Detrital Muscovite Thermochronology in Two Drainage Basins in Western Bhutan

by

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Abstract

New reconnaissance data for a poorly characterized area in the western Bhutan Himalaya show distinction between the $^{40}Ar/^{39}Ar$ cooling age distributions of detrital minerals in the two river catchments of the Punatsang chu and the Wang chu. Muscovites from five samples of Wang chu river sands yield ages (corresponding roughly to the time of bedrock cooling through a temperature of ca.350˚C) between 9.37± 0.08 Ma and 13.98 ± 0.08 Ma. The majority of ages are less than 13 Ma, and the data for all samples have a unimodal distribution with an average age of ca. 11.4 ± 1.5 Ma. In contrast, muscovites from 14 Punatsang chu samples yield ages with nearly the same total range but with a distinctively multi-modal distribution. Two modes predominate in the Punatsang chu data: one at ca. 11.4 Ma, which is statistically indistinguishable from the single mode of the Wang chu data, and one at ca. 14.5 Ma.

The full explanation for this distribution must await further bedrock and detrital dating studies, but one hypothesis is that the out-of-sequence Kakhtang thrust fault system – which is thought to transect the upper reaches of the river catchments – has juxtaposed two bedrock terrains with different cooling histories. A second possibility is that the younger mode of cooling ages is related to uplift of the footwall of the Chomolhari fault system, which includes the major bounding structures of the Yadong-Gulu rift northwest of the catchments. Exactly why the older mode of ages is not found in the Wang chu dataset is unclear. If the first of the above hypotheses is correct, the lack of an older mode in the Wang chu dataset may mean that the muscovites in the Wang chu fluvial sediments were derived exclusively from the Kakhtang thrust system hanging wall. If the second hypothesis is correct, the muscovites may have been derived exclusively from the Chomolhari fault system footwall. However, since we do not know the actual distribution of muscovites in the Wang chu catchment and we do not know that modern erosion is uniform in the catchment, it is also possible that the older mode is simply missing as an artifact not-uniform sampling. Again, more studies are needed to evaluate these alternative explanations.

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CHAPTER 1: Introduction

Detrital mineral thermochronology is a powerful way to determine the temperature-time history and erosion rates of catchments in active orogens (Hodges, 2003; Reiners et al., 2005). Although several geochronometers have been applied to detrital samples, the $^{40}Ar/^{39}Ar$ technique is, at present, the most precise and accurate tool for the study of late Cenozoic samples (Ivanov et al., 2002).

This thesis is the result of an application of the $^{40}Ar/^{39}Ar$ dating method to infer cooling ages to the source regions of the detrital mineral samples from two river catchments in Bhutan. Ultimately, my intention was to explore the exhumation history of these areas with an eye toward understanding the impact of various known deformational structures on that history .

Bhutan is a small kingdom located between longitude 88°45' and 92°10' E and latitudes 26°40' and 28°15' N in the Eastern Himalaya, one of the least well-known segments of the Himalayan-Tibetan orogenic system. Bounded by India to the south and the Tibetan Autonomous Region of China to the North, the country displays a range of elevations from 100m along the Indian border to the 7,554m Kula Gangri peak on the Tibetan border. These two extremes frame a landscape which stretches from sub-tropical to alpine conditions over a lateral distance of only about 150 km.

1.1 Concepts of thermochronology

Many minerals contain elements that have one or more radioactive isotopes. Geochronology is based on the fact that the natural radioactive decay of these "parent" isotopes to radiogenic "daughter" isotopes occurs at constant rates over geologic time, such that measurements of the relative amounts of parent and daughter isotopes can be used to calculate a "date" (Faure, 1986). If the mineral is a closed system with respect to the gain or loss of parent or daughter isotope, the date that is calculated can be interpreted as the crystallization age of the mineral. However, many radiogenic daughter isotopes diffuse relatively rapidly out of the mineral structure at elevated temperatures, such that the radiometric "clock" does not start until the mineral cools below some threshold temperature range when it becomes an effectively closed system. Since diffusion rate is strongly temperature dependent, this temperature range is relatively narrow and it has become common practice to refer simply to the "closure temperature" of a mineral-isotopic system (Dodson, 1973).

Dodson's formula to calculate the bulk closure temperature (T_{cb}) of a crystal can be represented as:

$$T_{cb} = \frac{E}{R\ln(e^{G_{av}} R D_i T_{cb}^2 / a^2 \; E(dT/dt))}$$

where E is activation energy of the process, R is the gas constant, D_i is the diffusivity at infinite temperature, a is the diffusion dimension (often assumed to be half of the crystal's physical grain size), and dT/dt is the cooling rate (Hodges, 2003). In this equation, G_{av} is dependent on the assumed geometry of diffusion: 4.00660 for radial diffusion in a sphere, 3.29506 for radial diffusion in a cylinder, and 2.15821 for diffusion across a plane sheet (Dodson, 1986; Hodges, 2003).

With time, rocks from depth are brought upward towards the surface as a result of erosion or tectonic unroofing of the overlying material. Since temperature is known to increase with depth in the continental crust, the mineral grains pass through their closure temperatures and cooling ages are recorded to reflect the change in the rock's position in time with respect to the surface (Huntington and Hodges, 2006; Braun et at., 2006). The ability to date cooling through a specific closure temperature allows the reconstruction of the cooling history of the unit, since different mineral-isotopic systems have different closure temperatures (Stuart, 2002).

Although most thermochronologic studies focus on bedrock cooling ages, the research described here focused on detrital mineral grains in modern river sediments. Detrital mineral thermochronology has become a popular way to explore both the general exhumation history of the exposed bedrock within a river's catchment area and, where this history is known relatively well a priori, to establish variations in erosion rate within a catchment. One of the most effective tools for such studies is the $^{40}Ar/^{39}Ar$ muscovite thermochronometer, which yields ages corresponding to the timing of latest cooling of detrital muscovite grains through T_{cb} of ca.350˚C (Hodges, 2003; Hodges et al., 2005). Muscovites are relatively resistant to grain-size diminution and alteration during erosion and transport. They are preferable to biotites or phlogopites which frequently contain excess ^{40}Ar, are more susceptible to alteration, and often form complex intergrowths with – and can be difficult to separate from – chlorite.

The $^{40}Ar/^{39}Ar$ method itself is a variant of the K-Ar technique, which is predicated on the natural decay of ^{40}K to ^{40}Ar. In $^{40}Ar/^{39}Ar$ dating, samples are irradiated with fast neutrons to stimulate the formation of synthetic ^{39}Ar by a neutron-capture, proton-emission reaction:

$$^{39}_{19}K + n \rightarrow ^{39}_{18}Ar + P$$

The abundance of ^{39}Ar produced in this way is proportional to the abundance of ^{39}K in the sample, so that it is possible to calculate the equivalent of a K-Ar age from a measurement of the $^{40}Ar/^{39}Ar$ ratio in evolved Ar from an irradiated sample. Additional details of this technique can be found in McDougall and Harrison (1988).

1.2 Geologic Setting

As noted by Hodges (2000), the geology of the Himalaya is often described in terms of tectonostratigraphic packages separated by major fault systems. In Bhutan, all of the major tectonostratigraphic packages have been identified, as have the faults separating them. Bhutan is bounded on its northern border by the north-dipping, east-striking, low-angle brittle normal faults of the South Tibetan Fault (STF) system (Burchfiel et al, 1992; Hodges, et al.,1998; Hodges, 2000; Daniel et al., 2003). Farther south lies a series of subparallel, generally east-striking, north-dipping thrust fault systems: the Main Central Thrust (MCT), Main Boundary Thrust (MBT) and the Main Frontal Thrust (MFT) systems. Another major thrust system in Bhutan, interpreted as an out-of-sequence feature lying between the STF and MCT systems, is the Kakhtang

Thrust (KT) system. It is believed to postdate both the STF and the MCT systems (Gansser, 1983; Grujic et al., 1996; Hollister and Grujic, 2006).

In the northern part of Bhutan, the predominant rock types are weakly metamorphosed (greenschist facies) units of the Tibetan Sedimentary Sequence. They are separated from underlying high-grade (amphibolite facies) metasedimentary rocks of the Greater Himalayan Sequence (GHS) by structures of the STF system. South of their main outcrop belt, Tibetan sequence rocks also occur as klippen overlying GHS units in the Lingzhi and Tang chu basins (Gansser, 1983; Grujic, 2002). GHS schists and gneisses dominate a major part of the geology of Bhutan. Two major units have been identified within this sequence: orthogneisses of the Thimphu Formation and metacarbonates, amphibolites, and schists the Paro Formation (Gansser,1983;Tobgay, 2005). The Paro Formation also hosts large volumes of leucogranite which are interpreted as locally derived anatecic melts.

Structurally beneath the GHS – and separated from it by the MCT system – lies the Lesser Himalayan Sequence (LHS). As described by Gansser (1983) and Tobgay (2005), it includes low-grade to unmetamorphosed metasedimentary rocks of the Jaishidanda Formation (mainly garnetiferous schists), the Shumar Formation (interlayered quartzites and chloritic schists), and the Buxa Formation (mainly metacarbonate rocks). The lower boundary of the LHS corresponds to the MBT system of faults. Across that boundary, the Subhimalayan Zone of Hodges (2000) includes sedimentary rocks of the Siwalik molasse. At the margin of the Gangetic foreland basin farther south, these molasse deposits are thrust over the foreland deposits along the MFT system.

Five east-west trending physiographic transitions- PT1, PT 2a, PT2b, PT2c and PT 3 and a north-south physiographic transition, PT4, have been identified in Bhutan (Tobgay, 2005). PT1 is said to be the delineation between the main Himalayan ranges and the Tibetan Plateau, and PT2, occurring south of the range crest is described as a separation of the southern slopes of the high peaks from the lower foothill regions (cf., Hodges, 2001). In Bhutan, divisions of PT2 occur as PT2a, PT2b and PT2c based on changes in stream morphology (Tobgay, 2005). PT 3 separates the Himalayan foothills from the foreland basin near the Indian border. Eastern and western Bhutan are separated by another physiographic transition (PT4). As initially suggested by Hodges et al. (2001) for the central Himalaya, PT1 and PT3 in the Bhutan Himalaya may correspond to active traces of the STF and MFT systems. Tobgay (2005) suggested that PT2a, PT2b and PT2c, as well as PT4, may also correspond to active fault traces, though these transitions have not been studied in detail.

1.3 Motivations for Study and Definition of the Study Area

Compared to other Himalayan nations, the geology of Bhutan is less well known. Although numerous $^{40}Ar/^{39}Ar$ studies have been undertaken elsewhere in the Himalaya in order to constrain erosional histories, no systematic studies have been done in Bhutan and only a very few $^{40}Ar/^{39}Ar$ ages have been published at all for the kingdom (e.g., Stüwe and Foster, 1991). The present reconnaissance study was designed to improve our basic knowledge of the thermal evolution of the Bhutan Himalaya by concentrating on detrital muscovites collected from two major river systems in northwestern Bhutan. The data presented here constitute the first steps toward constraining erosional and bedrock uplift histories in this region.

The two rivers studied are the Wang chu and the Punatsang chu. Sediments collected from the Wang chu catchment represent the Thimphu dzogkhag (district), while the Punatsang chu samples were eroded mainly from three dzongkhags: Gasa, Punakha and Wangdi Phodrang. Both rivers have their sources in the high mountainous regions of Bhutan and some of their tributaries are fed by glacial lakes. Both rivers flow south to join the Brahmaputra in India. Baillie and Norbu (2002) described the dissection histories and longitudinal profiles of these rivers. Thimphu valley is at a much higher elevation than the Punakha valley at 2,200 meters above sea level. The temperatures in Thimphu range from approximately 15° C to 26° C during the summer monsoon season of June through September, but drop to between about -4° C and 16° C in winter. Thimphu experiences dry winter months and wet summers due to the monsoons. Punakha, on the other hand, is at a lower elevation (approximately 1300m) with an almost subtropical climate of hot summers – temperatures ranging between 22°C to 32°C – and pleasant winters with temperatures between 4°C to 15° C.

The catchment area above the sampling points on the Wang chu is considerably smaller than that of the Punatsang chu above its sampling points. The Wang chu includes drainage from the Lingzhi basin down through the Thimphu valley, and the main trunk stream is joined by only a few minor tributaries along that reach. In contrast, the lower Punatsang chu trunk stream is formed by the confluence of two major rivers, the Pho chu and the Mo chu, just below Punakha dzong. Further downstream, another tributary, the Dang chu, makes a major contribution to the Punatsang chu outflow. The Mo chu tributary drains the high peaks of Masagang as well as the Lingzhi basin, while the Pho chu drains the Lunana basin and other areas of northeastern Bhutan. The Dang chu drains the large glacial valley of Phobjikha down through the Wangdi Phodrang dzongkhag.

In 1994, glacial lake Lugge tso experienced an outburst event that released $20x10^6$ m^3 of water down the Pho chu channel (Watanabe and Rotacher,1994). Many more glacial lakes occur in this region and there is evidence for frequent outbursts of their restraining dams (landslides and moraines) in the past. As a consequence, there has been increased interest in learning more about the geologic hazards of this remote region in recent years.

CHAPTER 2: Approach

2.1 Sample collection

Sample collection along the catchments were carried out in November 2005. Most of the locations are fairly close to the motorable roads. Samples were collected from either side of the river banks depending on accessibility. Two to four handsful of sand were collected at each sampling point. The locations of sampling locations were determined by handheld GPS receivers and are mapped in Figure 2.

The Wang chu forms a relatively narrow valley and its bed is confined by steep walls. Five samples were collected from the Wang chu from a point about 50 meters above the Chari Monastery foot bridge to a point just upstream of the confluence of the Wang chu with the Pa chu. The four sampling points to the north (WC-1 through WC-4) lie between the STF and Physiographic Transition 2a. The southernmost point (WC-5) lies between PT2a and PT2b. The catchment above this sampling point has a total area of approximately 992 km^2 , with elevations ranging from 2330 m to 5768 m. The Wang chu samples were noted to have a larger number of biotites than muscovites, and the river sands contained many small red crystals of garnet.

Fourteen samples were collected in the Punatsang chu drainage between PT2a and PT2b. The entire catchment area above the same, collected farthest downstream (PC-14) is approximately 5748 square km, with a total relief of 7198 m to 1166 m. Five samples (PC-1 through PC-5) were taken from the Mo chu drainage above its confluence with the Pho chu. Seven (PC-6 through PC-12) were taken from the Punatsang chu trunk stream between the Mo chu-Pho chu confluence and the mouth of the Dang chu tributary. Finally, two samples (PC-13 and PC-14) were collected below the Punatsang chu-Dang chu confluence.

Most of the sampled reach flows through a broad, largely alluviated valley. Widespread sand deposits along some segments of the Mo chu and Punatsang chu imply past landslide damming and subsequent outbursts. Some segments, on the other hand, were almost free of riverbank sand and the principal shoreline alluvium was a mixture of cobbles and fine silt. In these cases, sand for analysis was collected underwater, directly from the active river bed. The Punatsang chu samples were found to contain considerably greater concentrations of muscovites than the Wang chu samples.

2.2 Analytical methods

2.2.1 Sample preparation and analysis

The samples were washed, cleaned of debris, and sieved to between 500 and 1000 microns. Smaller grain sizes were discarded because of the potential health hazard of working with fine-grained radioactive samples and because grains sizes of < 0.2 mm may loose ^{39}Ar though recoil during irradiation (Hodges et al., 2005). Larger sizes may also hamper analyses by resisting homogeneous heating to give erroneous results (Vasconcelos et al, 2002). The retained sand grains were washed again in water and dried. Muscovites were separated from other unwanted minerals by paper shaking. The mica was then washed in acetone, ethanol and distilled water. Vermeesh (2004) proposed that, in order to achieve a required level of statistical adequacy of 95% confidence level to include at least 95% of the total population of the sample, at least 117 grains should be dated from a detrital sample. In light of this, I picked about 150 to 200 muscovite grains from each sand sample under a binocular. These picked grains were packed into aluminum foil packets and loaded into fused silica vials for irradiation.

The samples were irradiated at the McMaster University Nuclear Reactor in Canada for 6 hours at a power level of 3 MW in the C5 position. Afterwards, the samples were unpackaged and individual micas were loaded into 2 mm diameter, 3 mm deep holes on a 100-hole Cu planchette in the Massachusetts Institute of Technology (MIT) noble gas laboratory. The planchette was then loaded into a UHV sample chamber with a glass view-port, and baked out at ca. 320° C for 8 hours in preparation for analysis.

Noble gasses were extracted from each grain by single-step melting with a laser. Detrital mineral $^{40}Ar/^{39}Ar$ studies sometimes employ a multi-step, incremental heating protocol for gas extraction, principally to minimize the impact of alteration and excess ^{40}Ar contamination. However, previous studies of muscovites from bedrock studies along the Himalayan front have revealed little evidence for excess ^{40}Ar contamination or excessive alteration and we simply liberated all noble gasses in one fusion step, thereby substantially decreasing the duration of each experiment. For this study, each crystal was heated with an 810 nm diode laser beam focused to a ca. 1.5 mm spot size, ramping from 0 to 15 W over two minutes and then held at 15W for 15 seconds. The slow heating rate and defocused laser beam minimizes the amount of crystal movement during heating, a problem encountered probably significantly more than is typically reported for automated mica laser fusion studies. With the laser protocol adopted here, muscovite typically begins to fuse at 4 W, and complete fusion to a refractory glass ball nearly always occurs. Note that mica crystals were not degassed with the laser beam before analysis as is often the case with CO^2 laser-based detrital mica studies. We feel that the significantly higher bake out temperatures possible with glass compared to special mid-infrared view-ports necessary for the CO^2 laser significantly reduces the need for such a cleaning step. The results presented here support that assertion- only 3 of the 1039 muscovite analyses reported below had radiogenic ^{40}Ar contents less than 40%, and fully 95% of the analyses had radiogenic ^{40}Ar contents over 78%.

After fusion, the released gases were purified for 10 minutes with a SAES glass-encased 10 l/sec St101 getter operated at ca. 650 deg, and a second, all metal, SAES 50 l/sec St101 getter operated ca. 350°C. The purified gases were then admitted to an MAP 215-50 mass spectrometer for Ar isotopic analysis using a Johnson MM-1 electronic multiplier operated at a gain of about 10,000.

The conversion efficiency of ^{39}K to ^{39}Ar was monitored using sanidine from the Taylor Creek rhyolite (TCR-2a) assuming an age of 28.34 Ma (Renne et al., 1998), and is known to better than 0.2 % (2σ). Corrections for neutron-induced interferences, previously determined for this reactor facility using Fe-doped kalsilite glass and optical CaF_2, were 0.025 for $^{40}Ar/^{39}Ar_K$, 0.000672 for $^{39}Ar/^{37}Ar_{Ca}$, and 0.00028 for $^{36}Ar/^{37}Ar_{Ca}$. Final data reduction was conducted with the program ArArCalc version 2 (Koppers, 2002). The output of this measurement for all samples is attached in Appendix 1 and 2.

2.2.2 Assumptions in age calculations

McDougal and Harrison (1998) and Hodges (2003) have emphasized some primary assumptions that need to be fulfilled in order to constrain geologically meaningful detrital mineral cooling ages from the quantitative estimates of closure temperatures. These may be summarized as follows:

1) The decay rate of the parent nuclide, ^{40}K must be independent of its physical state and is not affected by differences in pressure or temperature.

2) The $^{40}K/^{39}K$ ratio in nature remains constant. This is because ^{40}K is not measured directly. In the $^{40}Ar/^{39}Ar$ technique, it is derived from the measured ^{39}Ar (knowing the production efficiency of ^{39}Ar from ^{39}K) and assuming a $^{40}K/^{39}K$ ratio.

3) All radiogenic argon measured in the sample comes from the decay of the ^{40}K since time of crystallization, and no gain or loss of parent or daughter isotopes have occurred since this closure.

4) The isotopic composition of atmospheric argon $^{40}Ar/^{36}Ar$ ratio = 295.5, as measured by Nier (1950), such that measured ^{40}Ar can be corrected for its non-radiogenic "atmospheric" component .

5) Volume diffusion is the principle mode of daughter isotope loss.

2.3 Statistical analyses

2.3.1 Synoptic probability density function

To allow comparison, the cooling age signal from the ArArCALC data for each grain, comprising the calculated age t_m and the analytical uncertainty in that age σ_{t_m} is defined as a probability density function (PDF) of age (t). The PDF is calculated (Silverman,1986; Ruhl and Hodges, 2005) as follows:

$$\text{PDF} = \frac{1}{\sigma_{t_m}\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{t-t_m}{\sigma_{t_m}}\right)^2}$$

Where σ_{t_m} is the calculated uncertainty in that age, t_m is the calculated age.

The distribution of probability as a function of apparent age within the sample of 'n' number of grains is calculated using the sum of the PDFs for each grain dated, with the area under the curve normalized to one. This gives the synoptic probability density function (SPDF):

$$\text{SPDF} = \frac{1}{n}\sum_{i=1}^{n} PDF(i)$$

A final plot is made using the apparent cooling age with 1σ uncertainty and assuming a Gaussian distribution for each analysis (Figure 3 and Figure 4).

2.3.2. Estimating erosion rates

Ruhl and Hodges (2005) demonstrated how detrital thermochronologic data can be used to constrain catchment-wide bedrock erosion rates assuming steady-state topography and uniform erosion. The method involves comparing a non-dimensionalized hypsometric curve for the catchment region above the sampling point to a non-dimensionalized Cumulative SPDF curve for the sample. If steady-state and uniform erosion conditions are met, these two curves should have the same form and the erosion rate can be estimated simply as the catchment relief divided by the detrital mineral cooling age range.

CHAPTER 3: Results and Observations

Although the Wang chu and Punatsang chu are not very far apart, the detrital muscovite $^{40}Ar/^{39}Ar$ ages for the two drainage systems have very different frequency distributions.

3.1 Wang chu Data

Figure 3 shows the $^{40}Ar/^{39}Ar$ cooling age synoptic probability density function plots for each Wang chu sample. All show essentially the same unimodal pattern with means between ca.10.6 ± 1.2 Ma to ca.11.7 ± 1.4 Ma (Table 1). Most of the 247 analyzed grains yield ages between 13.98 ± 0.08 Ma and 9.37 ± 0.08 Ma, but two outliers were identified: a 21 Ma grain in WC-2 and a 15 Ma grain in WC-5. It is not possible to ascertain whether these anomalous ages reflect true heterogeneity or imply either excess ^{40}Ar or sample contamination, but the paucity of such older ages in the dataset led me to disregard these values in subsequent data interpretation. When these outliers are excluded, the Wang chu dates collectively yield a mean age of ca.11.4 ± 1.5 Ma.

3.2 Punatsang chu Data

In general, the $^{40}Ar/^{39}Ar$ age probability density functions for the Punatsang chu samples are more complicated than those for the Wang chu (Table 2). Dates for detrital muscovites in samples collected above the Mo chu-Po chu confluence range from 17.16 ± 0.09 Ma to 9.03 ± 0.08 Ma, with one ca. 22 Ma outlier detected in PC-1. Unlike all Wang chu samples, these five samples yielded distinctively multi-modal SPDFs. The seven samples collected between the Mo chu-Po chu confluence and the Punatsang chu-Dang chu confluence yielded similar results, with ages ranging from 17.25 ± 0.09 Ma to 9.04 ± 0.17 Ma. Finally, the southernmost samples (PC-13 and PC-14) had ages ranging from 16.85 ± 0.10 Ma to 9.29 ± 0.10 Ma.

Although the datasets for all three reaches along this drainage differed in detail, all fourteen samples collectively yield a multimodal SPDF with two predominate age modes. I used a program developed by Jose M. Hurtado, Jr to implement the multicomponent analysis as described in Sambridge and Compston, (1994) in order to better quantify these modes as having ages of ca. 11.4 Ma and ca. 14.5 Ma (Figure 5). The dominant mode in the PC-1 through PC-5 samples is statistically indistinguishable from the weighted mean age of samples from the Wang chu drainage. However, samples collected farther downstream display an increasing contribution from the older (ca. 14.5 Ma) mode. This systematic variation is illustrated in Figure 5. The simplest interpretation of these results is that the Po chu tributary, in particular, contributes many of the older age muscovites identified in this study.

Chapter 4. Data Analysis and Interpretation

The Wang chu data are relatively straightforward, and the unimodal nature of the SPDFs for these samples encouraged me to try using the approach described by Ruhl and Hodges (2005) to extract catchment-wide erosion rates from the data. Unfortunately, non-dimensionalized hypsometric curves and cumulative probability density curves for the muscovite ages showed very different morphologies (Figure 6), suggesting that one or more of the assumptions critical to the technique was incorrect. The multimodal nature of the Punatsang chu data suggested that these samples were also unlikely to be useful for erosion rate estimates, and a rigorous application of the approach of Ruhl and Hodges (2005) indicated that this was indeed correct.

Even though the Wang chu and Punatsang chu data are not useful for explicit erosion rate estimates, they indicate relatively rapid uplift of bedrock through the ca. 350°C closure isotherm for $^{40}Ar/^{39}Ar$ muscovite in Miocene time. In general, the detrital mineral age ranges obtained for the Bhutan samples are substantially older than those obtained in other studies from rivers in central Nepal (Wobus et al., 2003; Ruhl and Hodges, 2005; Wobus et al., 2006). This implies a late Miocene-Pliocene rejuvenation of exhumation of the Greater Himalayan Sequence in central Nepal that apparently did not occur in western Bhutan. The single Wang chu mode of ages, as well as the young Punatsang chu mode, are comparable to two of the four $^{40}Ar/^{39}Ar$ bedrock muscovite dates reported by Stüwe and Foster (2001) from a similar tectonostratigraphic level in eastern Bhutan: 11.6 and 11.3 Ma. (The other two muscovite ages reported by those authors were c. 14 and 14.7 Ma.) However, the distinction between the detrital mineral age signals in two adjacent drainage basins in western Bhutan requires further explanation. In the following paragraphs, I explore some of the potential causes.

4.1 Precipitation and Channel Morphology

One possibility for the discrepancy is that modern erosion rates are substantially different in the two catchments and perhaps distinctive in the different sub catchments studied in the Punatsang chu basin. The two principal drivers for erosion are precipitation and bedrock uplift, so we can explore this possibility by examining precipitation patterns and channel morphology (as a proxy for bedrock uplift rate; Kirby et al., 2003).

Most precipitation in the region of interest in Bhutan comes in the form of monsoon rain. Mean annual precipitation varies from ca. 4.5 m/year at the southern front to ca. 0.6 m/year around the northwestern parts of Bhutan (9 to 15 years data obtained from the Metrology. Dept. of Bhutan). At lower elevations, the two catchments receive similar rainfall each year. However, higher elevations of the Punatsang chu catchment receive an average of 1.1 m/yr as opposed to 0.8 m/yr at similar elevations in the Wang chu catchment. It is plausible, therefore, that the presence of older ages in the Punatsang chu dataset may partially reflect higher erosion rates at higher elevations (which would, in principle, yield older ages).

Since river channel steepness is thought to correlate with rock uplift rate in many instances (Kirby et al., 2003; Hodges et al, 2004), I compared the channel steepness indices for 89 individual streams in northwestern part of Bhutan. A normalized channel steepness index (CSI) was calculated from the regression intercept 'k_s' for all channels using a fixed concavity (regression slope (θ)) = -0.45, which effectively removes the dependence on profile concavity and enable comparison of channel steepness (Kirby et al, 2003).

In general, the Wang chu, has very few areas of high CSI values and generally remains at relatively lower steepness values for most of its length. On the other hand, the Pho chu and the Mo chu both are characterized by steep main channels and relatively lower tributary CSI. In the far northern reaches of these drainages, the CSI values are low, probably due to glaciations. (In glaciated regions, the relationship between channel steepness and rock uplift rate no longer holds). Again, this exercise suggests that some of the older age signal from the Punatsang chu drainage may reflect higher erosion rates at high elevations.

4.2 Non-Uniform Distribution of Muscovite

A second plausible reason for the difference in muscovite cooling age distributions in the two catchments is that muscovite is non-uniformly distributed in the Wang chu basin. If, for example, the bedrock in the upper parts of the catchment contained little or no muscovite, downstream sediments may contain none of the ca. 14.5 Ma signal that is so dominant in the Punatsang chu data.

Unfortunately, there has not been much bedrock mapping in the study area in recent years and it is not clear from previous descriptions of the lithologies in the area (mainly from Gansser, 1983 and 1964) whether or not muscovite is a common mineral in the upper Wang chu catchment. It is perhaps noteworthy that the uppermost parts of the catchment drain lower Paleozoic Tibetan Sedimentary Sequence hanging wall units of the STF system according to existing maps (Gansser, 1983). Elsewhere in the Himalaya, these rocks are predominately unmetamorphosed and contain little muscovite (Gaetani and Garzanti, 1991). Clearly, more bedrock mapping and thermochronology studies are needed in this part of Bhutan.

4.3 Possible Causes for the Young Age Mode

If the narrow range of muscovite ages in the Wang chu sediments does not reflect localized (rather than catchment-wide) erosion and there is, in fact, a more-or-less uniform distribution of muscovites in the catchment, then bedrock in the catchment over an elevation range of more than 3 kilometers cooled through the ca. 350°C isotherm in less than four million years. The simplest explanation for this is a rapid exhumation event in Middle to Late Miocene (Serravallian-Tortonian) time. If this interpretation is correct, the prominence of the same young age mode in the Mo chu muscovites implies that the same event also affected the upper reaches of the Punatsang chu catchment. Below I discuss three possible tectonic scenarios that might result in accelerated exhumation during the Middle to Late Miocene time frame.

4.3.1 Exhumation of the STF Footwall

The upper Wang chu and Mo chu catchments include substantial bedrock terrain that lies in the footwall of the South Tibetan fault system. Generally speaking, for a region that erodes uniformly during more or less vertical uplift, detrital muscovites eroded from rocks at higher elevations should be older than those eroded from rocks at lower elevations. However, tectonic denudation by slip on rooted detachments can lead to a younging of footwall cooling ages toward the detachment surface (Stockli, 2005). In the study area, this might be manifested as a narrow range of Serravallian-Tortonian muscovite ages preferentially sampled from the STF footwall. If this hypothesis is correct, the age of major STF slip in the study region should be Middle-Late Miocene.

Unfortunately, there are no direct constraints on the age of STF slip in northwestern Bhutan. The closest such constraints come from the Khula Kangri area of Tibet, north of eastern Bhutan (Edwards and Harrison, 1997). Edwards and Harrison presented ca. 12.5 Ma Th-Pb dates for monazites from a granite in that area, suggesting STF slip at sometime shortly after that date. Both the weighted-mean cooling ages for the Wang chu detrital muscovites and the young mode for the Punatsang chu detrital muscovites are consistent with the interpretation that slip on the STF system was responsible for rapid exhumation of the Wang chu and Mo chu headwaters.

4.3.2 Uplift of the Eastern Flank of the Yadong-Gulu Rift

The headwaters of the Wang chu and the Mo chu tributary of the Punatsang chu also lie within a mountain range that forms the southeastern boundary of a segment of the longest rift system in southern Tibet, the N30˚E-trending Yadong-Gulu rift (Armijo et al., 1986; Wu et al, 1998). The northwestern front of this range is marked by west-dipping, en echelon, normal and right-lateral structures of the Chomolhari fault zone (or "Yadong cross structure"). According to Wu et al. (1998) and Cogan et al. (1998), cumulative slip on the Yadong cross structure resulted in a ca. 70 km right-lateral offset of the Himalayan range crest and the STF system. More recently, Hodges (2006) has suggested that the Chomolhari fault zone may instead be a tear fault in the STF system. In any case, the elevation difference between the rift valley and the southeastern rift flank implies substantial rift flank uplift along the Chomolhari fault zone, and it is possible that the young muscovite ages that dominate the Wang chu sediment samples – as well as samples from the upper Mo chu catchment (PC-1 through PC-5) – reflect rift flank uplift in Serravallian-Tortonian time.

Although the Chomolhari fault zone is seismically active today, there are no independent constraints on the initiation age of the fault zone that might help test the hypothesis that early slip on it is responsible for the young muscovite ages. Wu et al. (1998) argued that the Yadong cross structure offset the STF system in such a way that different down-dip sections of the STF system were exposed at the surface west and east of the cross structure. Based on the Edwards and Harrison (1997) work in the

Khula Kangri area, the Yadong cross structure must have initiated sometime after 12.5 Ma. Edwards and Harrison themselves suggested an initiation age of 10-8 Ma for the Yadong cross structure, but that interpretation was based largely on assumptions regarding a relationship between rifting in southern Tibet and 10-8 Ma gravitational collapse of the Tibetan Plateau (Harrison et al, 1992). If they are correct, rift flank uplift on the Chomolhari fault zone would have been too young to explain the Serravallian-Tortonian detrital muscovite ages, but the lack of firm independent constraints on the initiation age permits rift-flank uplift to remain a viable explanation until further work is done.

4.3.3 Hanging Wall Uplift of the Kakhtang Thrust System

A final hypothesis derives from the interpretation by Grujic et al. (2002) that the out-of-sequence Kakhtang thrust system was active over the 14 -10 Ma age range in Bhutan. This range is consistent with the idea that hanging wall uplift on these structures may have forced focused erosion in northern Bhutan during the Serravallian-Tortonian interval. This hypothesis is difficult to test because the Kakhtang thrust system has been identified and mapped thus far only in eastern Bhutan and not in my study area. Future work, may help evaluate the role of the Kakhtang thrust system in bedrock exhumation.

CHAPTER 5: Conclusions

Detrital muscovites collected from two major river systems in western Bhutan yield Early to Late Miocene $^{40}Ar/^{39}Ar$ cooling ages. With the exception of two outliers thought to be without geologic significance, all single-grain muscovite ages from Wang chu sediment samples range between ca. 9.37±0.08 Ma and ca.13.98 ± 0.08 Ma, and individual sand samples yield mean muscovite ages between ca.10.6 ± 1.2 Ma and ca.11.7 ± 1.4 Ma. There are two plausible explanations for this persistent and narrow age signal: 1) the detrital muscovites are sourced from only a very small range of elevations in the Wang chu catchment; or 2) the entire Wang chu catchment above the lowermost sampling locality experienced rapid Serravallian-Tortonian uplift. The first explanation may be correct if erosion was decidedly non-uniform in the Wang chu catchment, or if muscovite only occurs in bedrock units exposed over a narrow range of elevations. Unfortunately, the state of geologic mapping in the Wang chu headwaters is not very advanced, and we do not know the true distribution of muscovite in the catchment. Precipitation patterns are relatively uniform across the catchment, and there is no evidence in the channel profiles for the Wang chu and its tributaries that would suggest differential uplift of the bedrock consistent with focused erosion at some elevations in the catchment. I tentatively interpret the Serravallian-Tortonian signal as indicative of rapid bedrock uplift over that interval.

In contrast to the Wang chu samples, the Punatsang chu samples yield complex, multimodal detrital muscovite age distributions ranging between ca. 9.03 ± 0.08 Ma and ca.17.25 ± 0.09 Ma (disregarding a single outlier). Modal analysis of these data indicate the presence of two dominant modes at ca. 11.4 Ma and ca. 14.5 Ma. The uppermost samples collected in this catchment, along the Mo chu drainage, contained a relatively high percentage of muscovites with Serravallian-Tortonian ages, whereas downstream samples contained an increasing abundance of micas with pre-Serravallian ages. This suggests that the Pho chu tributary contributes a large proportion of observed older ages.

The younger age mode in the Punatsang chu samples is statistically indistinguishable from the single mode found in the Wang chu samples, providing further evidence of an important Serravallian-Tortonian exhumation event in western Bhutan. If this event was related to tectonic activity, three alternative explanations are plausible. First, it is plausible that the micas with young cooling ages were sourced from the footwall of the extensional South Tibetan fault system and their young ages reflect a tectonic denudation event. Second, it is possible that these micas were derived principally from the southeastern flank of the Yadong-Gulu rift and that their young ages reflect erosional exhumation associated with rift-flank uplift. Finally, it is possible that they represent hanging wall units of the Kakhtang thrust system that were preferentially eroded as a consequence of hanging wall uplift related to out-of-sequence thrusting. Given the present state of geologic mapping in this part of Bhutan, it is not possible to determine which one of these alternatives might be the most plausible. However, all make testable predictions regarding the relationship between the position of major deformational structures in western Bhutan and the distribution of bedrock cooling ages. Hopefully, future studies will shed more light on the issue.

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Figure Captions

Table 1: Summary of sample data for Wang chu.

Table 2: Summary of sample data for Punatsang chu.

Figure 1 : Simplified geologic map of the study area (after Gansser, 1983) superimposed on 90 m digital elevation data. (For description of the dataset see Fielding et al., 1994).

Figure 2: Map of the catchment areas for Punatsang chu and the Wang chu with the sampling points. The different color shadings indicate the individual catchments of the Wang chu, the Mo chu, Pho chu and the Dang chu.

Figure 3: 3.01 – 3.06 : Plot of $^{40}Ar/^{39}Ar$ cooling age SPDFs for Wang chu (WC) samples at the different sampling locations. Area under each curve is normalized to one. Values labeled *n* correspond to the number of individual analyses defining each SPDF. Labeled gray bars indicate mean ages for each distribution.

Figure 4: 4.01 – 4.14: Plot of $^{40}Ar/^{39}Ar$ cooling age SPDFs for each Punatsang chu (PC) sample, showing the multiple modal frequency distribution mode of ages on all the samples. Area under each curve is normalized to one. Values labeled *n* correspond to the number of individual analyses defining each SPDF. Labeled gray bars indicate modeled ages for modes of a bimodal distribution as derived using the Sambridge and Compston (1994) method.

Figure 5: Plot of $^{40}Ar/^{39}Ar$ cooling age SPDFs for each group of Punatsang chu samples differentiated by the three major contributing catchments of the Pho chu, the Mo chu and the Dang chu (5.01- 5.03:) and for all Punatsang chu samples collectively (5.04). Area under each curve is normalized to one. Values labeled *n* correspond to the number of individual analyses defining each SPDF. Labeled gray bars indicate modeled ages for modes of a bimodal distribution as derived using the Sambridge and Compston (1994) method.

Figure 6: 6.01-6.05: Comparison of non-dimensionalized cumulative hypsometric curves ($CSPDF_{z^*}$) and cumulative probability density curves for the muscovite ages of the Wang chu basin ($CSPDF_{t^*}$). The blue curves represent the range of 500 model non dimensionalized curves plotted for

each catchment from *n* points randomly selected from the hypsometric curve where *n* is the number of grains analyzed .

Appendices

Appendix A.1: Detrital muscovite $^{40}Ar/^{39}Ar$ data with 2σ analytical uncertainties for the Wang chu samples.

Appendix A.2: Detrital muscovite $^{40}Ar/^{39}Ar$ data with 2σ analytical uncertainties for the Punatsang chu samples.

Appendix A.3: Map of the distribution of precipitation over the study area.

Appendix A.4: Channel morphology plots obtained for the four individual river channels. Codes and methods for slope/Area/*ks* analysis outlined in Wobus et al., 2006.

A.4.1 a to c: Wang chu channel morphology.

A.4.2. a to c: Estimated channel steepness index *'ks'* values for the Wang chu.

A.4.3 a to c: Mo chu channel morphology.

A.4.4. a to c: Estimated channel steepness index '*ks*' values for the Mo chu.

A.4.5 a to c: Pho chu channel morphology.

A.4.6. a to c: Estimated channel steepness index '*ks*' values for the Pho chu.

A.4.7 a to c: Dang chu channel morphology.

A.4.8. a to c: Estimated 'channel steepness index *ks*' values for the Dang chu.

Appendix A.5: Loaded fused silica vials A and B of packed samples (in Aluminum foil) and Taylor Creek sanidine standards (in copper foil) that were prepared for irradiation.

Appendix A.6: Neutron flux monitor, J, versus height in each vial. Individual values shown are the weighted mean of ca. 5 laser total-fusion analyses of the flux monitor standard Taylor Creek sanidine assuming an age of 28.34 Ma (Renne et al.,1998). J values for each sample unknown are interpolated using a quadratic fit of the measured standard values from each vial. Errors are reported as 2 s.d. of analytical precision, and are known to better than 0.2% at any given position.

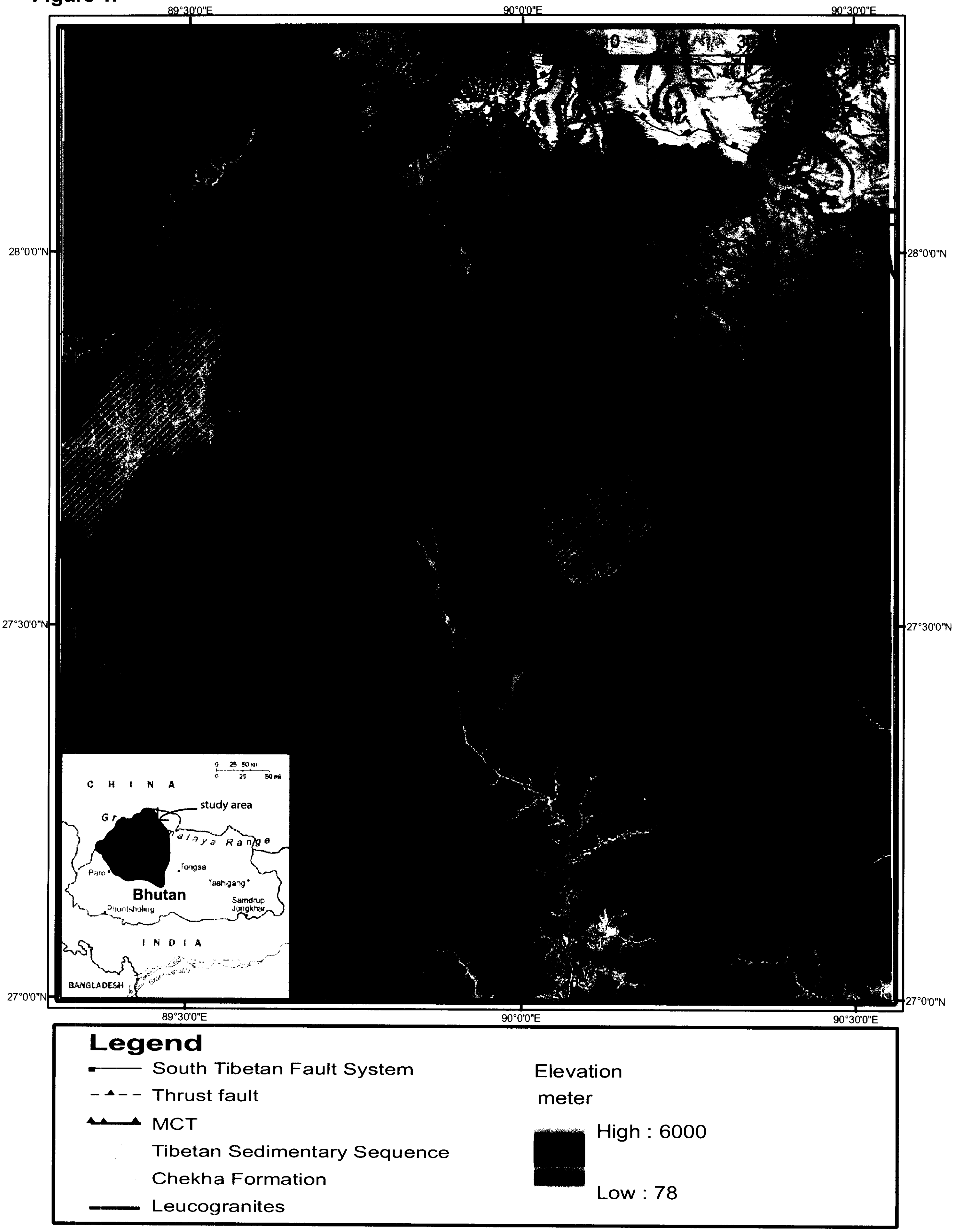
Table 1: Wang chu sample data

Sample #	Longitude Decimal degrees	Latitude Decimal degrees	Max. age (Ma)	Min. age (Ma)	Max. elevation (m)	Min elevation (m)	Relief (R) km	Catchment Area (sq. km)	Weighted mean (Ma) ±2 SD error	Arithmetic mean (Ma) ±2 SD
WC-1	27° 35.67'	89° 37.80'	12.39	10.83	5749	2628	3.121	308.48	11.59± 0.1	11.61± 0.66
WC-2	27° 35.33'	89° 37.89'	21.47	10.49	5768	2547	3.221	443.96	11.67± 0.01	11.73 ±1.24
WC-3	27° 34.37'	89° 38.33'	13.34	10.22	5749	2502	3.247	464.39	11.60± 0.01	11.74± 1.44
WC-4	27° 32.18'	89° 38.99'	12.97	9.82	5749	2412	3.337	505.23	11.38± 0.01	11.51± 1.31
WC-5	27° 30.04'	89° 38.47'	15.00	9.37	5749	2330	3.419	991.72	10.48± 0.01	10.57± 1.16

Table 2: Punatsang chu sample data

Sample number	Longitude Decimal degrees	Latitude Decimal degrees	Max age (Ma)	Min age (Ma)	Max. ele. (m)	Min ele. (m)	Relief (R) km	Catchment Area (sq.km)	Dominant Mode (Ma)	Secondary Mode (Ma)
PC-1	27° 37.99'	89° 48.89'	21.98	10.03	6768	1259	5.509	2317.512	14.93	11.38
PC-2	27° 37.34'	89° 49.82'	16.64	10.62	6768	1245	5.523	2330.708	15.66	11.68
PC-3	27° 37.06'	89° 50.37'	16.84	9.67	6768	1234	5.534	2335.795	15.64	11.69
PC-4	27° 36.15'	89° 51.28'	16.68	9.09	6768	1217	5.551	2341.775	15.85	11.99
PC-5	27° 35.30'	89° 51.65'	16.63	9.03	7192	1215	5.977	2364.749	15.25	11.26
PC-6	27° 34.63'	89° 52.04'	16.94	9.04	7198	1209	5.989	4772.755	14.88	11.59
PC-7	27° 34.06'	89° 52.21'	15.32	10.4	7198	1202	5.996	4778.430	13.93	11.35
PC-8	27° 32.92'	82° 52.38'	16.69	9.27	7192	1202	5.99	4782.321	14.19	10.12
PC-9	27° 32.19'	89° 52.59'	16.56	10.12	7192	1202	5.99	4788.361	14.70	11.92
PC-10	27° 31.74'	89° 52.86'	17.25	9.71	7192	1197	5.995	4914.597	14.53	11.29
PC-11	27° 30.31'	89° 53.28'	16.25	9.33	7192	1193	5.999	4937.037	14.23	10.83
PC-12	27° 28.70'	89° 53.77'	17.02	9.28	7192	1193	5.999	4975.449	14.10	11.33
PC-13	27° 26.72'	89° 54.49'	16.85	9.29	7192	1193	5.999	5719.373	14.58	10.88
PC-14	27° 24.85'	89° 54.23'	15.88	9.66	7192	1166	6.026	5747.984	14.29	10.87

Figure 1.


89°30'0"E
90°0'0"E
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28°0'0"N
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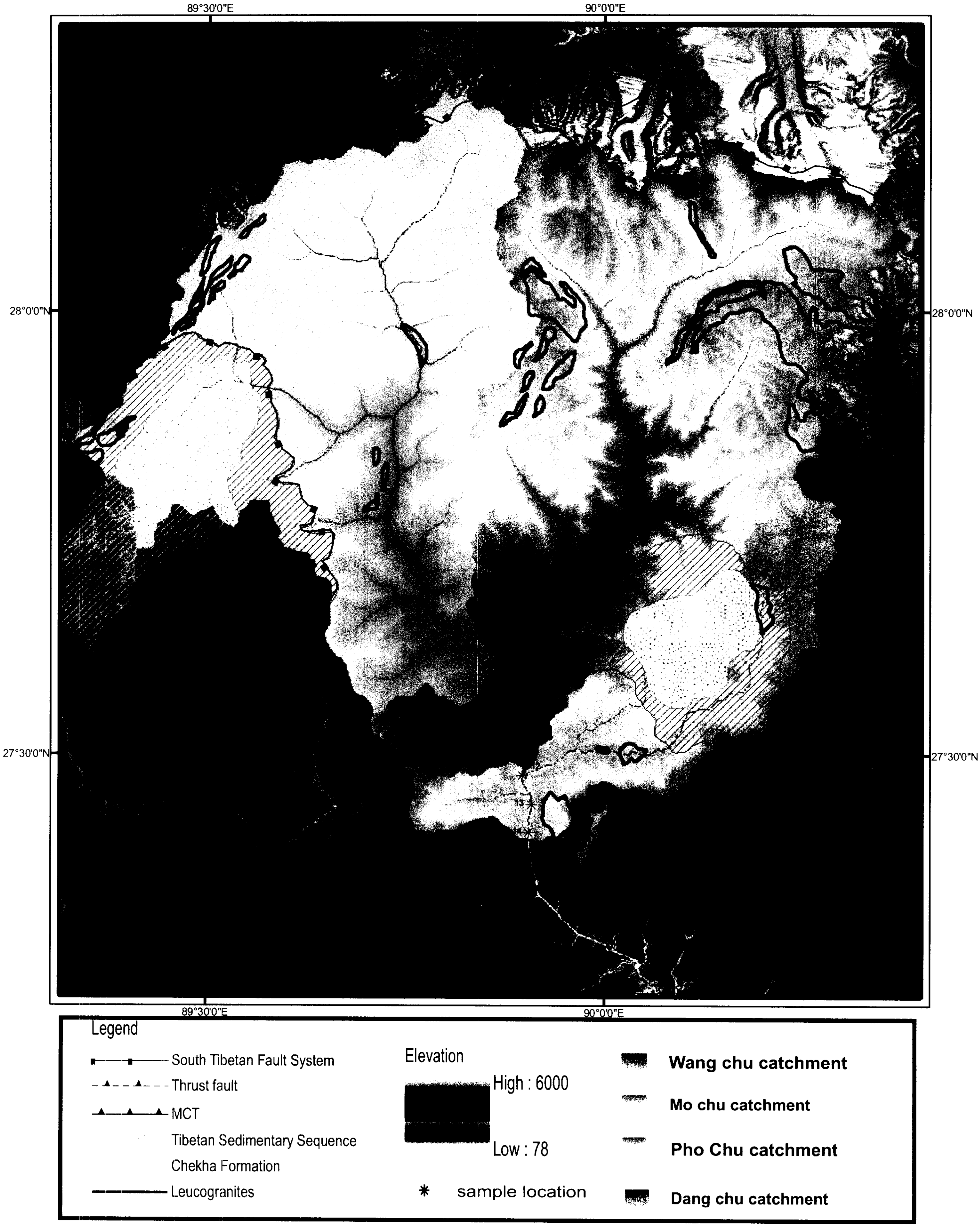
27°0'0"N
0 25 50 km
0 25 50 mi
C H I N A
study area
Bhutan
Paro
Tongsa
Tashigang
Samdrup Jongkhar
Phuntsholing
I N D I A
BANGLADESH
Legend
South Tibetan Fault System
Thrust fault
MCT
Tibetan Sedimentary Sequence
Chekha Formation
Leucogranites
Elevation
meter
High : 6000
Low : 78

Figure 2.


89°30'0"E
90°0'0"E
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27°30'0"N
13
Legend
South Tibetan Fault System
Thrust fault
MCT
Tibetan Sedimentary Sequence
Chekha Formation
Leucogranites
Elevation
High : 6000
Low : 78
sample location
Wang chu catchment
Mo chu catchment
Pho Chu catchment
Dang chu catchment

Figure 3.

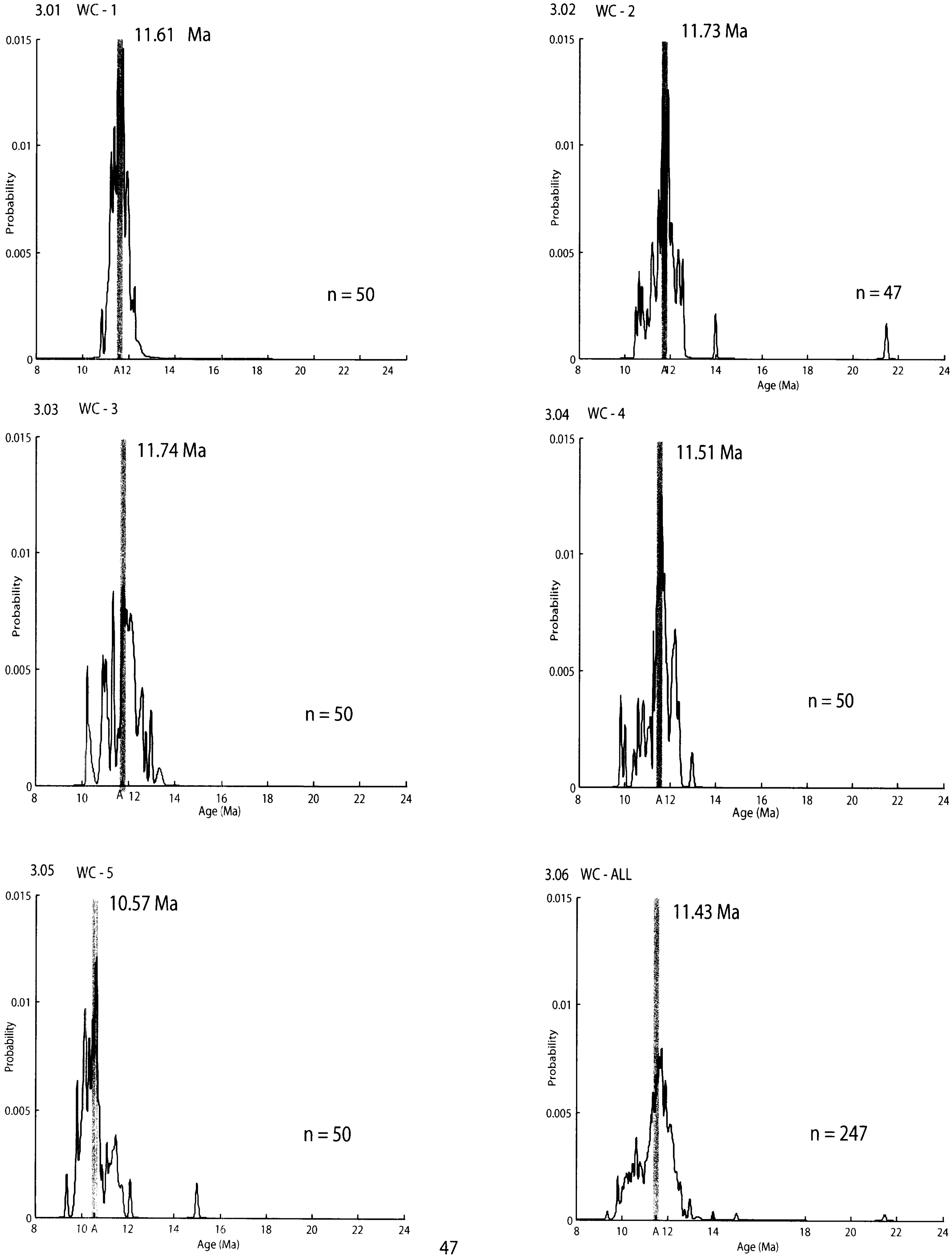
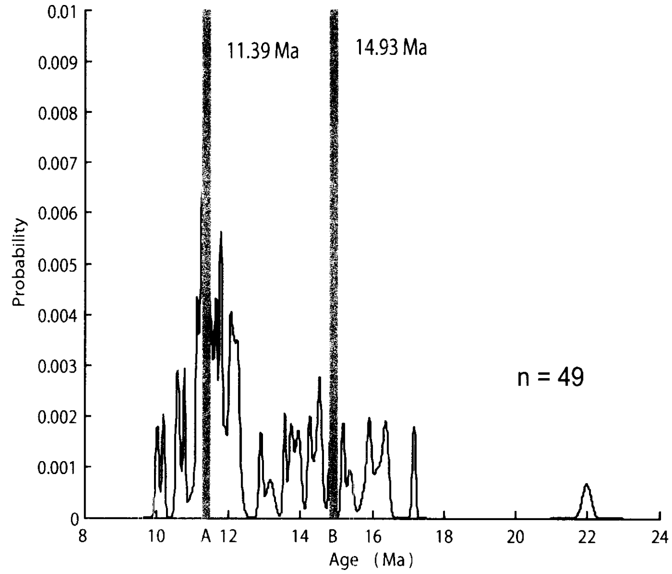
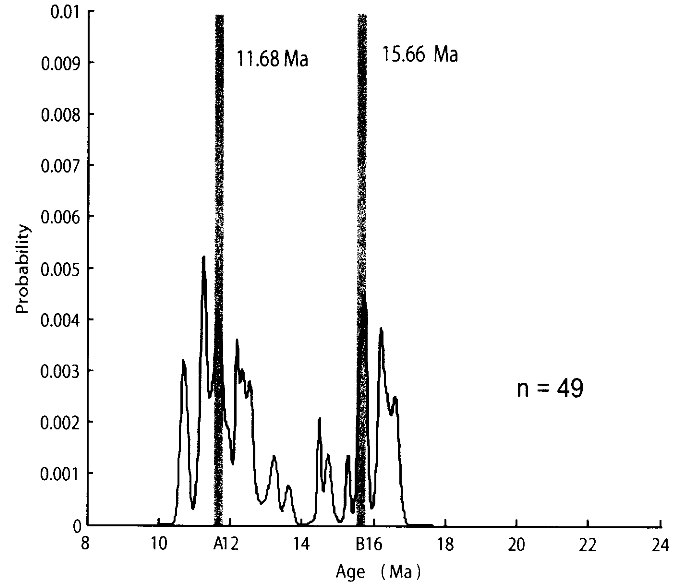

3.01 WC - 1
11.61 Ma
n = 50
Probability
0.015
0.01
0.005
0
8
10
A12
14
16
18
20
22
24
3.02 WC - 2
11.73 Ma
n = 47
Probability
Age (Ma)
3.03 WC - 3
11.74 Ma
n = 50
Probability
Age (Ma)
3.04 WC - 4
11.51 Ma
n = 50
Probability
Age (Ma)
3.05 WC - 5
10.57 Ma
n = 50
Probability
Age (Ma)
3.06 WC - ALL
11.43 Ma
n = 247
Probability
Age (Ma)

Figure 4.

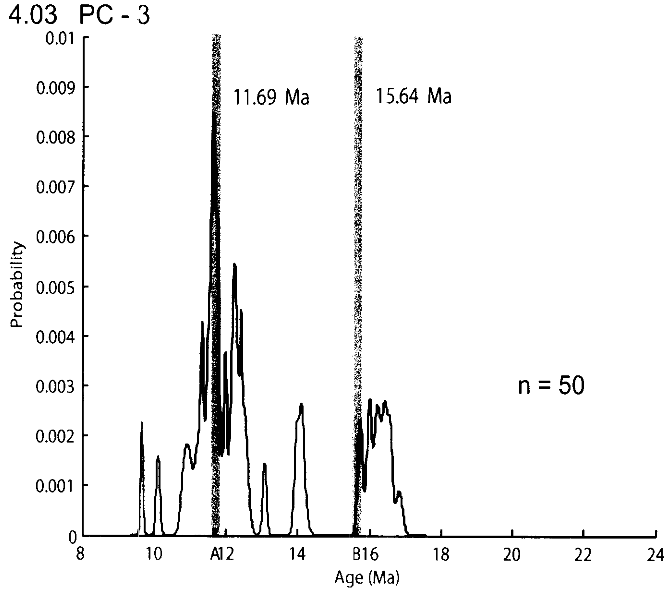
4.01 PC-1



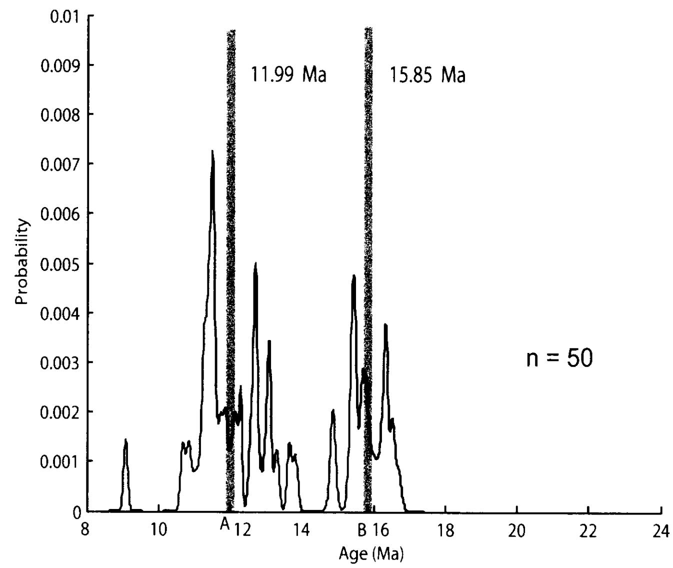
4.02 PC - 2



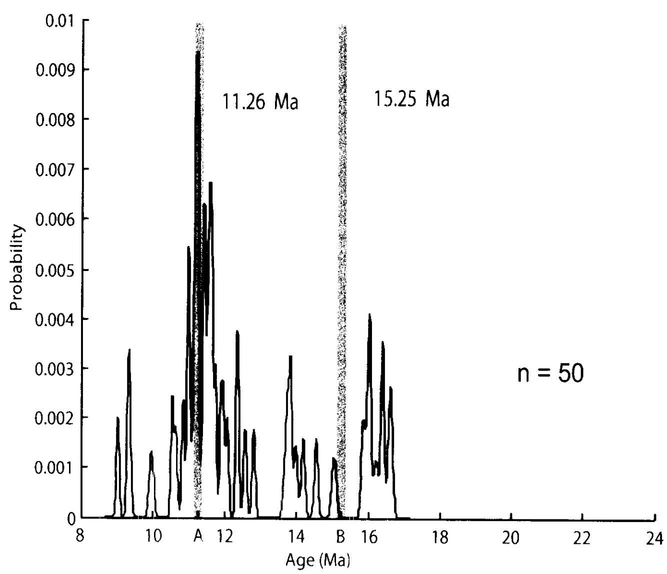
4.03 PC - 3



4.04 PC - 4



4.05 PC - 5



4.06 PC - 6

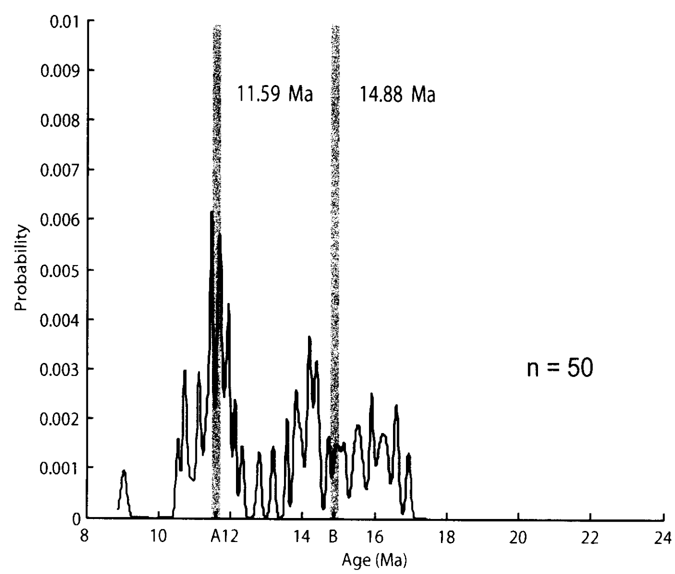


Figure 4.

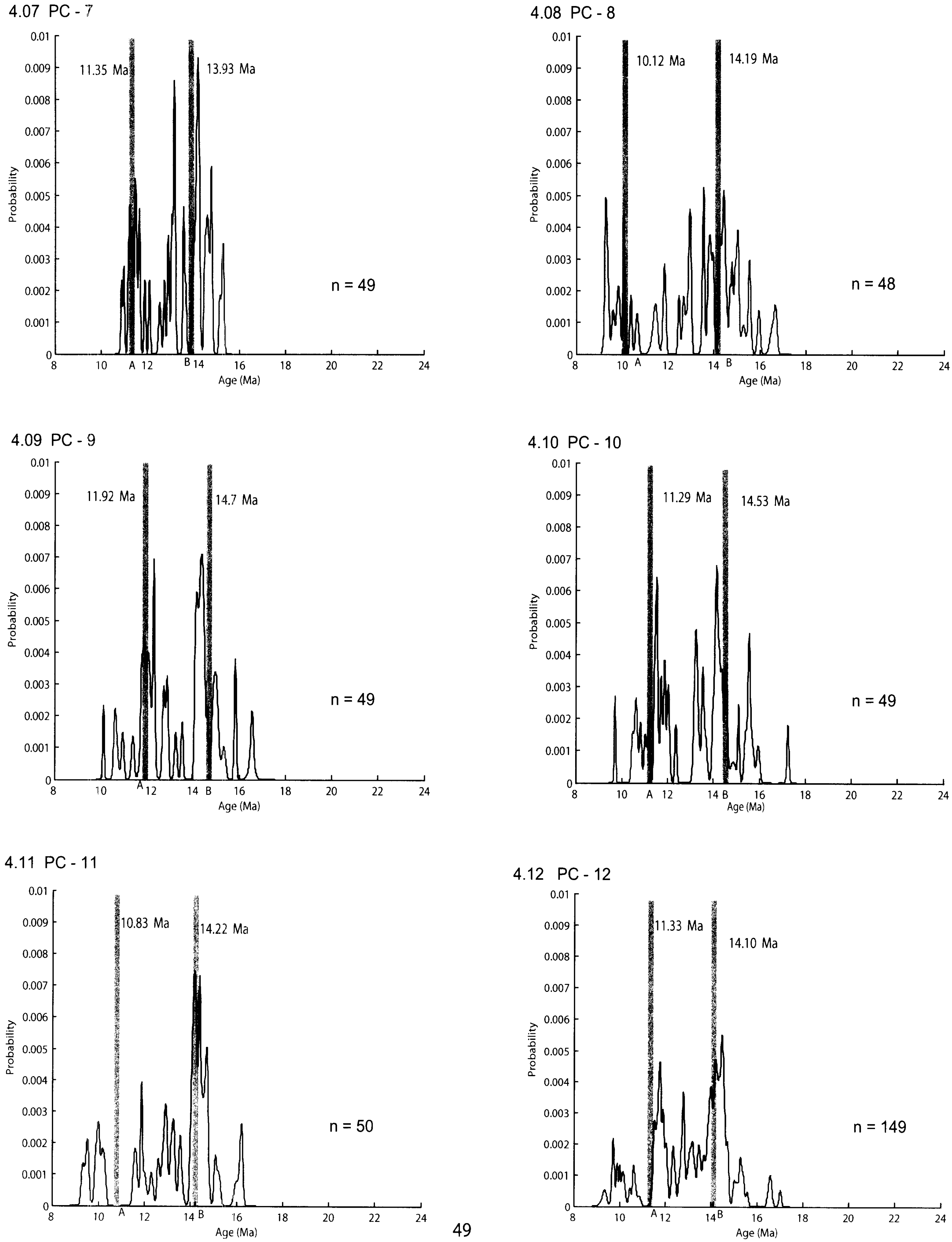
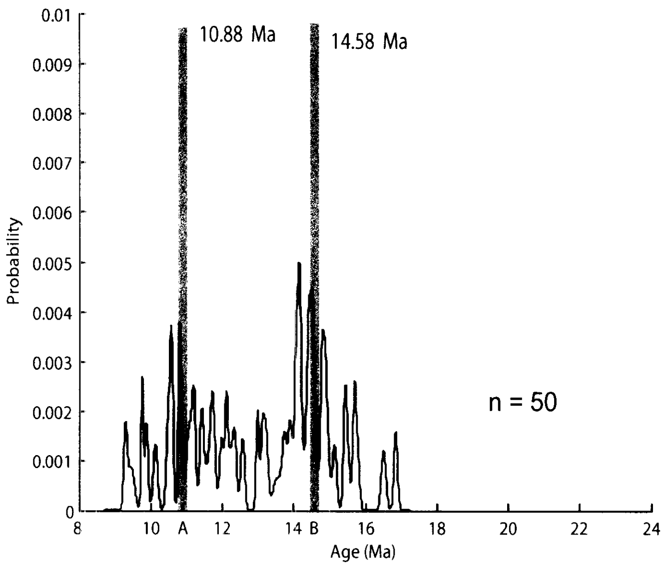

4.07 PC - 7
11.35 Ma
13.93 Ma
n = 49
4.08 PC - 8
10.12 Ma
14.19 Ma
n = 48
4.09 PC - 9
11.92 Ma
14.7 Ma
n = 49
4.10 PC - 10
11.29 Ma
14.53 Ma
n = 49
4.11 PC - 11
10.83 Ma
14.22 Ma
n = 50
4.12 PC - 12
11.33 Ma
14.10 Ma
n = 149
Probability
Age (Ma)
A
B

Figure 4.

4.13 PC -13



4.14 PC - 14

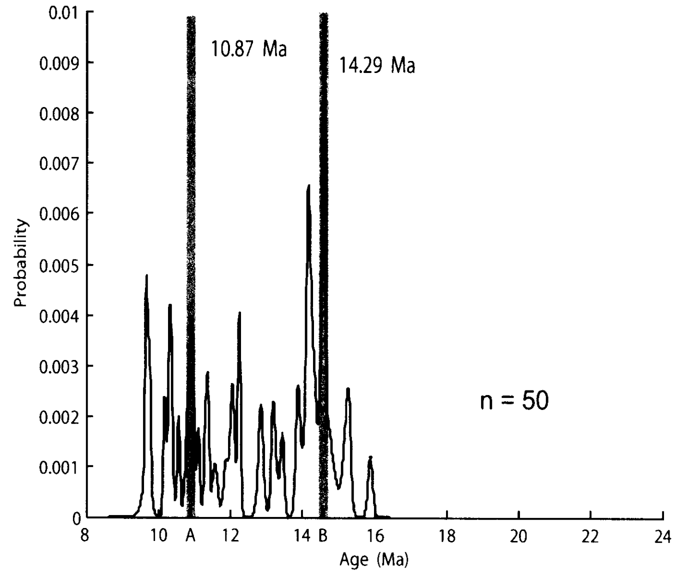
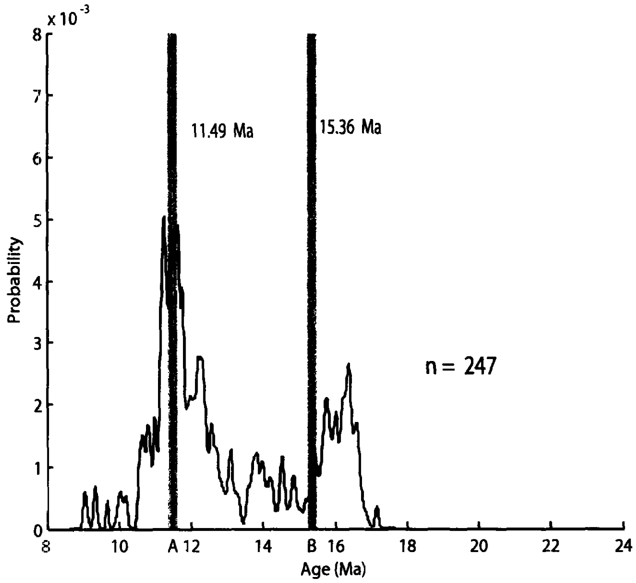
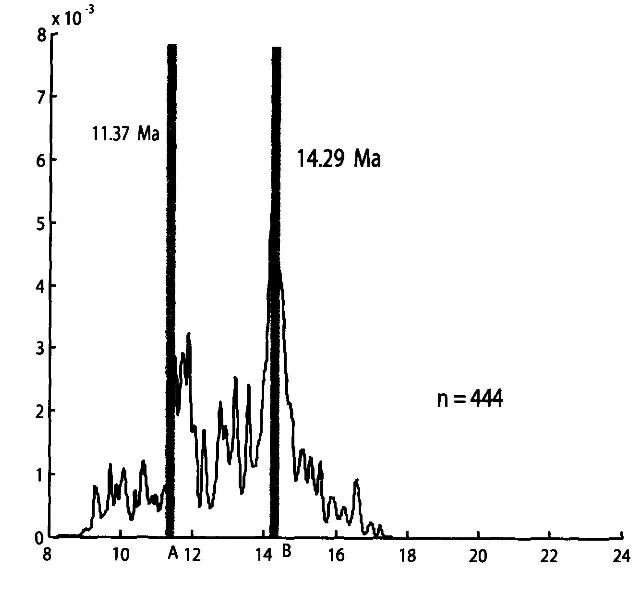


Figure 5.

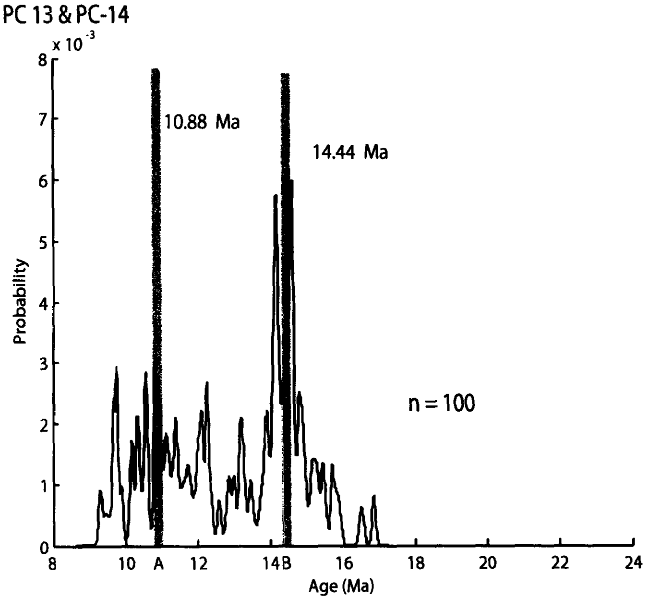
5.01 PC-1 to PC-5



5.02 PC-6 to PC-12



5.03 PC 13 & PC-14



5.04 PC- ALL

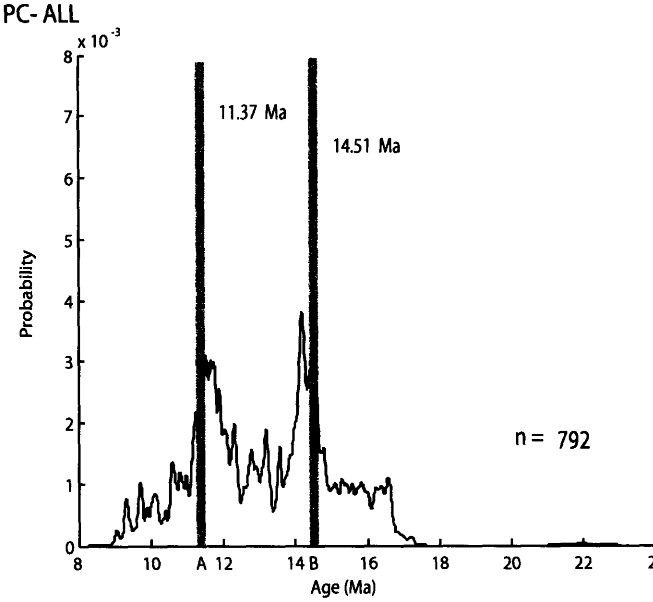
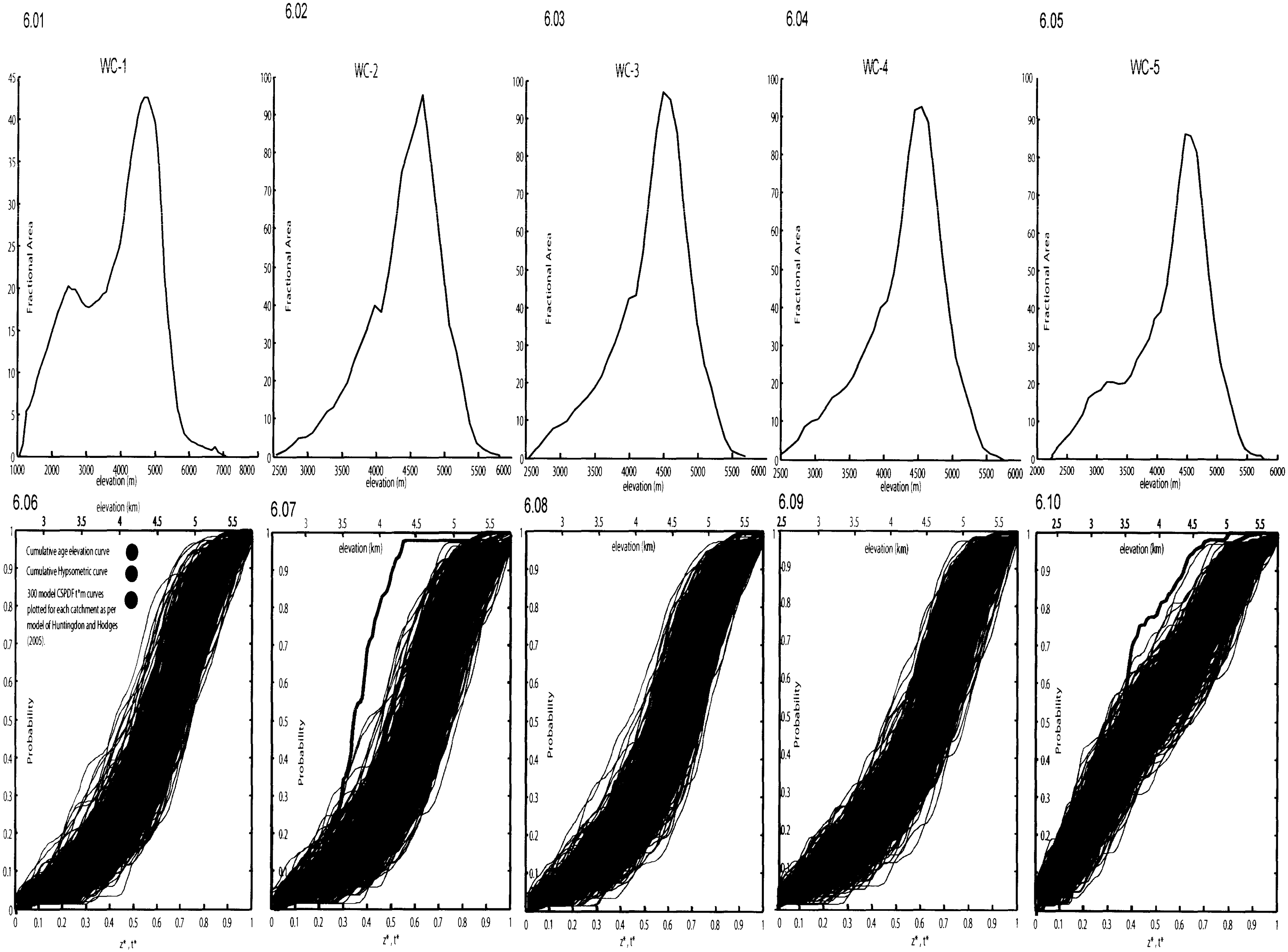


Figure 6.


6.01
6.02
6.03
6.04
6.05
WC-1
WC-2
WC-3
WC-4
WC-5
Fractional Area
elevation (m)
6.06
6.07
6.08
6.09
6.10
elevation (km)
Probability
z*, t*
Cumulative age elevation curve
Cumulative Hypsometric curve
300 model CSPDF t*m curves plotted for each catchment as per model of Huntingdon and Hodges (2005).

Appendix A.1.

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A020@39	39.00 W	0.00016	0.00030	0.00107	0.55528	1.90152	11.48 ± 0.11	96.88	1.25	919.802 ± 919.911
6A020@41	41.00 W	0.00031	0.00039	0.00123	0.72398	2.50062	11.58 ± 0.09	95.81	1.63	918.969 ± 919.070
6A020@46	46.00 W	0.00073	0.00023	0.00088	0.43183	1.49691	11.62 ± 0.13	86.92	0.97	918.991 ± 919.112
6A020@50	50.00 W	0.00293	0.00017	0.00069	0.31785	1.10254	11.63 ± 0.25	55.78	0.72	909.943 ± 910.082
6A020@38	38.00 W	0.00013	0.00031	0.00098	0.57970	2.02881	11.73 ± 0.11	97.40	1.30	923.678 ± 923.787
6A020@31	31.00 W	0.00070	0.00031	0.00104	0.57861	2.04711	11.86 ± 0.09	90.25	1.30	924.773 ± 924.883
6A020@49	49.00 W	0.00080	0.00014	0.00056	0.26366	0.94726	12.04 ± 0.24	79.59	0.59	921.460 ± 921.614
6A020@01	1.00 W	0.00066	0.00100	0.00023	1.91268	6.98831	12.24 ± 0.06	97.26	4.30	936.690 ± 936.775
6A020@47	47.00 W	0.00061	0.00014	0.00055	0.26532	0.98116	12.39 ± 0.23	83.95	0.60	912.510 ± 912.661
6A020@37	37.00 W	0.00032	0.00027	0.00094	0.51159	1.83100	12.00 ± 0.10	94.52	1.15	921.836 ± 921.950
6A020@33	33.00 W	0.00036	0.00035	0.00123	0.66055	2.35249	11.94 ± 0.09	95.00	1.49	920.395 ± 920.499
6A020@27	27.00 W	0.00061	0.00025	0.00114	0.47778	1.64277	11.53 ± 0.13	89.56	1.08	920.569 ± 920.686
6A020@06	6.00 W	0.00096	0.00057	0.00002	1.09459	3.96630	12.14 ± 0.08	93.29	2.46	934.478 ± 934.571
6A020@36	36.00 W	0.00700	0.00032	0.00129	0.61040	2.04830	11.25 ± 0.24	49.57	1.37	923.609 ± 923.715
6A020@45	45.00 W	0.00146	0.00027	0.00096	0.48968	1.78642	12.23 ± 0.15	80.06	1.10	894.615 ± 2516.140
6A020@28	28.00 W	0.00012	0.00027	0.00088	0.46312	1.65660	11.99 ± 0.10	97.29	1.04	843.279 ± 2322.472
6A020@40	40.00 W	0.00028	0.00038	0.00079	0.39596	1.36510	11.56 ± 0.13	93.72	0.89	508.056 ± 1205.139
6A020@26	26.00 W	0.00029	0.00043	0.00132	0.65479	2.22591	11.40 ± 0.10	95.58	1.47	739.708 ± 1407.627
6A020@04	4.00 W	0.00037	0.00048	0.00041	1.35583	4.82268	11.92 ± 0.07	97.79	3.05	1380.116 ± 2130.407
6A020@19	19.00 W	0.00044	0.00052	0.00145	0.72304	2.37933	11.03 ± 0.08	94.17	1.63	687.555 ± 1192.046
6A020@30	30.00 W	0.00033	0.00063	0.00099	0.53968	1.84386	11.45 ± 0.10	94.27	1.21	418.723 ± 539.734
6A020@44	44.00 W	0.00052	0.00069	0.00090	0.47422	1.64755	11.65 ± 0.16	90.89	1.07	337.936 ± 459.609
6A020@43	43.00 W	0.00030	0.00069	0.00068	0.37511	1.28258	11.46 ± 0.15	92.89	0.84	267.276 ± 329.463
6A020@29	29.00 W	0.00023	0.00070	0.00082	0.47671	1.60305	11.27 ± 0.14	95.17	1.07	333.310 ± 348.988
6A020@09	9.00 W	0.00324	0.00075	0.00032	1.18593	4.07743	11.52 ± 0.09	80.96	2.67	779.731 ± 698.199
6A020@14	14.00 W	0.00182	0.00075	0.00023	1.36719	4.79063	11.74 ± 0.07	89.88	3.08	893.256 ± 873.751
6A020@22	22.00 W	0.00057	0.00088	0.00122	0.53097	1.76911	11.17 ± 0.10	90.65	1.19	296.946 ± 260.906
6A020@18	18.00 W	0.00050	0.00092	0.00194	1.13491	3.84641	11.36 ± 0.06	95.65	2.55	606.645 ± 564.717
6A020@24	24.00 W	0.00034	0.00093	0.00140	0.67987	2.27453	11.22 ± 0.09	95.07	1.53	356.383 ± 298.310
6A020@23	23.00 W	0.00040	0.00094	0.00145	0.72437	2.52593	11.69 ± 0.08	94.88	1.63	378.000 ± 342.822
6A020@07	7.00 W	0.00119	0.00095	0.00029	1.00913	3.42975	11.39 ± 0.08	90.66	2.27	520.153 ± 420.172
6A020@08	8.00 W	0.00147	0.00106	0.00000	1.19902	4.00793	11.21 ± 0.07	90.21	2.70	554.267 ± 389.456
6A020@05	5.00 W	0.00263	0.00111	0.00013	1.55489	5.25851	11.34 ± 0.06	87.10	3.50	689.231 ± 499.548
6A020@16	16.00 W	0.00039	0.00118	0.00211	1.02172	3.59569	11.80 ± 0.10	96.21	2.30	423.769 ± 253.868
6A020@34	34.00 W	0.00064	0.00121	0.00198	0.74586	2.50182	11.24 ± 0.08	92.31	1.68	300.896 ± 214.241
6A020@03	3.00 W	0.00052	0.00129	0.00009	1.42289	4.94210	11.64 ± 0.06	96.99	3.20	538.956 ± 349.390
6A020@20	20.00 W	0.00141	0.00135	0.00356	1.65541	5.79764	11.74 ± 0.06	92.69	3.72	602.784 ± 332.216
6A020@21	21.00 W	0.00010	0.00137	0.00141	0.76616	2.47590	10.83 ± 0.07	98.12	1.72	274.072 ± 165.391
6A020@15	15.00 W	0.00355	0.00150	0.00234	1.30927	4.52154	11.58 ± 0.08	80.71	2.95	428.021 ± 193.331
6A020@13	13.00 W	0.00158	0.00198	0.00000	1.49577	5.17466	11.60 ± 0.06	91.70	3.37	370.568 ± 156.164
6A020@25	25.00 W	0.00086	0.00207	0.00154	0.79161	2.82503	11.96 ± 0.09	91.14	1.78	187.231 ± 88.641
6A020@11	11.00 W	0.00364	0.00228	0.00123	2.13405	7.56149	11.88 ± 0.06	87.55	4.80	459.259 ± 208.276
6A020@35	35.00 W	0.00098	0.00230	0.00104	0.55270	1.93821	11.75 ± 0.12	86.47	1.24	117.811 ± 47.187
6A020@12	12.00 W	0.00194	0.00274	0.00113	1.68439	5.89387	11.73 ± 0.06	91.13	3.79	301.040 ± 89.867
6A020@10	10.00 W	0.01195	0.00442	0.00013	1.45171	5.08471	11.74 ± 0.16	59.01	3.27	160.967 ± 30.649
6A020@17	17.00 W	0.00066	0.00778	0.00173	0.95020	3.26842	11.53 ± 0.07	93.69	2.14	59.862 ± 7.938
6A020@42	42.00 W	0.00029	0.00901	0.00112	0.42001	1.41014	11.25 ± 0.14	93.63	0.95	22.835 ± 2.207
6A020@48	48.00 W	0.00231	0.01406	0.00218	0.73233	2.47625	11.34 ± 0.13	77.94	1.65	25.518 ± 1.925
6A020@32	32.00 W	0.00034	0.02669	0.00140	0.78130	2.58594	11.10 ± 0.08	95.57	1.76	14.342 ± 0.500
6A020@02	2.00 W	0.00216	0.06142	0.00085	2.20751	7.58319	11.51 ± 0.05	92.24	4.97	17.611 ± 0.373
		0.06611	0.16075	0.05186	44.44115	154.06496				

Information on Analysis	
Sample	WC-1 B-1
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001864
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.4602 ± 0.0276 ± 0.80%	11.60 ± 0.10 ± 0.89%	58.38	100.00 50	16.856 ± 1.129
		External Error ± 0.10	2.01	Statistical T ratio	
		Analytical Error ± 0.09	7.6407	Error Magnification	
Total Fusion Age	3.4667 ± 0.0040 ± 0.12%	11.62 ± 0.05 ± 0.42%		50	135.468 ± 4.496
		External Error ± 0.05			
		Analytical Error ± 0.01			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A020@65	65.00 W	0.00061	0.00137	0.00204	1.07145	3.35719	10.49 ± 0.07	94.19	2.53	382.957 ± 274.257
6A020@66	66.00 W	0.00218	0.00138	0.00539	1.15693	3.67118	10.63 ± 0.07	84.50	2.73	411.001 ± 243.596
6A020@87	87.00 W	0.00035	0.00043	0.00148	0.75783	2.40679	10.64 ± 0.10	95.16	1.79	858.332 ± 858.423
6A020@59	59.00 W	0.00150	0.00093	0.00224	1.16265	3.73425	10.76 ± 0.06	88.75	2.75	612.351 ± 417.640
6A020@94	94.00 W	0.00017	0.00041	0.00132	0.57059	1.84733	10.84 ± 0.10	96.63	1.35	674.415 ± 1120.641
6A020@76	76.00 W	0.00073	0.00046	0.00148	0.80312	2.63531	10.99 ± 0.08	91.76	1.90	861.235 ± 861.325
6A020@81	81.00 W	0.00029	0.00093	0.00105	0.54545	1.81004	11.11 ± 0.12	94.76	1.29	287.732 ± 207.958
6A020@70	70.00 W	0.00047	0.00124	0.00171	0.89540	2.99060	11.18 ± 0.08	94.85	2.12	352.419 ± 189.536
6A020@57	57.00 W	0.00072	0.00071	0.00173	0.72000	2.41345	11.23 ± 0.09	91.28	1.70	494.943 ± 613.718
6A020@96	96.00 W	0.00089	0.00150	0.00154	0.78677	2.64116	11.24 ± 0.10	90.36	1.86	256.820 ± 159.727
6A020@98	98.00 W	0.00047	0.00051	0.00148	0.87875	2.97326	11.33 ± 0.09	94.85	2.08	852.583 ± 852.673
6A020@75	75.00 W	0.01090	0.00059	0.00163	0.82324	2.79311	11.36 ± 0.23	46.28	1.95	681.571 ± 760.298
6A020@99	99.00 W	0.00015	0.00039	0.00120	0.67168	2.30035	11.47 ± 0.09	97.37	1.59	852.195 ± 852.290
6A020@80	80.00 W	0.00078	0.00409	0.00119	0.60877	2.08816	11.49 ± 0.12	89.52	1.44	72.942 ± 16.021
6A020@71	71.00 W	0.00366	0.00053	0.00119	0.70073	2.40363	11.49 ± 0.14	68.61	1.66	649.054 ± 854.440
6A020@55	55.00 W	0.00100	0.00151	0.00350	1.88402	6.46322	11.49 ± 0.06	94.95	4.45	613.218 ± 401.436
6A020@73	73.00 W	0.00025	0.00775	0.00146	0.78773	2.72590	11.59 ± 0.09	96.70	1.86	49.777 ± 5.668
6A020@51	51.00 W	0.00357	0.00146	0.00487	2.39898	8.33145	11.63 ± 0.06	88.21	5.67	807.203 ± 530.011
6A020@79	79.00 W	0.00476	0.00069	0.00144	0.78497	2.73244	11.66 ± 0.14	65.70	1.85	554.211 ± 597.821
6A020@74	74.00 W	0.00099	0.00934	0.00172	0.78784	2.74309	11.66 ± 0.08	89.80	1.86	41.313 ± 3.159
6A020@88	88.00 W	0.00030	0.00100	0.00105	0.46743	1.62763	11.66 ± 0.12	94.17	1.10	229.534 ± 184.664
6A020@62	62.00 W	0.00066	0.00155	0.00294	1.67216	5.82461	11.66 ± 0.06	96.11	3.95	527.171 ± 272.384
6A020@58	58.00 W	0.00105	0.00124	0.00180	0.88525	3.09590	11.71 ± 0.11	90.30	2.09	348.761 ± 202.898
6A020@54	54.00 W	0.00060	0.00254	0.00185	1.02412	3.58556	11.72 ± 0.07	94.64	2.42	197.476 ± 61.447
6A020@78	78.00 W	0.00507	0.00061	0.00169	0.39565	1.38629	11.73 ± 0.25	47.91	0.93	317.922 ± 463.208
6A020@68	68.00 W	0.00130	0.00430	0.00196	0.96616	3.42420	11.87 ± 0.08	89.33	2.28	109.994 ± 25.959
6A020@100	100.00 W	0.00075	0.00078	0.00147	0.75177	2.66859	11.89 ± 0.11	91.70	1.78	475.086 ± 463.528
6A020@52	52.00 W	0.00031	0.00136	0.00249	1.47299	5.22875	11.89 ± 0.06	97.60	3.48	532.654 ± 309.957
6A020@93	93.00 W	0.00107	0.00113	0.00095	0.47532	1.68753	11.89 ± 0.14	83.66	1.12	206.981 ± 155.787
6A020@61	61.00 W	0.00186	0.00099	0.00185	1.09817	3.90266	11.90 ± 0.09	87.12	2.59	546.036 ± 392.629
6A020@95	95.00 W	0.00078	0.00040	0.00111	0.69015	2.45501	11.91 ± 0.13	90.79	1.63	855.450 ± 855.545
6A020@85	85.00 W	0.00003	0.00051	0.00176	0.89269	3.18289	11.94 ± 0.08	99.05	2.11	858.400 ± 858.489
6A020@69	69.00 W	0.01215	0.00070	0.00180	0.91210	3.25688	11.96 ± 0.24	47.41	2.16	642.853 ± 510.868
6A020@83	83.00 W	0.00050	0.00074	0.00169	0.87709	3.15355	12.04 ± 0.08	94.86	2.07	577.804 ± 627.287
6A020@92	92.00 W	0.00113	0.00136	0.00183	0.94331	3.39787	12.06 ± 0.08	90.45	2.23	339.386 ± 209.516
6A020@97	97.00 W	0.00037	0.01101	0.00073	0.38469	1.39079	12.10 ± 0.18	92.18	0.91	17.120 ± 1.397
6A020@86	86.00 W	0.00041	0.02398	0.00132	0.67559	2.45270	12.15 ± 0.10	94.69	1.60	13.804 ± 0.579
6A020@77	77.00 W	0.00025	0.00031	0.00105	0.54099	1.96649	12.17 ± 0.12	95.74	1.28	860.502 ± 860.605
6A020@91	91.00 W	0.00037	0.00078	0.00142	0.76050	2.79528	12.30 ± 0.10	95.62	1.80	475.594 ± 462.643
6A020@89	89.00 W	0.02258	0.00083	0.00124	0.59085	2.17451	12.32 ± 0.62	24.54	1.40	349.244 ± 405.940
6A020@72	72.00 W	0.00059	0.00040	0.00128	0.70356	2.59530	12.35 ± 0.09	93.13	1.66	864.877 ± 864.972
6A020@84	84.00 W	0.00122	0.00406	0.00145	0.69325	2.56253	12.37 ± 0.10	87.15	1.64	83.671 ± 15.949
6A020@82	82.00 W	0.00017	0.00034	0.00100	0.58676	2.18054	12.44 ± 0.10	97.05	1.39	857.796 ± 857.895
6A020@56	56.00 W	0.00198	0.02358	0.00309	1.68733	6.32742	12.55 ± 0.07	90.97	3.99	35.062 ± 1.813
6A020@67	67.00 W	0.00125	0.00107	0.00160	0.82769	3.10425	12.55 ± 0.09	88.85	1.96	377.345 ± 306.824
6A020@53	53.00 W	0.00203	0.00392	0.00238	1.27700	5.33417	13.98 ± 0.08	89.41	3.02	159.706 ± 33.172
6A020@63	63.00 W	0.00244	0.00807	0.00243	1.27171	8.17758	21.47 ± 0.10	91.58	3.00	77.201 ± 7.189
		0.09568	0.13378	0.08489	42.32117	152.00139				

Information on Analysis	
Sample	WC-2 B-2
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001862
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.5338 ± 0.1236 ± 3.50%	11.83 ± 0.42 ± 3.51%	972.65	100.00 47	17.399 ± 3.016
		External Error ± 0.42	2.01	Statistical T ratio	
		Analytical Error ± 0.41	31.1873	Error Magnification	
Total Fusion Age	3.5916 ± 0.0051 ± 0.14%	12.02 ± 0.05 ± 0.42%		47	155.015 ± 6.113
		External Error ± 0.05			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A021@09	9.00 W	0.00080	0.01194	0.00313	1.93479	5.78259	10.22 ± 0.06	95.30	3.68	79.402 ± 6.687
6A021@20	20.00 W	0.00055	0.00312	0.00229	1.38962	4.16057	10.23 ± 0.07	95.45	2.64	218.168 ± 70.132
6A021@07	7.00 W	0.00095	0.00558	0.00201	1.12982	3.41113	10.32 ± 0.09	91.73	2.15	99.287 ± 15.630
6A021@49	49.00 W	0.00035	0.00145	0.00077	0.40021	1.22048	10.42 ± 0.18	91.49	0.76	134.980 ± 89.228
6A021@19	19.00 W	0.00233	0.00146	0.00165	0.90117	2.84851	10.80 ± 0.11	80.00	1.71	301.977 ± 184.370
6A021@12	12.00 W	0.00201	0.00199	0.00412	1.81074	5.76542	10.88 ± 0.07	90.01	3.44	446.323 ± 256.264
6A021@03	3.00 W	0.00372	0.00111	0.00300	1.64257	5.24595	10.91 ± 0.08	82.16	3.12	724.773 ± 725.641
6A021@29	29.00 W	0.00243	0.00081	0.00230	1.29081	4.12965	10.93 ± 0.10	84.62	2.45	780.377 ± 931.811
6A021@06	6.00 W	0.00105	0.02405	0.00245	1.58147	5.09538	11.01 ± 0.07	93.57	3.01	32.224 ± 1.244
6A021@04	4.00 W	0.00383	0.00111	0.00338	1.63957	5.29669	11.04 ± 0.08	81.89	3.12	723.171 ± 724.037
6A021@33	33.00 W	0.00019	0.00143	0.00109	0.59352	1.91867	11.05 ± 0.13	96.44	1.13	203.000 ± 143.256
6A021@17	17.00 W	0.00092	0.00107	0.00227	1.20199	3.91951	11.14 ± 0.07	92.86	2.29	549.599 ± 493.019
6A021@37	37.00 W	0.00167	0.00248	0.00000	1.38654	4.58560	11.30 ± 0.08	89.69	2.64	273.526 ± 120.247
6A021@26	26.00 W	0.00086	0.00071	0.00178	1.03290	3.42256	11.32 ± 0.09	92.44	1.96	715.154 ± 715.227
6A021@23	23.00 W	0.00051	0.00290	0.00286	1.56807	5.19658	11.32 ± 0.07	96.46	2.98	265.167 ± 82.720
6A021@13	13.00 W	0.00053	0.00069	0.00207	1.23482	4.10098	11.35 ± 0.08	95.62	2.35	872.852 ± 1041.741
6A021@24	24.00 W	0.00042	0.00087	0.00124	0.79608	2.64950	11.37 ± 0.10	94.89	1.51	448.684 ± 575.667
6A021@08	8.00 W	0.00229	0.00085	0.00219	1.14572	3.87300	11.55 ± 0.09	84.58	2.18	662.974 ± 558.045
6A021@47	47.00 W	0.00065	0.00085	0.00066	0.31464	1.07392	11.66 ± 0.22	84.25	0.60	181.516 ± 217.955
6A021@41	41.00 W	0.00197	0.00180	0.00287	1.44237	4.94228	11.71 ± 0.09	88.88	2.74	393.729 ± 258.081
6A021@38	38.00 W	0.00059	0.00077	0.00146	0.80975	2.77765	11.72 ± 0.10	93.43	1.54	512.861 ± 702.101
6A021@34	34.00 W	0.00102	0.00106	0.00142	0.79010	2.71775	11.75 ± 0.10	89.44	1.50	365.525 ± 380.919
6A021@05	5.00 W	0.00135	0.00636	0.00227	1.40089	4.82579	11.77 ± 0.08	91.77	2.66	107.925 ± 13.404
6A021@36	36.00 W	0.01242	0.00125	0.00127	0.78325	2.70154	11.78 ± 0.29	42.27	1.49	307.964 ± 236.416
6A021@18	18.00 W	0.00215	0.00275	0.00267	1.32831	4.59246	11.81 ± 0.08	87.27	2.53	237.086 ± 75.616
6A021@27	27.00 W	0.00066	0.00123	0.00144	0.80814	2.80684	11.87 ± 0.12	92.84	1.54	321.917 ± 237.456
6A021@50	50.00 W	0.00031	0.00019	0.00058	0.27313	0.94954	11.88 ± 0.26	90.71	0.52	709.532 ± 709.637
6A021@48	48.00 W	0.00039	0.00030	0.00083	0.43350	1.50800	11.88 ± 0.16	92.29	0.82	704.485 ± 704.573
6A021@15	15.00 W	0.00142	0.00102	0.00192	1.00317	3.49539	11.90 ± 0.09	88.73	1.91	481.039 ± 482.700
6A021@14	14.00 W	0.00134	0.00147	0.00176	1.02105	3.55906	11.91 ± 0.08	89.40	1.94	339.424 ± 182.780
6A021@02	2.00 W	0.00248	0.00183	0.00385	1.98625	6.96261	11.98 ± 0.07	89.90	3.78	533.276 ± 204.903
6A021@16	16.00 W	0.00405	0.00150	0.00299	1.38918	4.89468	12.04 ± 0.09	79.88	2.64	454.696 ± 306.450
6A021@21	21.00 W	0.00024	0.00060	0.00165	0.88412	3.12678	12.08 ± 0.10	97.15	1.68	719.327 ± 719.402
6A021@28	28.00 W	0.00048	0.00044	0.00125	0.64195	2.27256	12.09 ± 0.17	93.51	1.22	714.864 ± 714.949
6A021@44	44.00 W	0.00040	0.00054	0.00063	0.30010	1.06298	12.10 ± 0.24	89.43	0.57	272.592 ± 452.546
6A021@43	43.00 W	0.00032	0.00265	0.00107	0.55191	1.95600	12.11 ± 0.14	94.79	1.05	102.031 ± 35.947
6A021@39	39.00 W	0.00090	0.00163	0.00239	1.08800	3.86080	12.12 ± 0.15	92.92	2.07	326.879 ± 199.535
6A021@40	40.00 W	0.00077	0.00126	0.00120	0.68729	2.45288	12.19 ± 0.11	90.94	1.31	266.552 ± 203.455
6A021@46	46.00 W	0.00020	0.00026	0.00071	0.37594	1.34257	12.20 ± 0.18	95.16	0.71	709.008 ± 712.524
6A021@32	32.00 W	0.00047	0.02318	0.00099	0.55742	1.99251	12.21 ± 0.12	92.90	1.06	11.785 ± 0.629
6A021@11	11.00 W	0.00049	0.00102	0.00155	0.88727	3.18919	12.28 ± 0.09	95.00	1.69	426.508 ± 337.411
6A021@42	42.00 W	0.00034	0.00055	0.00066	0.31983	1.16311	12.42 ± 0.20	91.42	0.61	283.438 ± 526.007
6A021@30	30.00 W	0.00045	0.00250	0.00124	0.68748	2.50983	12.47 ± 0.15	94.31	1.31	134.685 ± 64.528
6A021@31	31.00 W	0.00023	0.00029	0.00078	0.42720	1.56003	12.47 ± 0.18	95.26	0.81	718.793 ± 718.883
6A021@25	25.00 W	0.00074	0.00679	0.00213	1.07083	3.93503	12.55 ± 0.08	94.16	2.04	77.247 ± 11.261
6A021@01	1.00 W	0.00249	0.04405	0.00594	3.39577	12.53693	12.61 ± 0.06	93.86	6.46	37.773 ± 1.126
6A021@35	35.00 W	0.00120	0.00301	0.00283	1.43979	5.37481	12.75 ± 0.07	93.22	2.74	234.345 ± 73.391
6A021@10	10.00 W	0.00130	0.00072	0.00219	1.15273	4.36900	12.95 ± 0.09	91.38	2.19	785.531 ± 1246.545
6A021@22	22.00 W	0.00129	0.00276	0.00246	1.17289	4.45943	12.99 ± 0.09	91.58	2.23	208.605 ± 98.349
6A021@45	45.00 W	0.00332	0.00033	0.00121	0.48580	1.89793	13.34 ± 0.21	65.63	0.92	710.639 ± 713.385
		0.07184	0.17858	0.09547	52.59046	179.49261				

Information on Analysis	
Sample	WC-3 B-3
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.0019
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.3979 ± 0.0640 ± 1.88%	11.61 ± 0.22 ± 1.88%	268.83	100.00 50	21.047 ± 3.997
		External Error ± 0.22	2.01	Statistical T ratio	
		Analytical Error ± 0.22	16.3960	Error Magnification	
Total Fusion Age	3.4130 ± 0.0042 ± 0.12%	11.66 ± 0.01 ± 0.12%		50	144.301 ± 5.349
		External Error ± 0.01			
		Analytical Error ± 0.01			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A021@69	69.00 W	0.00000	0.00036	0.00131	0.69182	2.03042	9.82 ± 0.06	99.16	1.40	952.361 ± 1428.646
6A021@92	92.00 W	0.00269	0.00055	0.00198	1.05387	3.10808	9.86 ± 0.09	79.11	2.13	942.322 ± 1415.778
6A021@61	61.00 W	0.00148	0.00155	0.00633	3.58613	10.74130	10.02 ± 0.06	95.31	7.24	1130.897 ± 702.491
6A021@81	81.00 W	0.00393	0.00046	0.00169	0.89716	2.79486	10.42 ± 0.10	70.27	1.81	949.404 ± 1426.818
6A021@73	73.00 W	0.00076	0.00045	0.00359	1.57042	4.97215	10.59 ± 0.06	94.97	3.17	1724.877 ± 3636.946
6A021@83	83.00 W	0.00043	0.00036	0.00140	0.69676	2.21510	10.63 ± 0.11	93.93	1.41	945.609 ± 1421.871
6A021@62	62.00 W	0.00154	0.00099	0.00338	1.92521	6.19389	10.76 ± 0.08	92.50	3.89	957.387 ± 1437.385
6A021@80	80.00 W	0.00158	0.00054	0.00226	1.05552	3.41966	10.83 ± 0.07	87.41	2.13	949.623 ± 1426.746
6A021@86	86.00 W	0.00038	0.00026	0.00095	0.50397	1.63811	10.87 ± 0.14	92.89	1.02	943.707 ± 1415.685
6A021@77	77.00 W	0.00050	0.00031	0.00128	0.61190	2.01430	11.01 ± 0.10	92.54	1.23	954.682 ± 1436.016
6A021@67	67.00 W	0.00040	0.00040	0.00153	0.78084	2.58869	11.08 ± 0.10	94.95	1.58	953.793 ± 1430.788
6A021@57	57.00 W	0.00040	0.00061	0.00220	1.18812	3.96072	11.15 ± 0.07	96.43	2.40	960.387 ± 1440.661
6A021@90	90.00 W	0.00023	0.00008	0.00026	0.16329	0.55009	11.26 ± 0.30	88.38	0.33	943.407 ± 1415.385
6A021@72	72.00 W	0.00149	0.00069	0.00272	1.27472	4.31173	11.31 ± 0.08	90.10	2.57	910.582 ± 1167.731
6A021@84	84.00 W	0.00076	0.00025	0.00099	0.47784	1.62309	11.36 ± 0.13	87.23	0.96	952.052 ± 1428.210
6A021@65	65.00 W	0.00145	0.00063	0.00256	1.22582	4.17083	11.38 ± 0.07	90.09	2.47	958.708 ± 1440.082
6A021@70	70.00 W	0.00018	0.00050	0.00169	0.71293	2.43677	11.43 ± 0.09	97.19	1.44	696.887 ± 1265.633
6A021@54	54.00 W	0.00067	0.00073	0.00320	1.42785	4.88191	11.43 ± 0.07	95.43	2.88	963.162 ± 1444.820
6A021@94	94.00 W	0.00382	0.00034	0.00167	0.64769	2.22006	11.46 ± 0.15	65.96	1.31	940.329 ± 1414.187
6A021@100	100.00 W	0.00038	0.00066	0.00146	0.67936	2.33720	11.50 ± 0.09	94.71	1.37	505.861 ± 726.356
6A021@87	87.00 W	0.00028	0.00030	0.00124	0.57082	1.96425	11.50 ± 0.12	95.32	1.15	947.600 ± 1425.636
6A021@88	88.00 W	0.00074	0.00018	0.00058	0.34183	1.17721	11.51 ± 0.19	83.90	0.69	945.356 ± 1425.043
6A021@85	85.00 W	0.00011	0.00028	0.00109	0.54267	1.87484	11.55 ± 0.15	97.58	1.10	942.704 ± 1414.175
6A021@60	60.00 W	0.00168	0.00291	0.00316	1.35845	4.69497	11.55 ± 0.08	89.83	2.74	228.838 ± 66.624
6A021@75	75.00 W	0.00162	0.00066	0.00234	1.28417	4.45475	11.60 ± 0.08	89.69	2.59	952.839 ± 1431.176
6A021@71	71.00 W	0.00109	0.00074	0.00304	1.43136	4.96644	11.60 ± 0.07	93.30	2.89	953.606 ± 1432.136
6A021@89	89.00 W	0.00079	0.00030	0.00111	0.58442	2.02871	11.60 ± 0.12	89.10	1.18	944.624 ± 1417.046
6A021@82	82.00 W	0.00270	0.00052	0.00167	1.00166	3.48336	11.63 ± 0.08	80.91	2.02	949.330 ± 1424.081
6A021@55	55.00 W	0.00021	0.00062	0.00220	1.21492	4.22993	11.64 ± 0.07	97.87	2.45	962.914 ± 1446.417
6A021@95	95.00 W	0.00136	0.00074	0.00135	0.64117	2.24072	11.68 ± 0.12	84.28	1.29	425.240 ± 456.253
6A021@97	97.00 W	0.00037	0.00354	0.00071	0.42257	1.47682	11.68 ± 0.13	92.43	0.85	58.500 ± 14.303
6A021@52	52.00 W	0.00347	0.00304	0.00572	3.15266	11.05121	11.72 ± 0.06	90.91	6.36	507.523 ± 156.477
6A021@64	64.00 W	0.00067	0.00045	0.00191	0.87277	3.06691	11.75 ± 0.09	93.35	1.76	958.399 ± 1437.691
6A021@56	56.00 W	0.00178	0.00051	0.00207	1.00050	3.51887	11.76 ± 0.10	86.43	2.02	961.332 ± 1442.085
6A021@78	78.00 W	0.00072	0.00038	0.00135	0.73969	2.60456	11.77 ± 0.10	91.81	1.49	952.237 ± 1431.649
6A021@51	51.00 W	0.00012	0.00054	0.00196	1.06525	3.76468	11.81 ± 0.08	98.39	2.15	964.387 ± 1448.909
6A021@53	53.00 W	0.00217	0.00259	0.00569	2.85661	10.14654	11.87 ± 0.06	93.43	5.77	540.947 ± 218.733
6A021@59	59.00 W	0.00045	0.00594	0.00116	0.65328	2.32581	11.90 ± 0.10	93.92	1.32	53.929 ± 8.716
6A021@74	74.00 W	0.00088	0.00061	0.00144	0.67259	2.41696	12.01 ± 0.10	89.69	1.36	542.823 ± 847.361
6A021@93	93.00 W	0.00358	0.00054	0.00248	1.03709	3.74897	12.08 ± 0.10	77.58	2.09	944.173 ± 1418.602
6A021@79	79.00 W	0.00056	0.00028	0.00136	0.55242	2.00097	12.11 ± 0.13	91.78	1.11	954.172 ± 1435.676
6A021@98	98.00 W	0.00065	0.00056	0.00153	0.74186	2.68840	12.11 ± 0.09	92.75	1.50	650.254 ± 973.426
6A021@96	96.00 W	0.00052	0.00029	0.00118	0.56381	2.05579	12.19 ± 0.12	92.48	1.14	939.726 ± 1409.703
6A021@76	76.00 W	0.00100	0.00035	0.00132	0.68454	2.50039	12.21 ± 0.10	88.86	1.38	952.833 ± 1429.353
6A021@68	68.00 W	0.00037	0.00028	0.00088	0.54302	1.98783	12.24 ± 0.13	94.21	1.10	952.296 ± 1428.560
6A021@99	99.00 W	0.00025	0.00066	0.00080	0.46428	1.70001	12.24 ± 0.17	95.20	0.94	343.841 ± 438.284
6A021@91	91.00 W	0.00028	0.00219	0.00142	0.68505	2.50921	12.24 ± 0.10	96.18	1.38	153.367 ± 62.145
6A021@63	63.00 W	0.00132	0.00720	0.00261	1.20759	4.47408	12.38 ± 0.08	91.42	2.44	82.140 ± 11.276
6A021@58	58.00 W	0.00212	0.00047	0.00233	0.72131	2.67913	12.41 ± 0.11	80.58	1.46	750.093 ± 1652.710
6A021@66	66.00 W	0.00062	0.00040	0.00141	0.77083	2.99211	12.97 ± 0.11	93.65	1.56	954.077 ± 1431.212
		0.05556	0.04876	0.09954	49.55042	169.03342				

Information on Analysis	
Sample	WC-4- B-4
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001859
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.4002 ± 0.0619 ± 1.82%	11.37 ± 0.21 ± 1.86%	266.27	100.00 50	67.577 ± 11.509
		External Error ± 0.21	2.01	Statistical T ratio	
		Analytical Error ± 0.21	16.3176	Error Magnification	
Total Fusion Age	3.4113 ± 0.0040 ± 0.12%	11.40 ± 0.05 ± 0.42%		50	497.910 ± 57.111
		External Error ± 0.05			
		Analytical Error ± 0.01			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A022@05	5.00 W	0.00513	0.00157	0.00355	2.01300	5.64413	9.37 ± 0.08	78.27	4.45	626.908 ± 509.782
6A022@32	32.00 W	0.00010	0.00027	0.00085	0.46198	1.34693	9.74 ± 0.13	97.03	1.02	829.383 ± 1105.949
6A022@01	1.00 W	0.00240	0.00071	0.00453	2.48343	7.29448	9.81 ± 0.05	90.43	5.49	1711.222 ± 1801.520
6A022@10	10.00 W	0.00120	0.00083	0.00260	1.35865	3.99204	9.82 ± 0.08	91.13	3.00	800.942 ± 999.656
6A022@33	33.00 W	0.00037	0.00020	0.00081	0.33699	0.99849	9.90 ± 0.19	89.44	0.74	833.599 ± 1111.968
6A022@17	17.00 W	0.00044	0.00061	0.00239	1.04717	3.11088	9.93 ± 0.09	95.21	2.31	835.496 ± 1114.069
6A022@12	12.00 W	0.00065	0.00064	0.00174	1.08675	3.25281	10.00 ± 0.08	93.72	2.40	836.157 ± 1114.949
6A022@36	36.00 W	0.00052	0.00130	0.00135	0.83408	2.50843	10.05 ± 0.11	93.47	1.84	314.233 ± 278.448
6A022@18	18.00 W	0.00056	0.00068	0.00191	1.16152	3.50677	10.09 ± 0.09	94.76	2.57	832.659 ± 1111.363
6A022@28	28.00 W	0.00016	0.00029	0.00109	0.49768	1.50585	10.11 ± 0.12	96.15	1.10	829.751 ± 1108.950
6A022@07	7.00 W	0.00661	0.00091	0.00314	1.53514	4.65335	10.13 ± 0.11	70.02	3.39	829.809 ± 837.670
6A022@35	35.00 W	0.00071	0.00045	0.00137	0.75645	2.29463	10.13 ± 0.09	90.93	1.67	828.179 ± 1105.974
6A022@19	19.00 W	0.00169	0.00084	0.00272	1.43538	4.36008	10.15 ± 0.07	89.06	3.17	833.578 ± 1112.380
6A022@41	41.00 W	0.00143	0.00086	0.00166	0.91125	2.78301	10.20 ± 0.11	86.20	2.01	520.239 ± 501.856
6A022@14	14.00 W	0.00200	0.00063	0.00209	1.08103	3.30181	10.20 ± 0.09	84.24	2.39	834.590 ± 1114.023
6A022@15	15.00 W	0.00066	0.00034	0.00088	0.57503	1.76706	10.27 ± 0.16	89.34	1.27	835.146 ± 1111.430
6A022@06	6.00 W	0.00070	0.00062	0.00334	1.99413	6.15784	10.32 ± 0.06	96.02	4.40	1572.642 ± 2900.778
6A022@46	46.00 W	0.00127	0.00039	0.00147	0.65339	2.01872	10.32 ± 0.12	83.78	1.44	825.802 ± 1101.157
6A022@21	21.00 W	0.00133	0.00055	0.00158	0.93874	2.90444	10.34 ± 0.10	87.48	2.07	834.231 ± 1112.384
6A022@09	9.00 W	0.00047	0.00077	0.00114	0.56180	1.74419	10.37 ± 0.14	91.94	1.24	359.575 ± 432.432
6A022@30	30.00 W	0.00027	0.00028	0.00090	0.47003	1.45958	10.37 ± 0.15	94.10	1.04	828.245 ± 1107.085
6A022@47	47.00 W	0.00053	0.00066	0.00131	0.69315	2.16612	10.44 ± 0.10	92.56	1.53	511.002 ± 705.045
6A022@26	26.00 W	0.00105	0.00087	0.00333	1.48163	4.64033	10.46 ± 0.06	93.01	3.27	831.895 ± 1109.259
6A022@42	42.00 W	0.00038	0.00037	0.00117	0.61673	1.93434	10.48 ± 0.11	93.87	1.36	826.896 ± 1100.591
6A022@04	4.00 W	0.00098	0.00068	0.00253	1.16972	3.67809	10.50 ± 0.08	92.05	2.58	840.090 ± 1120.191
6A022@40	40.00 W	0.00037	0.00035	0.00102	0.59061	1.86358	10.54 ± 0.13	93.79	1.30	829.077 ± 1103.403
6A022@44	44.00 W	0.00056	0.00165	0.00136	0.75356	2.38352	10.57 ± 0.10	92.84	1.66	224.207 ± 114.702
6A022@48	48.00 W	0.00027	0.00042	0.00081	0.41638	1.32246	10.61 ± 0.20	93.62	0.92	483.392 ± 1083.792
6A022@39	39.00 W	0.00028	0.00063	0.00076	0.44213	1.40471	10.61 ± 0.14	93.83	0.98	345.630 ± 584.916
6A022@11	11.00 W	0.00015	0.00064	0.00205	1.09836	3.49058	10.62 ± 0.08	97.95	2.43	834.975 ± 1113.372
6A022@16	16.00 W	0.00128	0.00048	0.00186	1.10991	3.52848	10.62 ± 0.08	89.71	2.45	1122.549 ± 2086.987
6A022@50	50.00 W	0.00074	0.00085	0.00228	1.00834	3.21232	10.64 ± 0.08	92.95	2.23	581.735 ± 800.975
6A022@27	27.00 W	0.00030	0.00026	0.00099	0.45027	1.43636	10.66 ± 0.12	93.44	0.99	834.449 ± 1112.705
6A022@25	25.00 W	0.00023	0.00026	0.00089	0.44461	1.41989	10.67 ± 0.15	94.72	0.98	833.318 ± 1114.032
6A022@31	31.00 W	0.00047	0.00036	0.00115	0.60398	1.93149	10.68 ± 0.11	92.56	1.33	831.884 ± 1107.185
6A022@22	22.00 W	0.00106	0.00045	0.00254	0.76411	2.46332	10.77 ± 0.10	88.14	1.69	831.404 ± 1106.982
6A022@08	8.00 W	0.00174	0.00095	0.00287	1.62090	5.22923	10.78 ± 0.07	90.39	3.58	837.669 ± 1116.177
6A022@03	3.00 W	0.00082	0.00129	0.00228	1.36185	4.44604	10.90 ± 0.07	94.17	3.01	518.680 ± 327.651
6A022@37	37.00 W	0.00037	0.00031	0.00111	0.52503	1.74081	11.07 ± 0.14	93.41	1.16	826.903 ± 1105.011
6A022@38	38.00 W	0.00188	0.00113	0.00200	1.07603	3.57706	11.10 ± 0.07	85.98	2.38	468.444 ± 341.871
6A022@13	13.00 W	0.00050	0.00050	0.00175	0.84695	2.84425	11.22 ± 0.10	94.41	1.87	836.029 ± 1113.294
6A022@24	24.00 W	0.00037	0.00028	0.00092	0.47613	1.60948	11.29 ± 0.17	93.05	1.05	833.225 ± 1111.070
6A022@20	20.00 W	0.00220	0.00046	0.00138	0.78846	2.67929	11.35 ± 0.10	79.99	1.74	833.895 ± 1111.942
6A022@43	43.00 W	0.00016	0.00029	0.00101	0.48691	1.67009	11.45 ± 0.13	96.63	1.08	821.481 ± 1095.407
6A022@29	29.00 W	0.00068	0.00036	0.00106	0.60784	2.09128	11.49 ± 0.10	90.59	1.34	831.589 ± 1110.945
6A022@34	34.00 W	0.00046	0.00022	0.00070	0.38218	1.31512	11.49 ± 0.20	90.04	0.84	832.512 ± 1110.132
6A022@23	23.00 W	0.00062	0.00033	0.00104	0.55985	1.94648	11.61 ± 0.15	90.78	1.24	829.916 ± 1104.417
6A022@45	45.00 W	0.00052	0.00033	0.00116	0.55017	1.93682	11.76 ± 0.12	92.02	1.22	821.048 ± 1097.068
6A022@02	2.00 W	0.00197	0.00670	0.00231	1.33355	4.83851	12.11 ± 0.09	88.74	2.95	97.589 ± 16.692
6A022@49	49.00 W	0.00045	0.00048	0.00176	0.82213	3.69738	15.00 ± 0.10	96.04	1.82	834.161 ± 1751.203
		0.05005	0.03631	0.08652	45.27509	143.10294				

Information on Analysis

Sample	WC-5 B-5
Material	Wh. Mica
Location	3hutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001857
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.1623 ± 0.0690 ± 2.18%	10.56 ± 0.23 ± 2.21%	300.36	100.00 50	110.739 ± 22.836
		External Error ± 0.23	2.01	Statistical T ratio	
		Analytical Error ± 0.23	17.3309	Error Magnification	
Total Fusion Age	3.1607 ± 0.0041 ± 0.13%	10.56 ± 0.04 ± 0.42%		50	610.975 ± 94.537
		External Error ± 0.04			
		Analytical Error ± 0.01			

Appendix A.2.

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A013@34	34.00 W	0.00014	0.00091	0.00136	0.55527	1.65849	10.03 ± 0.09	96.82	2.27	300.434 ± 179.831
6A013@31	31.00 W	0.00085	0.00088	0.00193	0.85923	2.61035	10.20 ± 0.08	90.58	3.52	480.402 ± 313.711
6A013@20	20.00 W	0.00012	0.00089	0.00120	0.62842	1.98087	10.58 ± 0.08	97.55	2.57	344.523 ± 264.368
6A013@36	36.00 W	0.00011	0.00063	0.00062	0.31328	0.99277	10.64 ± 0.13	96.15	1.28	244.696 ± 266.906
6A013@11	11.00 W	0.00041	0.00173	0.00248	1.20299	3.86366	10.78 ± 0.06	96.22	4.92	340.014 ± 340.043
6A013@49	49.00 W	0.00008	0.00022	0.00025	0.14844	0.48858	11.05 ± 0.30	94.44	0.61	333.994 ± 334.037
6A013@16	16.00 W	0.00055	0.00173	0.00213	1.12894	3.73944	11.12 ± 0.06	95.15	4.62	319.955 ± 120.481
6A013@40	40.00 W	0.00016	0.00110	0.00085	0.37849	1.26151	11.19 ± 0.12	95.69	1.55	168.333 ± 91.351
6A013@26	26.00 W	0.00034	0.00090	0.00083	0.34244	1.14772	11.25 ± 0.12	91.36	1.40	187.219 ± 128.184
6A013@15	15.00 W	0.00041	0.00075	0.00175	0.62257	2.09241	11.28 ± 0.08	93.86	2.55	407.461 ± 330.023
6A013@46	46.00 W	0.00009	0.00038	0.00043	0.26003	0.87665	11.31 ± 0.17	96.45	1.06	334.415 ± 334.449
6A013@48	48.00 W	0.00005	0.00025	0.00032	0.17081	0.57600	11.32 ± 0.22	96.66	0.70	334.135 ± 334.176
6A013@04	4.00 W	0.00058	0.00148	0.00074	0.40602	1.37006	11.32 ± 0.13	88.34	1.66	134.666 ± 52.613
6A013@14	14.00 W	0.00079	0.00100	0.00091	0.38604	1.30383	11.33 ± 0.11	84.22	1.58	188.954 ± 123.573
6A013@08	8.00 W	0.00007	0.00099	0.00127	0.69160	2.36187	11.46 ± 0.08	98.39	2.83	340.593 ± 340.622
6A013@02	2.00 W	0.00086	0.00081	0.00109	0.56695	1.94644	11.52 ± 0.11	87.84	2.32	341.615 ± 341.646
6A013@17	17.00 W	0.00013	0.00082	0.00069	0.32760	1.12973	11.57 ± 0.16	95.97	1.34	195.477 ± 126.605
6A013@47	47.00 W	0.00002	0.00040	0.00044	0.27432	0.95083	11.63 ± 0.19	98.57	1.12	334.272 ± 334.308
6A013@07	7.00 W	0.00046	0.00149	0.00192	1.03390	3.59085	11.65 ± 0.07	95.70	4.23	340.738 ± 340.766
6A013@13	13.00 W	0.00013	0.00143	0.00266	0.97611	3.42253	11.77 ± 0.07	98.23	3.99	334.599 ± 122.550
6A013@44	44.00 W	0.00007	0.00031	0.00046	0.21387	0.75045	11.77 ± 0.22	96.78	0.88	334.701 ± 334.738
6A013@21	21.00 W	0.00033	0.00025	0.00168	0.94290	3.31248	11.79 ± 0.07	96.50	3.86	1861.408 ± 4711.122
6A013@43	43.00 W	0.00016	0.00041	0.00082	0.33987	1.20629	11.91 ± 0.12	95.57	1.39	408.105 ± 620.101
6A013@33	33.00 W	0.00011	0.00078	0.00148	0.56777	2.03775	12.04 ± 0.08	97.73	2.32	357.041 ± 310.549
6A013@18	18.00 W	0.00023	0.00097	0.00092	0.36746	1.32335	12.08 ± 0.13	94.55	1.50	185.026 ± 115.912
6A013@38	38.00 W	0.00051	0.00115	0.00169	0.38572	1.39472	12.13 ± 0.12	89.77	1.58	164.426 ± 85.555
6A013@50	50.00 W	0.00020	0.00039	0.00063	0.29805	1.08255	12.19 ± 0.14	94.25	1.22	376.831 ± 592.712
6A013@41	41.00 W	0.00026	0.00110	0.00114	0.60911	2.22517	12.26 ± 0.10	96.08	2.49	272.487 ± 133.277
6A013@22	22.00 W	0.00129	0.00114	0.00270	0.28773	1.05354	12.28 ± 0.20	72.99	1.18	123.941 ± 69.909
6A013@29	29.00 W	0.00056	0.00055	0.00144	0.44613	1.71548	12.90 ± 0.10	90.72	1.83	400.672 ± 498.554
6A013@25	25.00 W	0.00007	0.00038	0.00058	0.20133	0.78998	13.16 ± 0.22	96.96	0.82	257.458 ± 425.881
6A013@10	10.00 W	0.00066	0.00023	0.00827	0.82852	3.34901	13.56 ± 0.08	93.96	3.39	1752.388 ± 4493.244
6A013@09	9.00 W	0.00024	0.00079	0.00090	0.55150	2.25863	13.73 ± 0.11	96.42	2.26	340.450 ± 340.481
6A013@27	27.00 W	0.00028	0.00057	0.00062	0.28160	1.16392	13.86 ± 0.19	92.86	1.15	243.928 ± 264.394
6A013@01	1.00 W	0.00016	0.00007	0.00073	0.39697	1.65294	13.96 ± 0.14	96.70	1.62	2642.494 ± 19826.914
6A013@19	19.00 W	0.00047	0.00047	0.00122	0.57535	2.44583	14.25 ± 0.10	94.15	2.35	601.046 ± 952.347
6A013@32	32.00 W	0.00013	0.00083	0.00061	0.23763	1.01892	14.38 ± 0.20	95.93	0.97	140.417 ± 100.785
6A013@39	39.00 W	0.00044	0.00090	0.00062	0.29732	1.28845	14.53 ± 0.19	90.39	1.22	161.078 ± 135.743
6A013@05	5.00 W	0.00026	0.00122	0.00135	0.85122	3.68908	14.53 ± 0.10	97.42	3.48	341.027 ± 341.058
6A013@30	30.00 W	0.00017	0.00127	0.00117	0.60709	2.68667	14.84 ± 0.10	97.57	2.48	234.190 ± 97.443
6A013@03	3.00 W	0.00107	0.00134	0.00164	0.93646	4.24177	15.18 ± 0.09	92.56	3.83	341.318 ± 341.346
6A013@37	37.00 W	0.00017	0.00092	0.00066	0.27668	1.26987	15.38 ± 0.17	95.68	1.13	147.917 ± 96.639
6A013@35	35.00 W	0.00010	0.00087	0.00032	0.15981	0.75514	15.84 ± 0.25	95.57	0.65	89.764 ± 61.380
6A013@06	6.00 W	0.00039	0.00085	0.00104	0.58921	2.79783	15.91 ± 0.12	95.60	2.41	340.885 ± 340.916
6A013@24	24.00 W	0.00026	0.00055	0.00047	0.24875	1.19718	16.13 ± 0.20	93.55	1.02	220.013 ± 250.425
6A013@23	23.00 W	0.00017	0.00071	0.00056	0.27978	1.36229	16.32 ± 0.19	96.02	1.14	193.775 ± 164.793
6A013@42	42.00 W	0.00044	0.00074	0.00078	0.38423	1.87949	16.39 ± 0.14	93.15	1.57	253.194 ± 200.280
6A013@12	12.00 W	0.00013	0.00007	0.00138	0.80438	4.11880	17.16 ± 0.09	98.60	3.29	5492.191 ± 49536.733
6A013@28	28.00 W	0.00021	0.00039	0.00068	0.19685	1.29295	21.98 ± 0.24	95.18	0.81	248.512 ± 458.847
		0.01585	0.03901	0.06043	24.43674	92.72511				

Information on Analysis	
Sample	PC-1 A-24
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001866
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.6927 ± 0.1621 ± 4.39%	12.39 ± 0.54 ± 4.38%	1254.28	100.00 49	183.947 ± 23.114
		External Error ± 0.54	2.01	Statistical T ratio	
		Analytical Error ± 0.54	35.4159	Error Magnification	
Total Fusion Age	3.7945 ± 0.0048 ± 0.13%	12.73 ± 0.04 ± 0.32%		49	306.914 ± 40.030
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A013@97	97.00 W	0.00016	0.00016	0.00076	0.33794	1.07066	10.62 ± 0.15	95.02	1.90	1046.561 ± 4269.482
6A013@51	51.00 W	0.00021	0.00112	0.00104	0.52661	1.67766	10.68 ± 0.11	95.76	2.95	229.515 ± 148.874
6A013@66	66.00 W	0.00057	0.00019	0.00099	0.37027	1.18803	10.76 ± 0.15	86.92	2.08	978.479 ± 3831.116
6A013@96	96.00 W	0.00017	0.00061	0.00093	0.42286	1.36210	10.80 ± 0.14	95.76	2.37	337.657 ± 370.327
6A013@93	93.00 W	0.00011	0.00022	0.00049	0.23442	0.78147	11.18 ± 0.23	95.46	1.31	530.340 ± 1736.763
6A013@57	57.00 W	0.00420	0.00016	0.00097	0.45030	1.50260	11.19 ± 0.20	54.56	2.53	1355.339 ± 4994.228
6A013@52	52.00 W	0.00016	0.00099	0.00129	0.67805	2.26981	11.22 ± 0.09	97.26	3.80	335.538 ± 214.885
6A013@91	91.00 W	0.00039	0.00063	0.00098	0.53264	1.79196	11.28 ± 0.10	93.30	2.99	411.297 ± 433.629
6A013@65	65.00 W	0.00036	0.00003	0.00047	0.20183	0.67908	11.28 ± 0.24	85.86	1.13	3947.274 ± 112652.018
6A013@76	76.00 W	0.00011	0.00066	0.00070	0.38900	1.31604	11.34 ± 0.13	96.94	2.18	288.287 ± 267.989
6A013@75	75.00 W	0.00069	0.00094	0.00112	0.42633	1.45861	11.47 ± 0.14	87.22	2.39	223.164 ± 152.296
6A013@94	94.00 W	0.00009	0.00014	0.00072	0.35714	1.22948	11.54 ± 0.15	97.12	2.00	1289.765 ± 6221.505
6A013@55	55.00 W	0.00080	0.00054	0.00056	0.25117	0.87143	11.63 ± 0.25	78.21	1.41	227.173 ± 265.374
6A013@58	58.00 W	0.00032	0.00006	0.00110	0.49141	1.70512	11.63 ± 0.11	94.08	2.76	4156.774 ± 45195.165
6A013@61	61.00 W	0.00018	0.00033	0.00065	0.30731	1.07267	11.70 ± 0.16	94.51	1.72	462.175 ± 1047.456
6A013@63	63.00 W	0.00010	0.00046	0.00081	0.34302	1.20103	11.74 ± 0.14	96.85	1.92	362.690 ± 511.747
6A013@73	73.00 W	0.00014	0.00030	0.00037	0.16089	0.56926	11.86 ± 0.29	92.59	0.90	259.422 ± 546.205
6A013@92	92.00 W	0.00032	0.00050	0.00042	0.17392	0.62015	11.95 ± 0.31	86.29	0.98	171.602 ± 244.630
6A013@69	69.00 W	0.00080	0.00081	0.00060	0.29347	1.04656	11.95 ± 0.20	81.05	1.65	176.677 ± 141.409
6A013@59	59.00 W	0.00009	0.00010	0.00185	0.74152	2.69415	12.18 ± 0.08	98.35	4.16	3687.949 ± 21042.270
6A013@100	100.00 W	0.00008	0.00067	0.00074	0.34017	1.24274	12.24 ± 0.16	97.45	1.91	247.310 ± 222.273
6A013@95	95.00 W	0.00020	0.00038	0.00050	0.24321	0.89365	12.31 ± 0.20	93.17	1.36	316.420 ± 585.135
6A013@56	56.00 W	0.00028	0.00169	0.00075	0.38670	1.42510	12.35 ± 0.14	93.83	2.17	112.297 ± 47.683
6A013@79	79.00 W	0.00018	0.00042	0.00067	0.30084	1.12135	12.49 ± 0.19	94.94	1.69	347.263 ± 565.932
6A013@71	71.00 W	0.00015	0.00058	0.00054	0.19915	0.74275	12.50 ± 0.28	93.78	1.12	167.421 ± 176.749
6A013@53	53.00 W	0.00006	0.00026	0.00238	0.48674	1.82649	12.57 ± 0.13	98.42	2.73	923.382 ± 2616.529
6A013@82	82.00 W	0.00022	0.00031	0.00030	0.15502	0.58858	12.72 ± 0.36	89.60	0.87	244.122 ± 492.435
6A013@67	67.00 W	0.00009	0.00021	0.00037	0.20718	0.81104	13.12 ± 0.25	96.09	1.16	488.520 ± 1703.259
6A013@64	64.00 W	0.00023	0.00046	0.00089	0.36904	1.46009	13.26 ± 0.17	95.01	2.07	396.341 ± 593.931
6A013@81	81.00 W	0.00008	0.00072	0.00044	0.25644	1.04362	13.63 ± 0.21	97.30	1.44	175.556 ± 150.961
6A013@54	54.00 W	0.00058	0.00133	0.00163	0.87977	3.80654	14.49 ± 0.09	95.17	4.93	324.566 ± 160.691
6A013@86	86.00 W	0.00009	0.00033	0.00018	0.10605	0.46440	14.67 ± 0.43	93.86	0.59	155.419 ± 345.501
6A013@74	74.00 W	0.00024	0.00079	0.00116	0.38421	1.69130	14.74 ± 0.16	95.38	2.16	239.442 ± 214.333
6A013@90	90.00 W	0.00138	0.00009	0.00082	0.51752	2.36255	15.29 ± 0.12	84.87	2.90	2727.961 ± 21895.095
6A013@60	60.00 W	0.00020	0.00048	0.00111	0.60895	2.83703	15.60 ± 0.11	97.41	3.42	617.235 ± 839.914
6A013@70	70.00 W	0.00185	0.01372	0.00103	0.46446	2.17124	15.65 ± 0.15	79.57	2.61	16.582 ± 1.022
6A013@98	98.00 W	0.00020	0.00041	0.00034	0.19032	0.88973	15.65 ± 0.24	93.19	1.07	228.717 ± 348.428
6A013@78	78.00 W	0.00012	0.00090	0.00075	0.41099	1.93348	15.75 ± 0.13	97.70	2.31	223.136 ± 153.714
6A013@62	62.00 W	0.00010	0.00076	0.00109	0.58948	2.77698	15.77 ± 0.11	98.47	3.31	381.215 ± 313.471
6A013@83	83.00 W	0.00051	0.00051	0.00078	0.37820	1.78301	15.78 ± 0.17	91.74	2.12	359.980 ± 467.760
6A013@84	84.00 W	0.00014	0.00051	0.00036	0.19499	0.94242	16.18 ± 0.25	95.36	1.09	186.922 ± 254.732
6A013@87	87.00 W	0.00023	0.00054	0.00099	0.54608	2.64136	16.19 ± 0.11	96.96	3.06	491.920 ± 557.410
6A013@85	85.00 W	0.00022	0.00055	0.00096	0.25791	1.24861	16.21 ± 0.21	94.62	1.45	228.592 ± 257.989
6A013@80	80.00 W	0.00048	0.00057	0.00049	0.25481	1.23922	16.28 ± 0.22	89.36	1.43	218.861 ± 295.042
6A013@68	68.00 W	0.00014	0.00007	0.00051	0.23432	1.14206	16.32 ± 0.19	95.96	1.31	1638.931 ± 14793.045
6A013@89	89.00 W	0.00041	0.00068	0.00066	0.36445	1.78993	16.44 ± 0.16	93.20	2.04	261.825 ± 241.434
6A013@99	99.00 W	0.00055	0.00040	0.00070	0.36638	1.81774	16.61 ± 0.16	91.43	2.06	449.585 ± 804.880
6A013@72	72.00 W	0.00013	0.00058	0.00051	0.25787	1.28091	16.63 ± 0.22	96.53	1.45	218.525 ± 262.122
6A013@88	88.00 W	0.00014	0.00005	0.00029	0.18704	0.92954	16.64 ± 0.25	95.27	1.05	2004.720 ± 27473.327
		0.01927	0.03793	0.03874	17.82842	71.01133				

Information on Analysis	
Sample	PC-2 A-25
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001864
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.9421 ± 0.1784 ± 4.52%	13.21 ± 0.60 ± 4.52%	771.51	100.00 49	16.755 ± 1.727
		External Error ± 0.60	2.01	Statistical T ratio	
		Analytical Error ± 0.60	27.7762	Error Magnification	
Total Fusion Age	3.9830 ± 0.0068 ± 0.17%	13.34 ± 0.05 ± 0.34%		49	230.338 ± 28.568
		External Error ± 0.05			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A018@18	18.00 W	0.00017	0.00106	0.00177	0.77424	2.23450	9.67 ± 0.07	96.93	2.95	358.103 ± 448.145
6A018@31	31.00 W	0.00043	0.00057	0.00145	0.64536	1.94944	10.12 ± 0.10	93.17	2.46	550.200 ± 1284.909
6A018@12	12.00 W	0.00007	0.00020	0.00056	0.35282	1.14146	10.84 ± 0.17	97.47	1.35	867.926 ± 1153.514
6A018@41	41.00 W	0.00021	0.00016	0.00055	0.30225	0.98661	10.93 ± 0.21	93.51	1.15	914.018 ± 7952.886
6A018@11	11.00 W	0.00008	0.00043	0.00072	0.37927	1.24808	11.02 ± 0.18	97.41	1.45	436.199 ± 1272.916
6A018@10	10.00 W	0.00010	0.00098	0.00087	0.41498	1.38704	11.19 ± 0.14	97.19	1.58	207.212 ± 264.424
6A018@24	24.00 W	0.00036	0.00020	0.00067	0.34585	1.16720	11.30 ± 0.14	91.01	1.32	865.798 ± 1049.589
6A018@29	29.00 W	0.00020	0.00104	0.00291	1.34165	4.54343	11.34 ± 0.07	97.99	5.12	630.652 ± 761.002
6A018@38	38.00 W	0.00035	0.00019	0.00067	0.33418	1.13538	11.38 ± 0.18	90.99	1.27	864.228 ± 1155.622
6A018@48	48.00 W	0.00046	0.00035	0.00088	0.44913	1.54438	11.51 ± 0.15	91.27	1.71	630.024 ± 2156.161
6A018@19	19.00 W	0.00018	0.00476	0.00110	0.48513	1.66864	11.52 ± 0.12	96.31	1.85	49.919 ± 13.148
6A018@04	4.00 W	0.00264	0.00042	0.00104	0.55880	1.93136	11.57 ± 0.15	70.84	2.13	644.744 ± 2057.909
6A018@26	26.00 W	0.00027	0.00078	0.00153	0.79558	2.76197	11.62 ± 0.09	96.55	3.03	499.269 ± 798.215
6A018@34	34.00 W	0.00030	0.00098	0.00089	0.48209	1.67479	11.63 ± 0.12	94.26	1.84	240.117 ± 305.079
6A018@44	44.00 W	0.00058	0.00047	0.00105	0.45514	1.58542	11.66 ± 0.14	89.61	1.74	469.787 ± 1231.768
6A018@03	3.00 W	0.00024	0.00065	0.00145	0.74970	2.61344	11.67 ± 0.09	96.67	2.86	568.325 ± 1099.459
6A018@49	49.00 W	0.00009	0.00016	0.00063	0.28007	0.97675	11.68 ± 0.23	96.66	1.07	855.757 ± 1139.034
6A018@22	22.00 W	0.00018	0.00092	0.00097	0.34153	1.19238	11.69 ± 0.18	95.06	1.30	181.934 ± 255.488
6A018@43	43.00 W	0.00032	0.00149	0.00099	0.36145	1.26919	11.76 ± 0.17	92.50	1.38	118.769 ± 103.838
6A018@08	8.00 W	0.00006	0.00017	0.00188	0.86288	3.03203	11.77 ± 0.07	98.68	3.29	2552.651 ± 19432.563
6A018@42	42.00 W	0.00120	0.00039	0.00085	0.50763	1.78384	11.77 ± 0.13	82.93	1.94	638.459 ± 2359.016
6A018@09	9.00 W	0.00015	0.00054	0.00130	0.47288	1.68820	11.95 ± 0.12	96.86	1.80	425.514 ± 1051.372
6A018@32	32.00 W	0.00079	0.00110	0.00249	1.20128	4.30303	11.99 ± 0.07	94.23	4.58	533.965 ± 633.734
6A018@39	39.00 W	0.00019	0.00020	0.00096	0.43767	1.58471	12.12 ± 0.15	95.99	1.67	1063.824 ± 6541.093
6A018@50	50.00 W	0.00051	0.00025	0.00080	0.40274	1.46750	12.20 ± 0.15	90.18	1.54	777.224 ± 3849.591
6A018@23	23.00 W	0.00012	0.00084	0.00083	0.40464	1.47471	12.20 ± 0.13	96.94	1.54	236.579 ± 337.172
6A018@33	33.00 W	0.00050	0.00081	0.00229	0.97108	3.54481	12.22 ± 0.09	95.36	3.70	584.933 ± 857.067
6A018@01	1.00 W	0.00015	0.00038	0.00180	0.68769	2.52070	12.27 ± 0.09	97.66	2.62	876.334 ± 1170.773
6A018@07	7.00 W	0.00064	0.00056	0.00197	0.90847	3.35000	12.34 ± 0.08	94.02	3.46	792.935 ± 1894.290
6A018@02	2.00 W	0.00017	0.00037	0.00239	1.08910	4.03984	12.42 ± 0.06	98.12	4.15	1436.419 ± 4732.984
6A018@46	46.00 W	0.00015	0.00037	0.00079	0.45680	1.70142	12.47 ± 0.15	96.87	1.74	607.796 ± 2063.173
6A018@47	47.00 W	0.00026	0.00065	0.00075	0.27921	1.04482	12.53 ± 0.23	92.67	1.06	209.253 ± 388.386
6A018@45	45.00 W	0.00008	0.00018	0.00068	0.38666	1.44952	12.55 ± 0.16	97.76	1.47	1050.665 ± 7822.224
6A018@06	6.00 W	0.00043	0.00061	0.00107	0.60538	2.36578	13.08 ± 0.11	94.33	2.31	487.500 ± 1011.150
6A018@35	35.00 W	0.00027	0.00096	0.00119	0.60891	2.54058	13.96 ± 0.11	96.41	2.32	311.840 ± 370.628
6A018@28	28.00 W	0.00044	0.00091	0.00052	0.29822	1.25642	14.10 ± 0.26	90.07	1.14	161.037 ± 206.912
6A018@30	30.00 W	0.00017	0.00089	0.00065	0.30666	1.29237	14.10 ± 0.21	95.73	1.17	169.304 ± 255.326
6A018@21	21.00 W	0.00080	0.00020	0.00099	0.50945	2.14825	14.11 ± 0.13	89.57	1.94	1277.004 ± 8628.206
6A018@05	5.00 W	0.00068	0.00029	0.00068	0.37952	1.78631	15.74 ± 0.15	89.44	1.45	643.444 ± 2866.972
6A018@36	36.00 W	0.00056	0.00048	0.00098	0.55572	2.61619	15.75 ± 0.13	93.59	2.12	563.695 ± 1411.346
6A018@16	16.00 W	0.00040	0.00132	0.00100	0.58452	2.79198	15.97 ± 0.12	95.43	2.23	216.847 ± 191.318
6A018@15	15.00 W	0.00042	0.00070	0.00099	0.53167	2.54474	16.01 ± 0.12	94.93	2.03	370.682 ± 761.852
6A018@17	17.00 W	0.00020	0.00040	0.00051	0.25324	1.22616	16.19 ± 0.21	94.92	0.97	312.971 ± 1131.111
6A018@13	13.00 W	0.00011	0.00032	0.00076	0.41991	2.03553	16.21 ± 0.16	97.88	1.60	653.037 ± 2808.494
6A018@27	27.00 W	0.00040	0.00026	0.00047	0.27957	1.35923	16.26 ± 0.23	91.64	1.07	523.031 ± 2941.294
6A018@20	20.00 W	0.00006	0.00014	0.00041	0.24584	1.20568	16.40 ± 0.24	98.10	0.94	868.354 ± 1158.599
6A018@25	25.00 W	0.00030	0.00089	0.00082	0.45852	2.25348	16.43 ± 0.13	95.75	1.75	253.833 ± 352.334
6A018@37	37.00 W	0.00132	0.00089	0.00061	0.34591	1.70946	16.53 ± 0.23	81.08	1.32	189.729 ± 301.589
6A018@14	14.00 W	0.00038	0.00059	0.00104	0.53573	2.65561	16.58 ± 0.12	95.48	2.04	447.019 ± 975.169
6A018@40	40.00 W	0.00103	0.00022	0.00074	0.39266	1.97741	16.84 ± 0.18	86.29	1.50	859.102 ± 1143.305
		0.02017	0.03271	0.05392	26.22939	99.76179				

Information on Analysis	
Sample	PC-3 A-26
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001862
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.7196 ± 0.1511 ± 4.06%	12.45 ± 0.51 ± 4.06%	903.62	100.00 50	57.124 ± 12.853
		External Error ± 0.51	2.01	Statistical T ratio	
		Analytical Error ± 0.50	30.0603	Error Magnification	
Total Fusion Age	3.8034 ± 0.0054 ± 0.14%	12.73 ± 0.04 ± 0.33%		50	392.970 ± 102.070
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A018@52	52.00 W	0.00029	0.00086	0.00425	0.53456	1.45177	9.09 ± 0.11	93.58	1.98	303.895 ± 474.534
6A018@69	69.00 W	0.00041	0.00083	0.00111	0.59622	1.90256	10.68 ± 0.12	93.34	2.21	353.496 ± 540.451
6A018@81	81.00 W	0.00014	0.00069	0.00099	0.48827	1.58272	10.84 ± 0.13	96.65	1.81	347.102 ± 704.878
6A018@74	74.00 W	0.00008	0.00023	0.00064	0.29271	0.96529	11.03 ± 0.21	96.78	1.08	611.991 ± 3624.952
6A018@86	86.00 W	0.00044	0.00040	0.00106	0.50842	1.70573	11.22 ± 0.15	92.25	1.88	628.376 ± 2225.194
6A018@64	64.00 W	0.00019	0.00244	0.00136	0.69734	2.34844	11.27 ± 0.10	97.02	2.58	139.794 ± 76.983
6A018@63	63.00 W	0.00089	0.00058	0.00140	0.70092	2.37545	11.34 ± 0.13	89.41	2.59	595.012 ± 1476.947
6A018@66	66.00 W	0.00047	0.00058	0.00162	0.73723	2.51365	11.41 ± 0.10	94.16	2.73	620.203 ± 1369.288
6A018@99	99.00 W	0.00024	0.00021	0.00073	0.36100	1.23141	11.41 ± 0.19	93.84	1.34	861.794 ± 1146.195
6A018@90	90.00 W	0.00021	0.00066	0.00067	0.36334	1.24224	11.44 ± 0.18	94.67	1.34	269.118 ± 535.477
6A018@82	82.00 W	0.00025	0.00043	0.00105	0.43233	1.48632	11.50 ± 0.15	94.56	1.60	493.650 ± 1454.237
6A018@59	59.00 W	0.00030	0.00107	0.00254	0.96679	3.32503	11.50 ± 0.08	96.74	3.58	443.672 ± 609.293
6A018@67	67.00 W	0.00021	0.00042	0.00162	0.75633	2.60373	11.51 ± 0.11	97.00	2.80	876.015 ± 1170.200
6A018@89	89.00 W	0.00048	0.00275	0.00073	0.36299	1.25269	11.54 ± 0.19	89.21	1.34	64.718 ± 35.360
6A018@87	87.00 W	0.00028	0.00017	0.00059	0.31184	1.08451	11.63 ± 0.20	92.19	1.15	921.357 ± 7990.295
6A018@94	94.00 W	0.00020	0.00030	0.00127	0.52155	1.83271	11.75 ± 0.12	96.23	1.93	866.070 ± 1157.863
6A018@79	79.00 W	0.00045	0.00121	0.00157	0.65081	2.31026	11.87 ± 0.11	93.97	2.41	263.504 ± 291.620
6A018@97	97.00 W	0.00008	0.00016	0.00056	0.28304	1.01462	11.99 ± 0.21	97.11	1.05	862.950 ± 1147.477
6A018@88	88.00 W	0.00078	0.00019	0.00079	0.34161	1.24054	12.14 ± 0.20	83.83	1.26	871.274 ± 1165.994
6A018@75	75.00 W	0.00031	0.00110	0.00080	0.38600	1.40459	12.17 ± 0.16	93.22	1.43	171.788 ± 201.997
6A018@62	62.00 W	0.00109	0.00158	0.00383	1.00409	3.69341	12.30 ± 0.08	91.39	3.72	311.564 ± 268.045
6A018@78	78.00 W	0.00030	0.00142	0.00111	0.58629	2.20352	12.57 ± 0.12	95.58	2.17	201.923 ± 179.938
6A018@93	93.00 W	0.00057	0.00041	0.00151	0.71839	2.72220	12.67 ± 0.10	93.60	2.66	865.858 ± 1152.402
6A018@61	61.00 W	0.00114	0.00107	0.00313	1.15036	4.37100	12.71 ± 0.08	92.28	4.26	526.870 ± 607.965
6A018@57	57.00 W	0.00025	0.00026	0.00095	0.46239	1.75758	12.71 ± 0.15	95.35	1.71	880.657 ± 1174.330
6A018@100	100.00 W	0.00009	0.00019	0.00073	0.33953	1.29726	12.78 ± 0.20	97.35	1.26	861.329 ± 1145.847
6A018@95	95.00 W	0.00060	0.00035	0.00111	0.55301	2.15693	13.04 ± 0.14	91.90	2.05	773.452 ± 2769.888
6A018@84	84.00 W	0.00018	0.00049	0.00090	0.37842	1.47679	13.05 ± 0.18	96.00	1.40	379.795 ± 1109.788
6A018@51	51.00 W	0.00115	0.00073	0.00189	0.88098	3.45200	13.10 ± 0.09	90.54	3.26	590.992 ± 1157.736
6A018@91	91.00 W	0.00033	0.00061	0.00117	0.59153	2.35359	13.30 ± 0.13	95.40	2.19	476.498 ± 1033.002
6A018@80	80.00 W	0.00028	0.00128	0.00109	0.57954	2.36711	13.65 ± 0.12	96.08	2.15	222.457 ± 232.306
6A018@70	70.00 W	0.00035	0.00294	0.00084	0.48045	1.98574	13.82 ± 0.14	94.50	1.78	80.028 ± 37.699
6A018@58	58.00 W	0.00032	0.00035	0.00121	0.63275	2.81532	14.87 ± 0.13	96.26	2.34	880.311 ± 1173.851
6A018@65	65.00 W	0.00050	0.00062	0.00064	0.34821	1.54986	14.87 ± 0.19	90.82	1.29	276.187 ± 565.692
6A018@68	68.00 W	0.00070	0.00099	0.00094	0.44671	2.05666	15.38 ± 0.15	90.42	1.65	220.527 ± 278.030
6A018@85	85.00 W	0.00047	0.00083	0.00084	0.47957	2.21156	15.41 ± 0.13	93.58	1.77	282.361 ± 420.026
6A018@71	71.00 W	0.00054	0.00068	0.00070	0.34174	1.57877	15.44 ± 0.20	90.37	1.26	246.687 ± 513.296
6A018@56	56.00 W	0.00034	0.00085	0.00114	0.55582	2.57055	15.45 ± 0.13	95.74	2.06	322.035 ± 516.259
6A018@76	76.00 W	0.00039	0.00153	0.00102	0.53536	2.48234	15.49 ± 0.14	95.02	1.98	171.574 ± 143.120
6A018@54	54.00 W	0.00016	0.00039	0.00134	0.70736	3.31788	15.67 ± 0.11	98.05	2.62	880.271 ± 1176.032
6A018@72	72.00 W	0.00010	0.00034	0.00057	0.30578	1.43949	15.73 ± 0.20	97.41	1.13	442.381 ± 1751.281
6A018@77	77.00 W	0.00112	0.00103	0.00113	0.59291	2.80035	15.78 ± 0.13	89.04	2.19	282.712 ± 350.896
6A018@96	96.00 W	0.00041	0.00015	0.00046	0.25603	1.21744	15.89 ± 0.24	90.48	0.95	864.927 ± 1153.410
6A018@83	83.00 W	0.00027	0.00031	0.00054	0.26165	1.25371	16.01 ± 0.28	93.57	0.97	407.771 ± 1686.477
6A018@73	73.00 W	0.00047	0.00119	0.00093	0.42138	2.04489	16.21 ± 0.23	93.20	1.56	173.922 ± 200.177
6A018@98	98.00 W	0.00040	0.00082	0.00106	0.60375	2.94191	16.28 ± 0.13	95.65	2.23	360.110 ± 572.313
6A018@55	55.00 W	0.00040	0.00250	0.00159	0.85264	4.17200	16.34 ± 0.09	96.74	3.16	167.157 ± 86.864
6A018@92	92.00 W	0.00047	0.00086	0.00094	0.47360	2.32538	16.40 ± 0.14	93.87	1.75	269.252 ± 378.597
6A018@53	53.00 W	0.00062	0.00072	0.00152	0.77412	3.83009	16.53 ± 0.11	94.96	2.87	524.095 ± 1034.284
6A018@60	60.00 W	0.00084	0.00128	0.00079	0.41066	2.05099	16.68 ± 0.18	88.78	1.52	156.896 ± 158.758
		0.02157	0.04204	0.06098	27.01833	107.37059				

Information on Analysis	
Sample	PC-4 A-27
Material	Wh. Mica
Location	3hutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.00186
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.9282 ± 0.1680 ± 4.28%	13.13 ± 0.56 ± 4.27%	943.98	100.00 50	107.011 ± 22.498
		External Error ± 0.56	2.01	Statistical T ratio	
		Analytical Error ± 0.56	30.7243	Error Magnification	
Total Fusion Age	3.9740 ± 0.0057 ± 0.14%	13.29 ± 0.04 ± 0.33%		50	314.907 ± 63.350
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A0019@42	42.00 W	0.00009	0.00035	0.00128	0.59931	1.61919	9.03 ± 0.08	97.47	1.22	850.692 ± 1136.677
6A0019@37	37.00 W	0.00161	0.00170	0.00222	0.86651	2.41669	9.32 ± 0.08	82.93	1.77	249.353 ± 182.421
6A0019@08	8.00 W	0.00105	0.00142	0.00200	0.79083	2.21512	9.36 ± 0.09	87.06	1.61	272.406 ± 238.705
6A0019@47	47.00 W	0.00072	0.00067	0.00187	0.58158	1.73381	9.97 ± 0.12	88.40	1.19	425.740 ± 810.088
6A0019@09	9.00 W	0.00108	0.00285	0.00319	1.25695	3.96267	10.54 ± 0.07	91.86	2.56	216.182 ± 101.806
6A0019@43	43.00 W	0.00015	0.00057	0.00122	0.71459	2.27420	10.64 ± 0.09	97.30	1.46	610.719 ± 1273.355
6A0019@25	25.00 W	0.00031	0.00092	0.00181	0.86625	2.81074	10.84 ± 0.07	96.13	1.77	461.463 ± 616.363
6A0019@03	3.00 W	0.00056	0.00127	0.00513	2.28853	7.51107	10.97 ± 0.05	97.14	4.66	883.639 ± 870.003
6A0019@06	6.00 W	0.00724	0.01223	0.00208	1.27358	4.18318	10.98 ± 0.12	65.84	2.60	51.025 ± 5.257
6A0019@19	19.00 W	0.00047	0.00055	0.00149	0.77319	2.54953	11.02 ± 0.07	94.17	1.58	691.878 ± 1550.523
6A0019@33	33.00 W	0.00024	0.00054	0.00146	0.66244	2.21271	11.16 ± 0.09	96.17	1.35	598.693 ± 1365.587
6A0019@02	2.00 W	0.00647	0.00084	0.00718	3.62726	12.12178	11.17 ± 0.08	85.82	7.39	2114.397 ± 2893.179
6A0019@39	39.00 W	0.00045	0.00034	0.00136	0.69117	2.30988	11.17 ± 0.08	93.92	1.41	991.483 ± 3631.729
6A0019@27	27.00 W	0.00092	0.00079	0.00293	0.97164	3.26193	11.22 ± 0.08	91.64	1.98	605.915 ± 1118.646
6A0019@40	40.00 W	0.00025	0.00061	0.00183	0.91551	3.07360	11.22 ± 0.08	96.93	1.87	731.162 ± 1590.401
6A0019@12	12.00 W	0.00237	0.00231	0.00314	1.51030	5.07843	11.24 ± 0.07	87.31	3.08	320.189 ± 218.462
6A0019@17	17.00 W	0.00140	0.00290	0.00363	1.51768	5.11709	11.27 ± 0.07	91.90	3.09	256.263 ± 146.693
6A0019@14	14.00 W	0.00065	0.00346	0.00271	1.36164	4.64774	11.41 ± 0.08	95.34	2.77	193.063 ± 92.054
6A0019@11	11.00 W	0.00108	0.00137	0.00258	0.91785	3.13689	11.42 ± 0.08	90.19	1.87	329.116 ± 443.818
6A0019@05	5.00 W	0.00110	0.00267	0.00246	1.17189	4.00936	11.43 ± 0.07	91.89	2.39	214.861 ± 98.016
6A0019@15	15.00 W	0.00327	0.00101	0.00293	1.08194	3.72881	11.52 ± 0.09	78.95	2.20	526.934 ± 870.541
6A0019@10	10.00 W	0.00073	0.00185	0.00274	1.22055	4.22087	11.55 ± 0.07	94.51	2.49	322.770 ± 204.414
6A0019@44	44.00 W	0.00013	0.00037	0.00128	0.63893	2.21336	11.57 ± 0.10	97.59	1.30	850.147 ± 1131.444
6A0019@41	41.00 W	0.00032	0.00080	0.00241	0.75767	2.63340	11.61 ± 0.09	95.88	1.54	464.238 ± 787.846
6A0019@20	20.00 W	0.00037	0.00089	0.00159	0.77742	2.70285	11.62 ± 0.08	95.50	1.58	427.486 ± 652.668
6A0019@21	21.00 W	0.00053	0.03240	0.00177	0.71911	2.51199	11.67 ± 0.09	93.45	1.47	10.877 ± 0.529
6A0019@04	4.00 W	0.00135	0.00150	0.00275	1.42048	4.99358	11.75 ± 0.06	92.02	2.89	462.806 ± 366.571
6A0019@07	7.00 W	0.00096	0.00236	0.00290	1.23944	4.41176	11.89 ± 0.07	93.35	2.53	257.684 ± 138.888
6A0019@16	16.00 W	0.00121	0.00259	0.00268	1.17519	4.20684	11.96 ± 0.07	91.59	2.39	222.345 ± 135.186
6A0019@24	24.00 W	0.00030	0.00100	0.00175	0.87330	3.15619	12.07 ± 0.08	96.65	1.78	427.852 ± 504.614
6A0019@36	36.00 W	0.00030	0.00117	0.00157	0.73855	2.73042	12.35 ± 0.09	96.19	1.50	308.193 ± 369.282
6A0019@46	46.00 W	0.00068	0.00102	0.00309	0.95832	3.54377	12.35 ± 0.08	94.05	1.95	460.526 ± 550.909
6A0019@30	30.00 W	0.00042	0.00071	0.00174	0.80062	3.01308	12.57 ± 0.09	95.40	1.63	555.988 ± 1065.817
6A0019@23	23.00 W	0.00034	0.00062	0.00136	0.69533	2.66723	12.81 ± 0.09	95.75	1.42	553.384 ± 1140.394
6A0019@29	29.00 W	0.00265	0.00098	0.00282	0.76050	3.12174	13.71 ± 0.14	79.53	1.55	380.551 ± 516.749
6A0019@31	31.00 W	0.00197	0.00355	0.00212	1.09435	4.51292	13.77 ± 0.10	88.12	2.23	151.101 ± 56.229
6A0019@35	35.00 W	0.00269	0.00108	0.00431	2.05150	8.50524	13.84 ± 0.07	90.94	4.18	930.865 ± 1138.506
6A0019@34	34.00 W	0.00027	0.00106	0.00119	0.58652	2.45526	13.98 ± 0.11	96.26	1.20	271.326 ± 335.011
6A0019@22	22.00 W	0.00030	0.00151	0.00121	0.63472	2.69721	14.19 ± 0.10	96.27	1.29	205.598 ± 179.791
6A0019@48	48.00 W	0.00056	0.00295	0.00117	0.62672	2.73088	14.55 ± 0.10	93.79	1.28	103.932 ± 47.890
6A0019@49	49.00 W	0.00055	0.00087	0.00096	0.55132	2.48528	15.05 ± 0.13	93.42	1.12	311.367 ± 452.871
6A0019@50	50.00 W	0.00020	0.00075	0.00118	0.60055	2.85309	15.85 ± 0.10	97.44	1.22	391.953 ± 791.734
6A0019@38	38.00 W	0.00086	0.00096	0.00085	0.45173	2.16053	15.96 ± 0.14	89.07	0.92	230.753 ± 330.033
6A0019@28	28.00 W	0.00040	0.00046	0.00143	0.80995	3.89112	16.03 ± 0.10	96.53	1.65	854.962 ± 1140.035
6A0019@26	26.00 W	0.00047	0.00071	0.00146	0.88210	4.23822	16.03 ± 0.09	96.32	1.80	605.464 ± 1040.719
6A0019@13	13.00 W	0.00089	0.00330	0.00107	0.55397	2.69317	16.22 ± 0.14	90.67	1.13	82.352 ± 42.732
6A0019@01	1.00 W	0.00009	0.00135	0.00194	1.14529	5.62664	16.39 ± 0.08	99.05	2.33	414.365 ± 345.986
6A0019@45	45.00 W	0.00041	0.00079	0.00134	0.67213	3.30618	16.41 ± 0.10	96.01	1.37	416.846 ± 758.494
6A0019@18	18.00 W	0.00087	0.00301	0.00144	0.72769	3.62272	16.61 ± 0.11	92.93	1.48	118.596 ± 60.926
6A0019@32	32.00 W	0.00013	0.00084	0.00099	0.47304	2.35712	16.63 ± 0.13	97.92	0.96	277.204 ± 441.521
		0.05243	0.11081	0.10760	49.07763	180.23706				

Information on Analysis

Sample	PC-5 A-28
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001858
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.6264 ± 0.1575 ± 4.34%	12.11 ± 0.53 ± 4.34%	1915.78	100.00 50	11.368 ± 1.638
		External Error ± 0.53	2.01	Statistical T ratio	
		Analytical Error ± 0.52	43.7696	Error Magnification	
Total Fusion Age	3.6725 ± 0.0040 ± 0.11%	12.27 ± 0.04 ± 0.32%		50	217.013 ± 18.423
		External Error ± 0.04			
		Analytical Error ± 0.01			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A014@48	48.00 W	0.00015	0.00035	0.00079	0.37103	1.00477	9.04 ± 0.17	95.01	1.23	516.596 ± 516.652
6A014@29	29.00 W	0.00029	0.00065	0.00131	0.68876	2.17391	10.54 ± 0.10	95.54	2.29	521.114 ± 520.404
6A014@28	28.00 W	0.00046	0.00059	0.00116	0.63303	2.03045	10.71 ± 0.10	93.05	2.10	521.680 ± 522.557
6A014@37	37.00 W	0.00043	0.00032	0.00160	0.47294	1.52212	10.74 ± 0.12	91.69	1.57	735.103 ± 1626.833
6A014@13	13.00 W	0.00035	0.00044	0.00070	0.30382	0.99291	10.91 ± 0.21	89.98	1.01	335.889 ± 569.988
6A014@11	11.00 W	0.00013	0.00076	0.00184	0.81285	2.70434	11.11 ± 0.09	97.86	2.70	525.429 ± 524.829
6A014@05	5.00 W	0.00010	0.00113	0.00090	0.46829	1.56335	11.14 ± 0.15	97.42	1.56	203.533 ± 334.983
6A014@06	6.00 W	0.00036	0.00065	0.00127	0.61096	2.07225	11.32 ± 0.17	94.52	2.03	459.412 ± 571.563
6A014@26	26.00 W	0.00061	0.00063	0.00121	0.58688	1.99709	11.36 ± 0.13	91.07	1.95	458.338 ± 559.197
6A014@03	3.00 W	0.00041	0.00060	0.00228	1.06845	3.66817	11.46 ± 0.07	96.13	3.55	866.492 ± 983.963
6A014@02	2.00 W	0.00039	0.00066	0.00219	1.06016	3.64038	11.46 ± 0.08	96.29	3.52	789.952 ± 1240.238
6A014@47	47.00 W	0.00017	0.00042	0.00085	0.44540	1.53265	11.49 ± 0.15	96.07	1.48	517.005 ± 517.058
6A014@46	46.00 W	0.00283	0.00070	0.00141	0.73970	2.57759	11.63 ± 0.11	75.10	2.46	516.783 ± 516.832
6A014@40	40.00 W	0.00010	0.00052	0.00066	0.27035	0.94238	11.63 ± 0.25	96.29	0.90	254.912 ± 365.247
6A014@50	50.00 W	0.00032	0.00059	0.00180	0.77752	2.72022	11.68 ± 0.09	96.00	2.58	640.945 ± 754.962
6A014@15	15.00 W	0.00005	0.00049	0.00104	0.52837	1.85055	11.69 ± 0.13	98.53	1.76	524.705 ± 523.762
6A014@12	12.00 W	0.00016	0.00083	0.00170	0.88747	3.11817	11.73 ± 0.08	97.81	2.95	525.468 ± 524.922
6A014@19	19.00 W	0.00027	0.00118	0.00119	0.57326	2.03655	11.86 ± 0.11	95.55	1.91	238.555 ± 135.175
6A014@04	4.00 W	0.00020	0.00046	0.00116	0.50007	1.78802	11.93 ± 0.19	96.20	1.66	527.150 ± 526.147
6A014@01	1.00 W	0.00124	0.00065	0.00261	1.26327	4.52106	11.94 ± 0.07	91.91	4.20	950.006 ± 1276.329
6A014@35	35.00 W	0.00029	0.00045	0.00059	0.25514	0.91352	11.95 ± 0.26	90.84	0.85	276.267 ± 402.556
6A014@16	16.00 W	0.00065	0.00089	0.00222	0.94820	3.44350	12.12 ± 0.08	94.11	3.15	524.887 ± 525.490
6A014@24	24.00 W	0.00011	0.00073	0.00128	0.66021	2.43729	12.32 ± 0.11	97.97	2.19	446.128 ± 443.088
6A014@36	36.00 W	0.00014	0.00047	0.00100	0.49847	1.91138	12.79 ± 0.12	97.20	1.66	519.556 ± 520.653
6A014@30	30.00 W	0.00019	0.00054	0.00155	0.56329	2.22504	13.18 ± 0.11	96.90	1.87	515.861 ± 625.273
6A014@20	20.00 W	0.00059	0.00055	0.00225	1.18942	4.83340	13.56 ± 0.08	95.97	3.95	1060.321 ± 1271.776
6A014@10	10.00 W	0.00012	0.00044	0.00132	0.63292	2.61732	13.79 ± 0.12	98.09	2.10	706.902 ± 1105.065
6A014@38	38.00 W	0.00051	0.00060	0.00098	0.53443	2.21586	13.83 ± 0.12	93.05	1.78	439.829 ± 491.593
6A014@09	9.00 W	0.00029	0.00080	0.00117	0.60099	2.51280	13.95 ± 0.11	96.20	2.00	369.306 ± 388.241
6A014@43	43.00 W	0.00016	0.00056	0.00076	0.40625	1.71959	14.12 ± 0.16	96.78	1.35	352.555 ± 432.727
6A014@32	32.00 W	0.00018	0.00080	0.00163	0.85143	3.62065	14.18 ± 0.10	97.98	2.83	520.604 ± 520.038
6A014@21	21.00 W	0.00045	0.00055	0.00110	0.59231	2.52317	14.21 ± 0.12	94.50	1.97	522.939 ± 522.104
6A014@07	7.00 W	0.00110	0.00157	0.00175	0.61004	2.62330	14.34 ± 0.15	88.48	2.03	190.506 ± 116.159
6A014@49	49.00 W	0.00022	0.00053	0.00094	0.52290	2.25528	14.38 ± 0.12	96.64	1.74	480.356 ± 686.929
6A014@31	31.00 W	0.00011	0.00044	0.00097	0.46508	2.01251	14.43 ± 0.14	97.88	1.55	520.556 ± 520.608
6A014@08	8.00 W	0.00103	0.00147	0.00169	0.94761	4.17907	14.71 ± 0.10	92.72	3.15	315.190 ± 172.647
6A014@14	14.00 W	0.00031	0.00049	0.00094	0.52407	2.34074	14.89 ± 0.14	95.73	1.74	524.635 ± 523.684
6A014@27	27.00 W	0.00055	0.00038	0.00094	0.56774	2.55800	15.02 ± 0.14	93.57	1.89	729.765 ± 1528.470
6A014@18	18.00 W	0.00042	0.00047	0.00110	0.56867	2.58579	15.16 ± 0.12	94.93	1.89	587.562 ± 861.260
6A014@25	25.00 W	0.00006	0.00033	0.00074	0.35213	1.63323	15.46 ± 0.20	98.34	1.17	522.566 ± 524.113
6A014@17	17.00 W	0.00017	0.00024	0.00048	0.25384	1.18080	15.51 ± 0.23	95.34	0.84	524.636 ± 526.773
6A014@33	33.00 W	0.00052	0.00036	0.00067	0.38303	1.79349	15.61 ± 0.19	91.69	1.27	520.301 ± 520.356
6A014@22	22.00 W	0.00054	0.00055	0.00178	0.97358	4.64738	15.91 ± 0.09	96.17	3.24	860.159 ± 1043.854
6A014@34	34.00 W	0.00029	0.00048	0.00050	0.25743	1.22972	15.92 ± 0.24	93.04	0.86	262.436 ± 372.099
6A014@41	41.00 W	0.00062	0.00051	0.00065	0.29689	1.43845	16.15 ± 0.23	88.33	0.99	283.057 ± 415.846
6A014@42	42.00 W	0.00044	0.00031	0.00059	0.32406	1.57475	16.20 ± 0.20	91.87	1.08	518.390 ± 520.053
6A014@44	44.00 W	0.00029	0.00041	0.00080	0.43463	2.13046	16.34 ± 0.16	95.68	1.44	517.977 ± 519.226
6A014@39	39.00 W	0.00039	0.00062	0.00120	0.58483	2.90788	16.57 ± 0.13	95.77	1.94	463.501 ± 581.037
6A014@23	23.00 W	0.00048	0.00043	0.00114	0.60279	3.00673	16.62 ± 0.13	95.07	2.00	683.225 ± 1287.512
6A014@45	45.00 W	0.00045	0.00041	0.00110	0.62146	3.15854	16.94 ± 0.12	95.50	2.07	748.798 ± 1427.919
		0.02068	0.03001	0.06151	30.08642	118.68660				

Information on Analysis

Sample	PC-6 A-29
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001856
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.8837 ± 0.1573 ± 4.05%	12.96 ± 0.52 ± 4.05%	997.71	100.00 50	339.435 ± 55.966
		External Error ± 0.52	2.01	Statistical T ratio	
		Analytical Error ± 0.52	31.5866	Error Magnification	
Total Fusion Age	3.9449 ± 0.0052 ± 0.13%	13.16 ± 0.04 ± 0.33%		50	491.217 ± 83.917
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A0019@55	55.00 W	0.00071	0.00082	0.00298	1.60492	5.00607	10.40 ± 0.05	95.23	2.89	955.817 ± 1273.398
6A0019@72	72.00 W	0.00110	0.00058	0.00238	1.29472	4.22726	10.89 ± 0.07	92.21	2.33	1100.319 ± 1657.737
6A0019@77	77.00 W	0.00076	0.00102	0.00266	1.57767	5.19807	10.99 ± 0.06	95.19	2.84	756.405 ± 715.894
6A0019@84	84.00 W	0.00097	0.00103	0.00196	1.04912	3.52020	11.19 ± 0.07	91.86	1.89	499.371 ± 436.815
6A0019@88	88.00 W	0.00057	0.00088	0.00219	1.08957	3.67731	11.25 ± 0.07	94.92	1.96	604.340 ± 662.163
6A0019@99	99.00 W	0.00044	0.00041	0.00152	0.73054	2.46838	11.27 ± 0.08	94.34	1.31	871.524 ± 1799.471
6A0019@64	64.00 W	0.00061	0.00112	0.00166	0.83778	2.85527	11.36 ± 0.07	93.44	1.51	367.378 ± 271.191
6A0019@71	71.00 W	0.00039	0.00080	0.00173	0.80928	2.76577	11.39 ± 0.09	95.32	1.45	493.364 ± 597.373
6A0019@63	63.00 W	0.00040	0.00054	0.00206	1.04567	3.60461	11.49 ± 0.07	96.13	1.88	954.038 ± 1273.833
6A0019@74	74.00 W	0.00041	0.00064	0.00262	1.24306	4.28512	11.49 ± 0.06	96.59	2.23	951.726 ± 1267.630
6A0019@53	53.00 W	0.00016	0.00159	0.00217	1.17520	4.07632	11.56 ± 0.07	98.16	2.11	361.258 ± 252.150
6A0019@89	89.00 W	0.00129	0.00150	0.00247	1.32695	4.63703	11.65 ± 0.06	91.79	2.39	433.269 ± 343.592
6A0019@73	73.00 W	0.00043	0.00044	0.00169	0.85799	3.00636	11.68 ± 0.07	95.31	1.54	951.609 ± 1266.850
6A0019@97	97.00 W	0.00190	0.00057	0.00212	1.09388	3.90410	11.90 ± 0.07	86.88	1.97	938.681 ± 1253.249
6A0019@81	81.00 W	0.00038	0.00064	0.00219	1.23195	4.47298	12.10 ± 0.07	96.90	2.21	948.863 ± 1266.667
6A0019@92	92.00 W	0.00101	0.00279	0.00188	0.98618	3.71437	12.55 ± 0.10	91.99	1.77	173.277 ± 58.149
6A0019@54	54.00 W	0.00019	0.00065	0.00230	1.26294	4.83226	12.75 ± 0.07	98.24	2.27	957.957 ± 1278.767
6A0019@79	79.00 W	0.00027	0.00045	0.00232	1.20889	4.68388	12.91 ± 0.08	97.69	2.17	1320.603 ± 2390.618
6A0019@86	86.00 W	0.00209	0.00096	0.00195	1.07731	4.17939	12.93 ± 0.09	86.62	1.94	547.208 ± 472.455
6A0019@57	57.00 W	0.00053	0.00107	0.00266	1.37139	5.37799	13.07 ± 0.06	96.59	2.47	626.357 ± 477.766
6A0019@59	59.00 W	0.00063	0.00041	0.00143	0.80641	3.16901	13.10 ± 0.09	93.88	1.45	955.765 ± 1272.256
6A0019@70	70.00 W	0.00046	0.00494	0.00234	1.35386	5.34651	13.16 ± 0.07	96.94	2.43	134.199 ± 24.841
6A0019@66	66.00 W	0.00112	0.00175	0.00536	2.92856	11.58590	13.18 ± 0.06	96.62	5.26	821.271 ± 455.318
6A0019@90	90.00 W	0.00037	0.00264	0.00258	1.34063	5.31215	13.20 ± 0.07	97.38	2.41	249.266 ± 83.464
6A0019@100	100.00 W	0.00214	0.00066	0.00247	1.27081	5.03911	13.21 ± 0.08	88.35	2.28	940.795 ± 1254.476
6A0019@60	60.00 W	0.00109	0.00083	0.00315	1.70322	6.93383	13.57 ± 0.06	95.02	3.06	1001.031 ± 1311.986
6A0019@98	98.00 W	0.00048	0.00079	0.00259	1.24273	5.07097	13.60 ± 0.07	96.70	2.23	772.023 ± 1114.622
6A0019@65	65.00 W	0.00367	0.00057	0.00283	1.59938	6.56545	13.68 ± 0.08	85.38	2.88	1371.245 ± 2514.446
6A0019@95	95.00 W	0.00060	0.00056	0.00147	0.72673	3.05007	13.98 ± 0.09	93.95	1.31	631.569 ± 818.765
6A0019@80	80.00 W	0.00056	0.00046	0.00181	0.89342	3.76550	14.04 ± 0.08	95.25	1.61	944.940 ± 1261.971
6A0019@62	62.00 W	0.00042	0.00051	0.00188	0.96782	4.09646	14.10 ± 0.08	96.48	1.74	936.691 ± 1249.012
6A0019@67	67.00 W	0.00102	0.00130	0.00232	1.28000	5.43224	14.14 ± 0.07	94.21	2.30	481.600 ± 298.166
6A0019@76	76.00 W	0.00118	0.00476	0.00163	0.86598	3.68657	14.18 ± 0.09	90.87	1.56	89.140 ± 15.492
6A0019@94	94.00 W	0.00044	0.00036	0.00119	0.69854	2.97699	14.20 ± 0.09	95.27	1.26	938.287 ± 1251.154
6A0019@51	51.00 W	0.00074	0.00053	0.00243	1.37759	5.87627	14.21 ± 0.07	95.86	2.48	1263.594 ± 2046.620
6A0019@93	93.00 W	0.00022	0.00037	0.00132	0.71397	3.04577	14.21 ± 0.10	97.37	1.28	944.392 ± 1261.755
6A0019@83	83.00 W	0.00035	0.00051	0.00199	1.10319	4.71841	14.25 ± 0.07	97.33	1.98	1067.402 ± 1886.142
6A0019@58	58.00 W	0.00040	0.00038	0.00197	1.04081	4.46195	14.28 ± 0.09	96.86	1.87	1343.326 ± 2752.401
6A0019@68	68.00 W	0.00027	0.00143	0.00272	1.50707	6.56042	14.50 ± 0.07	98.22	2.71	515.201 ± 338.737
6A0019@96	96.00 W	0.00030	0.00058	0.00115	0.58270	2.54788	14.57 ± 0.12	96.12	1.05	490.405 ± 797.785
6A0019@82	82.00 W	0.00024	0.00054	0.00210	1.04470	4.57135	14.58 ± 0.09	97.91	1.88	946.819 ± 1608.483
6A0019@69	69.00 W	0.00121	0.00063	0.00219	1.13257	4.97673	14.64 ± 0.09	92.79	2.04	875.497 ± 1244.806
6A0019@56	56.00 W	0.00076	0.00159	0.00174	0.93721	4.13400	14.69 ± 0.09	94.34	1.68	289.578 ± 167.169
6A0019@85	85.00 W	0.00066	0.00042	0.00148	0.81286	3.60878	14.79 ± 0.09	94.37	1.46	945.876 ± 1263.426
6A0019@52	52.00 W	0.00020	0.00237	0.00235	1.31072	5.82097	14.79 ± 0.07	98.43	2.36	270.679 ± 97.309
6A0019@91	91.00 W	0.00049	0.00029	0.00118	0.56659	2.51734	14.80 ± 0.10	94.06	1.02	941.571 ± 1255.545
6A0019@75	75.00 W	0.00061	0.00288	0.00151	0.77374	3.52482	15.17 ± 0.09	94.62	1.39	131.671 ± 42.777
6A0019@61	61.00 W	0.00149	0.00074	0.00238	1.27654	5.85660	15.28 ± 0.08	92.53	2.29	845.650 ± 807.164
6A0019@87	87.00 W	0.00012	0.00093	0.00190	0.89416	4.11423	15.32 ± 0.09	98.60	1.61	469.189 ± 373.590
		0.03686	0.05327	0.10497	55.62751	218.85904				

Information on Analysis	
Sample	PC-7 A-30
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001854
Standard	28.34

Results	40(r)/39(k) ± 2σ		Age ± 2σ (Ma)		MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.8829	± 0.1216 ± 3.13%	12.94	± 0.41 ± 3.14%	1436.51	100.00 49	120.512 ± 20.424
			External Error ± 0.41		2.01	Statistical T ratio	
			Analytical Error ± 0.40		37.9013	Error Magnification	
Total Fusion Age	3.9344	± 0.0033 ± 0.08%	13.11	± 0.04 ± 0.31%		49	511.665 ± 57.744
			External Error ± 0.04				
			Analytical Error ± 0.01				

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A014@92	92.00 W	0.00041	0.00048	0.00083	0.40316	1.12321	9.27 ± 0.13	89.56	1.27	409.582 ± 585.235
6A014@70	70.00 W	0.00043	0.00042	0.00135	0.67874	1.89267	9.28 ± 0.07	92.94	2.14	798.254 ± 1544.517
6A014@81	81.00 W	0.00101	0.00016	0.00098	0.41498	1.16345	9.33 ± 0.12	79.09	1.31	1245.975 ± 6259.012
6A014@54	54.00 W	0.00035	0.00020	0.00164	0.73897	2.08281	9.38 ± 0.10	94.46	2.33	1774.361 ± 6207.248
6A014@52	52.00 W	0.00045	0.00057	0.00128	0.53091	1.53041	9.60 ± 0.12	91.25	1.67	457.845 ± 716.908
6A014@55	55.00 W	0.00051	0.00006	0.00136	0.46323	1.36109	9.78 ± 0.12	89.37	1.46	4100.101 ± 61272.973
6A014@95	95.00 W	0.00022	0.00054	0.00117	0.43747	1.29722	9.87 ± 0.11	94.45	1.38	398.969 ± 399.009
6A014@62	62.00 W	0.00045	0.00068	0.00458	1.59578	4.82640	10.07 ± 0.06	96.57	5.03	1143.083 ± 1328.378
6A014@73	73.00 W	0.00051	0.00164	0.00114	0.52753	1.59808	10.08 ± 0.10	90.67	1.66	157.940 ± 63.689
6A014@86	86.00 W	0.00007	0.00031	0.00098	0.55984	1.74634	10.38 ± 0.09	98.02	1.77	872.604 ± 1944.040
6A014@96	96.00 W	0.00055	0.00046	0.00074	0.37572	1.20209	10.65 ± 0.13	87.49	1.18	400.561 ± 400.602
6A014@88	88.00 W	0.00307	0.00068	0.00067	0.31626	1.08172	11.38 ± 0.24	54.15	1.00	226.655 ± 209.179
6A014@100	100.00 W	0.00003	0.00043	0.00078	0.34938	1.20492	11.47 ± 0.16	98.55	1.10	398.707 ± 398.750
6A014@99	99.00 W	0.00002	0.00054	0.00083	0.43905	1.56017	11.82 ± 0.11	98.95	1.38	399.721 ± 399.761
6A014@80	80.00 W	0.00054	0.00070	0.00129	0.63543	2.26697	11.87 ± 0.10	92.83	2.00	446.343 ± 430.906
6A014@57	57.00 W	0.00050	0.00070	0.00153	0.86450	3.24467	12.48 ± 0.09	95.07	2.73	604.630 ± 644.462
6A014@68	68.00 W	0.00086	0.00319	0.00150	0.69836	2.65992	12.67 ± 0.10	90.74	2.20	107.158 ± 26.082
6A014@90	90.00 W	0.00032	0.00042	0.00065	0.38872	1.49769	12.81 ± 0.14	93.48	1.23	457.889 ± 862.961
6A014@58	58.00 W	0.00045	0.00087	0.00156	0.85961	3.33974	12.92 ± 0.09	95.58	2.71	482.720 ± 409.747
6A014@65	65.00 W	0.00309	0.00480	0.00214	1.13138	4.41562	12.98 ± 0.09	82.43	3.57	115.557 ± 18.586
6A014@67	67.00 W	0.00042	0.00275	0.00157	0.77416	3.02271	12.98 ± 0.10	95.43	2.44	137.862 ± 37.065
6A014@83	83.00 W	0.00022	0.00026	0.00085	0.45527	1.85245	13.53 ± 0.12	96.09	1.44	867.608 ± 2214.311
6A014@74	74.00 W	0.00025	0.00064	0.00125	0.69445	2.83028	13.55 ± 0.10	96.92	2.19	529.253 ± 666.317
6A014@61	61.00 W	0.00098	0.00085	0.00278	1.43043	5.83386	13.56 ± 0.07	94.71	4.51	828.497 ± 857.937
6A014@72	72.00 W	0.00042	0.00251	0.00158	0.68507	2.83416	13.75 ± 0.09	95.22	2.16	133.580 ± 34.151
6A014@77	77.00 W	0.00053	0.01107	0.00103	0.54938	2.28423	13.82 ± 0.10	93.07	1.73	24.328 ± 1.735
6A014@82	82.00 W	0.00013	0.00053	0.00094	0.45232	1.88654	13.87 ± 0.12	97.40	1.43	421.531 ± 563.601
6A014@60	60.00 W	0.00009	0.00055	0.00076	0.42913	1.79490	13.91 ± 0.15	97.95	1.35	380.742 ± 546.547
6A014@66	66.00 W	0.00054	0.00199	0.00239	1.25886	5.29181	13.98 ± 0.08	96.51	3.97	309.278 ± 113.134
6A014@98	98.00 W	0.00066	0.00005	0.00103	0.57524	2.46719	14.26 ± 0.10	92.13	1.81	5163.211 ± 66544.273
6A014@85	85.00 W	0.00013	0.00057	0.00088	0.43044	1.84810	14.27 ± 0.13	97.38	1.36	371.274 ± 411.454
6A014@97	97.00 W	0.00057	0.00060	0.00079	0.44400	1.91685	14.35 ± 0.12	91.42	1.40	360.879 ± 390.553
6A014@78	78.00 W	0.00071	0.00057	0.00115	0.62388	2.70574	14.42 ± 0.09	92.30	1.97	531.831 ± 679.382
6A014@84	84.00 W	0.00173	0.00053	0.00086	0.42954	1.86540	14.44 ± 0.15	78.10	1.35	396.467 ± 458.565
6A014@69	69.00 W	0.00321	0.00040	0.00208	1.13968	4.95870	14.46 ± 0.09	83.55	3.59	1410.926 ± 2698.029
6A014@53	53.00 W	0.00012	0.00080	0.00120	0.68594	3.00340	14.55 ± 0.11	98.32	2.16	422.647 ± 440.734
6A014@51	51.00 W	0.00031	0.00046	0.00157	0.91376	4.04460	14.71 ± 0.08	97.22	2.88	970.797 ± 1691.805
6A014@64	64.00 W	0.00044	0.00111	0.00336	1.55633	6.92899	14.80 ± 0.07	97.61	4.91	688.895 ± 471.193
6A014@56	56.00 W	0.00047	0.00067	0.00139	0.68740	3.08104	14.90 ± 0.12	95.16	2.17	499.484 ± 584.139
6A014@59	59.00 W	0.00034	0.00086	0.00155	0.71511	3.21904	14.96 ± 0.10	96.47	2.25	407.057 ± 407.094
6A014@79	79.00 W	0.00090	0.00062	0.00151	0.76104	3.44587	15.05 ± 0.09	92.38	2.40	604.883 ± 774.464
6A014@94	94.00 W	0.00008	0.00040	0.00143	0.70662	3.20216	15.06 ± 0.10	98.77	2.23	869.569 ± 1658.410
6A014@71	71.00 W	0.00110	0.00031	0.00076	0.35297	1.62389	15.29 ± 0.18	82.96	1.11	558.639 ± 1284.205
6A014@89	89.00 W	0.00042	0.00006	0.00075	0.42379	1.98255	15.55 ± 0.15	93.70	1.34	3536.874 ± 36597.386
6A014@75	75.00 W	0.00094	0.00420	0.00216	0.96497	4.51869	15.56 ± 0.09	93.71	3.04	112.453 ± 17.627
6A014@76	76.00 W	0.00027	0.00046	0.00081	0.40032	1.92326	15.96 ± 0.12	95.55	1.26	427.321 ± 682.156
6A014@63	63.00 W	0.00078	0.00070	0.00067	0.30520	1.51950	16.54 ± 0.20	86.52	0.96	212.178 ± 232.098
6A014@93	93.00 W	0.00051	0.00057	0.00091	0.46407	2.33131	16.69 ± 0.13	93.45	1.46	400.370 ± 400.410
		0.03111	0.05294	0.06503	31.71843	125.31241				

Information on Analysis	
Sample	PC-8 A-34
Material	Wh. Mica
Location	3hutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.00185
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.8777 ± 0.1835 ± 4.73%	12.90 ± 0.61 ± 4.72%	1707.78	100.00 48	27.122 ± 5.227
		External Error ± 0.61	2.01	Statistical T ratio	
		Analytical Error ± 0.61	41.3253	Error Magnification	
Total Fusion Age	3.9508 ± 0.0046 ± 0.12%	13.14 ± 0.04 ± 0.32%		48	293.555 ± 27.842
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A015@21	21.00 W	0.00018	0.00070	0.00208	0.89946	2.73885	10.12 ± 0.07	97.32	3.13	632.568 ± 632.628
6A015@24	24.00 W	0.00038	0.00347	0.00128	0.56412	1.80103	10.61 ± 0.11	93.45	1.96	79.609 ± 17.565
6A015@13	13.00 W	0.00027	0.00080	0.00069	0.36987	1.18928	10.68 ± 0.16	93.10	1.29	226.690 ± 225.753
6A015@19	19.00 W	0.00033	0.00037	0.00104	0.47587	1.56885	10.95 ± 0.11	93.53	1.66	633.429 ± 635.412
6A015@29	29.00 W	0.00011	0.00039	0.00089	0.50747	1.74089	11.39 ± 0.12	97.50	1.77	630.734 ± 632.589
6A015@39	39.00 W	0.00036	0.00045	0.00084	0.38625	1.36742	11.76 ± 0.17	92.16	1.34	424.166 ± 866.283
6A015@30	30.00 W	0.00057	0.00061	0.00166	0.85641	3.03465	11.77 ± 0.08	94.13	2.98	689.878 ± 841.244
6A015@43	43.00 W	0.00012	0.00047	0.00115	0.59601	2.12612	11.85 ± 0.11	97.75	2.07	626.264 ± 624.820
6A015@26	26.00 W	0.00058	0.00051	0.00126	0.66015	2.36240	11.89 ± 0.09	92.65	2.30	631.978 ± 633.419
6A015@48	48.00 W	0.00010	0.00091	0.00066	0.29855	1.07287	11.93 ± 0.18	96.62	1.04	160.719 ± 137.008
6A015@01	1.00 W	0.00021	0.00142	0.00068	0.38728	1.40020	12.01 ± 0.13	95.17	1.35	133.674 ± 67.830
6A015@46	46.00 W	0.00001	0.00034	0.00080	0.36546	1.32708	12.06 ± 0.16	99.13	1.27	534.346 ± 1374.279
6A015@17	17.00 W	0.00024	0.00030	0.00101	0.38210	1.39251	12.10 ± 0.16	94.49	1.33	633.623 ± 633.698
6A015@41	41.00 W	0.00030	0.00035	0.00073	0.44265	1.61521	12.12 ± 0.16	94.17	1.54	627.427 ± 627.497
6A015@37	37.00 W	0.00012	0.00026	0.00065	0.33127	1.22413	12.27 ± 0.18	96.63	1.15	629.769 ± 629.847
6A015@25	25.00 W	0.00079	0.00073	0.00157	0.94405	3.49373	12.29 ± 0.08	93.16	3.28	631.635 ± 630.734
6A015@23	23.00 W	0.00040	0.00090	0.00336	1.16266	4.30555	12.30 ± 0.07	96.67	4.04	632.219 ± 631.495
6A015@31	31.00 W	0.00026	0.00116	0.00125	0.72719	2.69725	12.32 ± 0.09	96.59	2.53	308.024 ± 263.215
6A015@27	27.00 W	0.00014	0.00033	0.00097	0.42750	1.63893	12.73 ± 0.13	96.86	1.49	632.009 ± 634.211
6A015@16	16.00 W	0.00052	0.00055	0.00154	0.64243	2.46352	12.73 ± 0.10	93.51	2.23	569.215 ± 924.956
6A015@34	34.00 W	0.00027	0.00050	0.00110	0.63626	2.46471	12.86 ± 0.10	96.32	2.21	628.943 ± 627.588
6A015@35	35.00 W	0.00135	0.00105	0.00180	0.86853	3.37533	12.90 ± 0.09	88.90	3.02	405.585 ± 304.137
6A015@45	45.00 W	0.00193	0.00071	0.00135	0.65963	2.63218	13.25 ± 0.11	81.76	2.29	455.590 ± 536.290
6A015@11	11.00 W	0.00030	0.00108	0.00140	0.77945	3.17662	13.53 ± 0.09	96.72	2.71	354.485 ± 291.683
6A015@14	14.00 W	0.00009	0.00062	0.00154	0.80121	3.40709	14.11 ± 0.09	98.64	2.79	635.213 ± 636.415
6A015@38	38.00 W	0.00011	0.00038	0.00089	0.48588	2.06691	14.12 ± 0.11	97.84	1.69	628.299 ± 628.367
6A015@09	9.00 W	0.00092	0.00038	0.00090	0.49695	2.11658	14.14 ± 0.15	88.17	1.73	635.724 ± 635.792
6A015@02	2.00 W	0.00069	0.00051	0.00127	0.66232	2.82845	14.17 ± 0.10	92.77	2.30	638.064 ± 1247.974
6A015@03	3.00 W	0.00026	0.00095	0.00125	0.73424	3.14528	14.22 ± 0.10	97.09	2.55	380.094 ± 297.351
6A015@15	15.00 W	0.00044	0.00057	0.00078	0.46040	1.98194	14.29 ± 0.13	93.40	1.60	396.762 ± 473.417
6A015@07	7.00 W	0.00023	0.00067	0.00101	0.49955	2.15171	14.30 ± 0.11	96.42	1.74	364.710 ± 423.984
6A015@22	22.00 W	0.00083	0.00045	0.00109	0.57648	2.48725	14.32 ± 0.12	90.50	2.01	632.673 ± 634.317
6A015@10	10.00 W	0.00014	0.00096	0.00097	0.51218	2.21865	14.38 ± 0.12	97.68	1.78	262.107 ± 243.886
6A015@36	36.00 W	0.00005	0.00024	0.00066	0.30619	1.32706	14.38 ± 0.17	98.42	1.07	628.775 ± 631.807
6A015@06	6.00 W	0.00069	0.00085	0.00118	0.67625	2.93581	14.41 ± 0.11	92.96	2.35	387.908 ± 362.396
6A015@49	49.00 W	0.00189	0.00062	0.00149	0.79225	3.44063	14.41 ± 0.13	85.58	2.76	625.559 ± 626.755
6A015@28	28.00 W	0.00007	0.00115	0.00087	0.43674	1.90620	14.49 ± 0.14	98.35	1.52	186.472 ± 141.600
6A015@44	44.00 W	0.00006	0.00038	0.00096	0.48873	2.13378	14.49 ± 0.11	98.64	1.70	626.584 ± 626.653
6A015@04	4.00 W	0.00094	0.00078	0.00173	1.02105	4.50133	14.63 ± 0.08	93.70	3.55	637.752 ± 637.812
6A015@40	40.00 W	0.00008	0.00040	0.00098	0.50961	2.28295	14.87 ± 0.14	98.42	1.77	626.950 ± 625.252
6A015@20	20.00 W	0.00007	0.00049	0.00061	0.38827	1.74079	14.88 ± 0.15	98.26	1.35	388.442 ± 579.468
6A015@32	32.00 W	0.00018	0.00036	0.00081	0.45639	2.06352	15.00 ± 0.13	96.96	1.59	628.963 ± 629.033
6A015@12	12.00 W	0.00029	0.00101	0.00054	0.28654	1.29588	15.01 ± 0.18	93.37	1.00	138.406 ± 130.288
6A015@47	47.00 W	0.00120	0.00032	0.00077	0.40600	1.84386	15.07 ± 0.18	83.44	1.41	626.859 ± 626.931
6A015@18	18.00 W	0.00059	0.00033	0.00081	0.42686	1.97401	15.34 ± 0.16	91.42	1.49	633.725 ± 635.930
6A015@50	50.00 W	0.00038	0.00051	0.00228	1.20632	5.75710	15.83 ± 0.08	97.58	4.20	1152.534 ± 1809.401
6A015@05	5.00 W	0.00045	0.00083	0.00164	0.86385	4.12482	15.84 ± 0.09	96.42	3.01	507.341 ± 480.885
6A015@42	42.00 W	0.00027	0.00036	0.00043	0.24043	1.19966	16.55 ± 0.24	93.29	0.84	325.764 ± 694.053
6A015@08	8.00 W	0.00015	0.00124	0.00115	0.63911	3.19127	16.56 ± 0.11	98.10	2.22	252.205 ± 147.158
		0.02090	0.03370	0.05637	28.74440	116.33181				

Information on Analysis	
Sample	PC-9 A-35
Material	Wh. Mica
Location	3hutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001847
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	4.0047 ± 0.1386 ± 3.46%	13.29 ± 0.46 ± 3.46%	833.28	100.00 49	105.129 ± 24.916
		External Error ± 0.46	2.01	Statistical T ratio	
		Analytical Error ± 0.46	28.8665	Error Magnification	
Total Fusion Age	4.0471 ± 0.0049 ± 0.12%	13.44 ± 0.04 ± 0.32%		49	417.986 ± 59.222
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A015@52	52.00 W	0.00380	0.00051	0.00481	1.97351	5.77349	9.71 ± 0.06	83.12	5.13	1911.894 ± 3970.780
6A015@68	68.00 W	0.00162	0.00051	0.00105	0.56705	1.79181	10.48 ± 0.11	78.42	1.48	540.070 ± 861.370
6A015@95	95.00 W	0.00045	0.00072	0.00140	0.76055	2.43540	10.62 ± 0.10	94.10	1.98	518.407 ± 600.745
6A015@74	74.00 W	0.00036	0.00301	0.00091	0.49499	1.59034	10.66 ± 0.15	93.11	1.29	80.585 ± 25.289
6A015@56	56.00 W	0.00109	0.00050	0.00151	0.84329	2.75354	10.83 ± 0.09	88.89	2.19	834.766 ± 834.850
6A015@71	71.00 W	0.00151	0.00045	0.00133	0.75256	2.50265	11.03 ± 0.11	84.31	1.96	826.872 ± 826.958
6A015@69	69.00 W	0.00099	0.00035	0.00119	0.59983	2.02139	11.18 ± 0.10	86.74	1.56	829.018 ± 829.111
6A015@65	65.00 W	0.00090	0.00060	0.00311	1.01445	3.49839	11.44 ± 0.08	92.31	2.64	829.837 ± 829.918
6A015@55	55.00 W	0.00045	0.00058	0.00129	0.67688	2.33784	11.45 ± 0.10	94.02	1.76	573.418 ± 1030.993
6A015@58	58.00 W	0.00030	0.00897	0.00274	1.46600	5.09724	11.53 ± 0.06	97.62	3.81	80.123 ± 9.628
6A015@60	60.00 W	0.00120	0.00054	0.00175	0.91923	3.19793	11.54 ± 0.09	89.44	2.39	832.525 ± 832.608
6A015@82	82.00 W	0.00101	0.00033	0.00102	0.55329	1.92552	11.54 ± 0.13	86.09	1.44	823.664 ± 823.758
6A015@81	81.00 W	0.00364	0.00057	0.00110	0.50948	1.80013	11.72 ± 0.17	62.31	1.33	439.236 ± 640.705
6A015@93	93.00 W	0.00014	0.00144	0.00178	1.03882	3.67565	11.73 ± 0.07	98.23	2.70	353.320 ± 263.132
6A015@80	80.00 W	0.00009	0.00040	0.00129	0.66547	2.38319	11.87 ± 0.10	98.16	1.73	825.230 ± 825.319
6A015@64	64.00 W	0.00019	0.00056	0.00173	0.94536	3.38657	11.88 ± 0.08	97.74	2.46	830.227 ± 830.310
6A015@66	66.00 W	0.00018	0.00045	0.00148	0.76390	2.76972	12.02 ± 0.09	97.49	1.99	828.696 ± 828.783
6A015@88	88.00 W	0.00015	0.00038	0.00110	0.63745	2.31899	12.06 ± 0.11	97.44	1.66	820.996 ± 821.086
6A015@79	79.00 W	0.00020	0.00043	0.00141	0.73129	2.72846	12.37 ± 0.09	97.29	1.90	826.028 ± 826.115
6A015@91	91.00 W	0.00049	0.00059	0.00084	0.45850	1.82404	13.19 ± 0.14	92.17	1.19	378.983 ± 552.984
6A015@96	96.00 W	0.00106	0.00100	0.00151	0.82534	3.29544	13.23 ± 0.12	90.80	2.15	406.340 ± 369.844
6A015@63	63.00 W	0.00013	0.00040	0.00123	0.68167	2.72457	13.25 ± 0.12	98.03	1.77	832.347 ± 832.436
6A015@77	77.00 W	0.00011	0.00022	0.00070	0.36784	1.47655	13.30 ± 0.16	97.32	0.96	822.980 ± 823.090
6A015@86	86.00 W	0.00076	0.00024	0.00070	0.39845	1.60487	13.35 ± 0.20	87.32	1.04	819.755 ± 819.860
6A015@75	75.00 W	0.00181	0.00062	0.00207	1.03834	4.23985	13.53 ± 0.08	88.33	2.70	826.917 ± 826.998
6A015@53	53.00 W	0.00173	0.00054	0.00171	0.91131	3.73222	13.57 ± 0.10	87.51	2.37	834.543 ± 834.626
6A015@61	61.00 W	0.00039	0.00038	0.00118	0.64265	2.65331	13.68 ± 0.13	95.28	1.67	832.339 ± 832.430
6A015@78	78.00 W	0.00061	0.00049	0.00129	0.73818	3.11676	13.99 ± 0.10	94.00	1.92	741.303 ± 1302.063
6A015@62	62.00 W	0.00046	0.00028	0.00087	0.46766	1.98636	14.07 ± 0.16	93.14	1.22	828.803 ± 828.903
6A015@57	57.00 W	0.00021	0.00047	0.00173	0.90926	3.86901	14.10 ± 0.08	97.85	2.37	949.848 ± 1644.804
6A015@54	54.00 W	0.00039	0.00063	0.00249	1.43149	6.11222	14.15 ± 0.07	97.58	3.72	1119.298 ± 1391.534
6A015@98	98.00 W	0.00059	0.00083	0.00074	0.40512	1.73186	14.17 ± 0.16	90.37	1.05	240.611 ± 252.685
6A015@51	51.00 W	0.00197	0.00028	0.00086	0.48182	2.06052	14.17 ± 0.18	77.66	1.25	837.557 ± 837.657
6A015@72	72.00 W	0.00061	0.00119	0.00104	0.59099	2.53483	14.21 ± 0.12	92.82	1.54	242.363 ± 200.497
6A015@90	90.00 W	0.00003	0.00037	0.00117	0.61324	2.64319	14.28 ± 0.12	99.14	1.60	818.810 ± 818.903
6A015@100	100.00 W	0.00035	0.00080	0.00093	0.51214	2.21306	14.32 ± 0.13	95.02	1.33	314.505 ± 393.362
6A015@94	94.00 W	0.00142	0.00061	0.00182	0.96120	4.17565	14.39 ± 0.08	90.42	2.50	776.759 ± 1095.728
6A015@76	76.00 W	0.00129	0.00051	0.00159	0.85772	3.76146	14.53 ± 0.10	90.33	2.23	826.719 ± 826.803
6A015@73	73.00 W	0.00050	0.00019	0.00065	0.32243	1.41440	14.53 ± 0.20	90.13	0.84	826.018 ± 826.135
6A015@89	89.00 W	0.00188	0.00074	0.00169	0.95860	4.21720	14.58 ± 0.10	87.92	2.49	630.769 ± 1040.131
6A015@99	99.00 W	0.00015	0.00052	0.00055	0.26528	1.19165	14.88 ± 0.25	95.86	0.69	247.897 ± 449.764
6A015@59	59.00 W	0.00029	0.00158	0.00403	1.75442	8.00024	15.11 ± 0.07	98.40	4.56	543.610 ± 324.237
6A015@84	84.00 W	0.00054	0.00051	0.00103	0.55479	2.58145	15.41 ± 0.13	93.72	1.44	534.415 ± 914.465
6A015@97	97.00 W	0.00026	0.00111	0.00082	0.37048	1.73758	15.54 ± 0.19	95.34	0.96	163.520 ± 134.379
6A015@67	67.00 W	0.00108	0.00336	0.00203	1.11423	5.23686	15.57 ± 0.09	93.79	2.90	162.335 ± 50.897
6A015@70	70.00 W	0.00336	0.00123	0.00299	1.72334	8.09980	15.57 ± 0.09	88.67	4.48	683.760 ± 501.167
6A015@83	83.00 W	0.00052	0.00035	0.00117	0.59196	2.80690	15.71 ± 0.14	94.36	1.54	823.697 ± 823.790
6A015@92	92.00 W	0.00066	0.00073	0.00111	0.59683	2.87523	15.96 ± 0.14	93.21	1.55	402.670 ± 474.842
6A015@87	87.00 W	0.00138	0.00058	0.00188	0.97434	5.07731	17.25 ± 0.09	92.18	2.54	820.424 ± 820.505
		0.04324	0.04262	0.07442	38.43300	152.98262				

Information on Analysis	
Sample	PC-10 A-36
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001844
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.9184 ± 0.1606 ± 4.10%	12.99 ± 0.53 ± 4.09%	1343.90	100.00 49	87.381 ± 14.612
		External Error ± 0.53	2.01	Statistical T ratio	
		Analytical Error ± 0.53	36.6593	Error Magnification	
Total Fusion Age	3.9805 ± 0.0045 ± 0.11%	13.19 ± 0.04 ± 0.32%		49	441.847 ± 53.348
		External Error ± 0.04			
		Analytical Error ± 0.01			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A016@02	2.00 W	0.00080	0.00064	0.00136	0.68878	1.93894	9.33 ± 0.13	88.41	2.05	524.889 ± 524.939
6A016@20	20.00 W	0.00022	0.00054	0.00106	0.57723	1.65330	9.49 ± 0.15	95.43	1.72	519.732 ± 518.778
6A016@24	24.00 W	0.00075	0.00052	0.00123	0.55456	1.59926	9.56 ± 0.12	87.23	1.65	519.661 ± 519.713
6A016@45	45.00 W	0.00070	0.00039	0.00127	0.61372	1.83176	9.89 ± 0.13	89.18	1.83	761.683 ± 2040.070
6A016@50	50.00 W	0.00064	0.00051	0.00181	0.63703	1.91916	9.98 ± 0.12	90.35	1.90	609.191 ± 1124.201
6A016@36	36.00 W	0.00053	0.00054	0.00115	0.56933	1.72509	10.04 ± 0.11	91.01	1.70	517.092 ± 518.159
6A016@27	27.00 W	0.00081	0.00064	0.00324	0.67672	2.07585	10.17 ± 0.11	88.97	2.02	518.222 ± 518.272
6A016@26	26.00 W	0.00069	0.00068	0.00131	0.71764	2.22628	10.28 ± 0.12	90.89	2.14	519.141 ± 519.190
6A016@12	12.00 W	0.00052	0.00055	0.00098	0.58802	2.05186	11.56 ± 0.13	92.45	1.75	522.179 ± 522.231
6A016@16	16.00 W	0.00030	0.00051	0.00131	0.54297	1.91159	11.66 ± 0.13	94.99	1.62	521.055 ± 521.108
6A016@25	25.00 W	0.00038	0.00070	0.00183	0.79887	2.86370	11.87 ± 0.11	95.63	2.38	559.909 ± 641.267
6A016@46	46.00 W	0.00158	0.00052	0.00302	1.62907	5.84166	11.88 ± 0.07	91.99	4.86	1534.518 ± 2151.228
6A016@41	41.00 W	0.00016	0.00043	0.00086	0.45595	1.65512	12.02 ± 0.16	96.61	1.36	515.652 ± 515.707
6A016@11	11.00 W	0.00010	0.00047	0.00093	0.49635	1.84430	12.31 ± 0.15	97.81	1.48	522.378 ± 522.431
6A016@29	29.00 W	0.00183	0.00074	0.00300	0.78068	2.97277	12.61 ± 0.11	84.11	2.33	517.906 ± 517.215
6A016@38	38.00 W	0.00027	0.00040	0.00080	0.42354	1.63738	12.80 ± 0.16	94.82	1.26	516.237 ± 514.930
6A016@35	35.00 W	0.00018	0.00042	0.00095	0.44002	1.70984	12.87 ± 0.16	96.38	1.31	516.491 ± 516.546
6A016@19	19.00 W	0.00036	0.00068	0.00145	0.72064	2.81688	12.94 ± 0.11	95.73	2.15	520.282 ± 519.525
6A016@23	23.00 W	0.00008	0.00045	0.00087	0.47597	1.86772	12.99 ± 0.14	98.08	1.42	519.501 ± 519.554
6A016@18	18.00 W	0.00063	0.00075	0.00162	0.79762	3.17221	13.17 ± 0.11	93.94	2.38	520.613 ± 520.661
6A016@34	34.00 W	0.00020	0.00048	0.00101	0.51195	2.05267	13.28 ± 0.15	96.64	1.53	517.345 ± 517.399
6A016@49	49.00 W	0.00106	0.00064	0.00125	0.67059	2.68943	13.28 ± 0.11	89.05	2.00	513.931 ± 513.981
6A016@31	31.00 W	0.00152	0.00072	0.00141	0.76551	3.13652	13.56 ± 0.11	87.02	2.28	517.821 ± 517.113
6A016@47	47.00 W	0.00041	0.00047	0.00094	0.39586	1.62475	13.59 ± 0.19	92.51	1.18	408.399 ± 677.745
6A016@15	15.00 W	0.00075	0.00067	0.00148	0.71370	3.02825	14.05 ± 0.12	92.65	2.13	521.106 ± 520.340
6A016@06	6.00 W	0.00107	0.00066	0.00129	0.70691	3.00577	14.07 ± 0.13	90.00	2.11	523.240 ± 522.463
6A016@44	44.00 W	0.00023	0.00036	0.00079	0.37740	1.60960	14.12 ± 0.17	95.46	1.13	514.422 ± 514.478
6A016@04	4.00 W	0.00095	0.00074	0.00154	0.79304	3.38833	14.14 ± 0.10	91.87	2.37	523.735 ± 523.784
6A016@40	40.00 W	0.00042	0.00039	0.00076	0.41068	1.75718	14.16 ± 0.21	92.87	1.22	516.538 ± 518.002
6A016@42	42.00 W	0.00105	0.00045	0.00104	0.47591	2.03735	14.17 ± 0.14	86.38	1.42	515.275 ± 515.328
6A016@05	5.00 W	0.00077	0.00108	0.00206	1.11608	4.78975	14.21 ± 0.10	94.93	3.33	507.299 ± 445.080
6A016@32	32.00 W	0.00087	0.00048	0.00089	0.50247	2.16028	14.23 ± 0.16	88.86	1.50	517.190 ± 517.243
6A016@33	33.00 W	0.00017	0.00108	0.00095	0.45577	1.96194	14.25 ± 0.19	96.92	1.36	207.625 ± 161.760
6A016@09	9.00 W	0.00021	0.00075	0.00163	0.80444	3.46901	14.27 ± 0.12	97.68	2.40	522.685 ± 522.734
6A016@14	14.00 W	0.00015	0.00050	0.00110	0.52741	2.28929	14.37 ± 0.14	97.51	1.57	521.537 ± 521.589
6A016@01	1.00 W	0.00051	0.00066	0.00361	1.82918	7.95499	14.39 ± 0.07	97.59	5.46	1348.570 ± 1967.574
6A016@08	8.00 W	0.00055	0.00155	0.00305	1.64951	7.17521	14.40 ± 0.08	97.24	4.92	521.597 ± 520.232
6A016@13	13.00 W	0.00039	0.00053	0.00113	0.56858	2.48017	14.44 ± 0.14	95.00	1.70	521.577 ± 520.604
6A016@48	48.00 W	0.00030	0.00047	0.00098	0.49658	2.17414	14.49 ± 0.12	95.62	1.48	514.480 ± 514.532
6A016@17	17.00 W	0.00054	0.00042	0.00095	0.44719	1.96872	14.57 ± 0.15	92.05	1.33	521.207 ± 521.262
6A016@37	37.00 W	0.00025	0.00237	0.00081	0.39558	1.74684	14.62 ± 0.17	95.38	1.18	81.850 ± 24.295
6A016@43	43.00 W	0.00062	0.00044	0.00069	0.34718	1.53870	14.67 ± 0.19	88.87	1.04	383.056 ± 739.622
6A016@10	10.00 W	0.00215	0.00076	0.00154	0.80741	3.58013	14.68 ± 0.13	84.51	2.41	522.960 ± 523.009
6A016@03	3.00 W	0.00056	0.00082	0.00167	0.87669	3.90140	14.73 ± 0.10	95.44	2.61	524.527 ± 524.576
6A016@39	39.00 W	0.00053	0.00060	0.00131	0.63020	2.80815	14.75 ± 0.14	94.18	1.88	515.971 ± 516.021
6A016@30	30.00 W	0.00033	0.00071	0.00159	0.74727	3.40861	15.09 ± 0.11	96.74	2.23	517.769 ± 517.044
6A016@28	28.00 W	0.00025	0.00046	0.00103	0.48393	2.22819	15.24 ± 0.15	96.23	1.44	518.466 ± 519.716
6A016@22	22.00 W	0.00046	0.00043	0.00085	0.45705	2.21160	16.01 ± 0.20	93.79	1.36	519.779 ± 518.563
6A016@07	7.00 W	0.00111	0.00064	0.00137	0.68571	3.35694	16.20 ± 0.12	90.65	2.05	522.848 ± 522.898
6A016@21	21.00 W	0.00041	0.00065	0.00129	0.69223	3.40070	16.25 ± 0.11	96.07	2.06	520.363 ± 521.253
		0.03033	0.03209	0.07007	33.52674	134.24931				

Information on Analysis	
Sample	PC-11 A-37
Material	Wh. Mica
Location	3hutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001842
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.9839 ± 0.1560 ± 3.92%	13.19 ± 0.52 ± 3.91%	888.78	100.00 50	121.720 ± 35.395
		External Error ± 0.52	2.01	Statistical T ratio	
		Analytical Error ± 0.51	29.8123	Error Magnification	
Total Fusion Age	4.0042 ± 0.0053 ± 0.13%	13.26 ± 0.04 ± 0.33%		50	511.961 ± 77.062
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A023@58	58.00 W	0.00187	0.00015	0.00056	0.24335	0.68490	9.28 ± 0.25	55.11	0.23	798.234 ± 1065.040
6A017@80	80.00 W	0.00179	0.00091	0.00178	0.64691	1.83507	9.36 ± 0.15	77.14	0.62	349.693 ± 392.830
6A017@65	65.00 W	0.00110	0.00039	0.00384	1.67441	4.91888	9.69 ± 0.06	93.06	1.60	2127.452 ± 4667.791
6A023@30	30.00 W	0.00027	0.00561	0.00110	0.49574	1.45640	9.69 ± 0.10	94.07	0.47	43.265 ± 9.627
6A023@47	47.00 W	0.00052	0.00078	0.00090	0.43595	1.28323	9.71 ± 0.13	88.65	0.42	274.690 ± 438.791
6A017@89	89.00 W	0.00034	0.00074	0.00321	1.31892	3.89485	9.74 ± 0.06	96.72	1.26	872.308 ± 873.595
6A017@97	97.00 W	0.00090	0.00049	0.00253	0.86958	2.59729	9.85 ± 0.10	90.04	0.83	868.732 ± 870.642
6A023@51X	51.00 W	0.00042	0.00075	0.00213	1.02898	3.08957	9.90 ± 0.06	95.41	0.98	675.483 ± 1041.140
6A017@55	55.00 W	0.00115	0.00317	0.00368	1.92106	5.82267	10.00 ± 0.06	93.75	1.83	296.504 ± 95.710
6A023.71	71.00 W	0.00366	0.00041	0.00125	0.61858	1.87501	10.00 ± 0.17	63.09	0.59	747.527 ± 998.757
6A017@69	69.00 W	0.00182	0.00045	0.00157	0.81608	2.51123	10.15 ± 0.12	81.78	0.78	880.440 ± 882.500
6A023@56	56.00 W	0.00059	0.00027	0.00188	0.44026	1.35485	10.15 ± 0.15	88.00	0.42	794.393 ± 1059.300
6A023.83	83.00 W	0.00036	0.00024	0.00309	0.36117	1.11645	10.19 ± 0.20	90.56	0.34	742.632 ± 990.623
6A023@19	19.00 W	0.00037	0.00039	0.00142	0.64948	2.05930	10.45 ± 0.09	94.30	0.62	809.344 ± 1079.217
6A017@58	58.00 W	0.00170	0.00071	0.00247	1.28162	4.11714	10.59 ± 0.08	88.53	1.22	881.071 ± 882.403
6A023.92	92.00 W	0.00025	0.00035	0.00130	0.53594	1.72708	10.63 ± 0.11	95.12	0.51	742.028 ± 989.462
6A023.84	84.00 W	0.00016	0.00094	0.00070	0.49904	1.61476	10.67 ± 0.12	96.38	0.48	259.786 ± 313.717
6A023@48	48.00 W	0.00022	0.00062	0.00047	0.26417	0.86964	10.85 ± 0.16	92.44	0.25	208.347 ± 366.864
6A023.50	50.00 W	0.00061	0.00123	0.00135	0.74526	2.59101	11.46 ± 0.11	92.83	0.71	296.671 ± 279.519
6A023 72	72.00 W	0.00042	0.00084	0.00060	0.34539	1.20142	11.47 ± 0.19	90.11	0.33	200.551 ± 302.103
6A017@72	72.00 W	0.00070	0.00070	0.00255	1.29658	4.51637	11.48 ± 0.07	94.95	1.24	905.845 ± 1398.467
6A023@15	15.00 W	0.00000	0.00035	0.00083	0.42349	1.47948	11.52 ± 0.07	99.29	0.40	585.796 ± 1497.839
6A023@60	60.00 W	0.00098	0.00136	0.00152	0.66691	2.33618	11.55 ± 0.09	88.40	0.64	240.942 ± 219.645
6A023@14	14.00 W	0.00013	0.00090	0.00091	0.44212	1.55248	11.57 ± 0.12	96.90	0.42	241.515 ± 306.964
6A023.39	39.00 W	0.00033	0.00089	0.00121	0.71713	2.52058	11.59 ± 0.10	95.67	0.68	394.424 ± 518.667
6A017@96	96.00 W	0.00042	0.00055	0.00159	0.97983	3.45691	11.63 ± 0.08	95.90	0.93	865.733 ± 1374.964
6A023.85	85.00 W	0.00015	0.00153	0.00104	0.57475	2.03551	11.67 ± 0.10	97.17	0.55	183.900 ± 144.095
6A023.69	69.00 W	0.00040	0.00120	0.00151	0.76145	2.70213	11.70 ± 0.08	95.18	0.73	310.890 ± 304.245
6A023.76	76.00 W	0.00025	0.00033	0.00106	0.56165	1.99376	11.70 ± 0.11	95.73	0.54	837.012 ± 3256.387
6A023.47	47.00 W	0.00147	0.00096	0.00120	0.55375	1.96634	11.70 ± 0.12	81.45	0.53	281.524 ± 336.095
6A023@10	10.00 W	0.00009	0.00083	0.00150	0.78733	2.79645	11.71 ± 0.09	98.36	0.75	464.789 ± 722.127
6A023.62	62.00 W	0.00019	0.00124	0.00038	0.18335	0.65225	11.73 ± 0.40	91.32	0.17	72.371 ± 66.461
6A023.65	65.00 W	0.00000	0.00054	0.00062	0.33232	1.18287	11.73 ± 0.06	99.30	0.32	304.261 ± 738.391
6A017@51	51.00 W	0.00088	0.00220	0.00523	2.67539	9.55382	11.77 ± 0.05	96.69	2.55	597.133 ± 283.875
6A023@28	28.00 W	0.00000	0.00043	0.00134	0.70878	2.53549	11.79 ± 0.05	99.31	0.68	806.461 ± 1073.413
6A017@87	87.00 W	0.00286	0.00289	0.00314	0.84645	3.02860	11.79 ± 0.11	77.74	0.81	143.754 ± 43.875
6A023.86	86.00 W	0.00010	0.00255	0.00098	0.50245	1.79776	11.79 ± 0.12	97.75	0.48	96.551 ± 52.265
6A023.93	93.00 W	0.00011	0.00024	0.00061	0.36879	1.31992	11.80 ± 0.14	97.04	0.35	740.024 ± 990.075
6A023@02	2.00 W	0.00027	0.00780	0.00152	0.78638	2.83468	11.88 ± 0.08	96.56	0.75	49.382 ± 8.503
6A017@59	59.00 W	0.00014	0.00083	0.00250	1.14213	4.11875	11.89 ± 0.08	98.31	1.09	675.395 ± 845.511
6A023.78	78.00 W	0.00016	0.00040	0.00109	0.60523	2.18803	11.92 ± 0.12	97.18	0.58	747.003 ± 998.106
6A023 80	80.00 W	0.00043	0.00033	0.00206	0.38443	1.38984	11.92 ± 0.14	91.06	0.37	578.812 ± 2467.018
6A023 89	89.00 W	0.00037	0.00086	0.00056	0.32918	1.19168	11.93 ± 0.20	91.05	0.31	188.622 ± 351.787
6A023.61	61.00 W	0.00039	0.00262	0.00104	0.51456	1.86444	11.94 ± 0.12	93.54	0.49	96.241 ± 45.535
6A017@66	66.00 W	0.00064	0.00058	0.00199	1.04595	3.81706	12.03 ± 0.08	94.64	1.00	881.648 ± 883.272
6A023.87	87.00 W	0.00004	0.00036	0.00096	0.54324	1.98703	12.06 ± 0.11	98.67	0.52	743.313 ± 991.175
6A023@04	4.00 W	0.00018	0.00138	0.00096	0.48668	1.78263	12.07 ± 0.10	96.40	0.46	172.509 ± 154.653
6A023@03	3.00 W	0.00014	0.00054	0.00105	0.47973	1.78687	12.28 ± 0.10	97.16	0.46	434.164 ± 792.558
6A023@07	7.00 W	0.00015	0.00076	0.00131	0.64586	2.41049	12.30 ± 0.10	97.60	0.62	414.939 ± 567.409
6A023@49	49.00 W	0.00083	0.00140	0.00173	0.78097	2.92316	12.34 ± 0.08	91.69	0.74	272.733 ± 187.857
6A023.66	66.00 W	0.00019	0.00157	0.00202	1.01653	3.81451	12.37 ± 0.07	97.91	0.97	317.919 ± 284.376
6A017@91	91.00 W	0.00095	0.00074	0.00249	1.30795	4.93548	12.44 ± 0.07	94.04	1.25	871.638 ± 872.935
6A023@09	9.00 W	0.01560	0.00380	0.00117	0.51786	1.96392	12.50 ± 0.49	29.81	0.49	66.796 ± 23.584
6A023@25	25.00 W	0.00000	0.00016	0.00047	0.26768	1.02232	12.59 ± 0.09	99.35	0.26	806.567 ± 1075.062
6A023.99	99.00 W	0.00016	0.00040	0.00111	0.60161	2.31430	12.68 ± 0.10	97.43	0.57	739.395 ± 985.944
6A017@64	64.00 W	0.00033	0.00049	0.00177	0.88410	3.40792	12.70 ± 0.09	96.65	0.84	879.297 ± 879.385
6A023@05	5.00 W	0.00003	0.00031	0.00096	0.48246	1.86583	12.74 ± 0.12	98.95	0.46	771.467 ± 2671.709
6A023.77	77.00 W	0.00019	0.00037	0.00111	0.55939	2.16580	12.76 ± 0.10	96.90	0.53	744.965 ± 995.544
6A017@84	84.00 W	0.00035	0.00056	0.00207	1.00418	3.89498	12.78 ± 0.09	96.79	0.96	871.896 ± 871.981
6A023.79	79.00 W	0.00000	0.00067	0.00067	0.39740	1.54233	12.79 ± 0.06	99.36	0.38	288.962 ± 538.735
6A023.40	40.00 W	0.00062	0.00098	0.00165	0.78783	3.05923	12.80 ± 0.09	93.80	0.75	394.818 ± 547.343
6A017@100	100.00 W	0.00034	0.00044	0.00152	0.78350	3.04928	12.82 ± 0.10	96.24	0.75	868.265 ± 870.378
6A023.98	98.00 W	0.00058	0.00030	0.00088	0.44780	1.74770	12.86 ± 0.12	90.48	0.43	740.099 ± 986.897
6A017@76	76.00 W	0.00085	0.00104	0.00233	1.13644	4.47078	12.96 ± 0.09	94.13	1.08	535.414 ± 522.466
6A017@74	74.00 W	0.00060	0.00081	0.00160	0.82995	3.28309	13.03 ± 0.10	94.32	0.79	502.016 ± 600.279
6A023.88	88.00 W	0.00016	0.00125	0.00064	0.38860	1.54081	13.06 ± 0.15	96.38	0.37	151.801 ± 167.301
6A023.75	75.00 W	0.00013	0.00044	0.00108	0.55971	2.22100	13.07 ± 0.10	97.66	0.53	625.497 ± 2407.278
6A023@08	8.00 W	0.00019	0.00032	0.00078	0.45144	1.79883	13.13 ± 0.11	96.32	0.43	699.748 ± 2396.296
6A023.95	95.00 W	0.00035	0.00034	0.00085	0.49186	1.96514	13.16 ± 0.12	94.43	0.47	719.151 ± 2627.562
6A017@90	90.00 W	0.00198	0.00098	0.00166	0.87286	3.48768	13.17 ± 0.11	85.16	0.83	437.441 ± 365.299
6A017@60	60.00 W	0.00041	0.00348	0.00403	2.09659	8.39799	13.20 ± 0.07	97.97	2.00	295.479 ± 89.086
6A017@67	67.00 W	0.00133	0.00064	0.00223	1.14074	4.59626	13.28 ± 0.08	91.58	1.09	878.399 ± 879.884
6A017@81	81.00 W	0.00124	0.00043	0.00152	0.76407	3.08403	13.30 ± 0.11	88.89	0.73	872.939 ± 873.030
6A017@77	77.00 W	0.00120	0.00054	0.00191	0.97045	3.95632	13.43 ± 0.10	91.29	0.93	873.376 ± 873.462
6A017@86	86.00 W	0.00010	0.00050	0.00186	0.89097	3.63230	13.43 ± 0.10	98.57	0.85	872.265 ± 874.136
6A023.48	48.00 W	0.00045	0.00077	0.00100	0.45568	1.85942	13.44 ± 0.13	92.75	0.43	290.943 ± 466.188
6A023.64	64.00 W	0.00018	0.00050	0.00146	0.78481	3.21583	13.50 ± 0.09	97.81	0.75	773.639 ± 1945.882
6A023.81	81.00 W	0.00017	0.00034	0.00102	0.43515	1.79008	13.55 ± 0.13	96.76	0.41	625.927 ± 2148.655
6A023.96	96.00 W	0.00333	0.00075	0.00052	0.31443	1.29932	13.61 ± 0.24	56.68	0.30	206.334 ± 362.107
6A023@17	17.00 W	0.00053	0.00111	0.00089	0.47403	1.96897	13.68 ± 0.13	92.14	0.45	208.510 ± 208.377
6A023@35	35.00 W	0.00015	0.00081	0.00073	0.44509	1.84934	13.69 ± 0.11	97.02	0.42	268.389 ± 369.227
6A023 74	74.00 W	0.00003	0.00024	0.00069	0.37266	1.55105	13.71 ± 0.20	98.87	0.36	748.795 ± 995.220

6A023.49	49.00 W	0.00043	0.00089	0.00046	0.26688	1.11917	13.81 ± 0.26	89.23	0.25	146.868 ± 196.641
6A017@70	70.00 W	0.00012	0.00040	0.00235	1.20315	5.05104	13.83 ± 0.08	98.71	1.15	1473.001 ± 3744.446
6A017@93	93.00 W	0.00984	0.00033	0.00112	0.58774	2.46916	13.84 ± 0.30	45.79	0.56	865.780 ± 865.878
6A023@50	50.00 W	0.00054	0.00179	0.00104	0.52159	2.19721	13.88 ± 0.12	92.75	0.50	142.437 ± 102.728
6A023@46	46.00 W	0.00018	0.00039	0.00050	0.25429	1.07188	13.89 ± 0.19	94.84	0.24	318.540 ± 909.184
6A023.30	30.00 W	0.00043	0.00106	0.00105	0.56862	2.39784	13.89 ± 0.12	94.40	0.54	263.045 ± 320.662
6A017@85	85.00 W	0.00004	0.00052	0.00183	0.93129	3.93972	13.94 ± 0.09	99.09	0.89	874.530 ± 874.616
6A023.68	68.00 W	0.00035	0.00088	0.00093	0.53128	2.25039	13.95 ± 0.11	95.10	0.51	295.925 ± 374.622
6A023@23	23.00 W	0.00012	0.00024	0.00073	0.38871	1.64727	13.96 ± 0.15	97.34	0.37	807.237 ± 1080.000
6A023@18	18.00 W	0.00014	0.00028	0.00070	0.36744	1.55874	13.97 ± 0.13	96.91	0.35	633.472 ± 2405.796
6A017@52	52.00 W	0.00026	0.00066	0.00250	1.29250	5.49335	14.00 ± 0.08	98.04	1.23	958.434 ± 1583.564
6A023@26	26.00 W	0.00002	0.00066	0.00106	0.58927	2.50791	14.02 ± 0.11	99.21	0.56	436.814 ± 663.235
6A017@95	95.00 W	0.00031	0.00026	0.00093	0.45223	1.92797	14.04 ± 0.16	94.97	0.43	866.152 ± 869.735
6A017@88	88.00 W	0.00009	0.00180	0.00190	1.00643	4.29074	14.04 ± 0.09	98.82	0.96	274.424 ± 121.161
6A023@53X	53.00 W	0.00088	0.00084	0.00110	0.51199	2.18900	14.08 ± 0.11	88.90	0.49	297.196 ± 435.669
6A023@37	37.00 W	0.00017	0.00079	0.00115	0.59274	2.54061	14.12 ± 0.11	97.54	0.56	368.839 ± 482.103
6A023.91	91.00 W	0.00035	0.00038	0.00101	0.57138	2.45248	14.14 ± 0.12	95.39	0.54	740.656 ± 987.630
6A023.90	90.00 W	0.00069	0.00068	0.00080	0.40342	1.73284	14.15 ± 0.14	89.03	0.38	290.312 ± 657.856
6A017@61	61.00 W	0.00051	0.00079	0.00265	1.41938	6.09880	14.15 ± 0.08	97.02	1.35	880.595 ± 880.676
6A023@39	39.00 W	0.00036	0.00069	0.00103	0.56044	2.41427	14.19 ± 0.10	95.27	0.53	397.229 ± 648.320
6A023@12	12.00 W	0.00029	0.00045	0.00094	0.50057	2.15778	14.20 ± 0.11	95.65	0.48	541.008 ± 1592.833
6A017@99	99.00 W	0.00002	0.00034	0.00106	0.59693	2.57661	14.22 ± 0.13	99.22	0.57	868.526 ± 871.278
6A023@55X	55.00 W	0.00025	0.00102	0.00122	0.65279	2.81807	14.22 ± 0.09	96.92	0.62	312.977 ± 281.588
6A023@34	34.00 W	0.00011	0.00075	0.00104	0.49487	2.13689	14.22 ± 0.12	97.89	0.47	322.538 ± 528.337
6A023.73	73.00 W	0.00015	0.00040	0.00068	0.40598	1.75581	14.25 ± 0.16	96.95	0.39	494.353 ± 1601.444
6A017@57	57.00 W	0.00038	0.00149	0.00185	0.91784	3.96994	14.25 ± 0.10	96.73	0.87	301.259 ± 218.664
6A023.63	63.00 W	0.00020	0.00156	0.00077	0.35584	1.54215	14.27 ± 0.18	95.79	0.34	111.466 ± 84.388
6A023.97	97.00 W	0.00062	0.00026	0.00082	0.39129	1.69656	14.28 ± 0.15	89.72	0.37	739.935 ± 989.771
6A023@38	38.00 W	0.00006	0.00097	0.00110	0.58254	2.53192	14.32 ± 0.10	98.70	0.56	293.728 ± 349.759
6A017@73	73.00 W	0.00207	0.00072	0.00178	0.89371	3.88818	14.33 ± 0.12	85.99	0.85	605.121 ± 853.464
6A023@27	27.00 W	0.00025	0.00031	0.00092	0.50761	2.20849	14.33 ± 0.11	96.19	0.48	806.544 ± 1072.765
6A023.29	29.00 W	0.00021	0.00118	0.00110	0.51020	2.22053	14.34 ± 0.14	96.77	0.49	211.436 ± 208.093
6A017@68	68.00 W	0.00103	0.00166	0.00354	1.74954	7.63206	14.37 ± 0.08	95.65	1.67	516.345 ± 292.963
6A023.67	67.00 W	0.00039	0.00104	0.00126	0.49159	2.14918	14.40 ± 0.13	94.39	0.47	231.316 ± 265.062
6A023.82	82.00 W	0.00010	0.00020	0.00056	0.31130	1.36367	14.43 ± 0.18	97.30	0.30	746.200 ± 995.449
6A017@92	92.00 W	0.00005	0.00037	0.00130	0.64826	2.84234	14.44 ± 0.11	98.93	0.62	867.322 ± 869.846
6A017@78	78.00 W	0.00145	0.00073	0.00218	1.26613	5.55313	14.45 ± 0.09	92.34	1.21	849.890 ± 1128.795
6A017@62	62.00 W	0.00127	0.00068	0.00275	1.22945	5.40112	14.47 ± 0.09	93.00	1.17	881.068 ± 882.456
6A017@98	98.00 W	0.00187	0.00039	0.00154	0.68261	2.99926	14.47 ± 0.11	84.04	0.65	867.098 ± 869.503
6A023@45	45.00 W	0.00019	0.00057	0.00065	0.33272	1.46190	14.47 ± 0.21	95.82	0.32	285.080 ± 646.328
6A023@54X	54.00 W	0.00014	0.00099	0.00081	0.42431	1.86525	14.48 ± 0.14	97.32	0.40	210.458 ± 219.410
6A017@63	63.00 W	0.00177	0.00078	0.00238	1.39723	6.14222	14.48 ± 0.08	91.67	1.33	879.714 ± 879.795
6A023.20	20.00 W	0.00027	0.00109	0.00076	0.36951	1.62541	14.49 ± 0.17	94.83	0.35	165.942 ± 201.173
6A023.100	100.00 W	0.00017	0.00024	0.00084	0.46897	2.06733	14.52 ± 0.12	97.05	0.45	948.335 ± 5031.082
6A023@40	40.00 W	0.00014	0.00154	0.00090	0.42605	1.87924	14.53 ± 0.12	97.36	0.41	135.848 ± 93.330
6A017@53	53.00 W	0.00071	0.00042	0.00285	1.45508	6.41819	14.53 ± 0.08	96.29	1.39	1702.659 ± 3755.260
6A023@20	20.00 W	0.00062	0.00047	0.00120	0.67510	2.98809	14.58 ± 0.10	93.72	0.64	704.792 ± 1714.574
6A023.94	94.00 W	0.00032	0.00132	0.00073	0.33234	1.47170	14.58 ± 0.18	93.38	0.32	123.295 ± 111.666
6A017@79	79.00 W	0.00020	0.00048	0.00185	0.86158	3.81859	14.60 ± 0.11	97.93	0.82	872.877 ± 872.965
6A023.38	38.00 W	0.00038	0.00022	0.00059	0.32967	1.46153	14.60 ± 0.17	92.34	0.31	737.544 ± 983.510
6A023@13	13.00 W	0.00015	0.00025	0.00075	0.41801	1.85968	14.65 ± 0.15	97.13	0.40	812.368 ± 1083.281
6A023@29	29.00 W	0.00049	0.00056	0.00174	0.92750	4.14296	14.71 ± 0.08	96.09	0.88	808.088 ± 1076.027
6A017@75	75.00 W	0.00063	0.00044	0.00153	0.79091	3.54094	14.74 ± 0.12	94.48	0.75	874.793 ± 876.893
6A023@16	16.00 W	0.00009	0.00085	0.00121	0.62685	2.80836	14.75 ± 0.09	98.49	0.60	363.437 ± 450.858
6A023@59	59.00 W	0.00065	0.00102	0.00139	0.60705	2.76422	15.00 ± 0.10	93.03	0.58	292.003 ± 315.275
6A023@06	6.00 W	0.00064	0.00045	0.00094	0.42473	1.94186	15.06 ± 0.14	90.70	0.40	466.350 ± 1007.483
6A023@36	36.00 W	0.00009	0.00137	0.00099	0.54298	2.49634	15.14 ± 0.10	98.39	0.52	193.989 ± 170.514
6A017@83	83.00 W	0.00058	0.00046	0.00178	0.98488	4.56410	15.26 ± 0.10	95.85	0.94	1039.030 ± 1882.481
6A017@71	71.00 W	0.00080	0.01255	0.00219	1.23481	5.72772	15.27 ± 0.10	95.56	1.18	48.207 ± 4.714
6A017@82	82.00 W	0.00056	0.00040	0.00139	0.71799	3.34196	15.33 ± 0.12	94.81	0.68	876.311 ± 878.635
6A017@94	94.00 W	0.00020	0.00029	0.00104	0.51773	2.41342	15.35 ± 0.14	97.08	0.49	866.681 ± 869.824
6A017@54	54.00 W	0.00096	0.00075	0.00294	1.34952	6.31959	15.42 ± 0.09	95.21	1.29	884.037 ± 885.311
6A023@24	24.00 W	0.00023	0.00084	0.00116	0.60174	2.84797	15.58 ± 0.11	97.16	0.57	352.862 ± 502.190
6A023.70	70.00 W	0.00033	0.00097	0.00092	0.50500	2.53331	16.51 ± 0.12	95.80	0.48	254.465 ± 332.122
6A023@52X	52.00 W	0.00044	0.00098	0.00089	0.46336	2.33534	16.59 ± 0.12	94.25	0.44	231.985 ± 312.542
6A023@57	57.00 W	0.00030	0.00076	0.00072	0.41592	2.09942	16.62 ± 0.13	95.49	0.40	267.236 ± 380.070
6A017@56	56.00 W	0.00122	0.00089	0.00250	1.24763	6.45289	17.02 ± 0.10	94.29	1.19	689.146 ± 749.362
		0.10394	0.14390	0.21344	104.91158	415.27759				

Information on Analysis	
Sample	PC-12 A-40
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001833
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.8924 ± 0.0832 ± 2.14%	12.83 ± 0.28 ± 2.15%	1094.51	100.00 149	53.385 ± 6.037
		External Error ± 0.28	1.98	Statistical T ratio	
		Analytical Error ± 0.27	33.0834	Error Magnification	
Total Fusion Age	3.9584 ± 0.0028 ± 0.07%	13.04 ± 0.04 ± 0.31%		149	357.247 ± 30.032
		External Error ± 0.04			
		Analytical Error ± 0.01			

Incremental Heating		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A016@93	93.00 W	0.00165	0.00079	0.00234	0.87519	2.45633	9.29 ± 0.10	82.80	2.43	541.324 ± 542.118
6A016@90	90.00 W	0.00323	0.00052	0.00189	0.57017	1.62841	9.45 ± 0.18	62.72	1.58	542.084 ± 543.280
6A016@78	78.00 W	0.00145	0.00222	0.00330	1.72287	5.08450	9.76 ± 0.06	91.50	4.78	380.130 ± 145.262
6A016@88	88.00 W	0.00020	0.00032	0.00212	0.85380	2.55061	9.88 ± 0.09	96.93	2.37	1321.428 ± 3857.953
6A016@89	89.00 W	0.00044	0.00089	0.00131	0.63989	1.95928	10.13 ± 0.12	93.04	1.78	354.117 ± 399.747
6A016@65	65.00 W	0.00037	0.00045	0.00140	0.49867	1.58007	10.48 ± 0.11	92.90	1.38	548.526 ± 549.905
6A016@64	64.00 W	0.00089	0.00074	0.00146	0.82564	2.63563	10.56 ± 0.09	90.28	2.29	548.020 ± 548.072
6A016@71	71.00 W	0.00049	0.00058	0.00155	0.64750	2.07316	10.59 ± 0.09	92.79	1.80	546.910 ± 547.979
6A016@59	59.00 W	0.00023	0.00132	0.00260	1.47903	4.82929	10.80 ± 0.06	97.86	4.11	550.381 ± 551.323
6A016@96	96.00 W	0.00036	0.00047	0.00104	0.52080	1.70649	10.84 ± 0.11	93.48	1.45	540.468 ± 540.524
6A016@53	53.00 W	0.00109	0.00041	0.00085	0.46389	1.54810	11.04 ± 0.13	82.32	1.29	551.338 ± 551.396
6A016@79	79.00 W	0.00721	0.00094	0.00268	1.04617	3.52837	11.15 ± 0.14	62.07	2.91	544.304 ± 544.353
6A016@61	61.00 W	0.00061	0.00054	0.00115	0.60151	2.03854	11.21 ± 0.10	91.31	1.67	548.919 ± 550.069
6A016@67	67.00 W	0.00010	0.00070	0.00123	0.65520	2.26188	11.42 ± 0.10	98.03	1.82	458.474 ± 526.690
6A016@99	99.00 W	0.00005	0.00023	0.00040	0.25400	0.88579	11.53 ± 0.20	97.52	0.71	539.005 ± 539.077
6A016@62	62.00 W	0.00003	0.00035	0.00072	0.38791	1.37427	11.72 ± 0.15	98.59	1.08	548.858 ± 550.619
6A016@68	68.00 W	0.00040	0.00048	0.00091	0.53116	1.88346	11.73 ± 0.13	93.51	1.48	546.709 ± 545.531
6A016@55	55.00 W	0.00049	0.00055	0.00113	0.61819	2.23894	11.98 ± 0.11	93.30	1.72	550.265 ± 551.389
6A016@56	56.00 W	0.00039	0.00092	0.00262	1.03722	3.79725	12.11 ± 0.08	96.42	2.88	550.113 ± 550.163
6A016@100	100.00 W	0.00026	0.00059	0.00076	0.40841	1.50955	12.22 ± 0.14	94.49	1.13	340.002 ± 514.931
6A016@85	85.00 W	0.00032	0.00060	0.00116	0.66660	2.48921	12.35 ± 0.11	95.67	1.85	543.453 ± 544.486
6A016@69	69.00 W	0.00023	0.00069	0.00166	0.77329	2.93926	12.57 ± 0.11	97.08	2.15	547.088 ± 547.140
6A016@63	63.00 W	0.00034	0.00075	0.00151	0.83926	3.29863	12.99 ± 0.08	96.45	2.33	548.506 ± 549.343
6A016@83	83.00 W	0.00154	0.00074	0.00149	0.82269	3.26751	13.13 ± 0.10	87.27	2.28	544.044 ± 544.889
6A016@77	77.00 W	0.00500	0.00096	0.00233	1.06473	4.25984	13.23 ± 0.11	73.92	2.96	545.009 ± 545.674
6A016@94	94.00 W	0.00025	0.00056	0.00043	0.23696	0.97070	13.54 ± 0.24	92.32	0.66	208.388 ± 376.250
6A016@66	66.00 W	0.00009	0.00058	0.00121	0.64898	2.69858	13.74 ± 0.12	98.41	1.80	547.392 ± 546.434
6A016@92	92.00 W	0.00068	0.00045	0.00098	0.49601	2.08581	13.90 ± 0.12	90.72	1.38	541.948 ± 543.317
6A016@91	91.00 W	0.00058	0.00031	0.00059	0.34097	1.44491	14.00 ± 0.25	88.89	0.95	541.991 ± 542.054
6A016@51	51.00 W	0.00020	0.00095	0.00195	1.07340	4.56604	14.06 ± 0.08	98.12	2.98	551.463 ± 551.513
6A016@52	52.00 W	0.00036	0.00063	0.00137	0.70863	3.02691	14.12 ± 0.10	96.08	1.97	551.430 ± 551.482
6A016@57	57.00 W	0.00046	0.00075	0.00157	0.83764	3.59090	14.17 ± 0.10	95.79	2.33	549.705 ± 549.756
6A016@75	75.00 W	0.00027	0.00094	0.00169	0.89358	3.83216	14.17 ± 0.09	97.43	2.48	466.328 ± 459.804
6A016@84	84.00 W	0.00011	0.00035	0.00083	0.41476	1.79774	14.32 ± 0.16	97.61	1.15	574.046 ± 1469.075
6A016@60	60.00 W	0.00053	0.00085	0.00172	0.95662	4.17108	14.41 ± 0.09	95.86	2.66	549.172 ± 548.533
6A016@72	72.00 W	0.00025	0.00050	0.00085	0.55524	2.42800	14.45 ± 0.12	96.54	1.54	545.754 ± 544.631
6A016@80	80.00 W	0.00036	0.00055	0.00115	0.60783	2.67168	14.52 ± 0.10	95.67	1.69	544.787 ± 544.841
6A016@76	76.00 W	0.00005	0.00047	0.00082	0.52326	2.30238	14.54 ± 0.13	98.80	1.45	545.329 ± 545.385
6A016@98	98.00 W	0.00014	0.00027	0.00048	0.29994	1.32041	14.55 ± 0.20	96.43	0.83	539.956 ± 540.022
6A016@70	70.00 W	0.00209	0.00397	0.00385	1.70589	7.63611	14.79 ± 0.08	92.04	4.74	210.368 ± 66.042
6A016@87	87.00 W	0.00028	0.00040	0.00066	0.38973	1.74570	14.80 ± 0.16	94.90	1.08	478.084 ± 1075.830
6A016@54	54.00 W	0.00029	0.00083	0.00146	0.93782	4.22137	14.87 ± 0.09	97.50	2.60	550.666 ± 551.422
6A016@97	97.00 W	0.00021	0.00049	0.00120	0.54265	2.45452	14.94 ± 0.12	97.01	1.51	540.518 ± 540.574
6A016@95	95.00 W	0.00076	0.00380	0.00111	0.58332	2.67276	15.14 ± 0.12	91.82	1.62	75.124 ± 21.815
6A016@73	73.00 W	0.00053	0.00079	0.00170	0.88464	4.13243	15.43 ± 0.09	95.83	2.46	546.039 ± 546.830
6A016@86	86.00 W	0.00089	0.00053	0.00118	0.58241	2.73270	15.50 ± 0.13	90.74	1.62	543.146 ± 544.321
6A016@74	74.00 W	0.00010	0.00104	0.00263	1.16090	5.51457	15.69 ± 0.08	98.94	3.22	545.915 ± 546.528
6A016@82	82.00 W	0.00048	0.00049	0.00113	0.54507	2.60160	15.77 ± 0.12	94.34	1.51	544.073 ± 544.128
6A016@81	81.00 W	0.00048	0.00042	0.00092	0.46799	2.33887	16.51 ± 0.13	93.82	1.30	543.999 ± 544.057
6A016@58	58.00 W	0.00019	0.00072	0.00159	0.81154	4.14218	16.85 ± 0.10	98.16	2.25	549.699 ± 549.751
		0.03804	0.03939	0.07270	36.00952	140.92447				

Information on Analysis	
Sample	PC-13 A-38
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001839
Standard	28.34

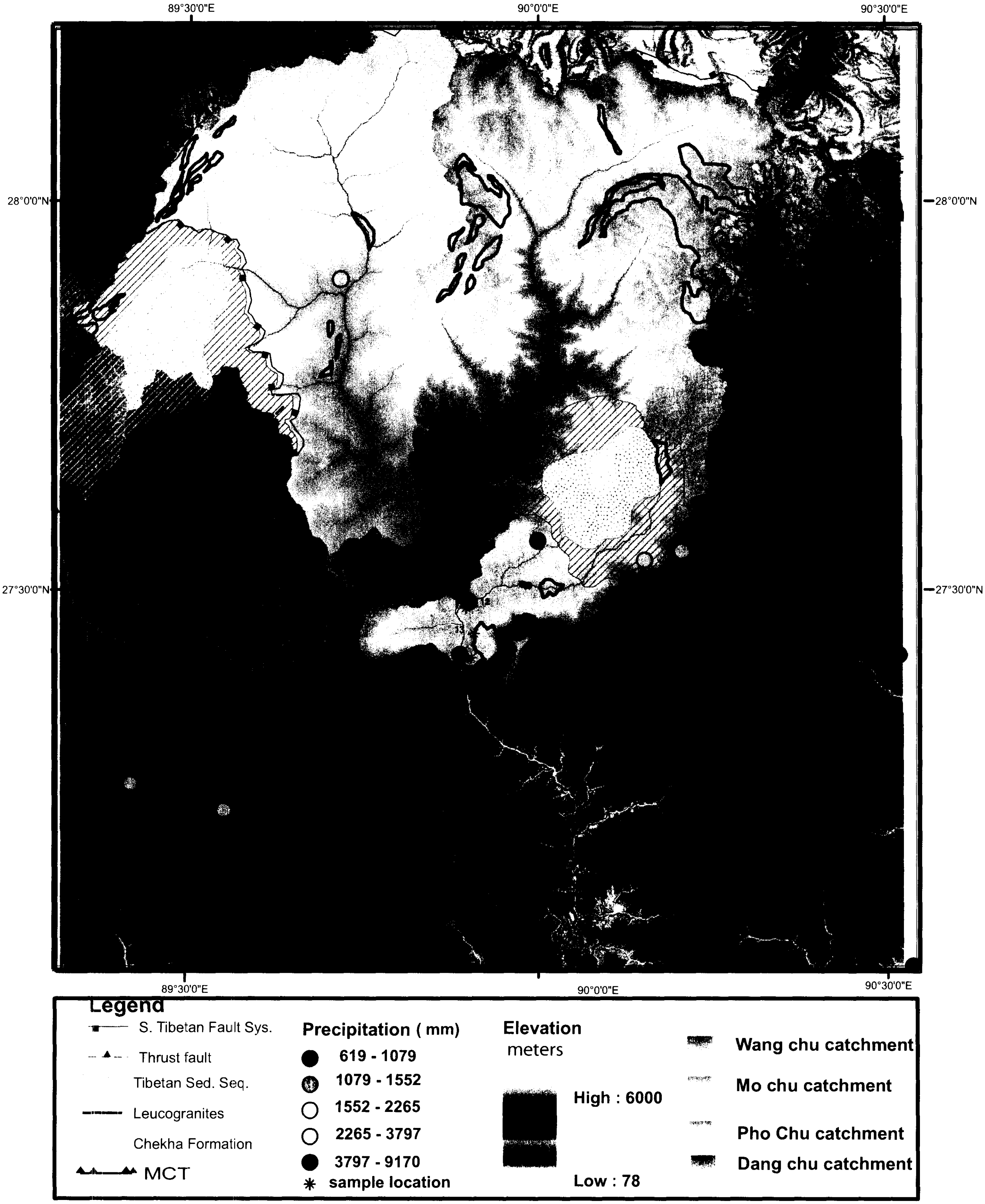
Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.8708 ± 0.1802 ± 4.66%	12.80 ± 0.59 ± 4.65%	1669.82	100.00 50	120.305 ± 33.514
		External Error ± 0.59	2.01	Statistical T ratio	
		Analytical Error ± 0.59	40.8634	Error Magnification	
Total Fusion Age	3.9135 ± 0.0046 ± 0.12%	12.94 ± 0.04 ± 0.32%		50	447.919 ± 60.122
		External Error ± 0.04			
		Analytical Error ± 0.02			

Single Crystal Laser Fusion		36Ar(a)	37Ar(ca)	38Ar(cl)	39Ar(k)	40Ar(r)	Age ± 2σ (Ma)	40Ar(r) (%)	39Ar(k) (%)	K/Ca ± 2σ
6A017@34	34.00 W	0.00675	0.00047	0.00163	0.58318	1.70495	9.66 ± 0.25	45.89	1.58	604.031 ± 602.815
6A017@01	1.00 W	0.00061	0.00091	0.00254	1.14114	3.33621	9.66 ± 0.06	94.09	3.08	613.538 ± 612.929
6A017@50	50.00 W	0.00111	0.00052	0.00128	0.64287	1.88641	9.69 ± 0.11	84.52	1.74	600.343 ± 601.554
6A017@45	45.00 W	0.00170	0.00107	0.00243	1.30979	3.86483	9.75 ± 0.08	87.86	3.54	602.326 ± 603.516
6A017@02	2.00 W	0.00032	0.00078	0.00195	0.97154	2.99120	10.17 ± 0.07	96.14	2.63	612.691 ± 612.747
6A017@27	27.00 W	0.00006	0.00047	0.00106	0.56807	1.77432	10.32 ± 0.10	98.30	1.53	588.010 ± 588.070
6A017@32	32.00 W	0.00043	0.00047	0.00098	0.58099	1.81518	10.32 ± 0.13	92.74	1.57	604.780 ± 603.557
6A017@39	39.00 W	0.00075	0.00059	0.00156	0.72091	2.25617	10.34 ± 0.11	90.37	1.95	603.367 ± 603.425
6A017@19	19.00 W	0.00192	0.00089	0.00199	1.10437	3.53024	10.56 ± 0.08	85.60	2.98	608.242 ± 608.977
6A017@47	47.00 W	0.00013	0.00044	0.00129	0.66193	2.16276	10.79 ± 0.12	97.53	1.79	743.862 ± 1647.077
6A017@38	38.00 W	0.00042	0.00048	0.00111	0.58885	1.93871	10.87 ± 0.13	93.34	1.59	603.620 ± 604.946
6A017@35	35.00 W	0.00035	0.00063	0.00172	0.77678	2.56659	10.91 ± 0.09	95.40	2.10	603.579 ± 603.638
6A017@44	44.00 W	0.00047	0.00064	0.00148	0.87185	2.89290	10.96 ± 0.09	94.76	2.36	669.153 ± 1057.908
6A017@13	13.00 W	0.00023	0.00072	0.00181	0.89385	3.00852	11.11 ± 0.09	97.11	2.42	609.370 ± 608.587
6A017@20	20.00 W	0.00018	0.00175	0.00224	0.92295	3.16030	11.31 ± 0.08	97.66	2.49	258.646 ± 131.375
6A017@05	5.00 W	0.00156	0.00102	0.00234	1.27292	4.38830	11.38 ± 0.07	89.93	3.44	613.171 ± 614.417
6A017@23	23.00 W	0.00176	0.00048	0.00120	0.51975	1.82120	11.57 ± 0.15	77.34	1.40	534.403 ± 907.972
6A017@16	16.00 W	0.00259	0.00048	0.00110	0.59601	2.14460	11.88 ± 0.14	73.30	1.61	609.207 ± 610.530
6A017@12	12.00 W	0.00008	0.00054	0.00129	0.67463	2.45753	12.03 ± 0.10	98.34	1.82	609.819 ± 608.765
6A017@08	8.00 W	0.00019	0.00060	0.00140	0.74649	2.73292	12.09 ± 0.11	97.29	2.02	611.255 ± 612.325
6A017@17	17.00 W	0.00108	0.00056	0.00223	1.12922	4.18771	12.24 ± 0.07	92.34	3.05	986.281 ± 1819.279
6A017@10	10.00 W	0.00039	0.00063	0.00163	0.77916	2.89233	12.25 ± 0.09	95.52	2.11	610.283 ± 610.342
6A017@49	49.00 W	0.00030	0.00034	0.00090	0.45772	1.77942	12.83 ± 0.17	94.72	1.24	652.847 ± 1791.127
6A017@40	40.00 W	0.00004	0.00050	0.00122	0.61208	2.38327	12.85 ± 0.12	98.84	1.65	602.928 ± 602.988
6A017@30	30.00 W	0.00242	0.00084	0.00202	1.03224	4.12211	13.18 ± 0.10	84.76	2.79	605.116 ± 604.448
6A017@46	46.00 W	0.00302	0.00034	0.00113	0.50186	2.01421	13.25 ± 0.17	68.97	1.36	722.482 ± 2173.412
6A017@14	14.00 W	0.00043	0.00065	0.00150	0.81126	3.30510	13.44 ± 0.10	95.77	2.19	609.144 ± 609.202
6A017@42	42.00 W	0.00009	0.00045	0.00115	0.55577	2.33555	13.87 ± 0.13	98.34	1.50	602.964 ± 603.026
6A017@15	15.00 W	0.00019	0.01561	0.00123	0.60260	2.53439	13.88 ± 0.12	97.31	1.63	18.917 ± 1.080
6A017@43	43.00 W	0.00066	0.00073	0.00106	0.47951	2.04268	14.06 ± 0.16	90.76	1.30	324.065 ± 457.173
6A017@28	28.00 W	0.00021	0.00044	0.00106	0.54304	2.32362	14.12 ± 0.15	96.86	1.47	606.043 ± 606.106
6A017@03	3.00 W	0.00073	0.00103	0.00234	1.28878	5.52449	14.14 ± 0.07	95.69	3.48	615.341 ± 617.762
6A017@41	41.00 W	0.00143	0.00064	0.00142	0.79275	3.41203	14.20 ± 0.12	88.51	2.14	603.079 ± 603.137
6A017@04	4.00 W	0.00022	0.00072	0.00170	0.90478	3.89505	14.20 ± 0.09	97.82	2.44	612.668 ± 613.561
6A017@11	11.00 W	0.00185	0.00048	0.00133	0.72153	3.10870	14.21 ± 0.13	84.66	1.95	735.910 ± 1290.442
6A017@18	18.00 W	0.00000	0.00060	0.00144	0.74054	3.21323	14.32 ± 0.11	99.39	2.00	608.859 ± 608.918
6A017@31	31.00 W	0.00037	0.00050	0.00119	0.61227	2.66212	14.34 ± 0.14	95.53	1.65	605.455 ± 605.517
6A017@24	24.00 W	0.00150	0.00049	0.00133	0.60882	2.67733	14.51 ± 0.16	85.39	1.64	607.572 ± 608.866
6A017@26	26.00 W	0.00041	0.00034	0.00084	0.42641	1.87775	14.53 ± 0.14	93.42	1.15	605.867 ± 605.935
6A017@33	33.00 W	0.00067	0.00062	0.00145	0.76824	3.39299	14.57 ± 0.13	93.95	2.08	604.346 ± 603.434
6A017@21	21.00 W	0.00052	0.00104	0.00106	0.53712	2.37366	14.58 ± 0.12	93.39	1.45	253.049 ± 265.853
6A017@37	37.00 W	0.00000	0.00040	0.00083	0.49022	2.16870	14.59 ± 0.08	99.44	1.32	604.019 ± 605.604
6A017@06	6.00 W	0.00000	0.00103	0.00239	1.34361	5.95022	14.61 ± 0.06	99.44	3.63	640.288 ± 527.026
6A017@07	7.00 W	0.00051	0.00093	0.00186	1.16412	5.15774	14.62 ± 0.08	96.63	3.15	611.146 ± 611.201
6A017@22	22.00 W	0.00065	0.00049	0.00119	0.60319	2.69587	14.74 ± 0.12	92.83	1.63	607.344 ± 606.164
6A017@36	36.00 W	0.00003	0.00033	0.00076	0.40864	1.84217	14.87 ± 0.18	98.99	1.10	604.125 ± 606.017
6A017@48	48.00 W	0.00050	0.00059	0.00080	0.35478	1.62973	15.15 ± 0.19	91.23	0.96	292.678 ± 495.719
6A017@25	25.00 W	0.00064	0.00028	0.00060	0.35086	1.62241	15.25 ± 0.18	89.11	0.95	607.586 ± 607.659
6A017@29	29.00 W	0.00010	0.00054	0.00128	0.66596	3.08616	15.28 ± 0.12	98.55	1.80	605.347 ± 605.407
6A017@09	9.00 W	0.00073	0.00109	0.00099	0.57521	2.77004	15.88 ± 0.13	92.32	1.55	259.196 ± 213.274
		0.04132	0.04716	0.07231	37.01114	141.41458				

Information on Analysis	
Sample	PC-14 A-39
Material	Wh. Mica
Location	Bhutan Micas
Analyst	msp
Project	Irradiations
Irradiation	cl156-
J-value	0.001836
Standard	28.34

Results	40(r)/39(k) ± 2σ	Age ± 2σ (Ma)	MSWD	39Ar(k) (%,n)	K/Ca ± 2σ
Error Plateau	3.7838 ± 0.1612 ± 4.26%	12.49 ± 0.53 ± 4.26%	1339.62	100.00 50	19.019 ± 2.022
		External Error ± 0.53	2.01	Statistical T ratio	
		Analytical Error ± 0.53	36.6008	Error Magnification	
Total Fusion Age	3.8209 ± 0.0047 ± 0.12%	12.61 ± 0.04 ± 0.32%		50	384.541 ± 42.871
		External Error ± 0.04			
		Analytical Error ± 0.02			

Appendix A.3.



89°30'0"E
90°0'0"E
90°30'0"E
28°0'0"N
27°30'0"N
Legend
S. Tibetan Fault Sys.
Thrust fault
Tibetan Sed. Seq.
Leucogranites
Chekha Formation
MCT
Precipitation (mm)
619 - 1079
1079 - 1552
1552 - 2265
2265 - 3797
3797 - 9170
sample location
Elevation
meters
High : 6000
Low : 78
Wang chu catchment
Mo chu catchment
Pho Chu catchment
Dang chu catchment

Figure A.4.1. WANG CHU CHANNEL MORPHOLOGY

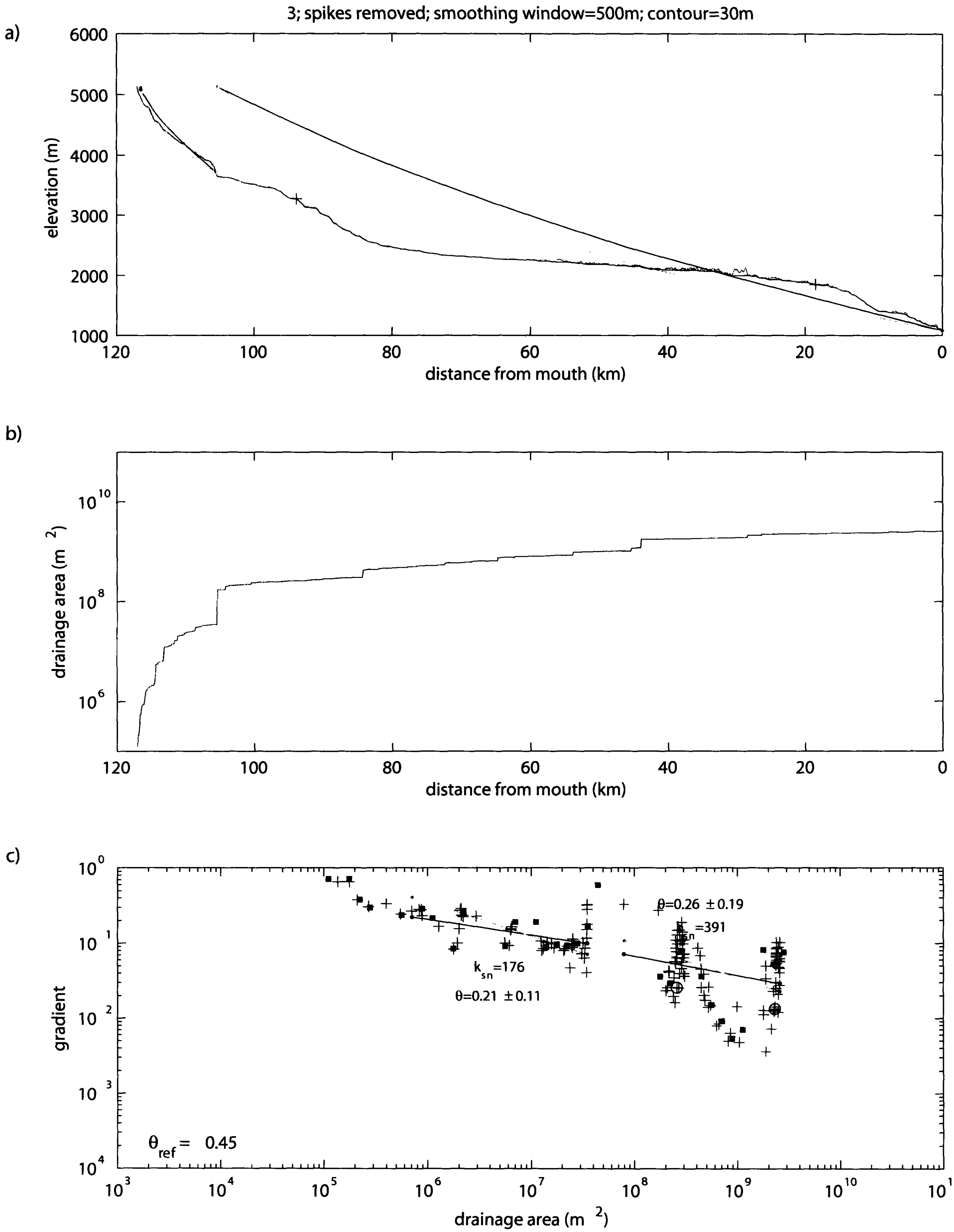


Figure A.4.2. Averaged '*ks*' values for the Wang chu basin

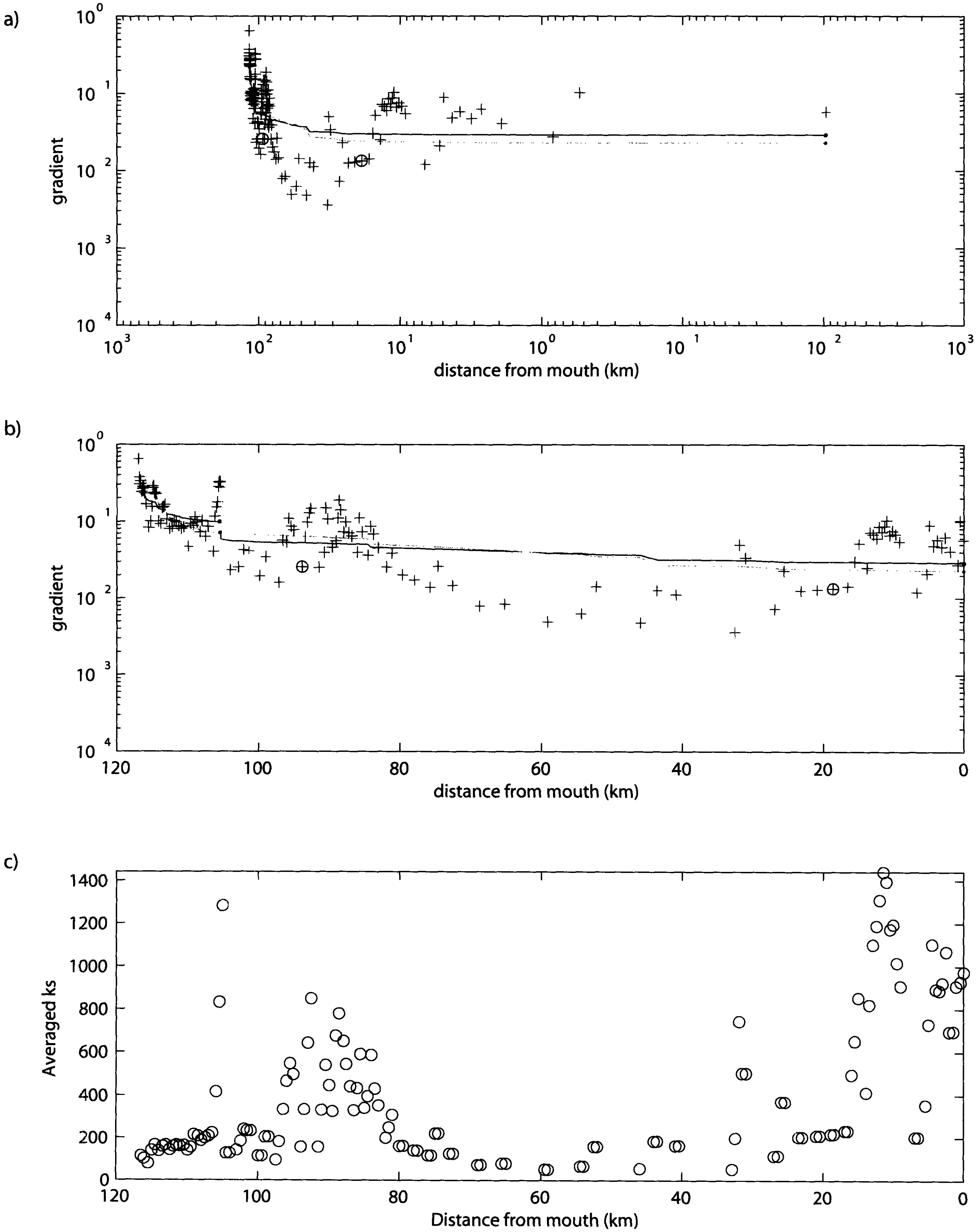


Figure A.4.3. Mo chu channel morphology

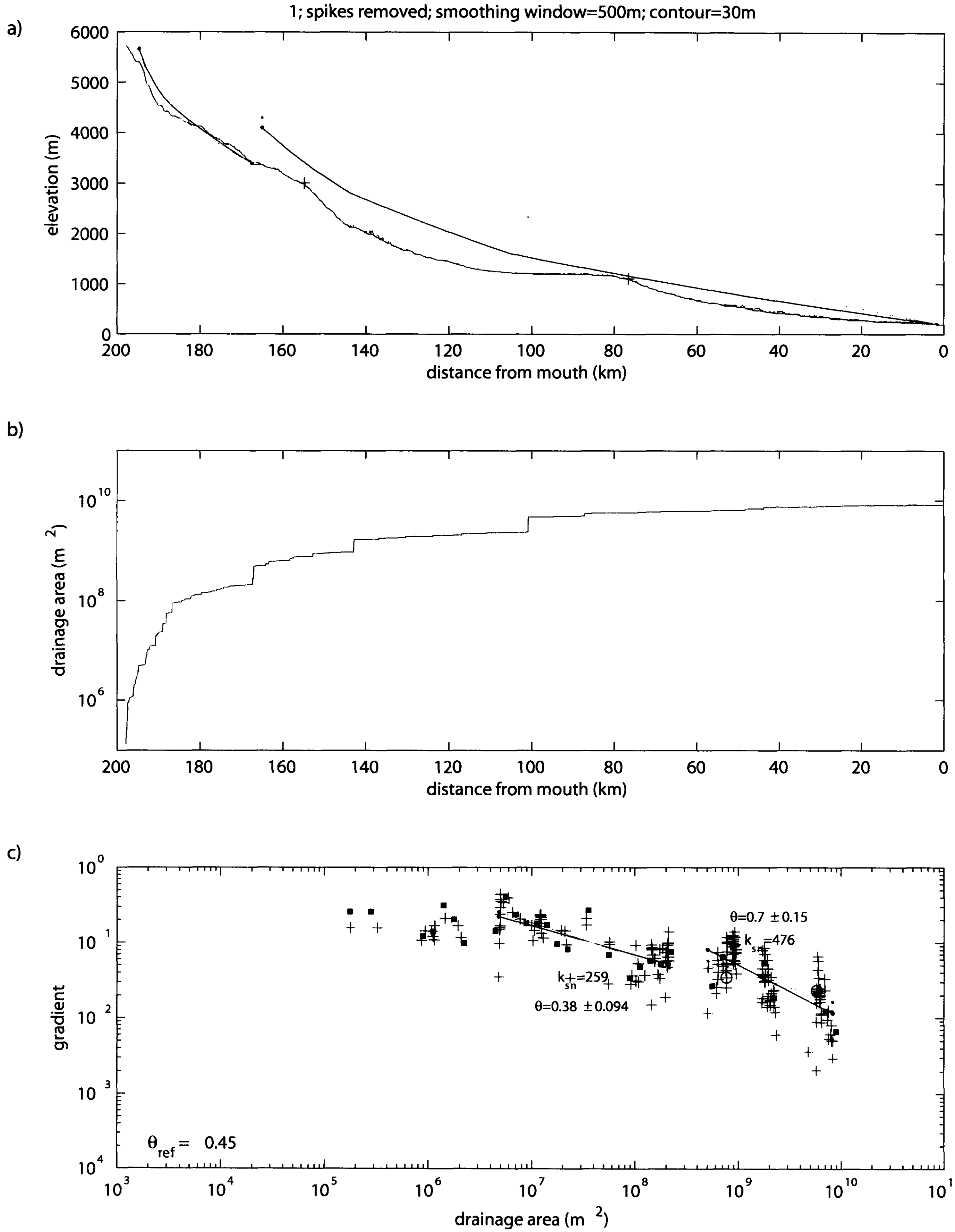


Figure A.4.4 Average '*ks*' values for the Mo chu tributary

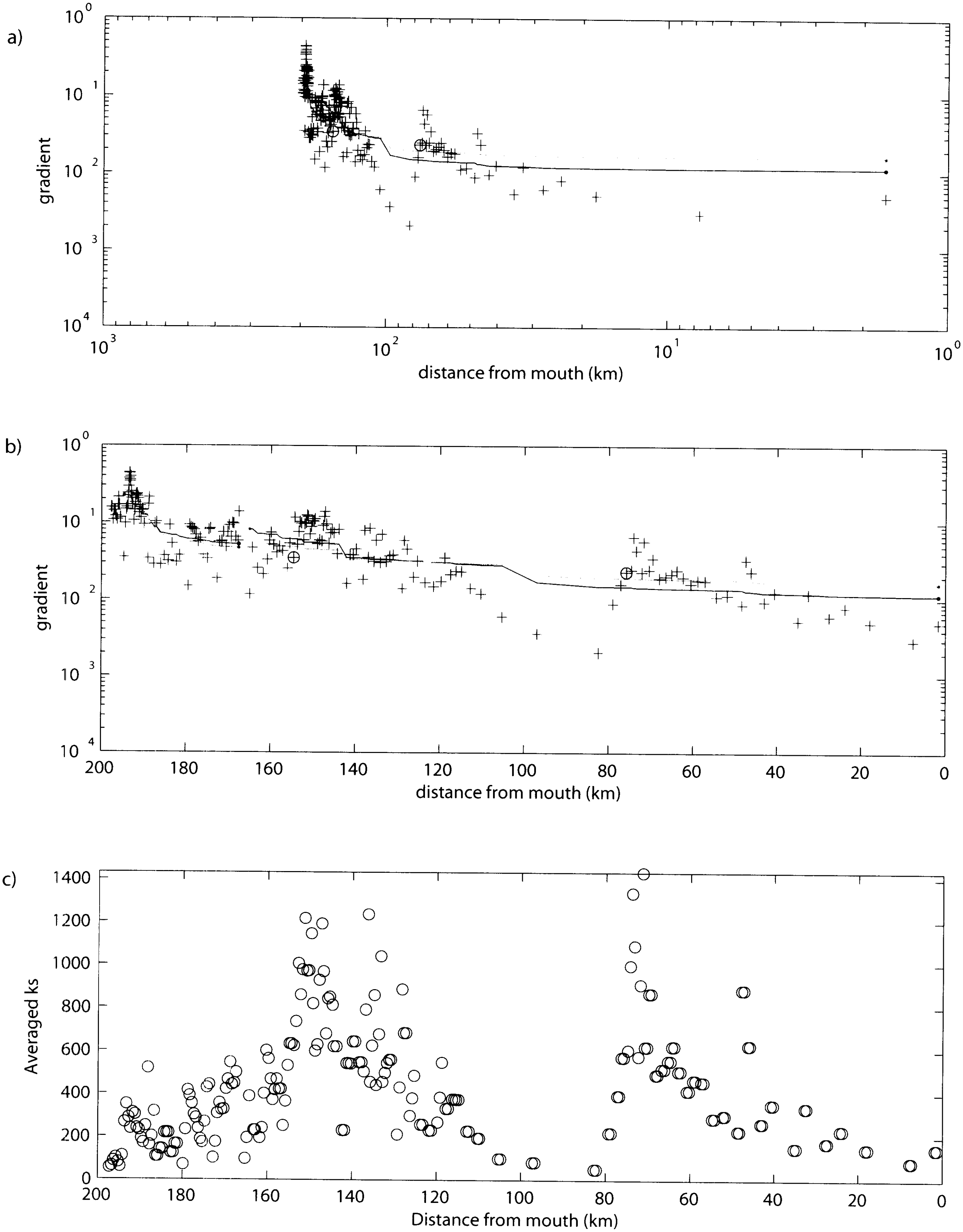


Figure A.4.5

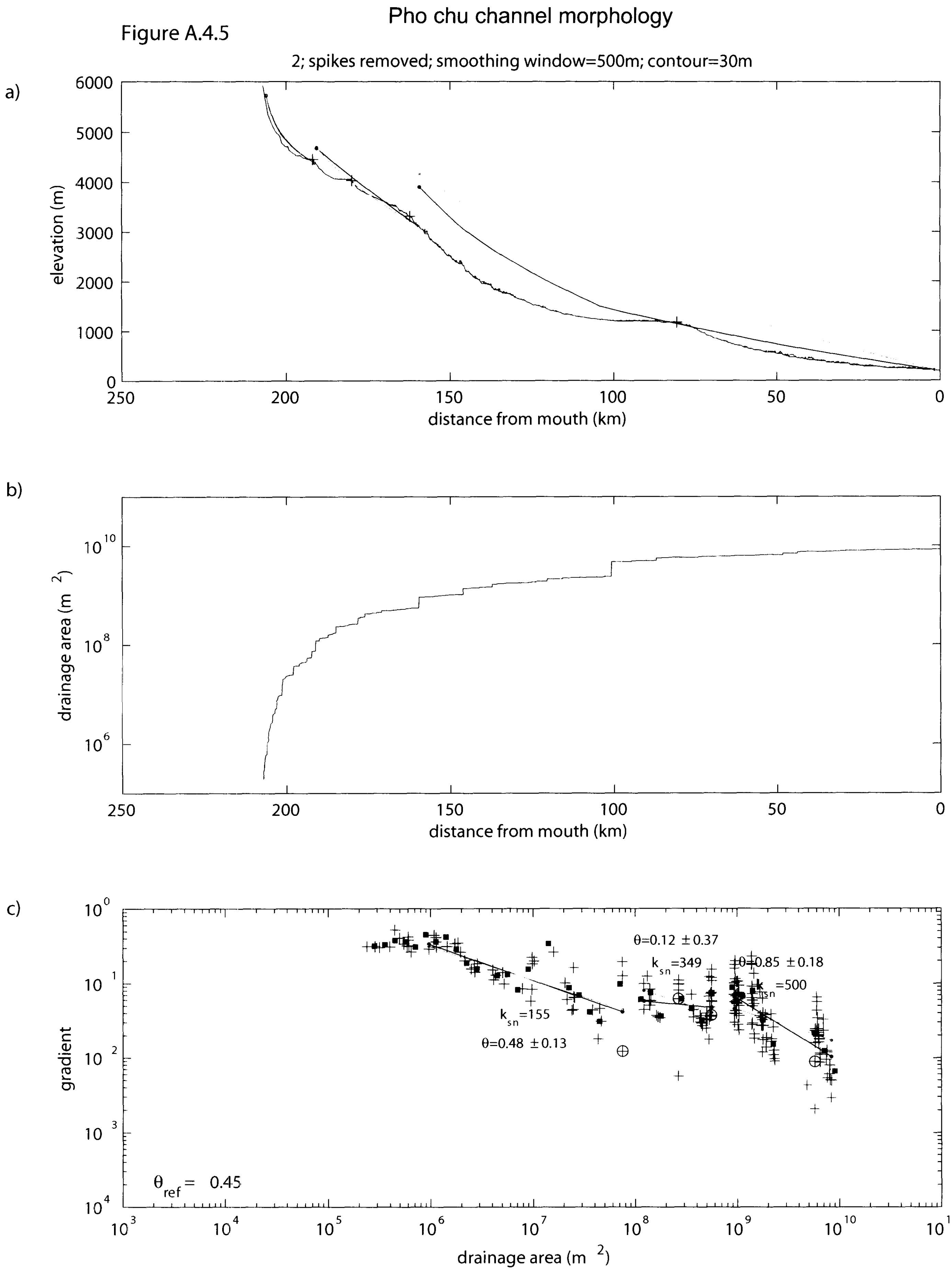

Pho chu channel morphology
2; spikes removed; smoothing window=500m; contour=30m
a)
elevation (m)
distance from mouth (km)
b)
drainage area (m 2)
distance from mouth (km)
c)
gradient
drainage area (m 2)
θ=0.12 ±0.37
k sn=349
θ=0.85 ±0.18
k sn=500
k sn=155
θ=0.48 ±0.13
θref = 0.45

Figure A.4.6. Averaged '*ks*' values for the Pho chu tributary

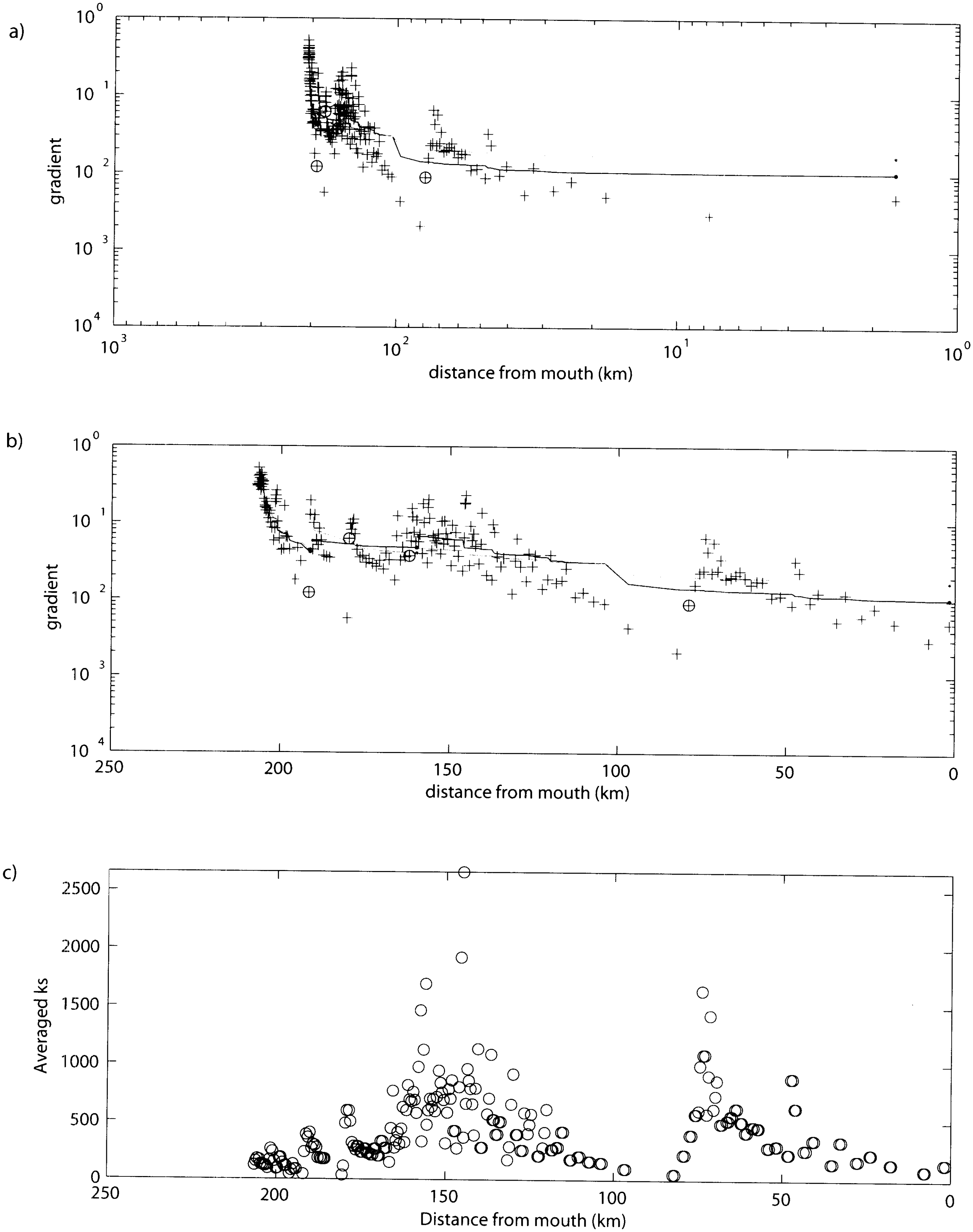


Figure A.4.7. Dang chu channel morphology

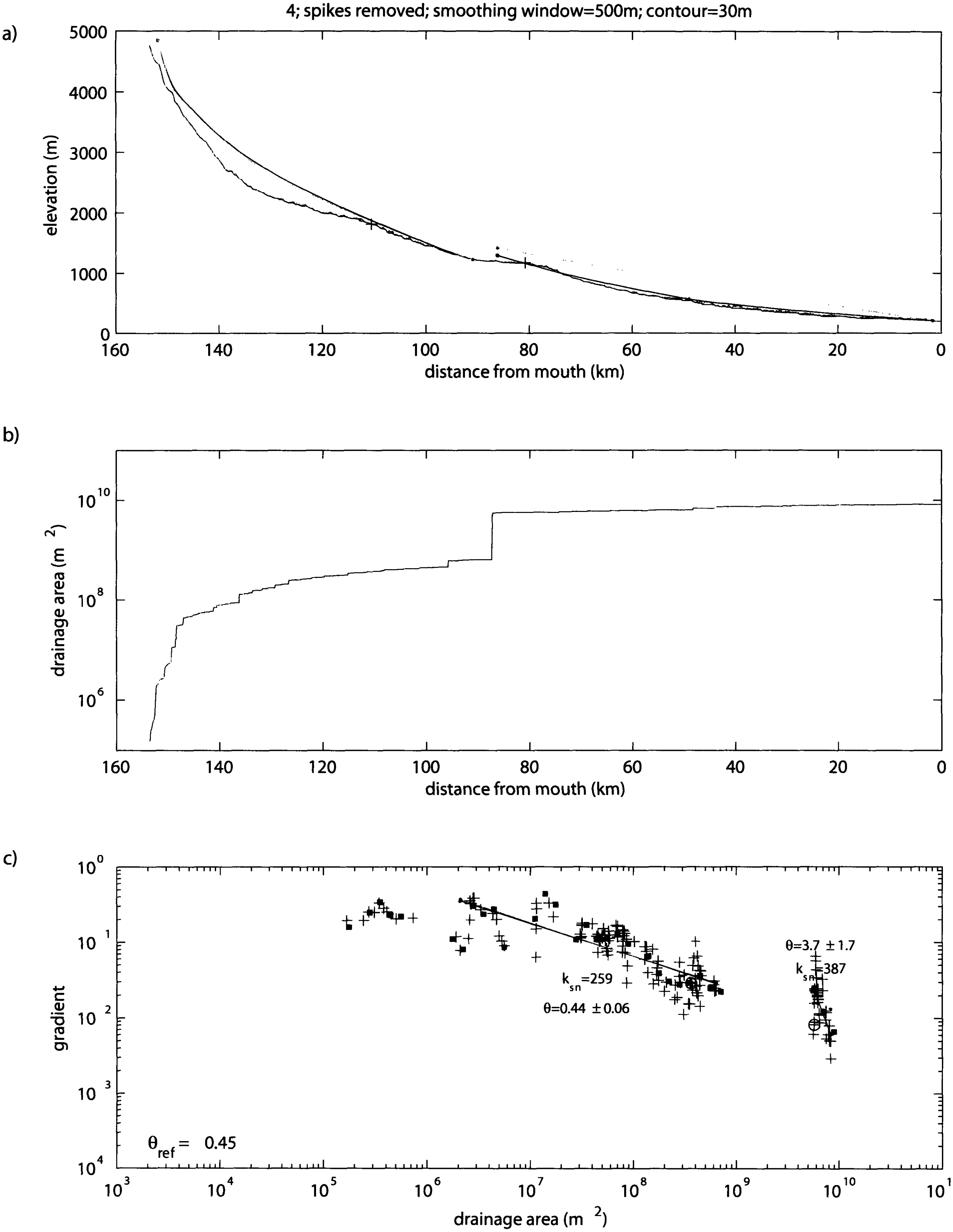
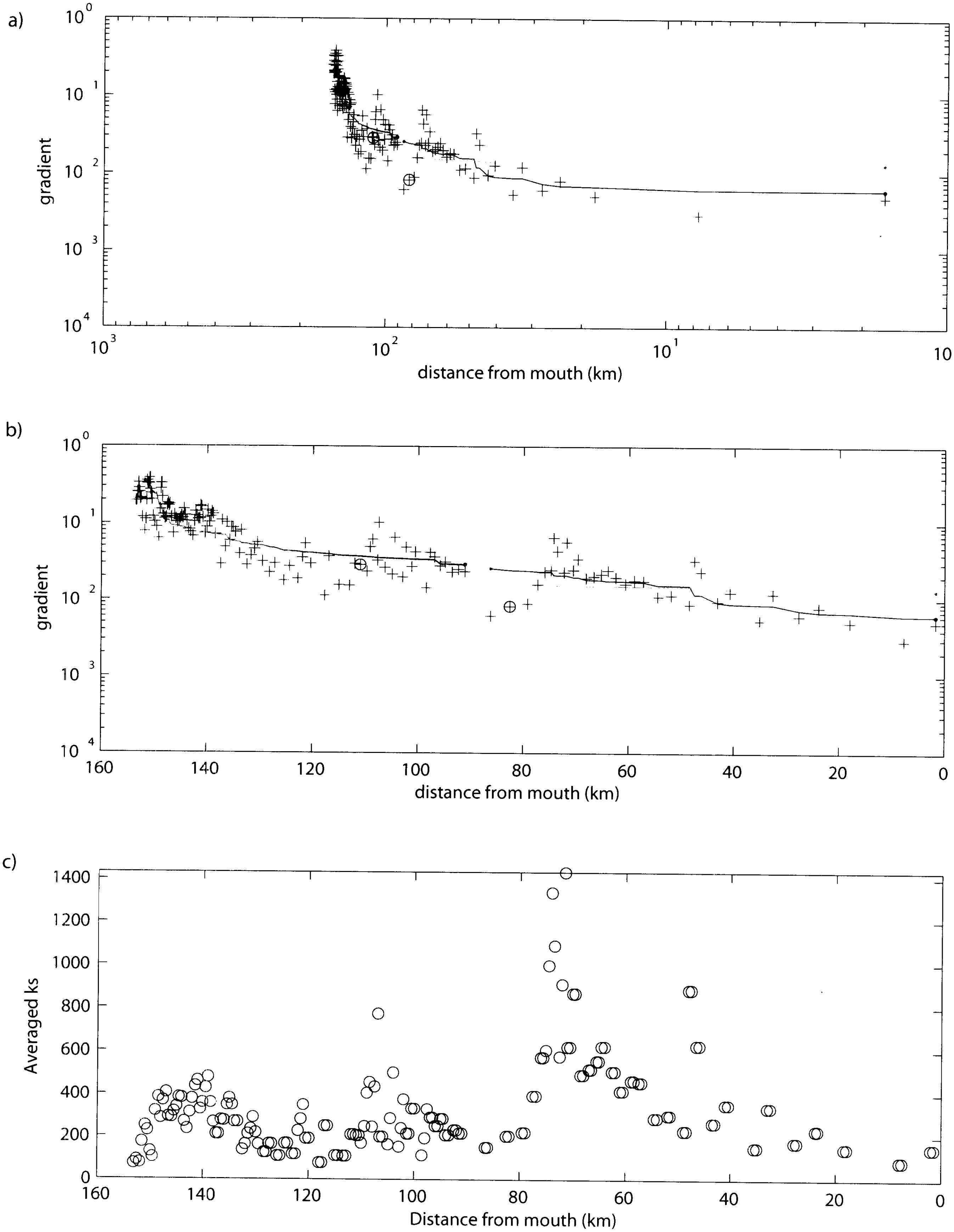


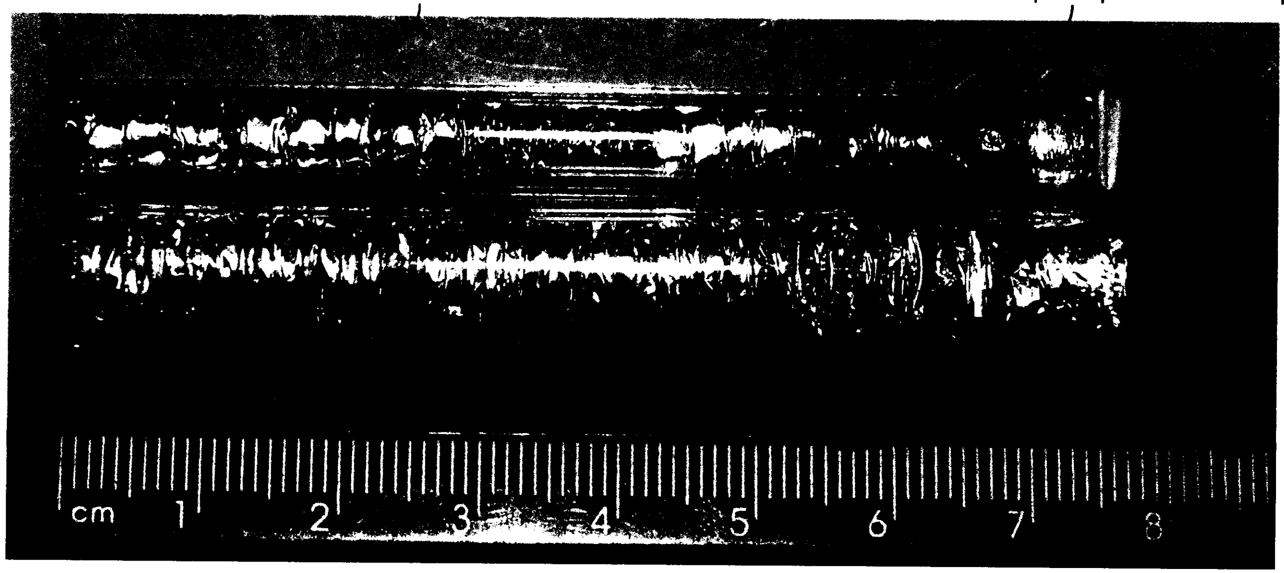
Figure A.4.8. Average '*ks*' values for the Dang chu tributary



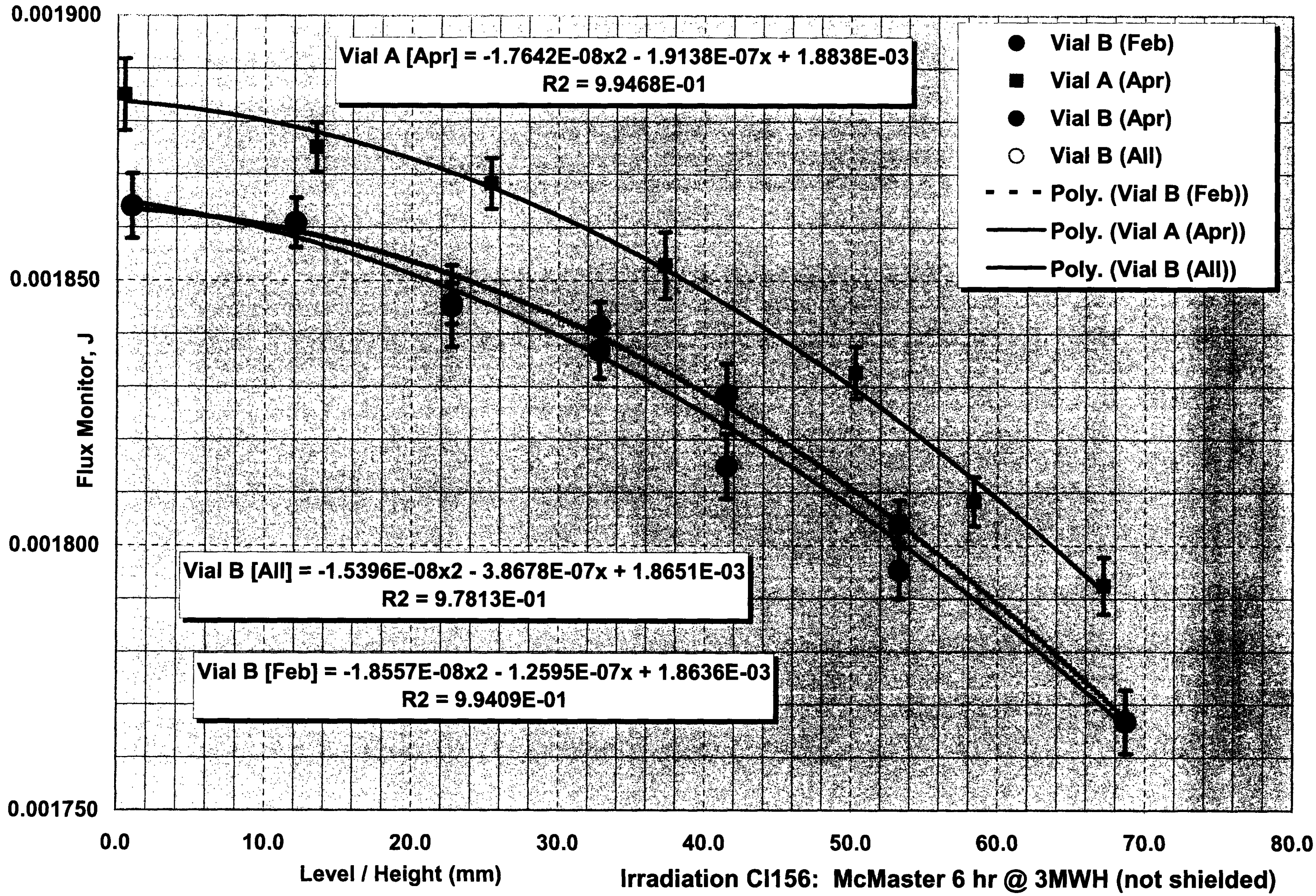
Appendix A.5.

samples packed in aliminium foil

sanidine samples packed in copper



Appendix A.6



Irradiation CI156: McMaster 6 hr @ 3MWH (not shielded)