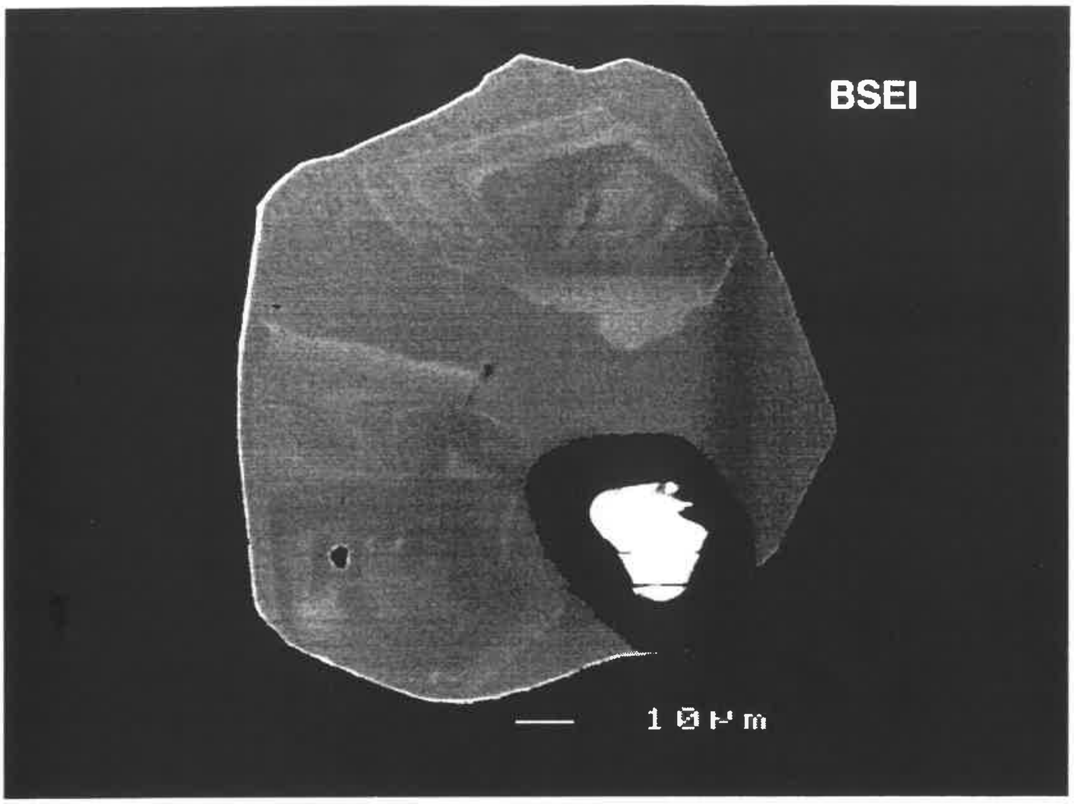
In transmitted light all the zircons analysed have inclusions and are colourless, clear, rounded grains lacking visible internal zonation. However, CL and BSEI showed that these zircons have highly complex growth patterns (e.g. Figure 3.3a). It is surprising that Th/U values for both the oldest and youngest analyses are very low, >0.06, whereas zircons with ages lying between the extremes have variable Th/U values which range from 0.06 to 2.53. Zircon U contents range between 126 and 7563 ppm, with generally low common Pb (see APPENDIX 2C).

Results

The initial 34 spot analyses from 33 grains gave a large range in ages (i.e. 208 ± 2 Ma to 44 ± 1 Ma) and a range of ages between these two extremes. The range in ages was so large that no single zircon population could be recognised. As a result, reanalysis of certain grains, on the SHRIMP, was required. This brought the total number of spots analysed to 58 from 33 grains. CL and BSE images of these grains allow spot analyses to be placed on recognisably distinct zones. SHRIMP analyses on zircons cores, defined using CL and BSE images, demonstrate that the zircon population contains a dominant *ca* 169.9 ± 1.6 Ma component. The analyses are plotted on a U-Pb concordia plot (Figure 3.3b), and the data is listed in APPENDIX 2C.

Interpretations

Although in transmitted light these zircons appear to lack internal zonation, CL imagery shows complex growth patterns. The origin of zircons is varied as reflected by cores derived from igneous (Th/U ratio <1) and metamorphic (Th/U ratio >1) zircon growth. Analyses of inherited cores form the bulk of the data. The most common type of core, giving an age of 169.9 ± 1.6 Ma, exhibits alternating low Th/U (dark BSE and light CL) and high Th/U (light BSE and dark CL) zoning, which is interpreted as a single period of igneous growth. The Th/U ratio is less than 1 for these growth zones, strengthening arguments for an igneous origin. This stage of growth also commonly incorporates euhedral reabsorbed cores which emit little CL. These zircon cores most likely represent inherited originally igneous populations incorporated into the magma during crustal anatexis. The magmatic or final stage of zircon growth is represented by a thin rim on most grains, with grain 2 an exception (Figure 3.3a). Spot placement on these rims suggests that the magmatic age is **43.8 ± 1.0 Ma.** However, these rim zones are rounded, a texture interpreted by Hanchar and Miller (1993)



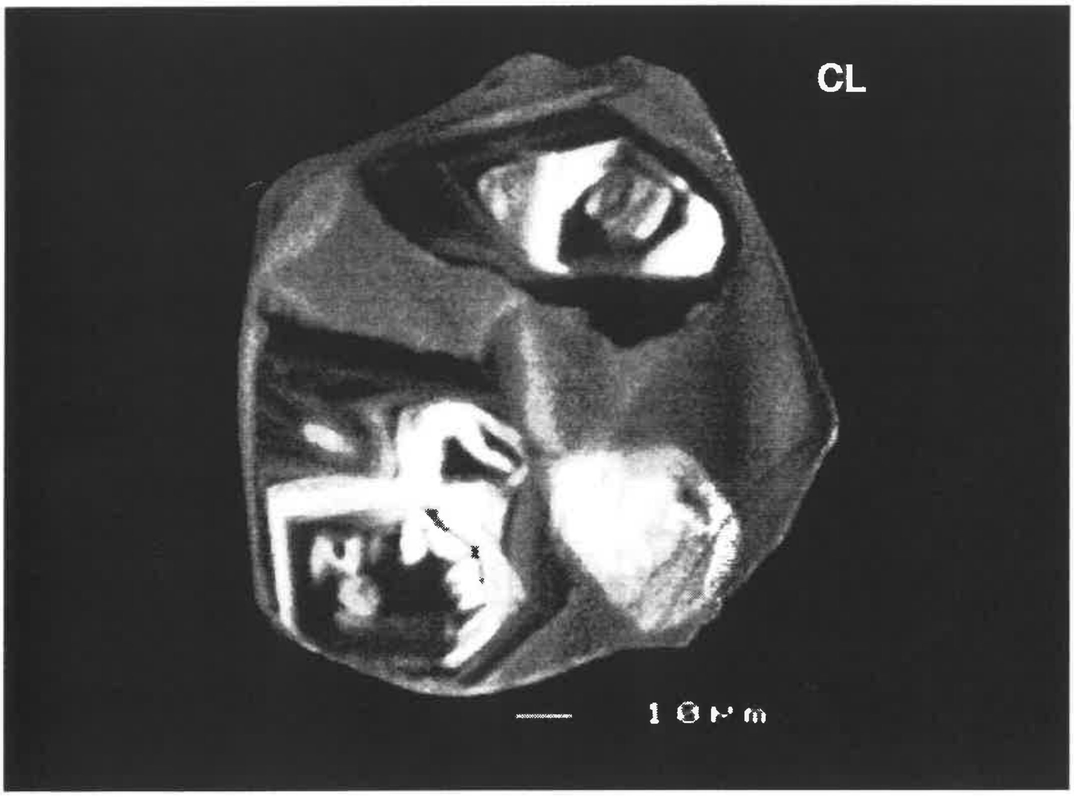


Figure 3.3a. Complex growth patterns of the twinned zircon grain 2. showing that a core analysis does not necessarily give an older age. Sample UB 055A.

lowTh no — see refs

as representing final growth during metamorphism. However, the presence of igneous cores suggests that the rounding is most likely due to reabsorption, or an arrested stage of rapid growth. Because of these complex growth patterns, it is not surprising that original spot placement for most analyses straddled more than one zircon growth stage, giving mixed ages with no geochronological significance. This population provides an excellent example of the importance of undertaking CL and BSEI of zircons from granitoids to aid interpetation of SHRIMP data, and the ability of SHRIMP to determine the ages of magmatic rims and xenocrystic cores on a single grain (e.g. grains 2 and 22).

3.4 YEBOKSON, SAMPLE UB 065B

Analytical Details

During the 24 hour session in which this sample was analysed, the primary ion beam had to be re-established twice, resulting in 3 standard calibration averages (3 standard analyses for 4 unknowns, 5 standard analyses for 15 unknowns, and 7 standard analyses for 17 unknowns). The Pb*/U calibration was relatively constant. The resulting σ for 3 periods of analysis was 0.65% (1% used), 1.12% for 5 standards and 1.05% for 7 standards. After CL and BSE imagery were carried out for this sample, a further session on the SHRIMP produced 6 standard and 5 spot analyses. Although the primary ion beam experience some spikes during the latter session, the Pb*/U calibration was stationary during the analysis time with an error of 1.22 %.

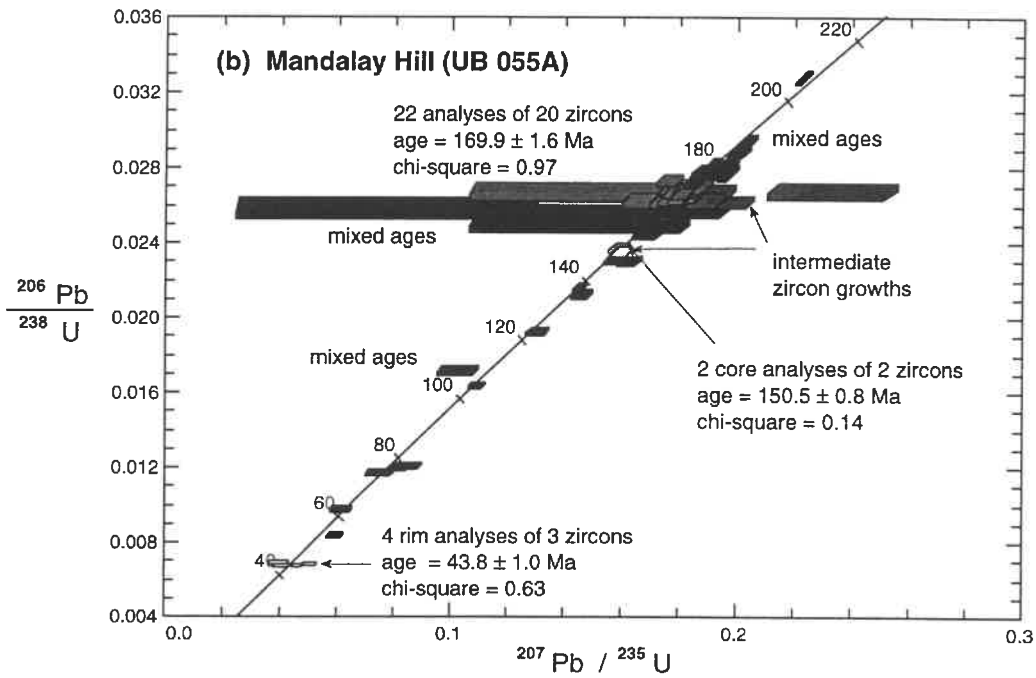


Figure 3.3b. Concordia diagram showing the spread of SHRIMP U-Pb in zircon ages for Mandalay Hill. Analyses straddling distinct growth zones are shown in dark grey.

Zircon Morphology and Geochemistry

In transmitted light, two zircon populations can be distinguished in this sample. Type-1 zircons are colourless, clear, equant, subrounded grains. Type-2 zircons are also clear and colourless, but are faceted, euhedral to subhedral grains. Both types have inclusions. Th/U ratios for Type-1 zircons range from 0.06 to 1.93, and Type-2 from 0.07 to 2.32. Zircon U contents range from 172 to 1822 ppm. CL and BSE images show that Type-1 zircons have fine euhedral concentric zoning, whereas Type-2 zircons have concentric or streaky internal zoning. However, the final stage of zircon growth rims the two types, but Type-2 zircons have thicker rims. The final growth stage consists of euhedral, concentric zoning, commonly finely oscillatory, which is typical of igneous growth during a single episode (Hanchar and Miller, 1993). Truncations of interior zones tend to be high angle, possibly reflecting fracture surfaces. Embayments into inherited cores is less common.

Results

The zircons from this sample form a single population, except for one older core (spot 14-1) with an Archaean age of 2621 ± 8 Ma. However, the spread of data for the resulting 35 spot analyses is fairly large, giving an age of 124.3 ± 1.5 Ma, with a chi-square value of 4.94 indicating scatter in data in excess of that expected for a single age population. Since a definite magmatic age could not be constrained from this data, further SHRIMP analyses, targetting growth zones defined using CL and BSE imagery, were carried out. As a result, 7 spot analyses on 6 zircons gave an age for granitoid emplacement of 118.8 ± 1.7 Ma (with a chi-square of 0.40). A slightly older period of growth for some of the zircons (mostly Type-1 zircons) is recognised at 124.9 ± 1.4 Ma. Analyses are plotted on U-Pb concordia plot (Figure 3.4), and a table of data is listed in APPENDIX 2D.

Interpretations

The magmatic age of **118.8 ± 1.7 Ma** is derived from Type-2 zircons. This is based on the final stage of zircon growth which is represented by thin rims on the Type-1 zircons. Analyses on cores demonstrate that the zircon population also contains a dominant *ca* 125 Ma inherited component, and one Archaean core rimmed by magmatic growth.

3.5 YESIN DAM, SAMPLE UB 069D

Analytical Details

Sample UB 041D (Khanza Chaung: discussed above) and UB 069D were analysed during a 24 hour session. Twenty-two standard analyses were made for 23 unknowns from sample UB 069D. The primary ion beam was very stable, and the Pb*/U calibration constant. Calibration error for 22 standards was 1.20%.

Zircon Morphology and Geochemistry

Two zircon populations are recognised. Type-1 zircons are colourless, very clear, bladed, euhedral grains with distinct terminations and inclusions. Type-2 zircons can be subdivided into 2 subtypes. Type-2a zircons are colourless, relatively clear, prismatic, faceted, euhedral grains with distinct terminations. Type-2b zircons are essentially the same as Type-2a zircons, but are subrounded to subangular. Zircon Th/U ratios range from 0.12 to 4.45, and U contents range between 113 to 2666 ppm.

Results

A total of 23 spots were analysed from 17 zircon grains. The U-Pb concordia plot in Figure 3.5 shows a distinct cluster of seven spot analyses derived from Type-1 zircons, giving a mean age of 22.2 ± 0.3 Ma with a chi-square value of 1.13. The remaining data points fall into age ranges of 44 to 70 Ma and 204 to 802 Ma. Spot analyses within the former age range consist mainly of Type-2b zircons, and the latter of Type-2a zircons. Table of data is listed in APPENDIX 2E.

Interpretations

Type-1 zircons are magmatic zircons and give a mean magmatic age of **22.2 ± 0.3 Ma**. The range in age of the remaining zircons is partly the result of mixing between magmatic and xenocrystic zircon during analysis.

3.6 AUK BOK, SAMPLE UB 038I

Analytical Details

This sample was analysed over a period of three days. Problems with primary ion beam stability were encountered, resulting in two standard calibration averages for the sample (3 standard analyses for 3 unknowns and 19 standard analyses for 33 unknowns). However, the Pb*/U calibration remained relatively constant for both periods of analysis. Calibration error for the 3 standards was 0.86% and 1.43% for the 19 standards. After CL and BSE imagery were carried out for this sample, a further session on the SHRIMP produced 6 standard and 7 spot analyses. Though the primary ion beam experienced some spikes during the latter session, the Pb*/U calibration was stationary during the analysis time with an error of 1.22%.

Zircon Morphology and Geochemistry

Two zircon populations were recognised in transmitted light. Type-1 zircons are colourless, clear, prismatic, faceted, euhedral to subhedral grains. Type-2 zircons are clear and colourless, but occur as subrounded-subangular grains. Both types have inclusions. Th/U ratios for Type-1 zircons range from 0.36 to 1.25, and Type-2 from 0.36 to 2.53. Zircon U contents range from 51 to 4529 ppm. Using CL and BSE techniques, two different inherited-core morphologies are recognised. One group of zircons has rounded cores (Th/U >1), with highly irregular zones, rimmed by finely oscillating euhedral zoning. The other group of zircons has multiple, commonly euhedral, discrete cores which are also rimmed by finely oscillating euhedral zoning. The former core type may represent palaeometamict zones, and the latter core-type is possibly the result of multiple igneous growths (Hanchar and Miller, 1993). The euhedral rims are interpreted to represent final zircon growth from a melt. Three magmatic zircons with fine oscillatory zoning fromcore to rim (grains 5, 6 and 18) were also identified.

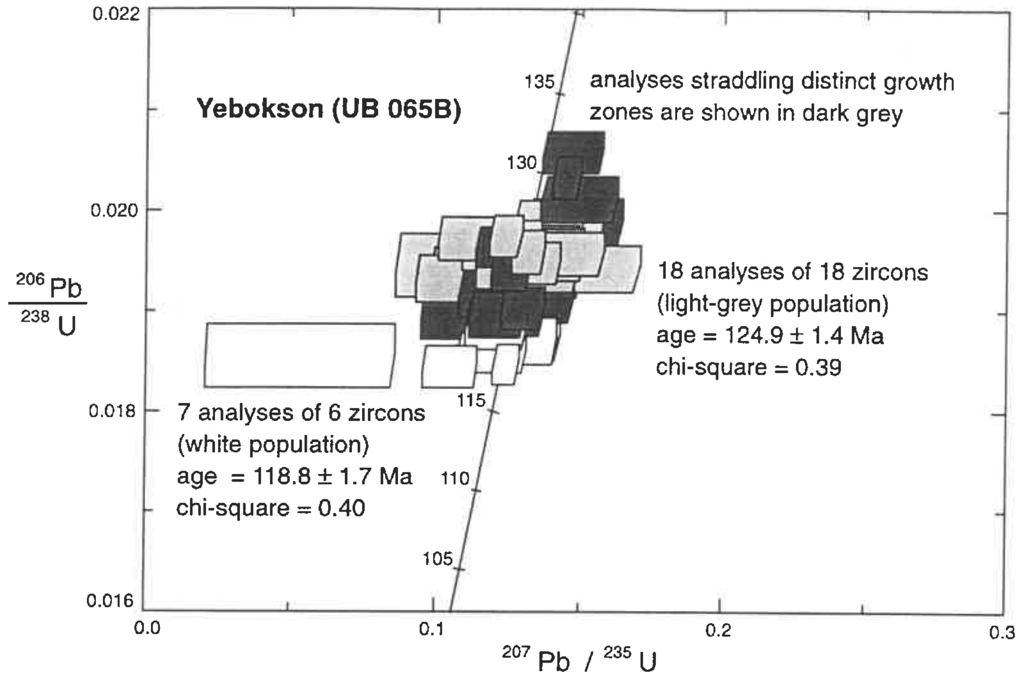


Figure 3.4. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Yebokson. The data for the oldest core (*ca* 2621 Ma, spot 14-1) and analyses with high common Pb (high f206 for spots 28-1 and 4-3) are excluded from the plot. Rim analysis of grain 14 (spot 14-2) gave an age of 121 ± 2 Ma; SEM images show that the spot straddled two visible zones.

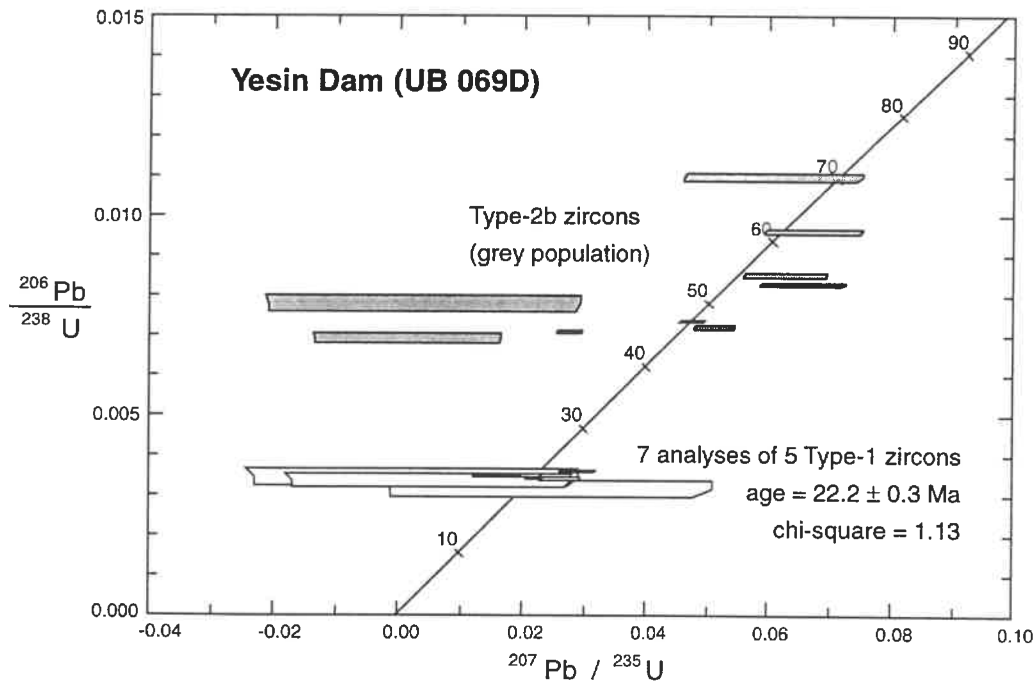


Figure 3.5. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Yesin Dam. Six analyses with ages > 200Ma are not shown.

Results

A total of 36 spots were initially analysed from 29 zircon grains. Four zircon populations were recognised, the oldest group gave an age of 81.1 ± 4.3 Ma, another 71.1 ± 3.0 Ma, and the youngest two groups gave ages of 58.1 ± 4.5 Ma and 51.1 ± 0.7 Ma (not shown). Since a definite magmatic age could not be interpreted further analyses on the SHRIMP were undertaken, targeting rim zones defined using CL and BSE imagery. As a result, 12 spot analyses on 8 zircons give an age of 49.7 ± 0.5 Ma (with a chi-square of 0.56) for the youngest stage of zircon growth. The next most recent stage of zircon growth occurred at 52.1 ± 0.6 Ma. Analyses are plotted on a U-Pb concordia plot (Figure 3.6), and data listed in APPENDIX 2F.

Interpretations

Multiple stages of zircon growth are reflected by the spread of data the consequent groupings. The two younger stages of zircon growth are seperated by less than 3 My. The final stage of zircon growth gives a mean age of **49.7 ± 0.5 Ma**. This is interpreted to represent the age of granitoid emplacement.

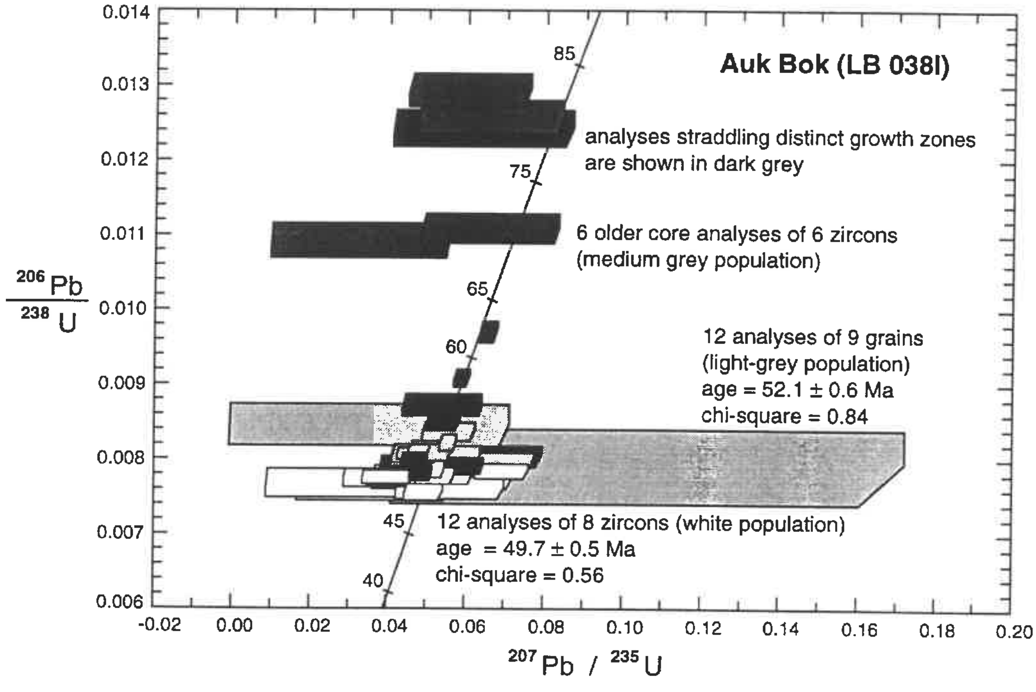


Figure 3.6. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Auk Bok. Analyses with high Pb loss (high f206 for spots 8-2, 9-1, 13-1, 15-1, and 28-1) are excluded from the plot.

3.7 HERMYINGYI, SAMPLE LB 040B

Analytical Details

During the 24 hour session in which samples LB 040 and LB 032A were run, a total of 9 standard analyses was made. Early problems were experienced with primary ion beam stability. This resulted in the exclusion of some data. The Pb*/U calibration remained relatively constant and σ for 9 standards was 1.82%.

Zircon Morphology and Geochemistry

Two populations of zircons can be differentiated. Type-1 zircons (grains 1, 7 and 8) are colourless, clear, euhedral grains with distinct terminations. They are euhedrally zoned with abundant inclusions around the margins of grain cores. Grain 1 is a xenocryst, whereas grains 7 and 8 have xenocrystic cores with magmatic rims. These grains have distinctively low Th/U ratios at approximately 0.1 and high U (> 4900 ppm). Type-2 (grains 3-6 and 9) are pale-green, clear, euhedral to subhedral grains that may or may not have cores. They are not as inclusion rich as Type-1 zircons, and have distinctly higher Th/U ratios (mostly > 1 and lower U values at < 2200 ppm).

Results

Thirteen spots were analysed from 8 zircon grains. Four spots give older dates ranging from 69 ± 1 (core ± rim analysis) to 100 ± 2 Ma. All 4 spots are from Type-1 zircons. Of the remaining 9 spots, one discordant and anomalous young analysis with high common Pb was removed, and the 8 concordant analyses of Type-2 zircons yielded a mean age of 61.7 ± 1.3 Ma with a chi-square value of 1.15. Analyses are plotted on U-Pb concordia plot (Figure 3.7), and data listed in APPENDIX 2G.

Interpretations

There are two distinct populations of zircons in this sample. Older xenocrysts (Type-1 zircons) occur either as individual grains, or as cores to internally zoned grains. Zircons considered to represent magmatic grains are Type-2 zircons, that either rim Type-1 zircons, or occur as individual grains. These zircons have high Th/U values suggesting that the melt was Th-rich. The weighted mean age of **61.7 ± 1.3 Ma** for those zircons represents the age of granitoid emplacement.

3.8 KAWSONG, SAMPLE LB 032A

Analytical Details

This sample was analysed under the same conditions as LB 040B (Hermyingyi). A total of 9 standard analyses and 30 unknown analyses were made. The resulting σ was 1.82%.

Zircon Morphology and Geochemistry

Most zircons in this sample form a single population of colourless, clear, euhedral to subhedral grains with distinct terminations, which lack any visible internal zonation. The zircons are inclusion rich and fracturing is minor. However, there is also a small population of highly faceted grains (grains 2, 3, 6, 17 and 26). There is a wide range in Th/U values from 0.09 to 2.78, and zircon U content ranges between 108 to 3249 ppm, with low common Pb.

Results

Thirty spot analyses were made on 28 grains. Four much older xenocrystic grains (2, 3, 6 and 17), with ages ranging from 662 Ma to 1229 Ma, and 3 outlying spot analyses were removed from the data set. The remaining 23 concordant analyses form a single population with a mean age of 82 ± 1.4 Ma, with a chi-square value of 2.04. Analyses are plotted on a U-Pb concordia plot (Figure 3.8), and the data is listed in APPENDIX 2H.

Interpretations

Highly faceted zircons with old U-Pb ages are xenocrysts. Zircon analyses which fall between the magmatic and xenocryst populations are probably the result of analysing a mixture of xenocryst and magmatic zircon. The best estimate of the age of magmatism is **82.0 ± 1.4 Ma.**

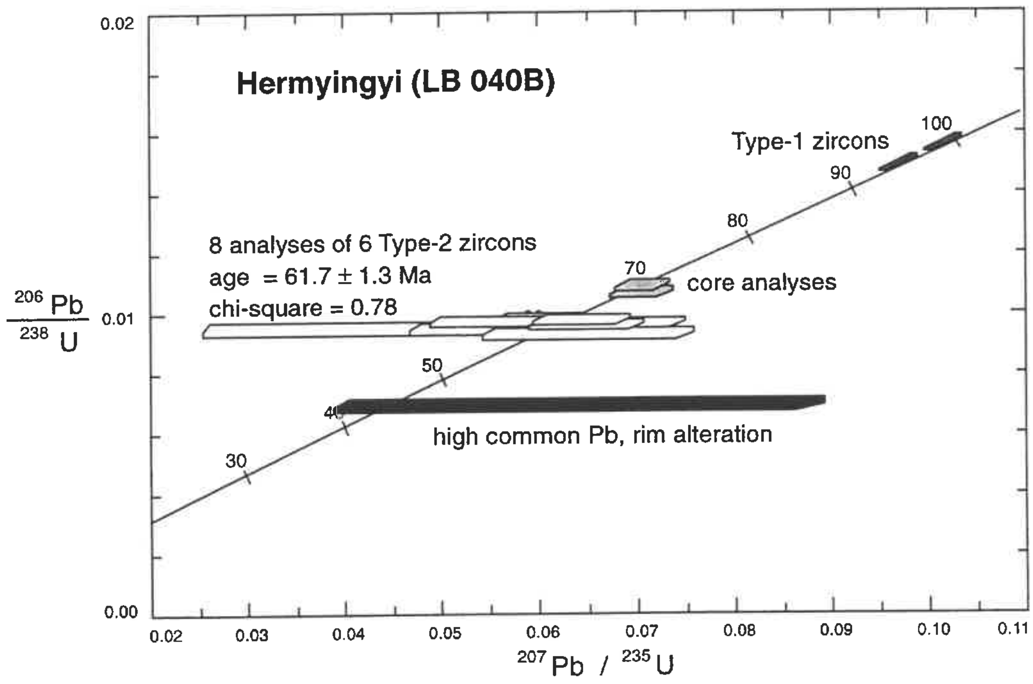


Figure 3.7. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Hermyingyi.

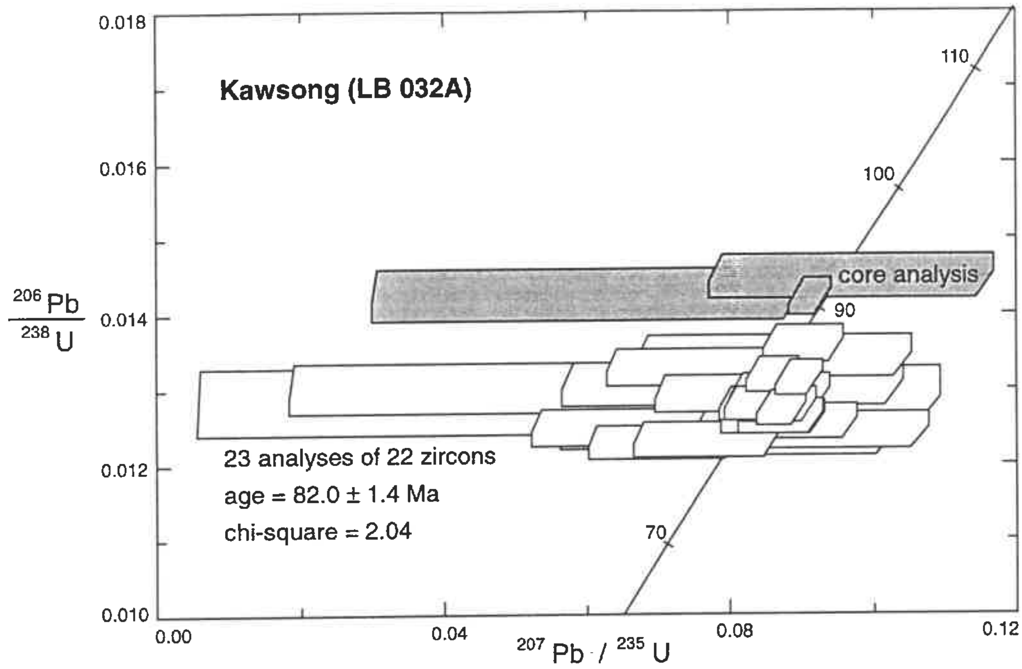


Figure 3.8. Concordia diagram showing the SHRIMP U-Pb in zircon ages for Kawsong.

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APPENDIX 1: STANDARD CALIBRATION DATA, TERMS AND METHODOLOGY

Table A1. Summary of standard data and calibration errors for SHRIMP analyses, using the CZ3 zircon standard (564 Ma; $^{206}Pb/^{238}U$ = 0.0914). For calibrations errors under 1%, the minimum value of 1% was used.

Date	Mount/ Sample	n_{std}	Calibration Averages Zr/U	UO/U	Pb*/U	Error (1σ %)
3-4 May	96-22A/UB055A	12	1.93269	6.25828	0.207332	1.18
19-20 May	96-22B/UB069D 96-22C/UB041D	22	1.90923	6.79891	0.246777	1.20
25 May	96-23A/LB038I	3	1.97968	6.64598	0.217955	0.86
26-27 May	96-23A/LB038I 96-23B/UB043D	19	1.83514	6.35223	0.172320	1.43
27 May	96-23C/UB065B	3	1.82438	6.25942	0.159717	0.65
27-28 May (1st set)	96-23C/UB065B	5	1.9889	7.27725	0.250368	1.12
27-28 May (2nd set)	96-23C/UB065B	7	1.96184	7.16443	0.234013	1.05
3-4 June	96-24A/LB040B 96-24B/LB032A	9	2.6329	6.65718	0.225546	1.82
20-21 July	96-22A/UB055A 96-22B/UB069D	18	1.98452	7.62312	0.278503	1.57
21 July	96-23A/LB038I 96-23C/UB065B	6	2.01522	7.53825	0.275928	1.22

Terms:

Data tables in Appendix 2 use the following terms.

4f206(%) - Data was corrected for common Pb using the measured ^{204}Pb.
f206(%) = % of ^{204}Pb which is attributed to common Pb Data with f206(%) values <1% are considered reliable because the common Pb correction is minor. Negative values are the result of higher baseline counts at mass 204.04 than at mass 204.00.

206*, 207*, 208* - asterisk refers to radiogenic Pb after the removal of common Pb.

Methodology:

Data reduction uses the programs PRAWN, WALLEAD and PLONK. The chi-square is a statistical measure of the scatter in a group of data. Chi-square values <1.0 are taken to indicate a single age population, whereas values >1.0 indicate more scatter than would be expected from a single age population.

Two ages are presented: 206*/238 and 207*/206*. The 206*/238 age is considered the more reliable for ages younger than *ca* 800Ma, whereas for older zircons the 207*/206* age is preferred.

APPENDIX 2A

Khanza Chaung (UB 041D), Mount 96-22C, 204-corrected data.

grain-area	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238 Age	207*/206* Age
analysed 19/5/96												
1-1	69	47	0.6812	0.00055	0.880	0.0259 ± 77	0.1224 ± 181	0.026 ± 0	0.09 ± 3	0.0047 ± 7	168 ± 2	0 ± 0
2-1	288	164	0.5694	-0.00017	-0.274	0.0441 ± 80	0.1897 ± 187	0.015 ± 0	0.09 ± 2	0.0050 ± 5	96 ± 1	0 ± 145
3-1	374	205	0.5481	0.00056	0.904	0.0393 ± 56	0.1679 ± 131	0.014 ± 0	0.08 ± 1	0.0044 ± 4	92 ± 1	0 ± 0
4-1	81	44	0.5432	0.00032	0.519	0.0237 ± 63	0.0899 ± 146	0.029 ± 0	0.10 ± 3	0.0048 ± 8	187 ± 3	0 ± 0
5-1	79	43	0.5443	0.00298	4.768	-0.0025 ± 220	0.0470 ± 510	0.023 ± 1	-0.01 ± 7	0.0020 ± 21	145 ± 4	0 ± 0
6-1	314	228	0.7261	0.00125	1.996	0.0268 ± 62	0.1914 ± 147	0.015 ± 0	0.05 ± 1	0.0039 ± 3	94 ± 1	0 ± 0
6-2	201	162	0.8060	-0.00046	-0.736	0.0613 ± 72	0.2697 ± 172	0.015 ± 0	0.13 ± 2	0.0050 ± 3	96 ± 1	649 ± 255
7-1	61	32	0.5246	0.00061	0.978	0.0140 ± 151	0.0818 ± 351	0.029 ± 1	0.06 ± 6	0.0045 ± 19	182 ± 4	0 ± 0
8-1	54	28	0.5185	0.00073	1.162	0.0203 ± 137	0.0806 ± 318	0.027 ± 1	0.07 ± 5	0.0041 ± 16	170 ± 3	0 ± 0
9-1	211	97	0.4597	0.00049	0.778	0.0451 ± 72	0.1385 ± 168	0.015 ± 0	0.09 ± 1	0.0044 ± 5	94 ± 1	0 ± 151
10-1	191	115	0.6021	0.00041	0.649	0.0467 ± 65	0.1862 ± 153	0.015 ± 0	0.10 ± 1	0.0046 ± 4	95 ± 1	36 ± 169
11-1	71	51	0.7183	0.00279	4.461	-0.0140 ± 181	0.0454 ± 420	0.022 ± 1	-0.04 ± 6	0.0014 ± 13	142 ± 3	0 ± 0
12-1	674	590	0.8754	-0.00041	-0.648	0.0553 ± 31	0.2898 ± 75	0.014 ± 0	0.11 ± 1	0.0046 ± 1	90 ± 1	423 ± 123
13-1	68	34	0.5000	0.00032	0.512	0.0157 ± 71	0.0576 ± 164	0.039 ± 1	0.08 ± 4	0.0044 ± 12	245 ± 3	0 ± 0
14-1	77	43	0.5584	0.00179	2.870	0.0067 ± 151	0.0684 ± 350	0.023 ± 0	0.02 ± 5	0.0028 ± 14	145 ± 3	0 ± 0
15-1	87	46	0.5287	0.00079	1.268	0.0154 ± 110	0.0615 ± 255	0.027 ± 0	0.06 ± 4	0.0032 ± 13	175 ± 3	0 ± 0
16-1	541	279	0.5157	0.00018	0.282	0.0468 ± 31	0.1597 ± 74	0.015 ± 0	0.10 ± 1	0.0046 ± 2	95 ± 1	38 ± 96
17-1	132	50	0.3788	0.00078	1.248	0.0441 ± 136	0.1105 ± 315	0.015 ± 0	0.09 ± 3	0.0043 ± 12	95 ± 2	0 ± 259
18-1	452	194	0.4292	0.00050	0.806	0.0429 ± 38	0.1240 ± 88	0:015 ± 0	0.09 ± 1	0.0043 ± 3	95 ± 1	0 ± 18
19-1	91	57	0.6264	0.00010	0.167	0.0376 ± 45	0.1532 ± 109	0.024 ± 0	0.12 ± 2	0.0057 ± 4	150 ± 2	0 ± 0
20-1	169	121	0.7160	0.00134	2.150	0.0352 ± 77	0.1896 ± 182	0.014 ± 0	0.07 ± 2	0.0038 ± 4	93 ± 1	0 ± 0
21-1	67	32	0.4776	0.00031	0.502	0.0130 ± 69	0.0610 ± 161	0.039 ± 1	0.07 ± 4	0.0051 ± 13	249 ± 3	0 ± 0
22-1	72	49	0.6806	-0.00027	-0.434	0.0372 ± 151	0.1365 ± 351	0.023 ± 0	0.12 ± 5	0.0046 ± 12	149 ± 3	0 ± 150
23-1	102	60	0.5882	0.00052	0.838	0.0291 ± 91	0.1368 ± 214	0.019 ± 0	0.08 ± 2	0.0044 ± 7	120 ± 2	0 ± 0
24-1	200	95	0.4750	-0.00068	-1.086	0.0564 ± 93	0.1744 ± 216	0.015 ± 0	0.11 ± 2	0.0053 ± 7	93 ± 1	467 ± 370
25-1	67	28	0.4179	0.00022	0.359	0.0217 ± 116	0.0746 ± 269	0.029 ± 0	0.09 ± 5	0.0053 ± 19	185 ± 3	0 ± 0
26-1	51	23	0.4510	0.00232	3.712	0.0137 ± 411	0.0849 ± 954	0.015 ± 1	0.03 ± 8	0.0028 ± 31	94 ± 4	0 ± 203
27-1	93	69	0.7419	0.00264	4.227	-0.0018 ± 151	0.0803 ± 352	0.020 ± 0	-0.01 ± 4	0.0022 ± 10	130 ± 3	0 ± 0
28-1	103	73	0.7087	0.00038	0.611	0.0337 ± 214	0.1406 ± 497	0.021 ± 1	0.10 ± 6	0.0042 ± 15	135 ± 3	0 ± 209

APPENDIX 2B

Shangalon (UB O43D), Mount 96-23B, 204-corrected data

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
analysed 26-27/5/96												
1-1	771	1119	1.4516	0.00106	1.689	0.0382 ± 84	0.4348 ± 209	0.006 ± 0	0.03 ± 1	0.0018 ± 1	38 ± 1	0 ± 13
2-1	2498	2759	1.1046	-0.00020	-0.322	0.0514 ± 24	0.3436 ± 62	0.006 ± 0	0.05 ± 0	0.0020 ± 0	42 ± 1	257 ± 110
2-2	490	497	1.0147	0.00045	0.717	0.0405 ± 105	0.3106 ± 251	0.006 ± 0	0.03 ± 1	0.0018 ± 2	38 ± 1	0 ± 121
2-3	1177	1647	1.3997	0.00024	0.377	0.0442 ± 47	0.4168 ± 122	0.006 ± 0	0.04 ± 0	0.0018 ± 1	39 ± 1	0 ± 71
3-1	597	600	1.0051	-0.00046	-0.732	0.0549 ± 235	0.3178 ± 550	0.006 ± 0	0.05 ± 2	0.0019 ± 3	39 ± 1	409 ± 578
4-1	992	1605	1.6176	-0.00047	-0.754	0.0574 ± 51	0.5177 ± 138	0.006 ± 0	0.05 ± 0	0.0020 ± 1	40 ± 1	509 ± 196
5-1	1076	1654	1.5366	-0.00010	-0.164	0.0494 ± 37	0.4744 ± 108	0.006 ± 0	0.04 ± 0	0.0018 ± 1	38 ± 1	167 ± 167
6-1	522	654	1.2523	-0.00011	-0.184	0.0485 ± 52	0.3784 ± 139	0.006 ± 0	0.04 ± 0	0.0019 ± 1	40 ± 1	126 ± 181
7-1	683	903	1.3208	0.00042	0.669	0.0445 ± 73	0.3901 ± 182	0.006 ± 0	0.04 ± 1	0.0017 ± 1	38 ± 1	0 ± 138
8-1	174	168	0.9684	0.00504	8.072	-0.0282 ± 327	0.1191 ± 760	0.006 ± 0	-0.02 ± 3	0.0007 ± 4	36 ± 1	0 ± 0
9-1	706	897	1.2717	0.00008	0.127	0.0437 ± 36	0.3963 ± 108	0.006 ± 0	0.04 ± 0	0.0019 ± 1	38 ± 1	0 ± 34
10-1	618	742	1.2011	-0.00091	-1.449	0.0612 ± 103	0.3838 ± 247	0.006 ± 0	0.05 ± 1	0.0019 ± 1	38 ± 1	645 ± 366
11-1	720	730	1.0134	0.00083	1.323	0.0343 ± 107	0.3035 ± 254	0.006 ± 0	0.03 ± 1	0.0018 ± 2	38 ± 1	0 ± 0
12-1	487	500	1.0255	0.00166	2.655	0.0191 ± 113	0.2261 ± 266	0.006 ± 0	0.02 ± 1	0.0014 ± 2	41 ± 1	0 ± 0
13-1	812	1195	1.4726	0.00050	0.796	0.0431 ± 74	0.4500 ± 188	0.006 ± 0	0.04 ± 1	0.0018 ± 1	39 ± 1	0 ± 111
14-1	771	1067	1.3843	0.00002	0.030	0.0529 ± 33	0.4659 ± 104	0.006 ± 0	0.04 ± 0	0.0020 ± 1	37 ± 1	323 ± 141
15-1	372	357	0.9601	0.00048	0.769	0.0333 ± 200	0.2198 ± 468	0.008 ± 0	0.03 ± 2	0.0017 ± 4	48 ± 1	0 ± 172
15-2	673	999	1.4842	-0.00056	-0.902	0.0563 ± 261	0.4871 ± 623	0.006 ± 0	0.04 ± 2	0.0018 ± 2	36 ± 1	465 ± 628
16-1	401	1028	2.5661	0.00108	1.733	0.0297 ± 133	0.6730 ± 355	0.007 ± 0	0.03 ± 1	0.0017 ± 1	42 ± 1	0 ± 0
17-1	934	1905	2.0400	-0.00018	-0.290	0.0479 ± 55	0.6491 ± 160	0.006 ± 0	0.04 ± 0	0.0021 ± 1	42 ± 1	92 ± 171
17-2	1312	1573	1.1994	0.00009	0.137	0.0436 ± 46	0.3643 ± 116	0.006 ± 0	0.04 ± 0	0.0019 ± 1	40 ± 1	0 ± 53
analysed 27-28/5/96												
18-1	526	480	0.9125	-0.00134	-2.140	0.0745 ± 264	0.3508 ± 618	0.006 ± 0	0.06 ± 2	0.0022 ± 4	37 ± 1	1054 ± 769
19-1	720	956	1.3278	0.00014	0.230	0.0442 ± 74	0.4189 ± 187	0.006 ± 0	0.04 ± 1	0.0020 ± 1	40 ± 1	0 ± 132
20-1	715	860	1.2028	0.00027	0.426	0.0443 ± 97	0.3733 ± 236	0.006 ± 0	0.04 ± 1	0.0019 ± 1	39 ± 1	0 ± 186

APPENDIX 2C

Mandalay Hill (UB 055A), Mount 96-22A, 204-corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238 Age	207*/206* Age
analysed 19/5/96												
1-1	1317	132	0.1002	0.00000	0.006	0.0495 ± 9	0.0312 ± 9	0.025 ± 0	0.17 ± 0	0.0079 ± 2	161 ± 2	172 ± 41
2-1	1983	48	0.0242	-0.00028	-0.454	0.0536 ± 28	0.0191 ± 56	0.007 ± 0	0.05 ± 0	0.0054 ± 16	44 ± 1	352 ± 116
3-1	2147	2691	1.2534	0.00005	0.081	0.0490 ± 8	0.3808 ± 22	0.028 ± 0	0.19 ± 0	0.0085 ± 1	177 ± 2	150 ± 39
3-2	2907	340	0.1170	0.00001	0.024	0.0500 ± 11	0.0374 ± 23	0.026 ± 0	0.18 ± 0	0.0085 ± 5	168 ± 2	197 ± 53
4-1	1834	2779	1.5153	-0.00005	-0.072	0.0504 ± 8	0.4840 ± 25	0.029 ± 0	0.20 ± 0	0.0092 ± 1	183 ± 2	213 ± 36
5-1	4443	4917	1.1067	0.00019	0.296	0.0488 ± 7	0.3721 ± 18	0.022 ± 0	0.15 ± 0	0.0073 ± 1	138 ± 2	137 ± 33
6-1	2008	440	0.2191	0.00003	0.042	0.0492 ± 8	0.0738 ± 12	0.027 ± 0	0.19 ± 0	0.0092 ± 2	174 ± 2	158 ± 37
7-1	638	452	0.7085	0.00001	0.012	0.0501 ± 13	0.2753 ± 33	0.024 ± 0	0.17 ± 1	0.0095 ± 2	156 ± 2	199 ± 62
8-1	1499	603	0.4023	-0.00003	-0.051	0.0499 ± 11	0.1417 ± 22	0.021 ± 0	0.15 ± 0	0.0075 ± 1	135 ± 2	188 ± 52
8-2	1133	95	0.0838	0.00001	0.018	0.0486 ± 11	0.0280 ± 16	0.027 ± 0	0.18 ± 0	0.0089 ± 5	170 ± 2	129 ± 53
9-1	1899	50	0.0263	0.00001	0.018	0.0494 ± 10	0.0083 ± 16	0.023 ± 0	0.16 ± 0	0.0073 ± 14	147 ± 2	166 ± 46
10-1	3793	791	0.2085	-0.00001	-0.016	0.0498 ± 7	0.0647 ± 13	0.028 ± 0	0.19 ± 0	0.0087 ± 2	178 ± 2	186 ± 33
11-1	1255	78	0.0622	0.00005	0.083	0.0482 ± 13	0.0169 ± 24	0.027 ± 0	0.18 ± 1	0.0073 ± 11	171 ± 2	107 ± 65
12-1	934	2362	2.5289	0.00007	0.116	0.0489 ± 14	0.7894 ± 52	0.027 ± 0	0.18 ± 1	0.0085 ± 1	172 ± 2	145 ± 66
13-1	2237	193	0.0863	0.00003	0.045	0.0493 ± 8	0.0274 ± 11	0.027 ± 0	0.18 ± 0	0.0084 ± 3	169 ± 2	164 ± 37
14-1	2252	292	0.1297	-0.00004	-0.062	0.0506 ± 7	0.0420 ± 11	0.028 ± 0	0.20 ± 0	0.0092 ± 3	179 ± 2	222 ± 33
15-1	1661	1061	0.6388	0.00003	0.052	0.0483 ± 11	0.3626 ± 31	0.016 ± 0	0.11 ± 0	0.0093 ± 1	105 ± 1	116 ± 56
16-1	1469	2449	1.6671	0.00002	0.025	0.0511 ± 12	0.6049 ± 39	0.023 ± 0	0.16 ± 0	0.0084 ± 1	147 ± 2	246 ± 53
17-1	3097	344	0.1111	0.00003	0.044	0.0505 ± 6	0.0386 ± 10	0.028 ± 0	0.19 ± 0	0.0096 ± 3	176 ± 2	220 ± 29
18-1	997	267	0.2678	0.00003	0.042	0.0487 ± 17	0.0824 ± 36	0.027 ± 0	0.18 ± 1	0.0082 ± 4	169 ± 2	135 ± 83
19-1	1690	187	0.1107	0.00006	0.103	0.0499 ± 10	0.0336 ± 16	0.027 ± 0	0.18 ± 0	0.0081 ± 4	170 ± 2	190 ± 45
20-1	1912	118	0.0617	0.00002	0.027	0.0493 ± 9	0.0201 ± 12	0.024 ± 0	0.16 ± 0	0.0077 ± 5	150 ± 2	163 ± 42
21-1	1135	524	0.4617	-0.00003	-0.045	0.0496 ± 11	0.1522 ± 22	0.027 ± 0	0.19 ± 0	0.0089 ± 2	172 ± 2	177 ± 52
22-1	6096	458	0.0751	0.00000	0.007	0.0492 ± 5	0.0244 ± 7	0.028 ± 0	0.19 ± 0	0.0092 ± 3	179 ± 2	159 ± 22
23-1	1846	2965	1.6062	0.00003	0.056	0.0492 ± 14	0.7185 ± 45	0.019 ± 0	0.13 ± 0	0.0086 ± 1	123 ± 1	158 ± 65
24-1	7563	439	0.0580	0.00000	0.005	0.0493 ± 3	0.0167 ± 3	0.033 ± 0	0.22 ± 0	0.0094 ± 2	208 ± 2	163 ± 15
25-1	1620	382	0.2358	0.00004	0.060	0.0491 ± 9	0.0769 ± 16	0.027 ± 0	0.18 ± 0	0.0088 ± 2	171 ± 2	153 ± 45
26-1	3905	4177	1.0697	-0.00001	-0.011	0.0503 ± 5	0.2999 ± 13	0.028 ± 0	0.20 ± 0	0.0079 ± 1	179 ± 2	210 ± 23
27-1	126	208	1.6508	0.00067	1.074	0.0459 ± 95	0.5289 ± 239	0.026 ± 0	0.16 ± 3	0.0083 ± 4	164 ± 2	0 ± 215
28-1	3050	186	0.0610	0.00001	0.016	0.0499 ± 6	0.0193 ± 8	0.028 ± 0	0.19 ± 0	0.0088 ± 4	178 ± 2	189 ± 29
29-1	1598	1926	1.2053	0.00006	0.097	0.0487 ± 9	0.4311 ± 28	0.024 ± 0	0.16 ± 0	0.0085 ± 1	151 ± 2	134 ± 45
30-1	1268	1553	1.2248	0.00002	0.026	0.0483 ± 13	0.4023 ± 35	0.026 ± 0	0.17 ± 1	0.0086 ± 1	167 ± 2	114 ± 63
31-1	1477	277	0.1875	0.00011	0.172	0.0468 ± 10	0.0558 ± 18	0.027 ± 0	0.18 ± 0	0.0081 ± 3	174 ± 2	39 ± 45
33-1	405	506	1.2494	-0.00024	-0.388	0.0543 ± 25	0.4041 ± 65	0.026 ± 0	0.20 ± 1	0.0085 ± 2	167 ± 2	384 ± 103

APPENDIX 2C

Mandalay Hill (UB 055A), Mount 96-22A, 204-corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238 Age	207*/206* Age
analysed 20-21/7/96												
1-2	180	255	1.4183	0.00089	1.431	0.03853 ± 95	0.4444 ± 231	0.0267 ± 0	0.14 ± 4	0.0084 ± 5	170 ± 3	0 ± 50
2-2	1431	252	0.1757	0.00002	0.039	0.04902 ± 17	0.0458 ± 35	0.0267 ± 0	0.18 ± 1	0.0069 ± 5	170 ± 3	149 ± 80
2-3	1895	46	0.0244	0.00032	0.506	0.04353 ± 30	0.0008 ± 61	0.0068 ± 0	0.04 ± 0	0.0002 ± 17	43 ± 1	0 ± 12
3-3	932	1053	1.1298	-0.00009	-0.144	0.05225 ± 15	0.3513 ± 40	0.0263 ± 0	0.19 ± 1	0.0082 ± 2	167 ± 3	296 ± 67
3-4	2229	58	0.0261	0.00008	0.122	0.04942 ± 21	0.0088 ± 36	0.0068 ± 0	0.05 ± 0	0.0023 ± 9	43 ± 1	168 ± 98
7-2	1587	36	0.0226	-0.00007	-0.109	0.05140 ± 23	0.0125 ± 42	0.0084 ± 0	0.06 ± 0	0.0046 ± 16	54 ± 1	259 ± 104
9-2	295	155	0.5247	-0.00044	-0.708	0.06320 ± 59	0.1756 ± 134	0.0268 ± 0	0.23 ± 2	0.0090 ± 7	170 ± 3	715 ± 201
10-2	2032	2552	1.2563	0.00002	0.028	0.05037 ± 8	0.3908 ± 24	0.0270 ± 0	0.19 ± 0	0.0084 ± 1	172 ± 3	212 ± 38
11-2	176	149	0.8499	0.00449	7.181	0.02173 ± 148	0.2456 ± 345	0.0258 ± 1	0.08 ± 5	0.0075 ± 11	164 ± 4	0 ± 0
14-2	1233	874	0.7087	-0.00004	-0.067	0.05239 ± 16	0.2152 ± 36	0.0267 ± 0	0.19 ± 1	0.0081 ± 2	170 ± 3	302 ± 70
18-2	1730	96	0.0554	0.00053	0.854	0.04638 ± 29	0.0243 ± 60	0.0117 ± 0	0.07 ± 0	0.0051 ± 13	75 ± 1	17 ± 80
21-2	342	241	0.7040	0.00117	1.867	0.03906 ± 80	0.2012 ± 186	0.0250 ± 0	0.13 ± 3	0.0071 ± 7	159 ± 3	0 ± 27
22-2	2058	1483	0.7206	-0.00001	-0.009	0.04951 ± 8	0.2364 ± 19	0.0264 ± 0	0.18 ± 0	0.0087 ± 2	168 ± 3	172 ± 38
22-3	2566	73	0.0284	0.00047	0.751	0.04113 ± 35	-0.0006 ± 75	0.0070 ± 0	0.04 ± 0	-0.0002 ± 18	45 ± 1	0 ± 0
24-2	2762	173	0.0628	0.00004	0.060	0.04934 ± 7	0.0196 ± 11	0.0274 ± 0	0.19 ± 0	0.0086 ± 5	175 ± 3	164 ± 34
24-3	1103	1658	1.5031	0.00013	0.203	0.04625 ± 19	0.4904 ± 51	0.0262 ± 0	0.17 ± 1	0.0086 ± 2	167 ± 3	11 ± 53
25-3	2081	56	0.0270	0.00039	0.625	0.04559 ± 28	0.0006 ± 59	0.0098 ± 0	0.06 ± 0	0.0002 ± 21	63 ± 1	0 ± 60
26-2	1860	173	0.0927	0.00076	1.209	0.04331 ± 30	0.0398 ± 65	0.0172 ± 0	0.10 ± 1	0.0074 ± 12	110 ± 2	0 ± 6
28-2	4280	253	0.0591	0.00002	0.027	0.05019 ± 5	0.0195 ± 6	0.0293 ± 0	0.20 ± 0	0.0097 ± 3	186 ± 3	204 ± 23
28-3	2216	60	0.0270	-0.00016	-0.255	0.05207 ± 16	0.0171 ± 30	0.0121 ± 0	0.09 ± 0	0.0076 ± 13	77 ± 1	288 ± 72
29-2	1801	101	0.0562	0.00020	0.325	0.04950 ± 21	0.0275 ± 42	0.0120 ± 0	0.08 ± 0	0.0059 ± 9	77 ± 1	172 ± 100
30-2	363	214	0.5896	-0.00006	-0.099	0.04963 ± 36	0.1849 ± 81	0.0249 ± 0	0.17 ± 1	0.0078 ± 4	159 ± 3	178 ± 170
31-2	1717	131	0.0765	0.00015	0.241	0.04888 ± 12	0.0189 ± 21	0.0264 ± 0	0.18 ± 1	0.0065 ± 7	168 ± 3	142 ± 56
33-2	3863	105	0.0273	0.00000	-0.001	0.05149 ± 5	0.0085 ± 2	0.0277 ± 0	0.20 ± 0	0.0086 ± 3	176 ± 3	263 ± 23

APPENDIX 2D

Yebokson (UB 065B), Mount 96-23C, 204-corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
analysed 27/8/96												
1-1	1267	85	0.0671	0.00021	0.333	0.0449 ± 28	0.0116 ± 58	0.020 ± 0	0.12 ± 1	0.0034 ± 17	125 ± 1	0 ± 42
2-1	581	594	1.0227	0.00010	0.166	0.0469 ± 25	0.3043 ± 63	0.019 ± 0	0.13 ± 1	0.0058 ± 1	124 ± 1	46 ± 84
3-1	622	698	1.1222	-0.00034	-0.543	0.0519 ± 36	0.3574 ± 89	0.021 ± 0	0.15 ± 1	0.0066 ± 2	131 ± 1	280 ± 158
4-1	540	646	1.1973	0.00006	0.091	0.0470 ± 33	0.3699 ± 84	0.020 ± 0	0.13 ± 1	0.0061 ± 2	126 ± 1	48 ± 103
analysed 27-28/5/96, first set												
5-1	402	713	1.7717	0.00044	0.702	0.0458 ± 49	0.5489 ± 130	0.019 ± 0	0.12 ± 1	0.0059 ± 2	122 ± 1	0 ± 115
6-1	863	1622	1.8797	-0.00005	-0.085	0.0488 ± 21	0.5858 ± 65	0.020 ± 0	0.13 ± 1	0.0061 ± 1	125 ± 1	139 ± 101
7-1	393	363	0.9236	-0.00018	-0.293	0.0517 ± 45	0.2959 ± 107	0.020 ± 0	0.14 ± 1	0.0063 ± 2	125 ± 1	274 ± 199
8-1	335	287	0.8561	-0.00024	-0.392	0.0515 ± 44	0.2738 ± 104	0.020 ± 0	0.14 ± 1	0.0063 ± 3	125 ± 1	264 ± 196
9-1	408	622	1.5243	0.00012	0.191	0.0462 ± 36	0.4773 ± 100	0.019 ± 0	0.12 ± 1	0.0059 ± 1	121 ± 1	8 ± 92
10-1	330	385	1.1646	-0.00026	-0.409	0.0583 ± 54	0.3681 ± 132	0.019 ± 0	0.16 ± 1	0.0061 ± 2	124 ± 2	540 ± 205
11-1	291	355	1.2217	0.00025	0.406	0.0442 ± 121	0.3606 ± 286	0.019 ± 0	0.12 ± 3	0.0057 ± 5	124 ± 2	0 ± 232
12-1	241	238	0.9895	0.00049	0.788	0.0436 ± 74	0.3022 ± 176	0.019 ± 0	0.11 ± 2	0.0058 ± 3	121 ± 2	0 ± 119
13-1	406	475	1.1687	-0.00012	-0.188	0.0506 ± 52	0.3721 ± 129	0.019 ± 0	0.13 ± 1	0.0061 ± 2	122 ± 1	224 ± 224
14-1	450	264	0.5857	0.00000	0.006	0.1765 ± 9	0.1586 ± 9	0.467 ± 5	11.36 ± 15	0.1264 ± 18	2469 ± 24	2621 ± 8
15-1	708	838	1.1834	0.00045	0.717	0.0412 ± 37	0.3687 ± 92	0.018 ± 0	0.10 ± 1	0.0057 ± 2	118 ± 1	0 ± 0
16-1	308	319	1.0361	0.00003	0.045	0.0495 ± 28	0.3195 ± 75	0.019 ± 0	0.13 ± 1	0.0059 ± 2	121 ± 1	172 ± 133
17-1	1822	4219	2.3163	0.00004	0.056	0.0488 ± 16	0.7215 ± 57	0,018 ± 0	0.12 ± 0	0.0058 ± 1	118 ± 1	136 ± 79
18-1	172	118	0.6861	0.00194	3.107	0.0208 ± 127	0.1443 ± 293	0.019 ± 0	0.05 ± 3	0.0039 ± 8	118 ± 2	0 ± 0
19-1	497	485	0.9766	-0.00011	-0.173	0.0509 ± 49	0.3073 ± 116	0.019 ± 0	0.14 ± 1	0.0061 ± 2	124 ± 1	234 ± 221
analysed 27-28/5/96, second set												
20-1	303	281	0.9288	0.00056	0.899	0.0422 ± 51	0.2791 ± 123	0.020 ± 0	0.11 ± 1	0.0059 ± 3	126 ± 1	0 ± 34
21-1	332	311	0.9371	0.00038	0.612	0.0465 ± 45	0.2842 ± 109	0.019 ± 0	0.12 ± 1	0.0056 ± 2	119 ± 1	23 ± 120
22-1	510	530	1.0395	-0.00019	-0.311	0.0540 ± 60	0.3319 ± 142	0.020 ± 0	0.15 ± 2	0.0063 ± 3	127 ± 2	373 ± 250
23-1	278	174	0.6245	0.00029	0.458	0.0455 ± 53	0.1789 ± 118	0.020 ± 0	0.12 ± 1	0.0056 ± 4	125 ± 1	0 ± 115
24-1	421	315	0.7487	-0.00022	-0.348	0.0501 ± 52	0.2409 ± 121	0.020 ± 0	0.14 ± 1	0.0063 ± 3	126 ± 1	202 ± 213
25-1	417	403	0.9672	0.00025	0.394	0.0413 ± 64	0.2908 ± 153	0.019 ± 0	0.11 ± 2	0.0058 ± 3	123 ± 2	0 ± 43
26-1	1342	1848	1.3776	-0.00002	-0.040	0.0517 ± 17	0.4250 ± 48	0.020 ± 0	0.15 ± 1	0.0063 ± 1	130 ± 1	274 ± 76
27-1	300	303	1.0086	0.00016	0.249	0.0445 ± 77	0.3009 ± 184	0.019 ± 0	0.12 ± 2	0.0058 ± 4	124 ± 2	0 ± 147
28-1	442	431	0.9746	0.00540	8.644	0.0333 ± 140	0.2771 ± 325	0.019 ± 0	0.09 ± 4	0.0053 ± 6	120 ± 2	0 ± 33
28-2	500	715	1.4311	0.00040	0.641	0.0539 ± 47	0.4361 ± 119	0.020 ± 0	0.15 ± 1	0.0061 ± 2	128 ± 1	369 ± 198
29-1	535	573	1.0721	-0.00032	-0.507	0.0542 ± 43	0.3299 ± 105	0.020 ± 0	0.15 ± 1	0.0060 ± 2	125 ± 1	377 ± 181
30-1	1246	77	0.0615	0.00017	0.269	0.0456 ± 19	0.0127 ± 34	0.020 ± 0	0.12 ± 1	0.0041 ± 11	126 ± 1	0 ± 38
31-1	825	1588	1.9256	-0.00009	-0.146	0.0505 ± 45	0.5917 ± 119	0.020 ± 0	0.14 ± 1	0.0060 ± 1	125 ± 1	216 ± 206
32-1	710	893	1.2589	0.00013	0.213	0.0455 ± 31	0.3863 ± 80	0.019 ± 0	0.12 ± 1	0.0060 ± 1	124 ± 1	0 ± 63
33-1	219	135	0.6180	-0.00017	-0.274	0.0521 ± 56	0.1944 ± 124	0.020 ± 0	0.14 ± 2	0.0063 ± 4	127 ± 1	291 ± 245
34-1	360	341	0.9484	-0.00006	-0.095	0.0489 ± 41	0.3054 ± 102	0.019 ± 0	0.13 ± 1	0.0063 ± 2	124 ± 1	144 ± 166
35-1	289	440	1.5250	0.00027	0.436	0.0493 ± 60	0.4784 ± 158	0.019 ± 0	0.13 ± 2	0.0059 ± 2	120 ± 1	160 ± 211

APPENDIX 2D

Yebokson (UB 065B), Mount 96-23C, 204-corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
analysed	20-21/7/96											
4-2	440	479	1.0887	0.00029	0.465	0.2070 ± 56	0.6969 ± 125	0.024 ± 0	0.67 ± 2	0.0151 ± 3	151 ± 2	2883 ± 44
4-3	1337	656	0.4906	0.00834	13.338	0.0600 ± 79	0.1951 ± 179	0.020 ± 0	0.16 ± 2	0.0079 ± 7	127 ± 2	604 ± 287
11-2	392	463	1.1791	-0.00007	-0.109	0.0504 ± 45	0.3832 ± 113	0.019 ± 0	0.13 ± 1	0.0061 ± 2	119 ± 2	213 ± 204
14-2	467	432	0.9266	0.00023	0.373	0.0480 ± 43	0.2928 ± 101	0.019 ± 0	0.13 ± 1	0.0060 ± 2	121 ± 2	101 ± 149
21-2	503	466	0.9262	0.00045	0.726	0.0465 ± 40	0.2748 ± 94	0.019 ± 0	0.12 ± 1	0.0056 ± 2	120 ± 2	22 ± 108

APPENDIX 2E

Yesin Dam (UB 069D), Mount 96-22B, 204 corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238 Age	207*/206* Age
analysed 19/5/96												
1-1	170	187	1.1000	0.00724	11.582	-0.0573 ± 602	0.1054 ± 1407	0.003 ± 0	-0.03 ± 3	0.0003 ± 4	20 ± 1	0 ± 0
1-2	224	239	1.0670	0.00170	2.722	0.0017 ± 156	0.1203 ± 366	0.007 ± 0	0.00 ± 1	0.0008 ± 2	44 ± 1	0 ± 0
2-1	815	672	0.8245	0.00074	1.186	0.0329 ± 78	0.2470 ± 188	0.003 ± 0	0.02 ± 0	0.0010 ± 1	22 ± 0	0 ± 0
2-2	1696	2572	1.5165	-0.00068	-1.088	0.0580 ± 56	0.5085 ± 142	0.004 ± 0	0.03 ± 0	0.0012 ± 0	23 ± 0	531 ± 213
3-1	458	84	0.1834	0.00007	0.118	0.0574 ± 9	0.0674 ± 20	0.088 ± 0	0.70 ± 1	0.0323 ± 10	543 ± 1	508 ± 36
4-1	283	315	1.1131	0.00002	0.036	0.0768 ± 9	0.1012 ± 16	0.065 ± 0	0.68 ± 1	0.0059 ± 1	404 ± 1	1117 ± 23
4-2	794	235	0.2960	0.00010	0.157	0.0739 ± 7	0.0648 ± 13	0.073 ± 0	0.75 ± 1	0.0161 ± 3	456 ± 1	1039 ± 18
5-1	1073	4777	4.4520	0.00059	0.945	0.0396 ± 81	1.4090 ± 266	0.004 ± 0	0.02 ± 0	0.0011 ± 0	23 ± 0	0 ± 41
6-1	240	97	0.4042	0.00000	-0.003	0.0967 ± 7	0.1505 ± 12	0.133 ± 0	1.77 ± 1	0.0493 ± 5	802 ± 2	1562 ± 13
7-1	198	295	1.4899	0.00401	6.422	-0.0041 ± 234	0.3542 ± 557	0.008 ± 0	0.00 ± 3	0.0019 ± 3	50 ± 1	0 ± 0
8-1	2596	318	0.1225	0.00609	9.745	0.0536 ± 58	0.0775 ± 135	0.009 ± 0	0.06 ± 1	0.0054 ± 9	55 ± 0	354 ± 248
8-2	2666	331	0.1242	0.00569	9.107	0.0576 ± 60	0.0838 ± 138	0.008 ± 0	0.07 ± 1	0.0056 ± 9	53 ± 0	514 ± 230
9-1	600	776	1.2933	0.00020	0.315	0.0516 ± 33	0.4241 ± 92	0.007 ± 0	0.05 ± 0	0.0024 ± 1	46 ± 0	269 ± 147
10-1	113	98	0.8673	0.00501	8.017	-0.0120 ± 487	0.1721 ± 1138	0.003 ± 0	-0.01 ± 2	0.0007 ± 4	22 ± 1	0 ± 0
10-2	125	71	0.5680	0.00385	6.166	-0.0067 ± 549	0.0665 ± 1274	0.003 ± 0	0.00 ± 3	0.0004 ± 8	22 ± 1	0 ± 56
11-1	571	104	0.1821	-0.00003	-0.048	0.0471 ± 20	0.0658 ± 41	0.007 ± 0	0.05 ± 0	0.0026 ± 2	47 ± 0	52 ± 74
12-1	645	139	0.2155	0.00004	0.059	0.0543 ± 10	0.1299 ± 23	0.032 ± 0	0.24 ± 0	0.0193 ± 4	204 ± 1	383 ± 42
13-1	1188	165	0.1389	0.00297	4.759	0.0509 ± 60	0.0411 ± 137	0.010 ± 0	0.07 ± 1	0.0029 ± 9	62 ± 0	237 ± 243
14-1	617	506	0.8201	0.00019	0.306	0.0561 ± 10	0.2898 ± 26	0.062 ± 0	0.48 ± 1	0.0218 ± 2	385 ± 1	457 ± 39
15-1	229	127	0.5546	-0.00002	-0.040	0.0283 ± 20	0.0931 ± 49	0.007 ± 0	0.03 ± 0	0.0012 ± 1	46 ± 0	0 ± 0
16-1	1711	2236	1.3068	0.00015	0.239	0.0463 ± 28	0.4039 ± 78	0.003 ± 0	0.02 ± 0	0.0011 ± 0	22 ± 0	14 ± 76
16-2	1059	909	0.8584	-0.00037	-0.597	0.0554 ± 70	0.2948 ± 168	0.003 ± 0	0.03 ± 0	0.0012 ± 1	22 ± 0	428 ± 285
17-1	269	347	1.2900	0.00067	1.069	0.0401 ± 96	0.1877 ± 226	0.011 ± 0	0.06 ± 1	0.0016 ± 2	70 ± 1	0 ± 92

APPENDIX 2F

Auk Bok (LB 038I), Mount 96-23A, 204-corrected data.

grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
analysed 25/5/96												
1-1	838	1050	1.2530	0.00027	0.433	0.0447 ± 40	0.3858 ± 99	0.008 ± 0	0.05 ± 0	0.0025 ± 1	52 ± 1	0 ± 65
2-1	582	541	0.9296	0.00116	1.862	0.0369 ± 60	0.2787 ± 141	0.008 ± 0	0.04 ± 1	0.0023 ± 1	50 ± 1	0 ± 0
3-1	1054	528	0.5009	0.00087	1.389	0.0423 ± 44	0.1420 ± 99	0.008 ± 0	0.05 ± 0	0.0023 ± 2	52 ± 1	0 ± 17
analysed 26-27/5/96												
4-1	865	365	0.4220	0.00002	0.028	0.0473 ± 25	0.1328 ± 44	0.008 ± 0	0.05 ± 0	0.0025 ± 1	52 ± 1	66 ± 93
5-1	1114	397	0.3564	-0.00009	-0.138	0.0467 ± 46	0.1154 ± 99	0.008 ± 0	0.05 ± 0	0.0024 ± 2	49 ± 1	36 ± 128
6-1	1316	706	0.5365	0.00006	0.100	0.0483 ± 44	0.1700 ± 99	0.008 ± 0	0.05 ± 0	0.0025 ± 1	50 ± 1	112 ± 158
7-1	1332	935	0.7020	0.00020	0.322	0.0428 ± 61	0.2151 ± 142	0.008 ± 0	0.05 ± 1	0.0025 ± 2	52 ± 1	0 ± 72
8-1	999	495	0.4955	0.00024	0.376	0.0438 ± 34	0.1437 ± 74	0.008 ± 0	0.05 ± 0	0.0023 ± 1	52 ± 1	0 ± 30
8-2	179	64	0.3575	0.00276	4.423	0.0121 ± 301	0.0005 ± 689	0.007 ± 0	0.01 ± 3	0.0000 ± 14	48 ± 2	0 ± 0
9-1	234	110	0.4701	0.00197	3.146	0.0457 ± 193	0.1551 ± 442	0.011 ± 0	0.07 ± 3	0.0037 ± 11	73 ± 2	0 ± 386
9-2	360	280	0.7778	0.00147	2.356	0.0341 ± 184	0.2040 ± 428	0.008 ± 0	0.04 ± 2	0.0020 ± 4	49 ± 1	0 ± 154
10-1	165	95	0.5758	0.00118	1.881	0.0214 ± 152	0.0966 ± 347	0.011 ± 0	0.03 ± 2	0.0018 ± 7	70 ± 2	0 ± 0
11-1	3128	7908	2.5281	0.00005	0.088	0.0467 ± 16	0.8580 ± 62	0.009 ± 0	0.06 ± 0	0.0031 ± 1	58 ± 1	33 ± 56
11-2	1564	914	0.5844	0.00022	0.350	0.0428 ± 34	0.1779 ± 77	0.008 ± 0	0.05 ± 0	0.0024 ± 1	51 ± 1	0 ± 3
12-1	156	184	1.1795	-0.00014	-0.226	0.0335 ± 85	0.2103 ± 203	0.013 ± 0	0.06 ± 2	0.0023 ± 2	83 ± 1	0 ± 0
12-2	229	231	1.0087	-0.00060	-0.960	0.0369 ± 133	0.2151 ± 311	0.012 ± 0	0.06 ± 2	0.0026 ± 4	80 ± 2	0 ± 101
13-1	1994	1765	0.8852	0.00199	3.177	0.0541 ± 54	0.2789 ± 125	0.009 ± 0	0.07 ± 1	0.0028 ± 1	56 ± 1	377 ± 227
14-1	239	118	0.4937	-0.00046	-0.742	0.0375 ± 104	0.1211 ± 238	0.013 ± 0	0.07 ± 2	0.0031 ± 6	81 ± 1	0 ± 48
15-1	832	714	0.8582	0.00777	12.436	0.0331 ± 170	0.2498 ± 391	0.007 ± 0	0.03 ± 2	0.0022 ± 3	48 ± 1	0 ± 99
16-1	4529	3625	0.8004	0.00012	0.199	0.0486 ± 16	0.2538 ± 36	0.010 ± 0	0.07 ± 0	0.0031 ± 1	62 ± 1	131 ± 75
17-1	1122	1367	1.2184	-0.00043	-0.682	0.0537 ± 51	0.3887 ± 125	0.008 ± 0	0.06 ± 1	0.0025 ± 1	51 ± 1	360 ± 214
18-1	231	88	0.3810	0.00138	2.212	0.0259 ± 178	0.0801 ± 406	0.008 ± 0	0.03 ± 2	0.0016 ± 8	49 ± 1	0 ± 0
19-1	3945	4855	1.2307	-0.00006	-0.102	0.0486 ± 18	0.3789 ± 46	0.008 ± 0	0.06 ± 0	0.0025 ± 0	53 ± 1	127 ± 85
20-1	231	239	1.0346	-0.00058	-0.930	0.0428 ± 113	0.2662 ± 269	0.011 ± 0	0.07 ± 2	0.0029 ± 3	71 ± 1	0 ± 188
21-1	2413	977	0.4049	0.00023	0.364	0.0446 ± 26	0.1193 ± 56	0.008 ± 0	0.05 ± 0	0.0023 ± 1	50 ± 1	0 ± 29
22-1	702	402	0.5726	0.00034	0.543	0.0425 ± 79	0.1653 ± 180	0.008 ± 0	0.05 ± 1	0.0023 ± 3	51 ± 1	0 ± 105
22-2	1394	700	0.5022	0.00034	0.548	0.0458 ± 36	0.1350 ± 78	0.008 ± 0	0.05 ± 0	0.0023 ± 1	55 ± 1	0 ± 82
23-1	676	663	0.9808	0.00033	0.521	0.0420 ± 51	0.2933 ± 124	0.008 ± 0	0.05 ± 1	0.0024 ± 1	52 ± 1	0 ± 27
23-2	541	196	0.3623	0.00080	1.272	0.0530 ± 129	0.1367 ± 293	0.008 ± 0	0.06 ± 1	0.0029 ± 6	49 ± 1	328 ± 401
24-1	648	873	1.3472	0.00021	0.331	0.0498 ± 70	0.4170 ± 173	0.008 ± 0	0.06 ± 1	0.0025 ± 1	52 ± 1	186 ± 242
25-1	424	203	0.4788	-0.00091	-1.458	0.0594 ± 114	0.1731 ± 260	0.008 ± 0	0.07 ± 1	0.0029 ± 4	52 ± 1	582 ± 426
26-1	535	349	0.6523	0.00070	1.121	0.0446 ± 84	0.1747 ± 190	0.009 ± 0	0.05 ± 1	0.0023 ± 3	56 ± 1	0 ± 163
27-1	358	355	0.9916	0.00008	0.134	0.0478 ± 55	0.3066 ± 137	0.008 ± 0	0.06 ± 1	0.0026 ± 1	54 ± 1	91 ± 172
28-1	62	72	1.1613	0.00301	4.813	0.0135 ± 695	0.2411 ± 1624	0.008 ± 1	0.01 ± 7	0.0016 ± 11	48 ± 4	0 ± 635
28-2	51	42	0.8235	-0.00114	-1.823	0.0969 ± 587	0.3449 ± 1363	0.008 ± 0	0.11 ± 7	0.0033 ± 13	51 ± 3	1566 ± 1204
29-1	1097	1336	1.2179	0.00026	0.423	0.0461 ± 37	0.3784 ± 96	0.008 ± 0	0.05 ± 0	0.0024 ± 1	50 ± 1	3 ± 93

APPENDIX 2G

Hermyingyi (LB 040B), Mount 96-24A, 204-corrected data.

grain-spot	U' (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
1-1	47555	6064	0.1275	0.00002	0.026	0.0473 ± 2	0.0370 ± 3	0.015 ± 0	0.10 ± 0	0.0043 ± 1	96 ± 2	63 ± 12
1-2	47755	6216	0.1302	0.00007	0.107	0.0473 ± 3	0.0406 ± 4	0.016 ± 0	0.10 ± 0	0.0049 ± 1	100 ± 2	67 ± 13
3-1	1072	577	0.5383	0.00045	0.723	0.0479 ± 35	0.1750 ± 77	0.010 ± 0	0.06 ± 0	0.0032 ± 2	63 ± 1	96 ± 130
3-2	1350	494	0.3659	0.00106	1.701	0.0409 ± 41	0.1109 ± 92	0.010 ± 0	0.05 ± 1	0.0029 ± 3	62 ± 1	0 ± 0
4-1	1350	701	0.5191	0.00216	3.455	0.0508 ± 55	0.1812 ± 124	0.010 ± 0	0.07 ± 1	0.0034 ± 2	62 ± 1	230 ± 231
4-2	493	661	1.3388	0.01129	18.069	0.0673 ± 261	0.4968 ± 613	0.007 ± 0	0.06 ± 3	0.0026 ± 3	45 ± 1	848 ± 748
5-1	2190	1387	0.6334	0.00111	1.776	0.0446 ± 32	0.1972 ± 72	0.010 ± 0	0.06 ± 0	0.0031 ± 1	63 ± 1	0 ± 44
6-1	483	686	1.4223	0.00440	7.033	0.0326 ± 130	0.4228 ± 310	0.009 ± 0	0.04 ± 2	0.0028 ± 2	61 ± 1	0 ± 0
7-1	4945	886	0.1792	0.00114	1.827	0.0480 ± 19	0.0562 ± 42	0.011 ± 0	0.07 ± 0	0.0034 ± 3	68 ± 1	99 ± 96
8-1	10388	1437	0.1383	0.00158	2.533	0.0471 ± 16	0.0447 ± 34	0.011 ± 0	0.07 ± 0	0.0035 ± 3	70 ± 1	52 ± 65
8-2	1054	414	0.3928	0.00476	7.610	0.0458 ± 96	0.1247 ± 217	0.009 ± 0	0.06 ± 1	0.0030 ± 5	61 ± 1	0 ± 213
9-1	329	486	1.4777	0.00006	0.094	0.0492 ± 42	0.4806 ± 126	0.010 ± 0	0.07 ± 1	0.0031 ± 1	62 ± 1	156 ± 172
9-2	384	656	1.7106	-0.00032	-0.505	0.0509 ± 82	0.5607 ± 214	0.009 ± 0	0.07 ± 1	0.0031 ± 1	60 ± 1	236 ± 285

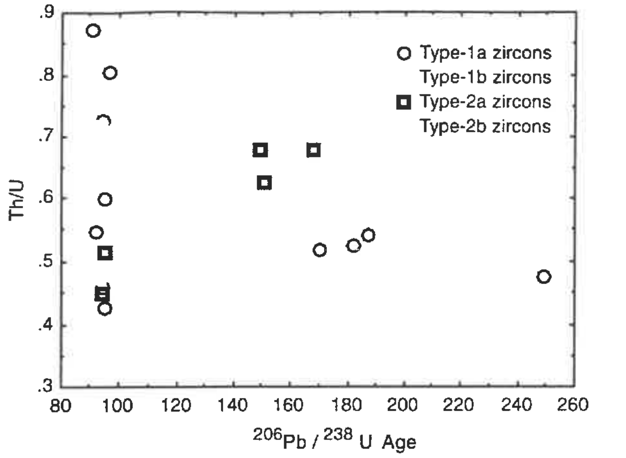
APPENDIX 2H

Kawsong (LB 032A), Mount 96-24B, 204-corrected data.

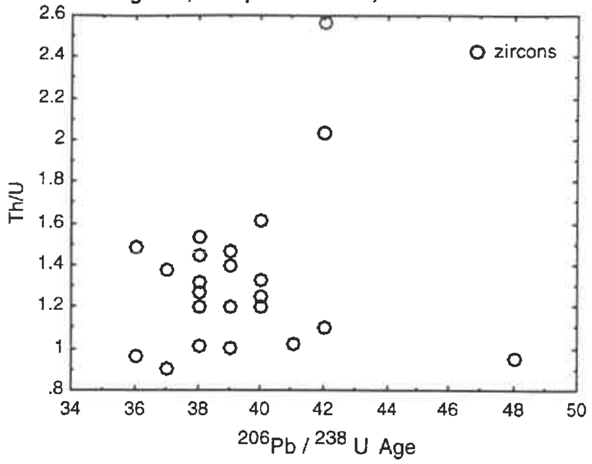
grain-spot	U (ppm)	Th (ppm)	Th/U	204/206	4f206 (%)	207*/206*	208*/206*	206*/238	207*/235	208*/232	206*/238* Age	207*/206* Age
analysed 4/6/96												
1-1	849	2356	2.7756	-0.00001	-0.019	0.0496 ± 16	0.8929 ± 77	0.013 ± 0	0.09 ± 0	0.0041 ± 1	82 ± 1	178 ± 76
2-1	517	46	0.0885	0.00030	0.474	0.0727 ± 11	0.0279 ± 20	0.125 ± 2	1.26 ± 3	0.0394 ± 30	762 ± 13	1005 ± 32
3-1	552	80	0.1441	-0.00001	-0.020	0.0813 ± 6	0.0390 ± 7	0.260 ± 5	2.92 ± 6	0.0704 ± 18	1491 ± 24	1229 ± 14
4-1	2285	1472	0.6441	0.00007	0.120	0.0495 ± 15	0.2040 ± 33	0.013 ± 0	0.09 ± 0	0.0042 ± 1	84 ± 2	169 ± 70
5-1	431	832	1.9308	0.00074	1.177	0.0403 ± 59	0.6012 ± 159	0.013 ± 0	0.07 ± 1	0.0041 ± 1	85 ± 2	0 ± 4
6-1	182	129	0.7091	0.00007	0.112	0.0792 ± 18	0.2114 ± 38	0.208 ± 4	2.27 ± 7	0.0619 ± 17	1217 ± 21	1176 ± 45
7-1	340	150	0.4409	0.00040	0.640	0.0417 ± 60	0.1252 ± 133	0.012 ± 0	0.07 ± 1	0.0035 ± 4	79 ± 1	0 ± 41
8-1	270	220	0.8169	0.00056	0.899	0.0465 ± 101	0.2599 ± 236	0.013 ± 0	0.09 ± 2	0.0043 ± 4	86 ± 2	25 ± 239
9-1	606	393	0.6493	0.00006	0.089	0.0487 ± 37	0.2032 ± 83	0.013 ± 0	0.09 ± 1	0.0041 ± 2	83 ± 2	131 ± 150
10-1	202	291	1.4368	0.00080	1.282	0.0445 ± 130	0.4494 ± 318	0.013 ± 0	0.08 ± 2	0.0041 ± 3	84 ± 2	0 ± 257
11-1	186	140	0.7489	0.00070	1.112	0.0294 ± 190	0.2142 ± 444	0.013 ± 0	0.05 ± 3	0.0037 ± 8	83 ± 2	0 ± 59
12-1	3249	961	0.2957	0.00006	0.089	0.0465 ± 11	0.0903 ± 22	0.014 ± 0	0.09 ± 0	0.0043 ± 1	91 ± 2	22 ± 40
13-1	1207	952	0.7885	0.00005	0.080	0.0472 ± 17	0.2471 ± 40	0.013 ± 0	0.09 ± 0	0.0041 ± 1	85 ± 2	62 ± 73
14-1	883	314	0.3555	0.00013	0.204	0.0481 ± 27	0.1017 ± 56	0.014 ± 0	0.09 ± 1	0.0039 ± 2	87 ± 2	103 ± 116
15-1	677	299	0.4419	-0.00013	-0.204	0.0494 ± 39	0.1562 ± 87	0.013 ± 0	0.09 ± 1	0.0045 ± 3	81 ± 1	167 ± 172
16-1	301	214	0.7103	-0.00035	-0.556	0.0519 ± 80	0.2334 ± 186	0.012 ± 0	0.09 ± 1	0.0041 ± 3	79 ± 2	282 ± 301
17-1	108	53	0.4925	0.00030	0.480	0.0566 ± 38	0.1472 ± 83	0.108 ± 2	0.84 ± 6	0.0323 ± 20	662 ± 12	474 ± 150
18-1	153	105	0.6863	-0.00027	-0.426	0.0486 ± 98	0.2035 ± 226	0.014 ± 0	0.10 ± 2	0.0043 ± 5	93 ± 2	128 ± 272
19-1	260	228	0.8767	0.00023	0.364	0.0439 ± 110	0.2811 ± 259	0.012 ± 0	0.08 ± 2	0.0040 ± 4	80 ± 2	0 ± 204
20-1	216	233	1.0763	-0.00013	-0.206	0.0499 ± 62	0.3495 ± 155	0.013 ± 0	0.09 ± 1	0.0041 ± 2	81 ± 2	192 ± 229
21-1	425	400	0.9400	0.00021	0.341	0.0450 ± 57	0.2862 ± 137	0.012 ± 0	0.08 ± 1	0.0038 ± 2	79 ± 1	0 ± 115
22-1	137	287	2.0971	0.00070	1.119	0.0324 ± 291	0.6158 ± 713	0.013 ± 0	0.06 ± 5	0.0038 ± 5	82 ± 3	0 ± 328
23-1	282	276	0.9787	-0.00059	-0.943	0.0547 ± 77	0.3516 ± 186	0.012 ± 0	0.09 ± 1	0.0045 ± 3	80 ± 2	401 ± 318
24-1	757	759	1.0018	-0.00008	-0.120	0.0486 ± 39	0.3279 ± 95	0.013 ± 0	0.09 ± 1	0.0042 ± 1	82 ± 2	128 ± 153
25-1	904	886	0.9805	0.00005	0.084	0.0500 ± 31	0.3243 ± 77	0.013 ± 0	0.09 ± 1	0.0042 ± 1	81 ± 1	194 ± 147
26-1	538	395	0.7345	0.00017	0.278	0.0443 ± 51	0.2261 ± 119	0.013 ± 0	0.08 ± 1	0.0040 ± 2	83 ± 2	0 ± 83
26-2	137	124	0.9028	0.00118	1.892	0.0304 ± 152	0.2175 ± 354	0.014 ± 0	0.06 ± 3	0.0034 ± 6	91 ± 2	0 ± 0
27-1	1126	350	0.3106	0.00014	0.222	0.0475 ± 24	0.0951 ± 48	0.013 ± 0	0.08 ± 0	0.0039 ± 2	82 ± 1	73 ± 94
28-1	1786	564	0.3159	0.00003	0.056	0.0492 ± 26	0.1007 ± 57	0.013 ± 0	0.09 ± 1	0.0041 ± 2	82 ± 1	158 ± 125
28-2	385	143	0.3729	0.00162	2.586	0.0395 ± 91	0.1049 ± 204	0.012 ± 0	0.07 ± 2	0.0035 ± 7	80 ± 2	0 ± 64

APPENDIX 3 Th/U vs $^{206}Pb/^{238}U$ AGE PLOTS

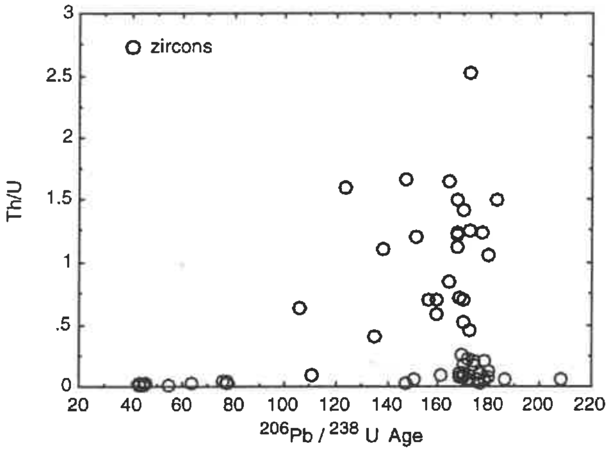
Khanza Chaung, Sample UB 041D, Mount UWA 96-22C



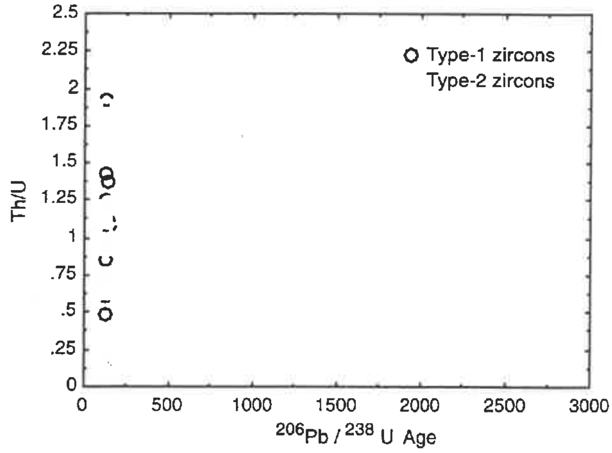
Shangalon, Sample UB 043D, Mount UWA 96-23B



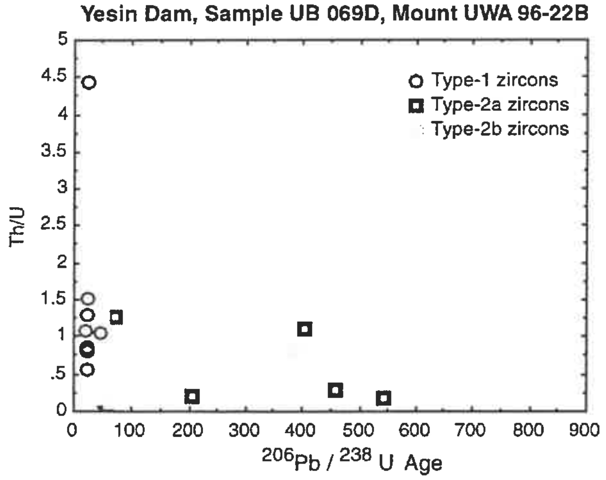
Mandalay Hill, Sample UB 055A, Mount UWA 96-22A



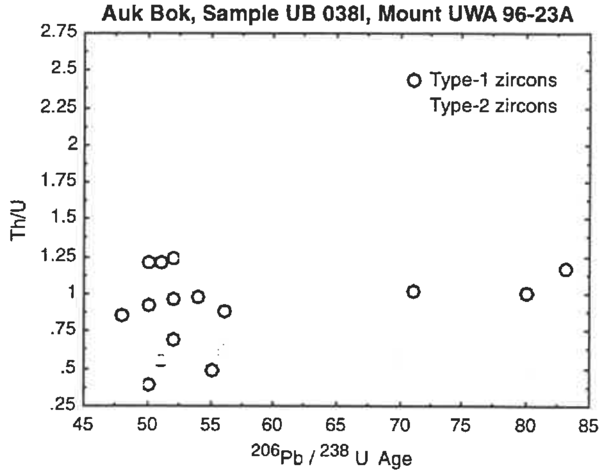
Yebokson, Sample UB 065B, Mount UWA 96-23C



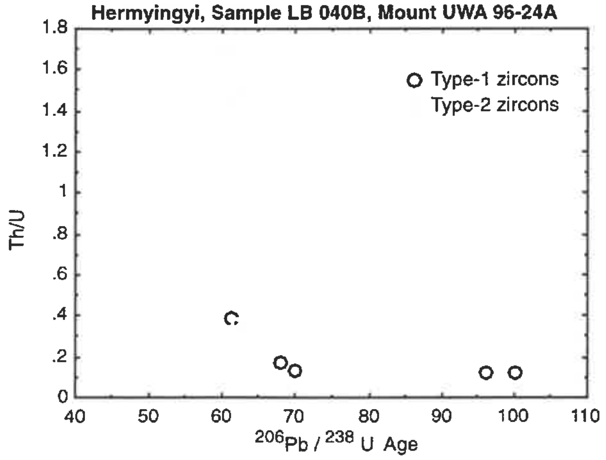
Yesin Dam, Sample UB 069D, Mount UWA 96-22B



Auk Bok, Sample UB 038I, Mount UWA 96-23A



Hermyingyi, Sample LB 040B, Mount UWA 96-24A



Kawsong, Sample LB 032A, Mount UWA 96-24B