U-Pb isotope geochronologic data from 23 igneous rock units in central and southeastern Arizona

by

Jon E. Spencer[1], Clark E. Isachsen[2], Charles A. Ferguson[1], Stephen M. Richard[1], Steve J. Skotnicki[1], Joe Wooden[3] and Nancy R. Riggs[4]

Arizona Geological Survey Open-File Report 03-08

November 2003

40 pages

Author Affiliations:

1. Arizona Geological Survey, Tucson
2. Dept. of Geosciences, University of Arizona, Tucson
3. US Geological Survey, Menlo Park, CA
4. Northern Arizona University, Flagstaff

Arizona Geological Survey

416 W. Congress St., #100, Tucson, Arizona 85701

Research partially supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under USGS award numbers 1434-HQ-97AG-01824, 98HQAG2064, 99HQAG0171, 00HQAG0149, and 01HQAG0098. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

U-Pb isotope geochronologic data from 23 igneous rock units in central and southeastern Arizona

INTRODUCTION

Geochronologic analyses of igneous rocks were done over the past several years as part of the joint State-Federal STATEMAP program. These analyses were done to determine the age of rocks in areas where Arizona Geological Survey geologists were making geologic maps at 1:24,000 scale or compiling geologic maps at 1:100,000 scale. Geochronologic analyses are a basic component of geologic map making in areas where igneous rocks are present but their ages are poorly known. Most of the dates reported here are the result of laboratory analyses by Clark Isachsen at the University of Arizona Department of Geosciences, and were determined in most cases by analysis of single zircon crystals from the rock samples. Two dates were produced at the US Geological Survey in Menlo Park, California, by Joe Wooden, and two are from samples collected by Nancy Riggs and analyzed at UC Santa Barbara. These analyses used multiple zircon crystals divided into size fractions for each laboratory analysis. Sample locations and descriptions are reported in Table 1, and basic geochronologic results are reported in Table 2. Concordia diagrams and analytical data are given in Appendix A.

OVERVIEW OF GEOCHRONOLOGIC RESULTS

Magmatism in Arizona occurred primarily during seven time periods, six of which are represented by dates reported here. The crust that underlies Arizona was first created by subduction-related magmatism and tectonic accretion between 1.8 and 1.6 Ga (giga-annum, or billion years). In general, igneous rocks in Arizona are older to the northwest and younger to the southeast, which probably reflects the process of continent construction on a southeastward facing continental margin (e.g., Condie and DeMalas, 1985; P. Anderson, 1989; DeWitt, 1989; Karlstrom and Bowring, 1991; Hawkins et al., 1996; Eisele and Isachsen, 2001). Six dates reported here, from the Mazatzal Mountains area northeast and east of Phoenix, the New River Mountains north of Phoenix, and the Maricopa Mountains southwest of Phoenix, reflect magmatism during this time period.

At about 1.4 Ga, after about 200 million years of magmatic quiescence, igneous activity resumed in Arizona with emplacement of voluminous granitic magmas. This magmatic event occurred in a belt extending across North America, from the American Southwest to eastern Canada, and from there eastward to Scandinavia, which was contiguous with the early North American continent at that time (Silver et al., 1980; J.L. Anderson, 1989). Three dates reported here reflect this period of magmatism. Two of these (1434.5 ± 3.4 Ma, and 1433.5 ± 2 Ma; Ma = mega-annum, or million years) are from north of Tucson and are part of what has been known as the Oracle granite. The other (1436.4 ± 1.8 Ma) is from the Ruin Granite north of Globe. The similarity of the ages of these two granites, each of which covers a large area, indicates a very short period of voluminous magmatism.

The next magmatic event in Arizona is the emplacement of diabase magmas that are largely represented by sills in the Mesoproterozoic Apache Group (Shride, 1967; Wrucke, 1989; Howard, 1991). At one location in the Sierra Ancha, where this diabase intruded and apparently melted the Dripping Spring Quartzite of the Apache Group, granophyre occupies the contact zone between the two rock units (Smith and Silver, 1975). Four of eight zircon crystals from a sample of this granophyre indicate a crystallization age of 1038.5 ± 11 Ma.

Magmatism next occurred in the Jurassic period and was largely restricted to southwestern Arizona and areas near the southern edge of Arizona (Tosdal et al., 1989; Riggs et al., 1994). Two dates reported here are from granites in the Sierrita Mountains and the Las Guijas Mountains south of the Sierrita Mountains. A location is given for a third volcanic rock sample from the Waterman Mountains, but analytical data for this sample, which indicated a Jurassic age, are missing.

Jurassic magmatism was followed after about 70 million years of magmatic quiescence by latest Cretaceous and early Tertiary magmatism during the Laramide orogeny. The Laramide orogeny was a period of mountain building and magmatism that also produced most of the porphyry copper deposits in southern Arizona, northern Sonora, and southwestern New Mexico (e.g., Keith, 1984; Titley and Anthony, 1989). Eight dates reported here, which range from 76 to 56 Ma, are from Laramide igneous rocks. In general, these rock units were dated because it was uncertain if they were middle Tertiary, Laramide, or possibly Jurassic or Proterozoic. Laramide granites are associated with all of Arizona's porphyry copper deposits except at Bisbee (which is Jurassic). Knowing the precise ages of granitic rock units and the distribution of Laramide granitoids will potentially assist future exploration for porphyry copper deposits.

The Laramide orogeny was following by about 20 Ma of magmatic quiescence (except for deep-seated peraluminous magmatism that did not reach the Earth's surface). Renewed magmatism in the middle Tertiary (largely 15-30 Ma in southwestern Arizona; Spencer et al., 1995; McIntosh and Ferguson, 1998; Peters et al., 2003) produced an undeformed rhyolite dike that cuts across a schistose to mylonitic shear zone in the northern Tortolita Mountains (Ferguson et al., 2002). This dike was dated at 25.1 ± 0.6 Ma. This shear zone is either Laramide or middle Tertiary.

Two samples yielded dates with such large uncertainty that it was not possible to assign the rock units to one of Arizona's major periods of magmatism.

Table 1. Sample location and description

Sample Number	UTM East	UTM North	NAD	Rock unit	Location	7 ½' Quadrangle	Collector
WG-3-7-98-5	414310	3761660	27, Z12	New River Mesa quartz porphyry	New River Mesa area	New River Mesa	W. Gilbert
11-16-95-1	455995	3742535	27, Z12	Granite near Sunflower	Mazatzal Mtns.	Boulder Mountain	S. Skotnicki
3-24-98-6 (P15)	481875	3722280	27, Z12	Cottonwood Creek Granite	Two Bar Ridge	Theo. Roos. Dam	Richard / Spencer
3-20-97-4	436460	3707305	27, Z12	Granite of the Usery Mountains	Usery Mtns.	Granite Reef Dam	S. Skotnicki
10-22-86-2	358225	3662270	27, Z12	Maricopa Mountains granite	Maricopa Mountains	Cotton Center SE	Joe Wooden / Ed DeWitt
10-22-86-3	358020	3661875	27, Z12	granite of Cotton Center	Maricopa Mountains	Cotton Center SE	Joe Wooden / Ed DeWitt
8-5-99-21	466905	3733375	27, Z12	Coarse grained granite of El Oso Road	Mazatzal Mtns.	Four Peaks	S. Skotnicki
3-24-98-1	506160	3712075	27, Z12	Ruin Granite	Salt River Mtns.	Salt River Peak	Richard / Spencer
F9-166	454450	3596570	27, Z12	Samaniego Hills granite	Samaniego Hills	Silver Bell east	C. Ferguson
CAF-02-3730	508755	3622980	27, Z12	Equigranular two-mica granite	Black Mountain north of Oracle Junction	Fortified Peak	C. Ferguson
4-15-99-4	503235	3749205	27, Z12	Yd granophyre	Sierra Ancha	McFadden Peak	Isachsen / Spencer
Riggs HRM	?	?	27, Z12	Harris Ranch monzonite	Sierrita Mountains	?	N. Riggs
Jg 89-21	468200	3498950	27, Z12	Durazno Granite	Las Guijas Mountains	Cerro Colorado	N. Riggs
3-14-00-3	499425	3630570	27, Z12	Foliated mafic granitoid, Ninetysix Hills	Ninetysix Hills	Ninetysix Hills SE	Richard / Spencer
F0-998	454900	3547675	27, Z12	San Pedro tuff, Roskruge Mts.	Roskruge Mts.	San Pedro	C. Ferguson
11-23-01-3	508552	3585386	27, Z12	Granite of Alamo Canyon	Santa Catalina Mts.	Oro Valley	J. Spencer
CAF-02-2666	495154	3600516	27, Z12	Pluton of Chirreon Wash	Tortolita Mts.	Tortolita Mountains	C. Ferguson
3-23-98-4	505420	3691225	27, Z12	Schultze Granite	Pinal Mtns.	Pinal Ranch	Richard / Spencer
11-19-99-1 and F2-3729	516138	3605480	27, Z12	Granite stock, Little Hill Mine, (recollected by CAF as F2-3729)	northwestern Santa Catalina Mts.	Oracle	Richard / Ferguson
1-6-99-5	461035	3623085	27, Z12	Picacho Mountains granite	Picacho Mtns.	Newman Peak	J. Spencer
981-21-1	349875	3723825	27, Z12	Granitoid, NW White Tank Mts.	White Tank Mtns	White Tank Mtns. NE	S. Reynolds
CAF-02-3233	500406	3604834	27, Z12	Undeformed dacite porphyry dike that cuts across Carpus Wash shear zone, northeastern Tortolita Mountains	Tortolita Mts.	Tortolita Mountains	C. Ferguson
3-13-01-2	540005	3527150	27, Z12	Aphyric felsic sill in Apache Canyon Fm (mistakenly identified as tuff)	Empire Mts.	The Narrows	J. Spencer

Table 2. Laboratory results

Sample Number	Rock unit	Location	U-Pb Date (Ma)	Uncertainty (Ma)	# zircons
WG-3-7-98-5	New River Mesa quartz porphyry	New River Mesa area	1711.6	2.8	5
11-16-95-1	Granite near Sunflower	Mazatzal Mtns.	1685.7	4.7	5
3-24-98-6 (P15)	Cottonwood Creek Granite	Two Bar Ridge	1685	4	4
3-20-97-4	Granite of the Usery Mountains	Usery Mtns.	1644	14	4
10-22-86-2	Maricopa Mountains granite	Maricopa Mountains	1641	5	3 size fractions
10-22-86-3	granite of Cotton Center	Maricopa Mountains	1632	7	4 size fractions
8-5-99-21	Coarse grained granite of El Oso Road	Mazatzal Mtns.	1446	+310 / -104	6
3-24-98-1	Ruin Granite	Salt River Mtns.	1436.4	1.8	6
F9-166	Samaniego Hills granite	Samaniego Hills	1434.5	3.4	4
CAF-02-3730	Equigranular two-mica granite	Black Mountain north of Oracle Junction	1433.5	2 (+2.1, -1.2)	6
4-15-99-4	Yd granophyre	Sierra Ancha	1038.5	11	8
Riggs HRM	Harris Ranch monzonite	Sierrita Mountains	179	5	3 size fractions
Jg 89-21	Durazno Granite	Las Guijas Mountains	178	3	3 size fractions
3-14-00-3	Foliated mafic granitoid, Ninetysix Hills	Ninetysix Hills	75.8	2.3	6
F0-998	San Pedro tuff, Roskruge Mts.	Roskruge Mts.	74.1	0.5	3
11-23-01-3	Granite of Alamo Canyon	Santa Catalina Mts.	71	1	6
CAF-02-2666	Pluton of Chirreon Wash	Tortolita Mts.	69.5	0.5	8
3-23-98-4	Schultze Granite	Pinal Mtns.	64	0.6	5
11-19-99-1 and F2-3729	Granite stock, Little Hill Mine, (recollected by CAF as F2-3729)	northwestern Santa Catalina Mts.	63.8	17.2	8
1-6-99-5	Picacho Mountains granite	Picacho Mtns.	59.3	1	5
981-21-1	Granitoid, NW White Tank Mts.	White Tank Mtns	56.2	14	6
CAF-02-3233	Undeformed dacite porphyry dike that cuts across Carpus Wash shear zone, northeastern Tortolita Mountains	Tortolita Mts.	25.1	0.6	6
3-13-01-2	Aphyric felsic sill in Apache Canyon Fm (mistakenly identified as tuff)	Empire Mts.	no date	no date	2

SAMPLE DATA AND INTERPRETATIONS

Early Proterozoic dates

New River Mesa, quartz porphyry, sample WG-3-7-98-5, 1711.6 ± 2.8 Ma. Ferguson et al. (1998a) sampled a dark, unfoliated, quartz porphyry sill near the north edge of the New River Mesa 7 ½' Quadrangle, which is north of Phoenix in northern Maricopa County. The sill intrudes a sequence of early Proterozoic metasedimentary rocks that consist largely of argillite and argillaceous sandstone and subaqueously deposited mafic lava flows and breccias, including local pillow structures. This date records a time of volcanism and sediment accumulation that occurred during early crustal genesis in central Arizona.

Mazatzal Mts., granite near Sunflower, sample 3-16-95-1, 1685.7 ± 4.7 Ma. This locally foliated granite is medium to coarse grained, slightly porphyritic, and has bluish quartz and rapakivi texture (K-feldspar rimmed with plagioclase). Up to 20% of rock consists of mafic minerals. This granite unit is exposed in the Tonto Basin and Boulder Mountain quadrangles (Ferguson et al., 1998b; Skotnicki and Leighty, 1998). K-feldspar phenocrysts are reported as euhedral to subhedral in the Tonto Basin 7 ½' Quadrangle but ovoid to subhedral in the Boulder Mountain Quadrangle. This granite previously yielded a U-Pb date of 1660 ρ 15 Ma (Silver, 1965; reported as 1640 Ma by Reynolds et al., 1986).

Northeastern Superstition Mountains, granodiorite near Cottonwood Creek, sample 3-24-98-6 (P15), 1685.3 ± 3.6 Ma. Diverse granitic rocks, commonly with gradational and indistinct contacts, are present below Theodore Roosevelt Dam between the Buckhorn Creek complex in the southern Mazatzal Mountains and the Ruin Granite of the Two Bar Ridge area in the southeastern Superstition Mountains (Spencer and Richard, 1999). These diverse rocks, known as the "granitic rocks of Cottonwood Creek", include granodiorite along Apache Trail next to upper Apache Lake (Spencer and Richard, 1999). This granite is the same age as the granite near Sunflower in the central Mazatzal Mountains, and the two could be related.

Granite of the Usery Mountains, sample 3-20-97-4, 1644 ± 14 Ma. This granite unit is exposed in the southeastern McDowell Mountains and Usery Mountains (on both sides of the Salt River near Granite Reef Dam) where it is medium to coarse grained and moderately porphyritic. It is locally foliated, with steep east-northeast striking foliations which in some areas form mylonite zones (Skotnicki, 1995; Skotnicki and Ferguson, 1996; Skotnicki and Leighty, 1997b; Ferguson and Gilbert, 1997).

Maricopa Mountains, Maricopa Mountains granite, sample 10-22-86-2, 1641 ± 5 Ma. This sample was analyzed by Joe Wooden of the U.S. Geological Survey. It is from the Maricopa Mountains granite, as defined by Cunningham et al. (1987) and Reynolds and DeWitt (1991), which is an aerially extensive, medium to coarse, porphyritic biotite granite with steep, northeast-striking zones of penetrative fabric development. A sample of this rock unit, from about 10 km south of sample 10-22-86-2, yielded a U-Pb date of 1645 ± 1 Ma, whereas another sample from about 10 km to the northwest yielded complex results in which the least discordant point represented a zircon crystal with a U-Pb age of 1655 Ma (Eisele and Isachsen, 2001).

Maricopa Mountains, granite of Cotton Center, sample 10-22-86-3, 1632 ± 7 Ma. This sample was analyzed by Joe Wooden of the U.S. Geological Survey. It was collected from a map unit designated "leucocratic granite" by Cunningham et al. (1987) and informally named granite of Cotton Center by Reynolds and DeWitt (1991). The granite of Cotton Center forms "dikes, irregularly shaped bodies, and minor small stocks of fine to medium grained, equigranular leucogranite" that intrude the 1641 ± 5 Ma Maricopa Mountains granite (Reynolds and DeWitt, 1991). U-Pb zircon analyses of four size fractions all yielded $^{207}Pb/^{206}Pb$ ages of 1626 to 1628 Ma. However, the points are not exactly concordant, and the lower intercept on a concordia diagram is a future age. Forcing the lower intercept to intersect zero age produces an upper intercept age of 1627 ± 2 Ma, whereas forcing the lower intercept to be the same as for the Maricopa Mountains granite (73 ± 62 Ma) yields an upper intercept of 1633 ± 5 Ma. Both of these ages and their uncertainties, and the $^{207}Pb/^{206}Pb$ ages, are included by an age of 1632 ± 7 Ma, which is here taken to represent the age of the granite.

Middle Proterozoic dates

Mazatzal Mountains, granite of El Oso Road, sample 8-5-99-21, 1446 +310 / -104 Ma. This granite, exposed in the central Mazatzal Mountains just north of Four Peaks, consists of coarse-grained, commonly reddish to pink, biotite granite with 1-4 cm diameter K-feldspar phenocrysts (Skotnicki and Leighty, 1997a; Ferguson et al., 1998b; Spencer and Richard, 1999; Skotnicki, 2000). The granite of El Oso Road, as presently understood, varies from strongly to weakly porphyritic. In the Theodore Roosevelt Dam 7 ½' Quadrangle, Spencer and Richard's (1999) map unit Xg_2, which is contiguous with the granite of El Oso Road, consists of only weakly porphyritic granite with K-feldspar phenocrysts up to 15 mm. It is possible that granite of El Oso Road includes more than one intrusion, or unmapped phases of a single heterogeneous intrusion. Except for a few foliation symbols shown by Skotnicki (2000) near the southern edge of the pluton, this unit is unfoliated. The lack of foliation is suggestive of a middle Proterozoic rather than an early Proterozoic age, as is the large size of its K-feldspar phenocrysts in some areas. The U-Pb date reported here is consistent with a middle Proterozoic age but allows an early Proterozoic age.

Salt River Mts., Ruin Granite, sample 3-24-98-1, 1436.4 ± 1.8 Ma. The unfoliated, porphyritic biotite granite north of Globe was named the Ruin Granite by Ransome (1903, 1904). It was dated by Silver et al. (1980) at 1440 ± 20 Ma using the U-Pb method on multi-grain samples of different grain-size fractions. The 1436.4 ± 1.8 Ma date reported here, includes two concordant analyses of single zircon grains and is well within the age range determined by Silver et al. (1980).

Granite in the Samaniego Hills, sample F9-166, 1434.5 ± 3.4 Ma. This medium to coarse grained, K-feldspar porphyritic granite (Ferguson et al., 1999) resembles the Oracle Granite 70 km to the east at the north end of the Santa Catalina Mountains (Peterson, 1938; Creasey, 1967; Spencer et al., 2000). Six radiometric age determinations of the Oracle Granite, considered likely to represent the approximate age of the granite by Reynolds et al. (1986), range from 1380 to 1430 Ma. The 1434.5 ± 3.4 Ma date reported here for the granite in the Samaniego Hills is similar to these other dates (see also date below for granite at Black Mountain).

Black Mountain north of Oracle Junction, equigranular two-mica granite, sample CAF-02-3730, 1433.5 +2.1 / -1.2 Ma. The dated rock is a medium to fine grained, light colored, equigranular, two-mica granite that forms irregular intrusions in porphyritic granite (Orr et al., 2002). This porphyritic granite is probably equivalent to the Oracle Granite (Peterson, 1938; Creasey, 1967; Spencer et al., 2000) and was correlated with the Ruin Granite by Krieger (1974). The two-mica equigranular granite was dated to determine if it was a late intrusion related to emplacement of the Oracle Granite, or a Cretaceous or Tertiary intrusion unrelated to the Oracle Granite. The U-Pb date reported here is almost identical to that of the granite in the Samaniego Hills, and our interpretation is that both are part of the Oracle Granite.

Sierra Ancha, granophyre associated with diabase sill, sample 4-15-99-4, 1038.5 ± 11 Ma. Diabase intrusions that form sills in the Mesoproterozoic Apache Group and dikes in underlying crystalline rocks are widespread in east-central Arizona (Shride, 1967; Bergquist et al., 1981; Wrucke, 1989; Skotnicki, 2002). In the Reynolds Creek area of the Sierra Ancha, diabase intruded Dripping Spring Quartzite and melted the overlying sandstone to produce a type of granitic rock known as granophyre (Smith, 1969; Smith and Silver, 1975). A U-Pb date of zircon from this granophyre, initially reported by Silver (1960), was "recalculated" (Wrucke, 1989) at 1,120 ± 11 Ma (Silver, 1978).

Eight zircon crystals were analyzed individually from the granophyre north of Reynolds Creek in the Sierra Ancha. Four of eight zircon crystals indicate a crystallization age of 1038.5 ± 11 Ma. The other four indicate a crystallization age of 1089 ± 15 Ma. Most likely, the younger date is the age of the granophyre, and the older age is due to inheritance from an earlier period of magmatism. However, this interpretation is speculative and the age for the diabase given here should be considered tentative.

Jurassic dates

Sierrita Mountains, Harris Ranch Monzonite, (Riggs HRM), 179 ± 5 Ma. The Harris Ranch Monzonite is the oldest of three extensive granitic units in the Sierrita Mountains and intrudes the Red Boy Rhyolite (Cooper, 1973; Ferguson et al., 2003; Johnson et al., 2003). Riggs et al. (1993) report that "The Harris Ranch monzonite, which intrudes the Ox Frame Volcanics, has yielded a concordant U-Pb zircon age of 176 Ma (Riggs, unpub. data, 1993)." The sample location for the dated sample is presently unknown. Analytical data are reported in Appendix A. One of the three zircon size fractions dated yielded concordant $^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$, and $^{207}Pb/^{206}Pb$ ages, all at 179 Ma. Uncertainty is estimated at ±5 Ma (Riggs et al., 1993).

Las Guijas Mountains, Durazno Granite, sample Jg 89-21, 178 ± 3 Ma. The Durazno Granite (granite of Durazno of Riggs and Haxel, 1990) is exposed on the north side of the Las Guijas Mountains, located southwest of Tucson and south of the Sierrita Mountains. It intrudes widespread granite porphyry, which in turn intrudes the Cobre Ridge caldera (Riggs and Busby-Spera, 1991; Riggs et al., 1994). The granite is leucocratic and perthitic. One of the three zircon fractions analyzed gave concordant $^{206}Pb/^{238}U$, $^{207}Pb/^{235}U$, and $^{207}Pb/^{206}Pb$ ages, all at 178 Ma. Uncertainty is estimated at ±3 Ma. The other two zircon fractions did not yield concordant zircons but $^{207}Pb/^{206}Pb$ ages are not greatly different. As noted by Riggs et al. (1994), the 178 ± 3 Ma date on the Durazno granite contradicts early estimations of the age of the Cobre Ridge caldera of 165-170 Ma (Riggs et al., 1993). The name "Durazno Granite" is used here to apply to the granite at the sample location site (UTME 468200, UTMN 3498950, zone 12; SE ¼, sec. 5, T. 21 S., R. 10 E.; just east of the Golden Star Mine, Cerro Colorado 7 ½' Quadrangle).

Laramide dates

Ninetysix Hills, foliated mafic granitoid, sample 3-14-00-3, 75.8 ± 2.3 Ma. Skotnicki (1999, map unit TYg) described this unit as a medium to coarse grained granite or granodiorite with a weak to strong foliation, and locally containing K-feldspar up to 3 cm. Krieger (1974, map unit dg) described this unit, in the adjacent Black Mountain 7 ½' Quadrangle, as fine to medium grained, "sheared and foliated to cataclastic gneiss and augen gneiss." Brief examination by Spencer and Richard identified a compositionally heterogeneous suite of tonalitic to quartz dioritic granitoids, some of which were variably mylonitic. The contact zone between the mafic granitoids and Oracle Granite is strongly mylonitic (eastern edge of NW ¼, sec. 21, T. 7 S., R. 13 E.). A sample of mafic granitoids ("biotite tonalite") yielded a date of 75.8 ± 2.3 Ma with a pronounced inherited component consistent with entrainment of zircons from Oracle Granite. This map unit is therefore interpreted as early Laramide. The mylonitic fabrics are inferred to have developed before all of the heterogeneous mafic granitoids were intruded and so are also early Laramide.

Roskruge Mountains, tuff of San Pedro, sample F0-998, 74.1 ± 0.5 Ma. The tuff of San Pedro consists of up to 60 m of phenocryst-rich (30% plagioclase, 1-3% biotite) welded ash-flow tuff exposed in the southern Roskruge Mountains west of Tucson (Ferguson et al., 2000). The tuff is at the base of a sequence of felsic Laramide volcanic rocks in the southern Roskruge Mountains. Its 74.1 ± 0.5 Ma age marks the beginning of felsic Laramide volcanism in the area.

Western Santa Catalina Mountains, granite of Alamo Canyon, sample 11-23-01-3, 71 ± 1 Ma. Dark, foliated, equigranular, fine to medium grained, biotite (4-8%) granite, intruded by abundant leucogranite and pegmatite dikes and sills (Spencer and Pearthree, 2002). This granite is intruded by Eocene leucogranites that form sills in the forerange of the Santa Catalina Mountains. The Laramide date reported here is consistent with these field relationships. The granite is similar to the pluton of Chirreon Wash in the Tortolita Mountains, the two granites are approximately the same age, and both display similar discordia patterns consistent with inheritance of Proterozoic zircons. The granite of Alamo Canyon is possibly part of the pluton of Chirreon Wash.

Tortolita Mountains, pluton of Chirreon Wash, sample CAF-02-2666, 69.5 ± 0.5 Ma. The pluton of Chirreon Wash consists of a main phase of medium-grained, equigranular monzogranite (right side of granite field in IUGS classification; Streckeisen, 1973), quartz monzonite and granodiorite containing 15-30% ferromagnesian minerals dominated by subequal amounts of biotite and hornblende, and minor clinopyroxene, and opaque minerals (Ferguson et al., 2002). The pluton is weakly foliated with a moderate northwesterly dip. A somewhat K-feldspar porphyritic phase, a mafic phase, and a leucocratic phase are present locally. The unit is similar to the granite of Alamo Canyon in the western Santa Catalina Mountains and the two granites are similar age.

Pinal Mountains, Schultze Granite, sample 3-23-98-4, 64 ± 0.6 Ma. The Schultze Granite in the Globe-Miami area of Gila County, first mapped and named by Ransome (1903, 1904), is associated with copper mineralization at the Inspiration porphyry copper deposit (e.g., Olmstead and Johnson, 1966).

Oracle area, northwestern Santa Catalina Mountains, granite stock, Little Hill mine, (samples 11-19-99-1 and F2-3729), 63.8 ± 17.2 Ma. The granite stock at the Little Hill mine intrudes the 1.4 Ga Oracle Granite and is cut by the steep, west-northwest striking Mogul fault (Spencer et al., 2000). Near the Mogul fault, both the granite stock and the Oracle Granite are mylonitized, with a steeply west-southwest dipping mylonitic foliation and steeply south plunging mylonitic lineation. Asymmetric petrofabrics indicate a normal sense of shear during mylonitization (Spencer et al., 2000). The localization of mylonitic fabrics to areas near the Little Hill stock, with the thickest part of the mylonite zone located where the stock is present, suggest that mylonitic shearing occurred under elevated temperatures associated with granite intrusion. These field relations and the 63.8 ± 17.2 Ma date reported here for the stock support the interpretation that the mylonitization is Laramide in age. Association of the Mogul fault with the earlier formed mylonite zone suggests that the Mogul Fault, which displaces middle to late Tertiary conglomerate, was localized by the earlier-formed mylonitic fabric and could be a reactivated Laramide high-angle fault.

Picacho Mountains granite, sample 1-6-99-5, 59.3 ± 1 Ma. The Picacho Mountains granite is heterogeneous and has several phases. The primary phase is a moderately to strongly foliated, medium grained, two-mica granite that is slightly K-feldspar porphyritic (Richard et al., 1999). The date reported here indicates that this granite is Laramide in age.

Northwestern White Tank Mountains, granitoid intrusion, sample 981-21-1, 56.2 ± 14 Ma. Fine grained biotite granite or granodiorite in the northwestern White Tank Mountains, west of Phoenix, forms the footwall to a west-dipping detachment fault on the west flank of the Mountains (Reynolds and Grubensky, 1993). This unit yielded a K-Ar biotite date of 19.6 ± 0.5 Ma (Shafiqullah et al., 1980) that is possibly a cooling date related to tectonic exhumation. This unit was dated because it was not known if it is middle Tertiary or Laramide, or possibly older. Although the uncertainty on the date is large, the intrusion can be confidently assigned to the Laramide period of magmatism and deformation.

Middle Tertiary date

Northeastern Tortolita Mountains, undeformed dacite porphyry dike that cuts across Carpus Wash shear zone, sample CAF-02-3233, 25.1 ± 0.6 Ma. An undeformed rhyolite dike cuts across a schistose to mylonitic shear zone in the northern Tortolita Mountains that affects the 69.5 ± 0.5 Ma pluton of Chirreon Wash (Ferguson et al., 2002). This dike was dated at 25.1 ± 0.6 Ma, which constrains the shear zone to between 70 and 25 Ma. This shear zone is most likely middle Tertiary because mylonitic lineation within the shear zone is nearly parallel to regional mylonitic lineation associated with middle Tertiary extensional exhumation (Ferguson et al., 2002).

No date

Empire Mountains, phynocryst-poor felsic sill in Apache Canyon Fm (mistakenly identified as tuff), sample 3-13-01-2 (no date). This unit consists of weakly to moderately foliated and lineated felsite with sparse biotite flakes up to 6 mm diameter, <2%, 0.5-2 mm plagioclase, and xenoliths up to 30 cm across that are probably derived from siltstones in host Apache Canyon Formation of the Bisbee Group (Spencer et al., 2001). Foliation and lineation wrap around xenoliths and flow lineation is somewhat consistently oriented over 2-3 km. The unit is pale orangish tan to buff and approximately 3 m thick. This unit was mistakenly identified as a tuff by J. Spencer but later determined to be a sill by C. Ferguson. U-Pb data (two points) did not yield a meaningful age.

REFERENCES CITED

Anderson, J.L., 1989, Proterozoic anorogenic granites of the southwestern United States, *in* Jenny, J.P., and Reynolds, S.J., eds., Geologic Evolution of Arizona: Arizona Geological Society Digest 17, p. 211-238.

Anderson, P., 1989, Proterozoic plate tectonic evolution of Arizona, *in* Jenny, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 17-55.

Bergquist, J.R., Shride, A.F., and Wrucke, C.T., 1981, Geologic map of the Sierra Ancha Wilderness and Salome Study Area, Gila County, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1162-A, scale 1:48,000.

Condie, K.C., and DeMalas, J.P., 1985, The Pinal Schist: An early Proterozoic quartz wacke association in southeastern Arizona: Precambrian Research, v. 27, p. 337-356.

Cooper, J.R., 1973, Geologic map of the Twin Buttes Quadrangle, southwest of Tucson, Pima County, Arizona: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-745, scale 1:48,000.

Creasey, S.C., 1967, General geology of the Mammoth Quadrangle, Pinal County, Arizona: U.S. Geological Survey Bulletin 1218, 94 p., plate 1 scale 1:48,000.

Cunningham, D., DeWitt, Ed, Haxel, G., Reynolds, S.J., and Spencer, J.E., 1987, Geologic map of the Maricopa Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Open-File Report 87-4, scale 1:62,500.

DeWitt, E., 1989, Geochemistry and tectonic polarity of early Proterozoic (1700-1750-Ma) plutonic rocks, north-central Arizona, *in* Jenny, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest 17, p. 149-163.

Eisele, J., and Isachsen, C.E., 2001, Crustal growth in southern Arizona: U-Pb geochronologic and Sm-Nd isotopic evidence for addition of the Paleoproterozoic Cochise block to the Mazatzal province: American Journal of Science, v. 301, p. 773-797.

Ferguson, C.A., and Gilbert, W.G., 1997, Geology of the Mormon Flat Dam quadrangle, Maricopa County, Arizona: Arizona Geological Survey Open-File Report 97-14, 28 p., 3 sheets, scale 1:24,000.

Ferguson, C.A., Gilbert, W.G., and Leighty, R.S., 1998a, Geologic map of the New River Mesa 7.5' Quadrangle, Maricopa County, Arizona: Arizona Geological Survey Open-File Report 98-12, scale 1:24,000, 3 sheets, 29 p. text.

Ferguson, C.A., Gilbert, W.G., Orr, T.R., Spencer, J.E., Richard, S.M., and Pearthree, P.A., 1999, Geologic map of the Samaniego Hills, Pinal and Pima Counties, southern Arizona: Arizona Geological Survey Open-File Report 99-17, 1 plate, scale 1:24,000, with 15 p. text.

Ferguson, C.A., Gilbert, W.G., Pearthree, P.A., and Biggs, T.H., 2000, Geologic map of the southern Roskruge Mountains (the San Pedro and the southern half of La Tortuga Butte 7.5' quadrangles), Pima County, Arizona: Arizona Geological Survey Open-File Report 00-06, 40 p., 2 sheets, scale 1:24,000.

Ferguson, C.A., Johnson, B.J., and Shipman, T.C., 2003, Geologic map of the Batamote Hills 7 ½' Quadrangle, Pima County, Arizona: Arizona Geological Survey Digital Geologic Map DGM-32, scale 1:24,000.

Ferguson, C.A., Johnson, B.J., Skotnicki, S.J., Maher, D.J., Spencer, J.E., Gilbert, W.G., Richard, S.M., and Youberg, A., 2002, Geologic map of the Tortolita Mountains, Pinal and Pima Counties, Arizona: Arizona Geological Survey Digital Geologic Map 26, scale 1:24,000.

Ferguson, C.A., Skotnicki, S.J., and Gilbert, W.G., 1998b, Geologic map of the Tonto Basin 7.5' Quadrangle, Gila and Maricopa Counties, Arizona: Arizona Geological Survey Open-File Report 98-16, 15 pp., 2 sheets, scale 1:24,000.

Hawkins, D.P., Bowring, S.A., Ilg, B.R., Karlstrom, K.E., and Williams, M.L., 1996, U-Pb geochronologic constraints on the Paleoproterozoic crustal evolution of the Upper Granite Gorge, Grand Canyon, Arizona: Geological Society of America Bulletin, v. 108, n. 9, p. 1167-1181.

Howard, K.A., 1991, Intrusion of horizontal dikes: Tectonic significance of middle Proterozoic diabase sheets widespread in the upper crust of the southwestern United States: Journal of Geophysical Research, v. 86, n. B7, p. 12,461-12,478.

Johnson, B.J., Ferguson, C.A., Pearthree, P.A., and Stavast, W.J., 2003, Geologic map of the Samaniego Peak 7 ½' Quadrangle, Pima County, Arizona: Arizona Geological Survey Digital Geologic Map DGM-30, scale 1:24,000.

Karlstrom, K.E., and Bowring, S.A., 1991, Styles and timing of early Proterozoic deformation in Arizona: Constraints on tectonic models, *in* Karlstrom, K.E., ed., Proterozoic geology and ore deposits of Arizona: Arizona Geological Society Digest 19, p. 1-10.

Keith, S.B., 1984, Map of outcrops of Laramide (Cretaceous – Tertiary) rocks in Arizona and adjacent regions: Arizona Bureau of Geology and Mineral Technology, Map 19, scale 1:100,000.

Krieger, M. H., 1974, Geologic map of the Black Mountain Quadrangle, Pinal County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ-1108, scale 1:24,000.

McIntosh, W.C., and Ferguson, C.A., 1998, Sanidine, single crystal, laser-fusion $^{40}Ar/^{39}Ar$ geochronology database for the Superstition volcanic field, central Arizona: Arizona Geological Survey Open-File Report 98-27, 74 p.

Olmstead, H.W., and Johnson, D.W., 1966, Inspiration geology, *in* Titley, S.R., and Hicks, C.L., eds., Geology of the porphyry copper deposits, southwestern North America: Tucson, University of Arizona Press, p. 143-150.

Orr, T.R., DeLong, S.B., Spencer, J.E., and Richard, S.M., 2002, Geologic map of the Fortified Peak 7 ½' Quadrangle, southeastern Pinal County, Arizona: Arizona Geological Survey Digital Geologic Map 18, scale 1:24,000.

Peters, L., Ferguson, C.A., Spencer, T.R., Orr, and Dickinson, W.R., 2003, Sixteen $^{40}Ar/^{39}Ar$ geochronologic analyses from the southeastern Arizona: Arizona Geological Survey Open-File Report 03-02, 8 p.

Peterson, N.P., 1938, Geology and ore deposits of the Mammoth mining camp area, Pinal County, Arizona: Arizona Bureau of Mines Bulletin, n. 144, 63 p., 10 sheets, scales 1:1,800 and 1:4,500.

Ransome, F.L., 1903, Geology of the Globe Copper District, Arizona: U.S. Geological Survey Professional Paper 12, 168 p., 2 sheets, scales 1:62,500, and 1:12,000.

Ransome, F.L., 1904, Description of the Globe quadrangle, Arizona: U.S. Geological Survey Geological Atlas Folio 111, 17 p., scale 1:62,500.
Reynolds, S.J., and Dewitt, Ed, 1991, Proterozoic geology of the Phoenix region, central Arizona, *in* Karlstrom, K.E., ed., Proterozoic geology and ore deposits of Arizona: Arizona Geological Society Digest 19, p. 237-250.
Reynolds, S.J., and Grubensky, 1993, M.J., Geologic map of the Phoenix North 30' x 60' quadrangle, central Arizona: Arizona Geological Survey, Open-File Report 93-17, scale 1:100,000.
Reynolds, S.J., Florence, F. P., Welty, J. W., Roddy, M. S., Currier, D. A., Anderson, A. V., and Keith, S. B., 1986, Compilation of radiometric age determinations in Arizona: Tucson, Arizona Bureau of Geology and Mineral Technology Bulletin 197, 258 p.
Richard, S.M., Ferguson, C.A., Spencer, J.E., Youberg, A., and Orr, T.R., 2000, Geologic map of the Waterman Peak 7.5' Quadrangle and northern La Tortuga Butte 7.5' Quadrangle, Pima County, Arizona: Arizona Geological Survey Digital Geologic Map 2, scale 1:24,000, 24 p.
Richard, S.M., Spencer, J.E., Ferguson, C.A., and Pearthree, P.A., 1999, Geologic map of the Picacho Mountains and Picacho Peak, Pinal County, southern Arizona: Arizona Geological Survey Open-File Report 99-18, 1 plate, scale 1:24,000, with 43 p. text.
Riggs, N.R., and Busby-Spera, C.J., 1991, Facies analysis of an ancient, dismembered, large caldera complex and implications for intra-arc subsidence: Middle Jurassic strata of Cobre Ridge, southern Arizona, USA: Sedimentary Geology, v. 74, p. 39-68.
Riggs, N.R., and Haxel, G.B., 1990, The Early to Middle Jurassic magmatic arc in southern Arizona: Plutons to sand dunes, *in* Gehrels, G.E., and Spencer, J.E., eds., Geologic excursions through the Sonoran Desert Region, Arizona and Sonora, Geological Society of America, Cordilleran section, 86th Annual Meeting, Tucson Ariz., March 14-16, 1990, Field-Trip Guidebook: Arizona Geological Survey Special Paper 7, p. 90-103.
Riggs, N.R., Hon, K.A., and Haxel, G.B., 1994, Early to Middle Jurassic magmatic arc rocks of south-central and southeastern Arizona, *in* Thorman, C.H. and Lane, D.E., eds, USGS research on mineral resources – 1994: U.S. Geological Survey Circular 1103-B, p. 7-13.
Riggs, N.R., Mattinson, J.M., and Busby, C.J., 1993, Correlation of Jurassic eolian strata between the magmatic arc and the Colorado Plateau: New U-Pb geochronologic data from southern Arizona: Geological Society of America Bulletin, v. 105, no. 9, p. 1231-1246.
Shafiqullah, M., Damon, P.E., Lynch, D.J., Reynolds, S.J., Rehrig, W.A., and Raymond, R.H., 1980, K-Ar geochronology and geologic history of southwestern Arizona and adjacent areas, *in* Jenny, J.P. and Stone, C., eds., Studies in Western Arizona: Arizona Geological Society Digest, v. 12, p. 201-260.
Shride, A.F., 1967, Younger Precambrian geology in southern Arizona: U.S. Geological Survey Professional Paper 566, 89 p.
Silver, L.T., 1960, Age determinations on Precambrian diabase differentiates in the Sierra Ancha, Gila County, Arizona [abs.]: Geological Society of America Bulletin, v. 71, p. 1973-1974.
Silver, L.T., 1965, Mazatzal orogeny and tectonic episodicity [abs.], *in* Abstracts for 1964: Geological Society of America Special Paper 82, p. 185-186.
Silver, L.T., 1978, Precambrian formations and Precambrian history in Cochise County, southeastern Arizona, *in* Callender, J. F., and others, eds., Land of Cochise: Socorro, New Mexico Geological Society, 29th Field Conference Guidebook, p. 157-163.
Silver, L.T., Williams, I.S. and Woodhead, J.A., 1980, Uranium in granites from the southwestern United States: Actinide parent-daughter systems, sites, and mobilization - First year report: U.S. Department of Energy Report GJBX-45(81), 380 p.
Skotnicki, S.J., 1995, Geologic map of the Fountain Hills and Mount McDowell areas, Maricopa County, Arizona: Arizona Geological Survey, Open-File Report 95-16, scale 1:24,000.
Skotnicki, S.J., 1999, Geologic map of the Ninetysix Hills, Pinal County, Arizona: Arizona Geological Survey Open-File Report 99-20, 4 plates, scale 1:24,000, with 14 p. text.
Skotnicki, S.J., 2000, Geologic map of the Four Peaks 7.5' Quadrangle, Maricopa and Gila Counties, Arizona: Arizona Geological Survey Open-File Report 00-11, scale 1:24,000, 35 p.

Skotnicki, S.J., and Ferguson, C.A., 1996, Bedrock geologic map of the Apache Junction and Buckhorn Quadrangles, Maricopa and Pinal Counties, Arizona: Arizona Geological Survey Open-File Report 96-8, 16 p., scale 1:24,000 (revised 1997).

Skotnicki, S.J., and Leighty, R.S., 1997a, Geologic map of the Mine Mountain Quadrangle, Maricopa and Gila Counties, Arizona: Arizona Geological Survey Open-File Report 97-11, 11 p., scale 1:24,000.

Skotnicki, S.J., and Leighty, R.S., 1997b, Geologic map of the Stewart Mountain Quadrangle, Maricopa County, Arizona: Arizona Geological Survey Open-File Report 97-12, 19 p., scale 1:24,000.

Skotnicki, S.J., and Leighty, R.S., 1998, Geologic Map of the Boulder Mountain 7.5' Quadrangle, Maricopa and Gila Counties, Arizona: Arizona Geological Survey Open-File Report 98-15, scale 1:24,000, 17 p. text.

Skotnicki, S.J., compiler, 2002, Geologic map of the Sierra Ancha, central Arizona: Arizona Geological Survey Digital Geologic Map 24 (DGM-24), 2 sheets, scale 1:100,000, text 29 p.

Smith, D., 1969, Mineralogy and petrology of an olivine diabase sill complex and associated unusually potassic granophyres Sierra Ancha, central Arizona: Pasadena, California, California Institute of Technology, unpublished Ph.D. dissertation, 314 p.

Smith, D., and Silver, L.T., 1975, Potassic granophyre associated with Precambrian diabase, Sierra Ancha, central Arizona: Geological Society of America Bulletin, v. 86, n. 4, p. 503-513.

Spencer, J.E., and Pearthree, P.A., 2002, Geologic map of the Oro Valley 7 ½' Quadrangle, Pima County, Arizona: Arizona Geological Survey Digital Geologic Map 21, scale 1:24,000.

Spencer, J.E., and Richard, S.M., 1999, Geologic map and report for the Theodore Roosevelt Dam area, Gila and Maricopa Counties, Arizona: Arizona Geological Survey Open-File Report 99-6, scale 1:24,000, 28 p.

Spencer, J.E., Ferguson, C.A., Richard, S.M., Orr, T.R., Pearthree, P.A., Gilbert, W.G., and Krantz, R.W., 2001, Geologic map of The Narrows 7 ½' Quadrangle and the southern part of the Rincon Peak 7 ½' Quadrangle, eastern Pima County, Arizona: Arizona Geological Survey Digital Geologic Map 10, layout scale 1:24,000, with 32 p. text (revised May, 2002).

Spencer, J.E., Richard, S.M., and Ferguson, C.A., 2000, Compilation geologic map of the Oracle 7 ½' Quadrangle, Pinal and Pima Counties, Arizona: Arizona Geological Survey Open-File Report 00-05, scale 1:24,000 (1 sheet), 30 p.

Spencer, J.E., Richard, S.M., Reynolds, S.J., Miller, R.J., Shafiqullah, M., Grubensky, M.J., and Gilbert, W.G., 1995, Spatial and temporal relationships between mid-Tertiary magmatism and extension in southwestern Arizona: Journal of Geophysical Research, v. 100, p. 10,321-10,351.

Streckeisen, A.L., 1973, Plutonic rocks: Classification and nomenclature recommended by the IUGS Subcommission on the Systematics of Igneous Rocks: Geotimes, v. 18, n. 10, p. 26-30.

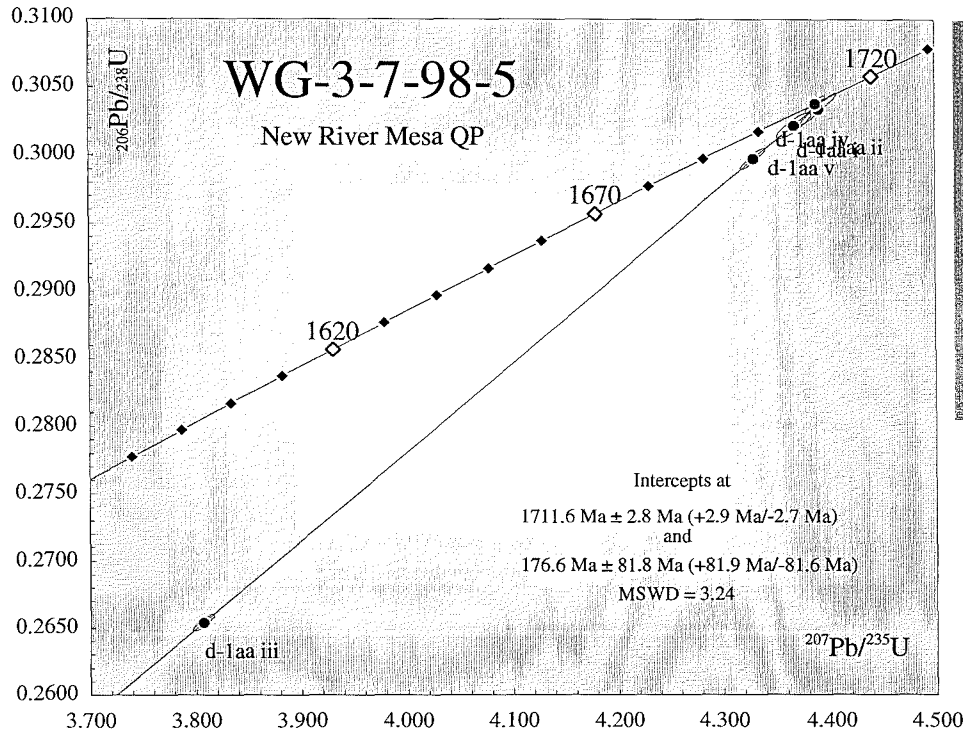
Titley, S.R., and Anthony, E.Y., 1989, Laramide mineral deposits in Arizona, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest, v. 17., p. 485-514.

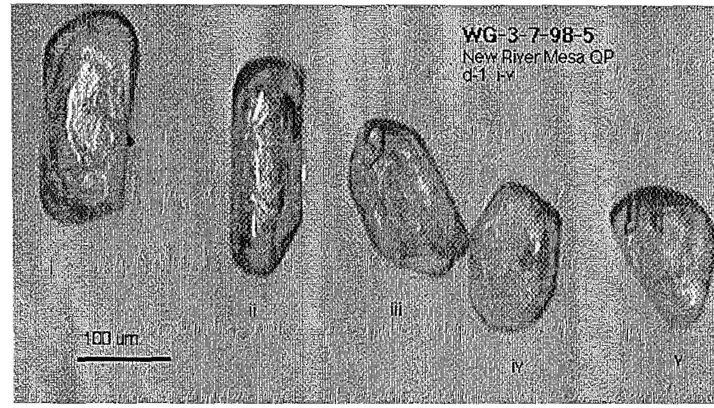
Tosdal, R.M., Haxel, G.B., and Wright, J.E., 1989, Jurassic geology of the Sonoran Desert region, southern Arizona, southeastern California, and northernmost Sonora: Construction of a continental-margin magmatic arc, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic evolution of Arizona: Arizona Geological Society Digest, v. 17., p. 397-434.

Wrucke, C.T., 1989, The middle Proterozoic Apache Group, Troy Quartzite, and associated diabase of Arizona, *in* Jenney, J.P., and Reynolds, S.J., eds., Geologic Evolution of Arizona: Arizona Geological Society, Digest 17, p. 239-258.

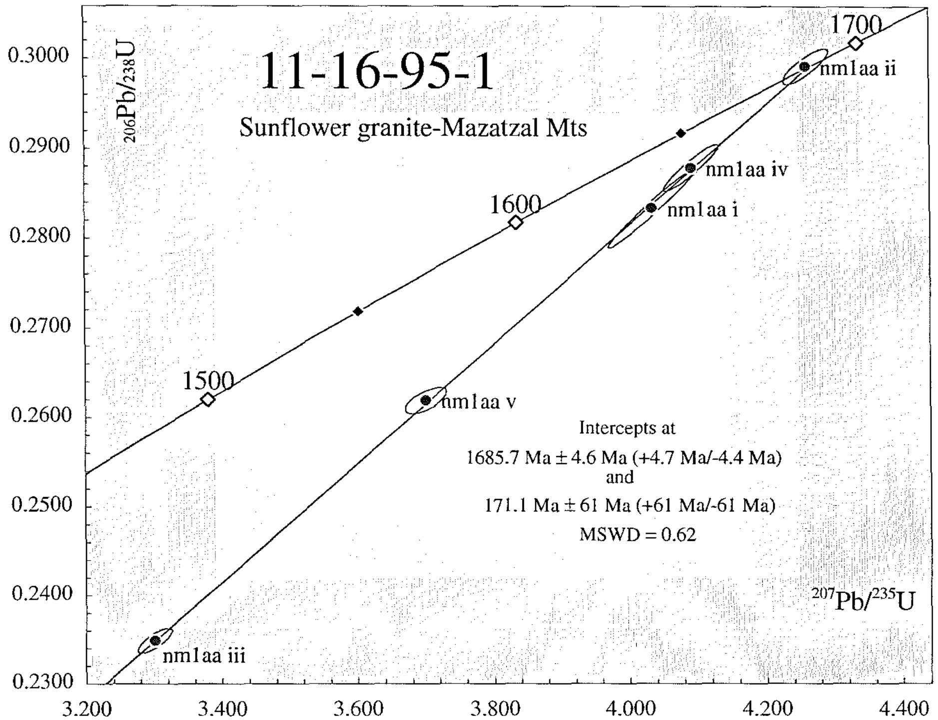
APPENDIX A: CONCORDIA DIAGRAMS AND ANALYTICAL DATA

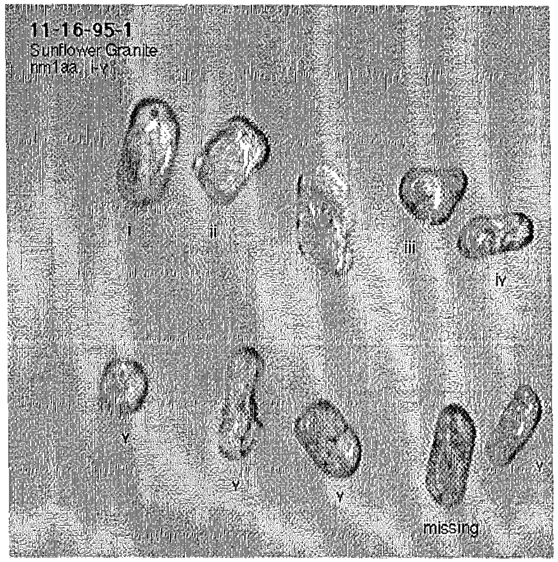
Names of dated rock units given in diagrams only approximately represent unit names as known elsewhere and were used simply to help identify laboratory samples.



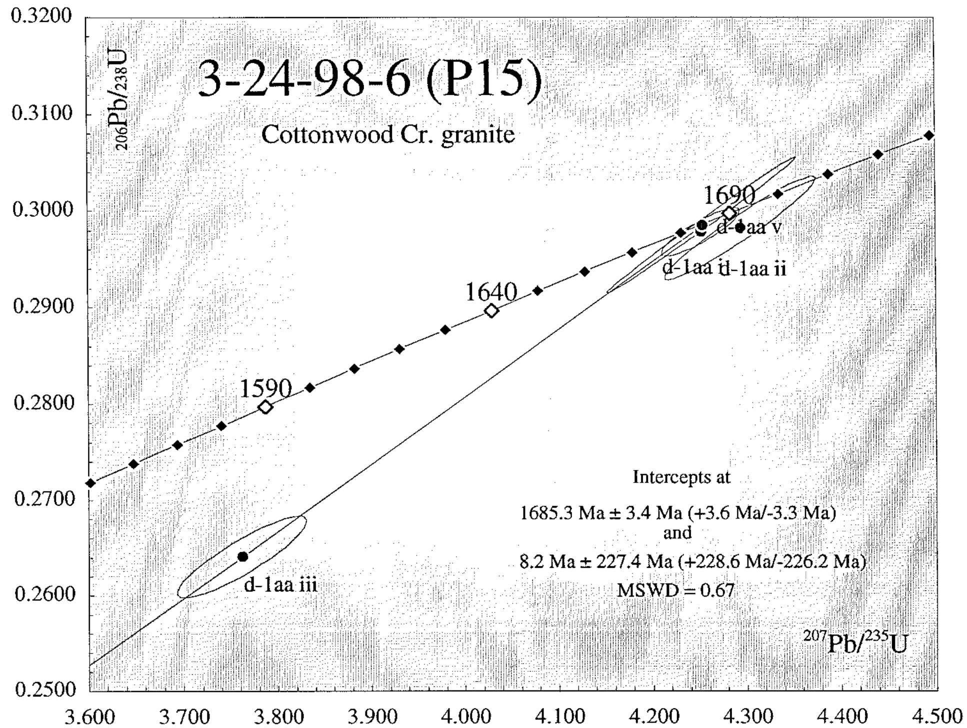


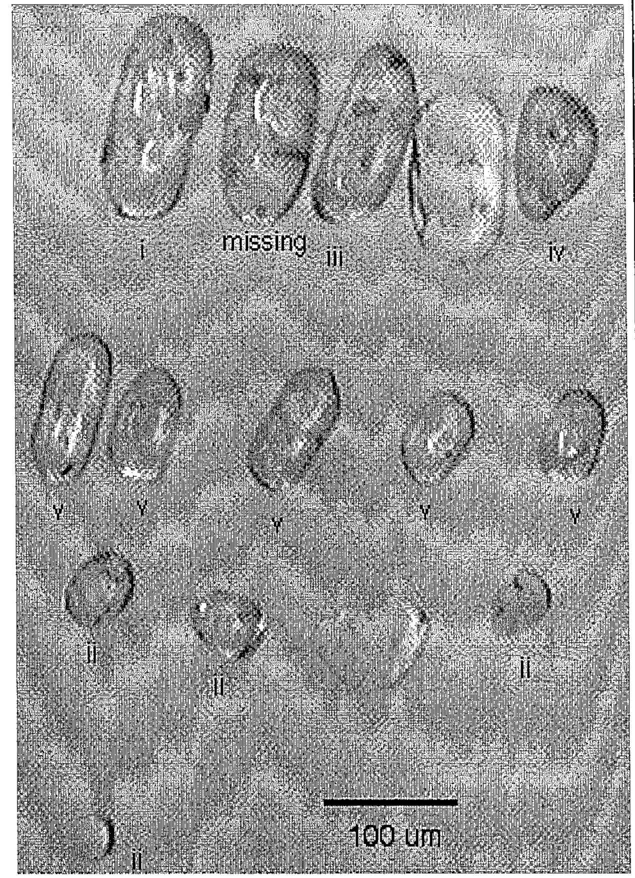
WG-3-7-98-5		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2s)	207 Pb / 235 U	% err (2s)	207 Pb / 206 Pb	% err (2s)	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	Pb
Fractions	(mg)	(ppm)	(ppm)													(pg)
d-1aa i	0.0010	2019.62	624.42	2463.02	0.061	0.30343	(.39)	4.39077	(.40)	0.10495	(.09)	**1708.3**	**1710.6**	**1713.4**	0.975	15.1
d-1aa iv	0.0010	1123.21	339.12	6018.40	0.051	0.30378	(.20)	4.38790	(.21)	0.10476	(.08)	**1710.0**	**1710.1**	**1710.1**	0.932	3.6
d-1aa ii	0.0010	1394.58	422.79	4871.43	0.060	0.30219	(.31)	4.36781	(.36)	0.10483	(.18)	**1702.2**	**1706.3**	**1711.3**	0.863	5.5
d-1aa v	0.0010	775.32	236.91	1879.47	0.060	0.29974	(.26)	4.32981	(.28)	0.10477	(.10)	**1690.0**	**1699.1**	**1710.2**	0.936	7.6
d-1aa iii	0.0010	1121.49	295.87	4848	0.052	0.26538	(.24)	3.80684	(.26)	0.10404	(.12)	**1517.3**	**1594.2**	**1697.4**	0.896	4.0



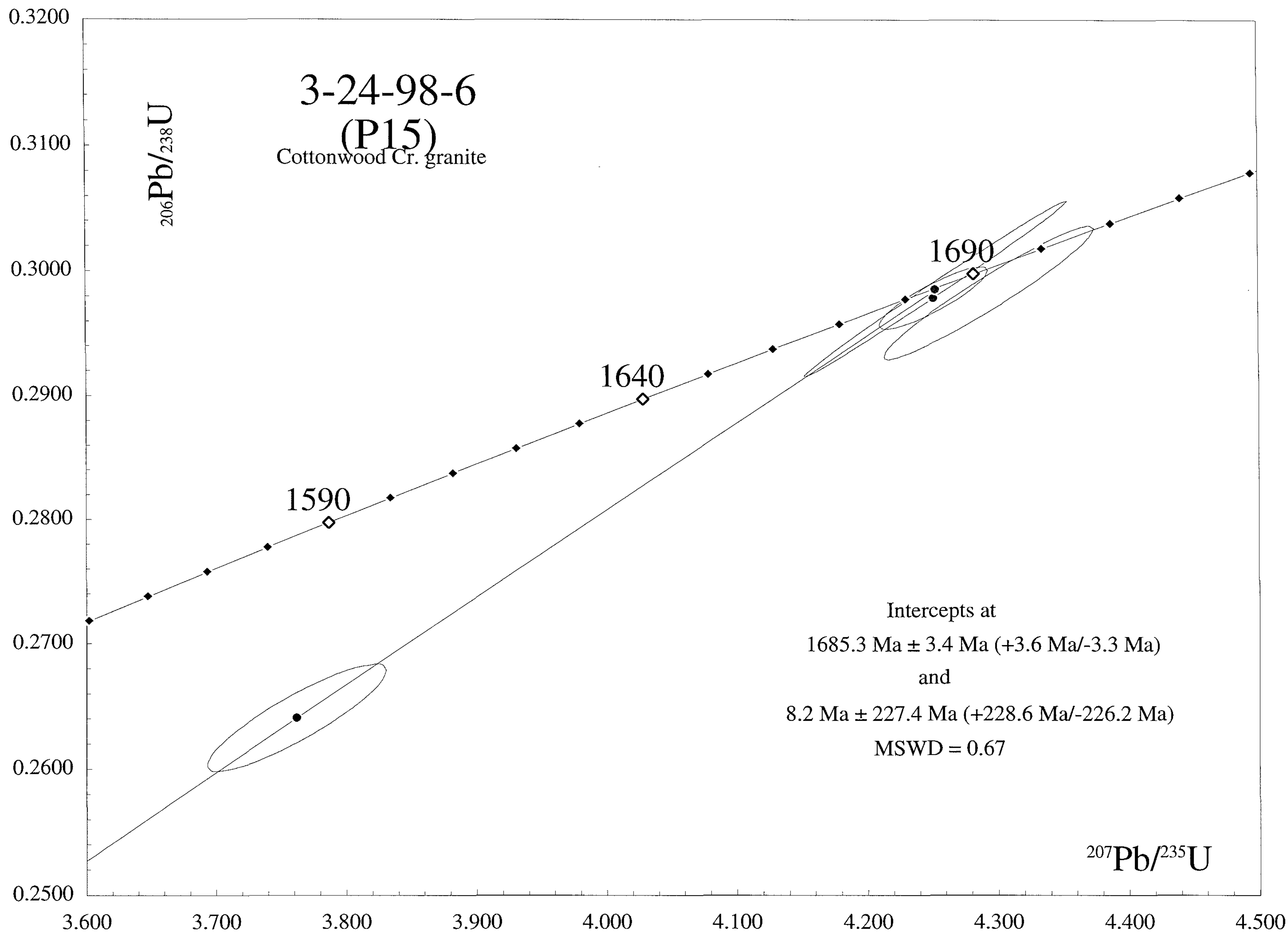


11-16-95-1		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
nm1aa i	0.0014	307.26	93.80	1047.35	0.113	0.28340	(1.58)	4.03518	(1.61)	0.10327	(.30)	**1608.5**	**1641.3**	**1683.7**	0.982	7.2
nm1aa ii	0.0009	439.96	138.24	2022.66	0.115	0.29914	(.66)	4.26008	(.78)	0.10329	(.41)	**1687.0**	**1685.7**	**1684.0**	0.852	3.8
nm1aa iii	0.0003	1455.49	374.58	1272.44	0.153	0.23489	(.61)	3.30095	(.76)	0.10192	(.45)	**1360.1**	**1481.3**	**1659.5**	0.805	5.1
nm1aa iv	0.0005	436.64	132.52	943.77	0.108	0.28787	(.91)	4.09194	(.97)	0.10309	(.34)	**1630.9**	**1652.7**	**1680.5**	0.937	4.3
nm1aa v	0.0026	610.70	179.51	752	0.119	0.26188	(.56)	3.70054	(.83)	0.10249	(.61)	**1499.4**	**1571.5**	**1669.6**	0.678	33.3



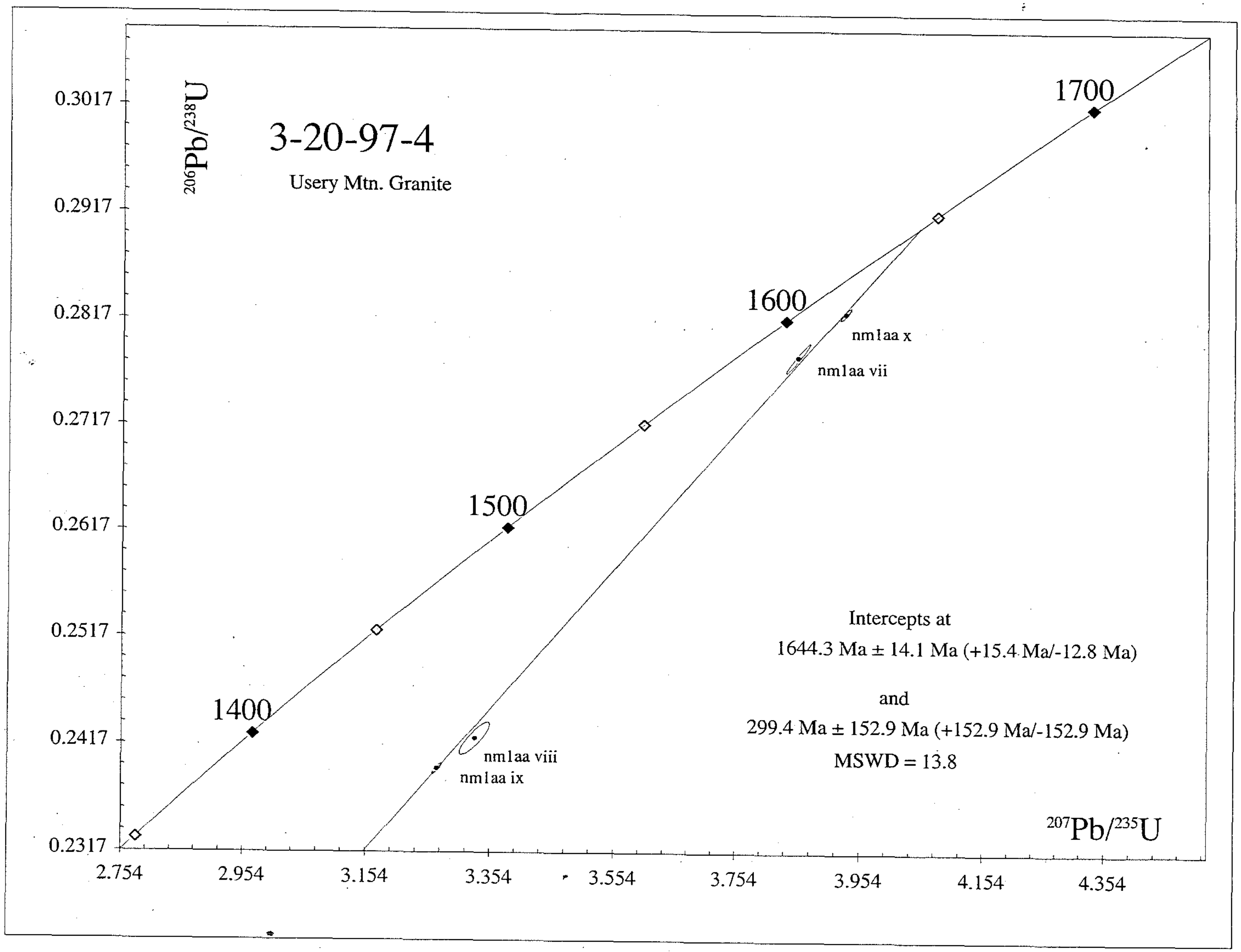


3-24-98-6 (P15)		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa ii	0.0007	314.69	108.35	372.89	0.127	0.29823	(1.80)	4.29419	(1.88)	0.10443	(.52)	**1682.5**	**1692.2**	**1704.3**	0.961	11.2
d-1aa v	0.0021	502.94	173.91	555.79	0.134	0.29854	(2.37)	4.25311	(2.38)	0.10332	(.21)	**1684.1**	**1684.3**	**1684.7**	0.996	34.6
d-1aa i	0.0015	417.47	138.38	693.36	0.118	0.29783	(.84)	4.25182	(.98)	0.10354	(.47)	**1680.5**	**1684.1**	**1688.5**	0.880	16.5
d-1aa iii	0.0011	648.39	194.93	579.80	0.128	0.26408	(1.62)	3.76193	(1.83)	0.10332	(.85)	**1510.7**	**1584.7**	**1684.5**	0.884	20.0



3-24-98-6
(P15)
Cottonwood Cr. granite
$^{206}Pb/^{238}U$
$^{207}Pb/^{235}U$
1590
1640
1690
Intercepts at
1685.3 Ma ± 3.4 Ma (+3.6 Ma/-3.3 Ma)
and
8.2 Ma ± 227.4 Ma (+228.6 Ma/-226.2 Ma)
MSWD = 0.67
0.3200
0.3100
0.3000
0.2900
0.2800
0.2700
0.2600
0.2500
3.600
3.700
3.800
3.900
4.000
4.100
4.200
4.300
4.400
4.500

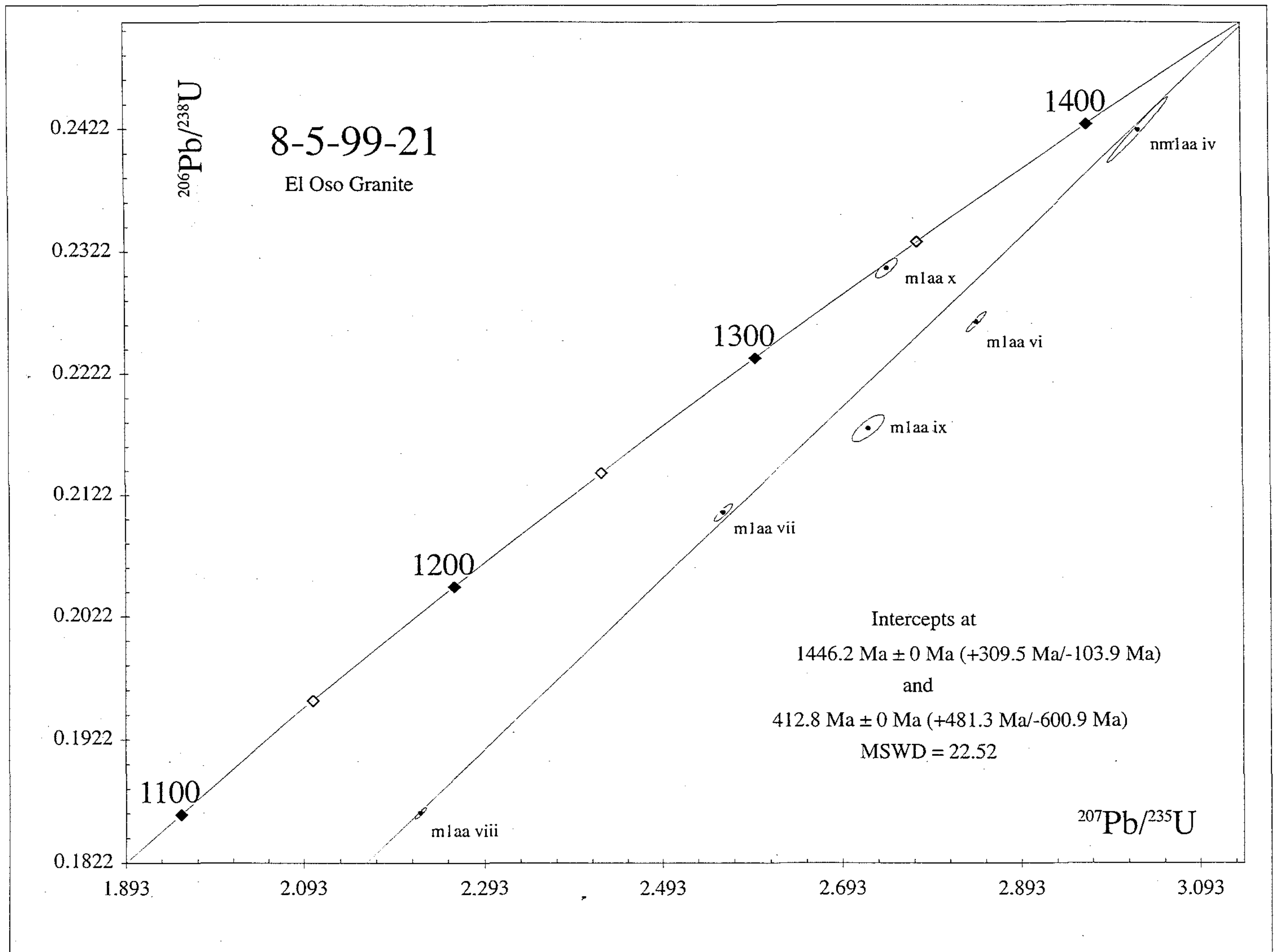
3-20-97-4		Concentrations										Age (Ma)				common	est. Pb
Fractions	Weight (mg)	U (ppm)	Pb (ppm)	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2σ)	207 Pb / 235 U	% err (2σ)	207 Pb / 206 Pb	% err (2σ)	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	Pb (pg)	Blank (pg)
nm1aa x	0.0100	360.9	118.1	2283.6	0.220	0.28244	(.20)	3.93041	(.22)	0.10093	(.08)	**1603.6**	**1620.0**	**1641.3**	0.921	27.7	5.0
nm1aa vii	0.0012	513.9	163.8	1792.3	0.222	0.27826	(.50)	3.85466	(.51)	0.10047	(.10)	**1582.6**	**1604.2**	**1632.8**	0.981	6.2	5.0
nm1aa viii	0.0014	379.9	108.9	580.8	0.192	0.24222	(.62)	3.32960	(.74)	0.09970	(.36)	**1398.2**	**1488.0**	**1618.5**	0.871	14.2	5.0
nm1aa ix	0.0085	333.0	90.3	3326.3	0.203	0.23943	(.21)	3.26960	(.24)	0.09904	(.10)	**1383.7**	**1473.8**	**1606.1**	0.905	12.8	5.0



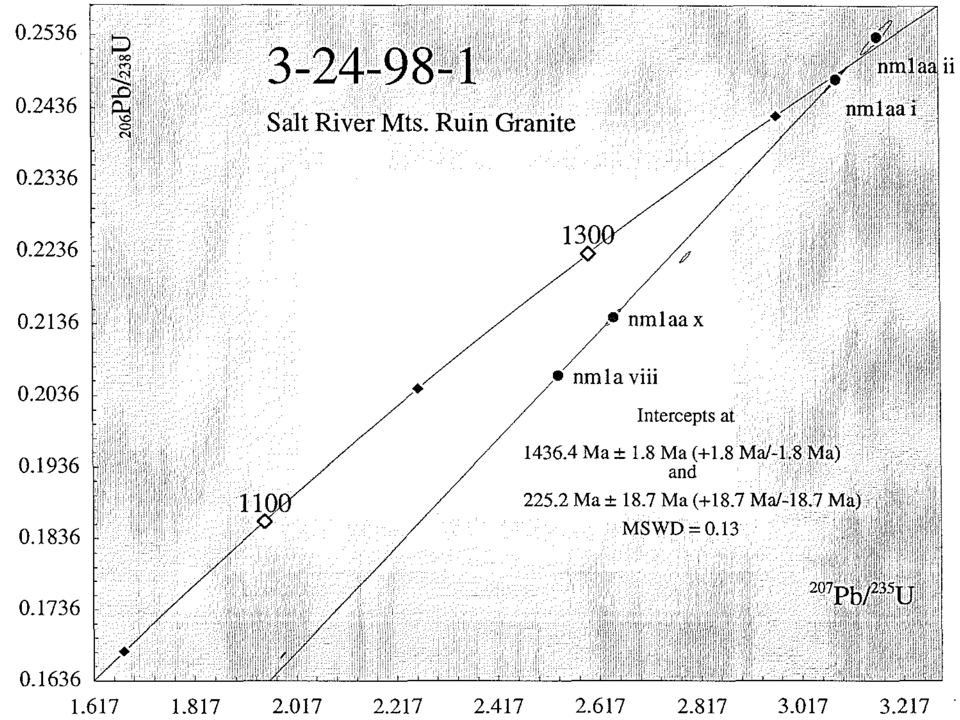
U-Pb analytical data for samples from the Maricopa Mountains analyzed by Joe Wooden

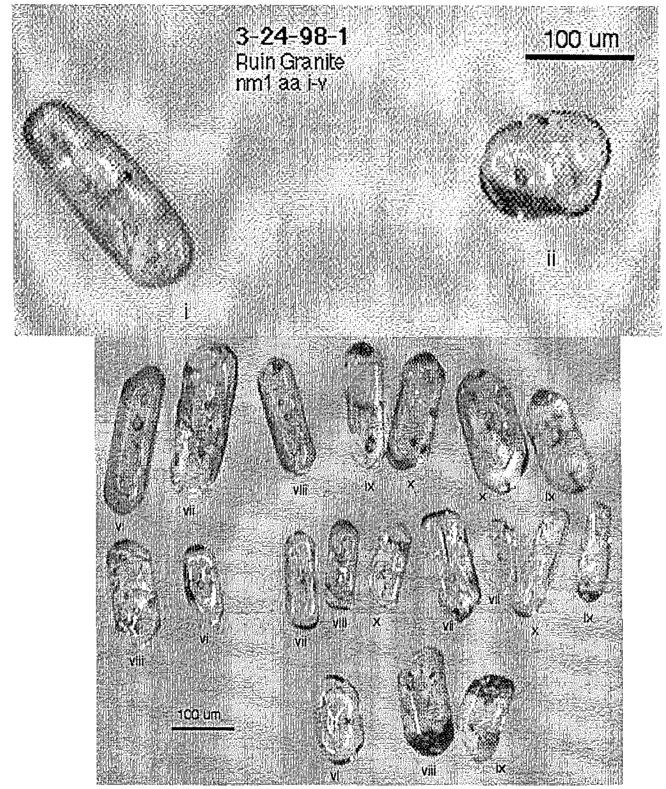
	Concentrations		Measured ratios		Corrected ratios						Age (Ma)		
	U	Pb	206 Pb	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb
Fractions	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2 sig.)	235 U	(2 sig.)	206 Pb	(2 sig.)	238 U	235 U	206 Pb
Sample 10-22-86-2 (Maricopa Mountains granite)													
50-100 mesh	367	100	4762	0.0796	0.26796	(.06)	3.7238	(.08)	0.10079	(.05)	**1530**	**1576**	**1639**
150-200 mesh	363	102	8696	0.0794	0.27592	(.12)	3.8329	(.12)	0.10075	(.04)	**1571**	**1600**	**1638**
250-325 mesh	439	115	9615	0.0810	0.25620	(.12)	3.5551	(.17)	0.10064	(.11)	**1470**	**1540**	**1636**
-400 mesh	559	138	14085	0.0877	0.24046	(.27)	3.3300	(.28)	0.10044	(.03)	**1389**	**1488**	**1632**
Sample 10-22-86-3 (granite of Cotton Center)													
100-200 mesh	324	88	1041	0.1110	0.25499	(.06)	3.5210	(.08)	0.10015	(.06)	**1464**	**1532**	**1627**
200-250 mesh	337	92	1001	0.1123	0.25500	(.05)	3.5206	(.06)	0.10013	(.04)	**1464**	**1532**	**1626**
250-325 mesh	363	97	2012	0.0969	0.25513	(.10)	3.5262	(.11)	0.10024	(.04)	**1465**	**1533**	**1628**
-400 mesh	421	110	2506	0.0980	0.25104	(.05)	3.4677	(.06)	0.10018	(.02)	**1444**	**1520**	**1627**

8-5-99-21		Concentrations										Age (Ma)				common	est. Pb
Fractions	Weight (mg)	U (ppm)	Pb (ppm)	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2σ)	207 Pb / 235 U	% err (2σ)	207 Pb / 206 Pb	% err (2σ)	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	Pb (pg)	Blank (pg)
nmlaa iv	0.0021	754.7	203.7	695.9	0.118	0.24207	(1.12)	3.02818	(1.13)	0.09073	(.17)	**1397.5**	**1414.7**	**1440.9**	0.989	33.9	5.0
mlaa vi	0.0035	285.9	70.1	2114.2	0.157	0.22640	(.37)	2.84504	(.40)	0.09114	(.13)	**1315.6**	**1367.5**	**1449.5**	0.947	6.8	5.0
mlaa vii	0.0087	399.8	89.2	3004.9	0.127	0.21072	(.3)	2.56202	(.39)	0.08818	(.18)	**1232.7**	**1289.9**	**1386.4**	0.892	15.0	5.0
mlaa viii	0.0050	418.6	83.0	1938.9	0.129	0.18621	(.24)	2.22256	(.28)	0.08657	(.13)	**1100.8**	**1188.2**	**1350.8**	0.888	12.3	5.0
mlaa ix	0.0020	394.8	91.9	2965.5	0.153	0.21764	(.51)	2.72419	(.66)	0.09078	(.42)	**1269.4**	**1335.1**	**1442.1**	0.775	3.7	3.7
mlaa x	0.0029	367.7	93.5	1577.8	0.172	0.23079	(.35)	2.74530	(.45)	0.08627	(.27)	**1338.6**	**1340.8**	**1344.3**	0.800	9.6	5.0

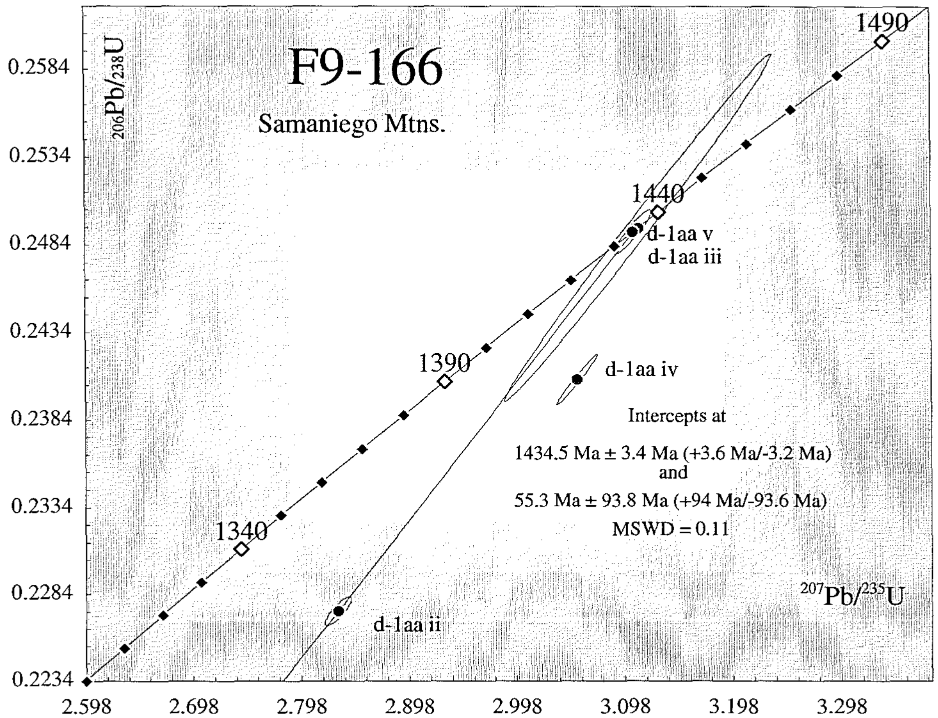


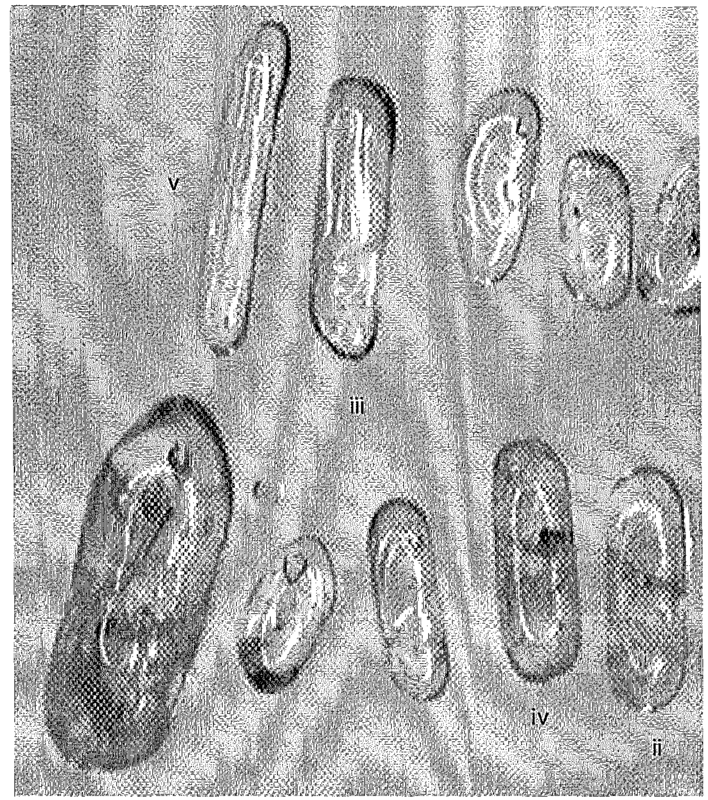
21





3-24-98-1		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
nm1aa ii	0.0019	292.71	85.34	1885.55	0.235	0.25352	(.94)	3.16950	(.98)	0.09067	(.25)	**1456.6**	**1449.8**	**1439.7**	0.967	4.8
nm1aa i	0.0034	596.44	166.61	1855.15	0.190	0.24762	(.73)	3.08823	(.74)	0.09045	(.08)	**1426.2**	**1429.8**	**1435.2**	0.995	16.5
nm1aa vii	0.0116	357.17	91.31	1513.68	0.199	0.22300	(.35)	2.78956	(.37)	0.09072	(.12)	**1297.7**	**1352.7**	**1440.8**	0.946	36.9
nm1aa x	0.0128	503.78	119.56	3122.27	0.177	0.21454	(.55)	2.64570	(.58)	0.08944	(.18)	**1252.9**	**1313.4**	**1413.6**	0.948	26.7
nm1a viii	0.0108	871.24	204.80	730	0.139	0.20646	(.30)	2.53722	(.32)	0.08913	(.11)	**1209.9**	**1282.8**	**1407.0**	0.937	162.0
nm1aa vi	0.0088	1026.55	184.58	3013	0.143	0.16725	(.27)	1.99014	(.27)	0.08630	(.06)	**996.9**	**1112.2**	**1344.9**	0.975	30.2

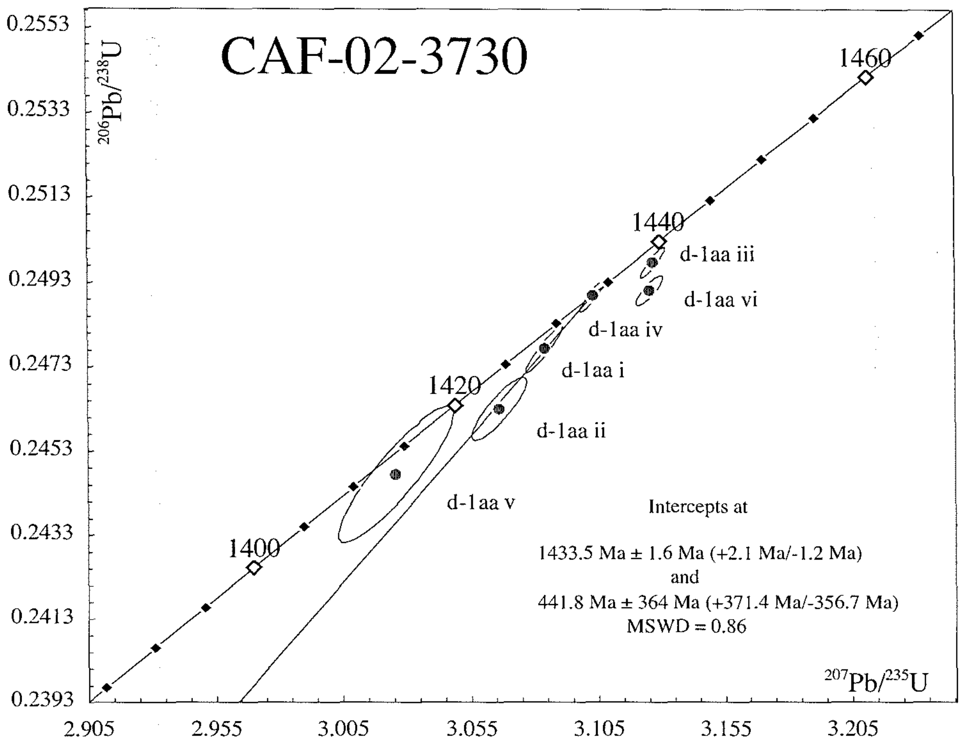


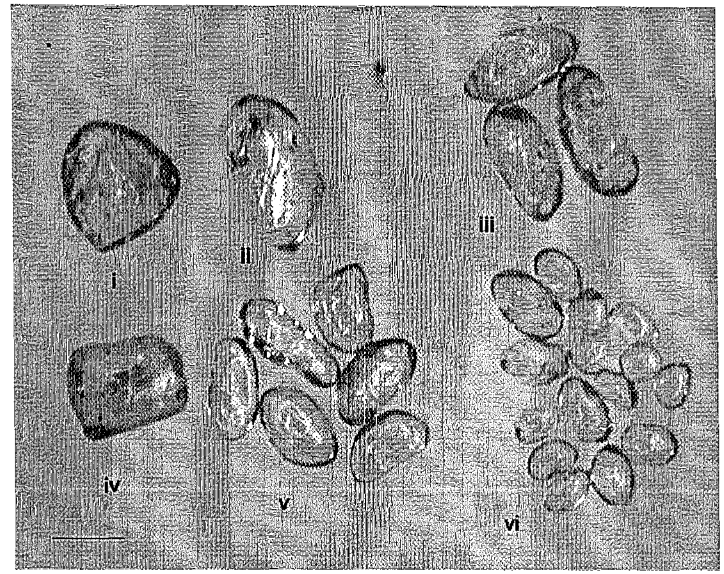


F9-166 (2)		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*/204 Pb	208 Pb/206 Pb	206 Pb/238 U	% err	207 Pb/235 U	% err	207 Pb/206 Pb	% err	206 Pb/238 U	207 Pb/235 U	207 Pb/206 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)				(2s)		(2s)		(2s)				coef.	(pg)
d-1aa iii	0.0033	130.58	50.52	222.87	0.411	0.24940	(3.98)	3.11142	(4.00)	0.09048	(.39)	**1435.4**	**1435.5**	**1435.8**	0.995	31.2
d-1aa v	0.0027	181.66	53.50	653.20	0.205	0.24917	(.50)	3.10619	(.55)	0.09041	(.20)	**1434.2**	**1434.2**	**1434.3**	0.929	11.7
d-1aa iv	0.0030	437.44	112.27	2161.22	0.127	0.24073	(.61)	3.05442	(.61)	0.09202	(.10)	**1390.5**	**1421.3**	**1467.8**	0.986	9.0
d-1aa ii	0.0037	265.72	70.30	609.18	0.162	0.22746	(.37)	2.83132	(.43)	0.09028	(.23)	**1321.2**	**1363.9**	**1431.5**	0.853	22.7

23

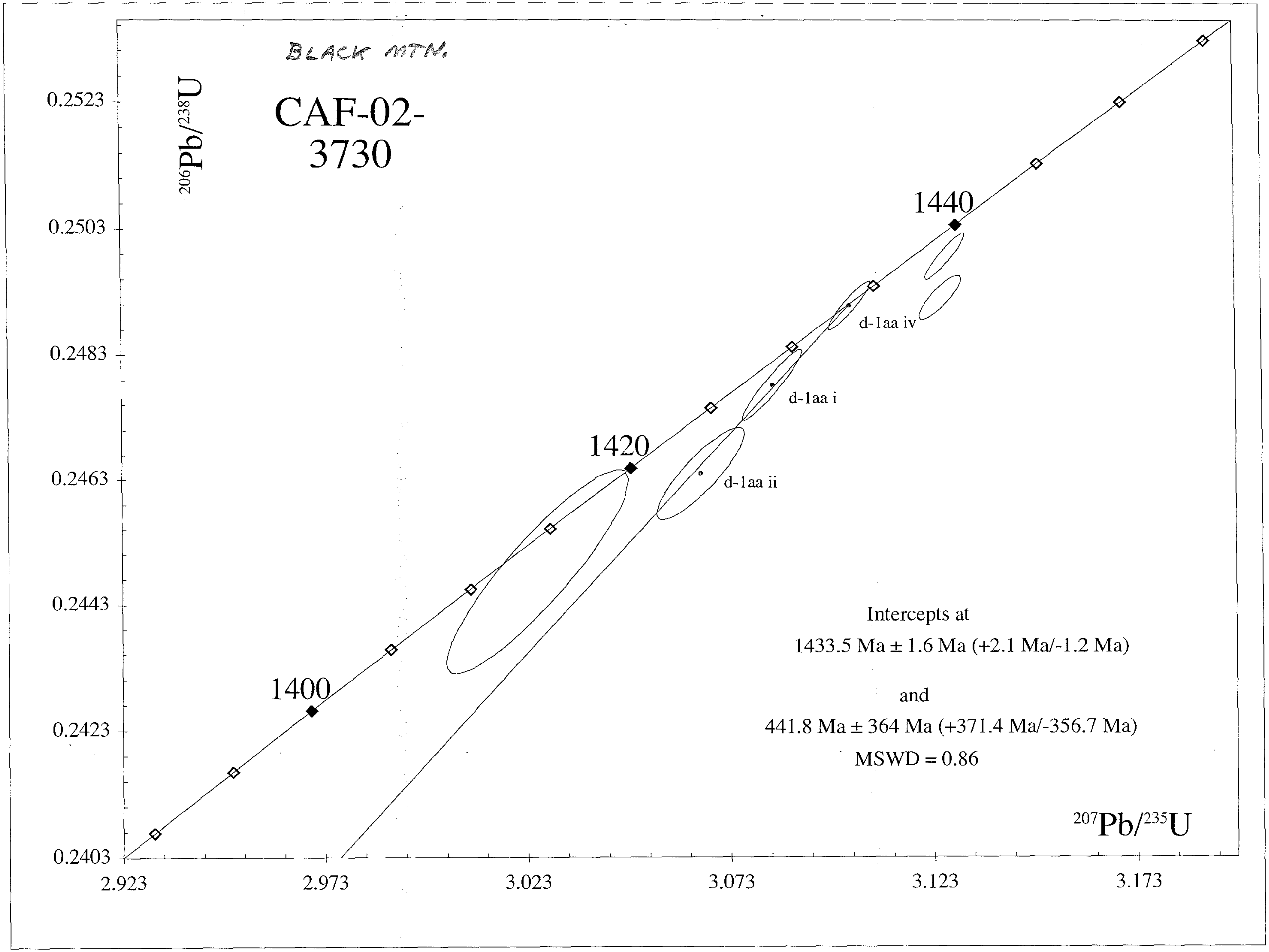
BLACK MTN. LEUCOGRANITE (PINAL CO.)



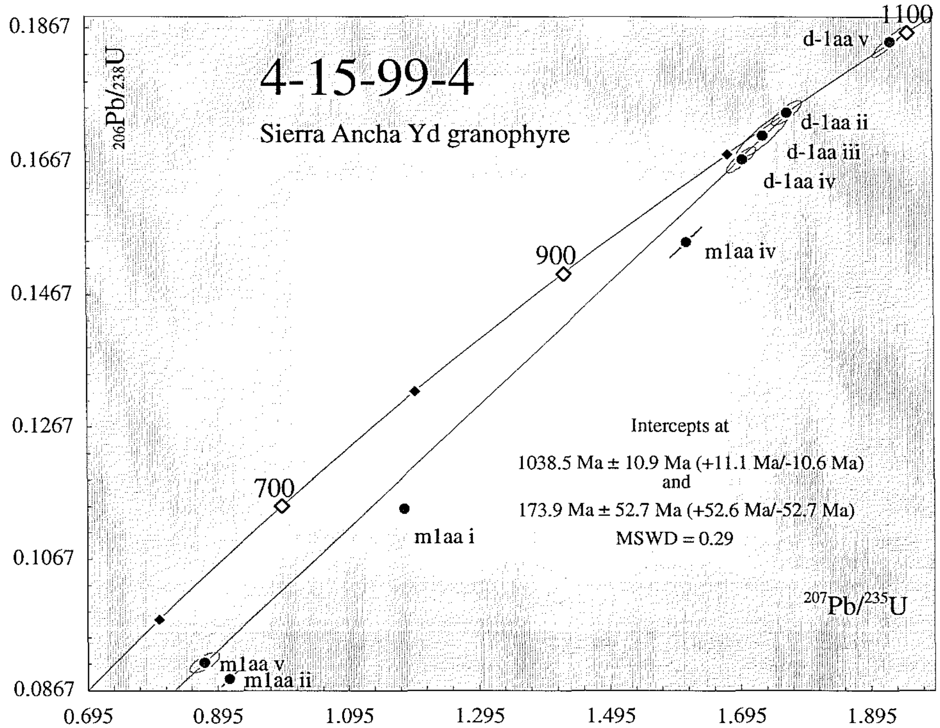


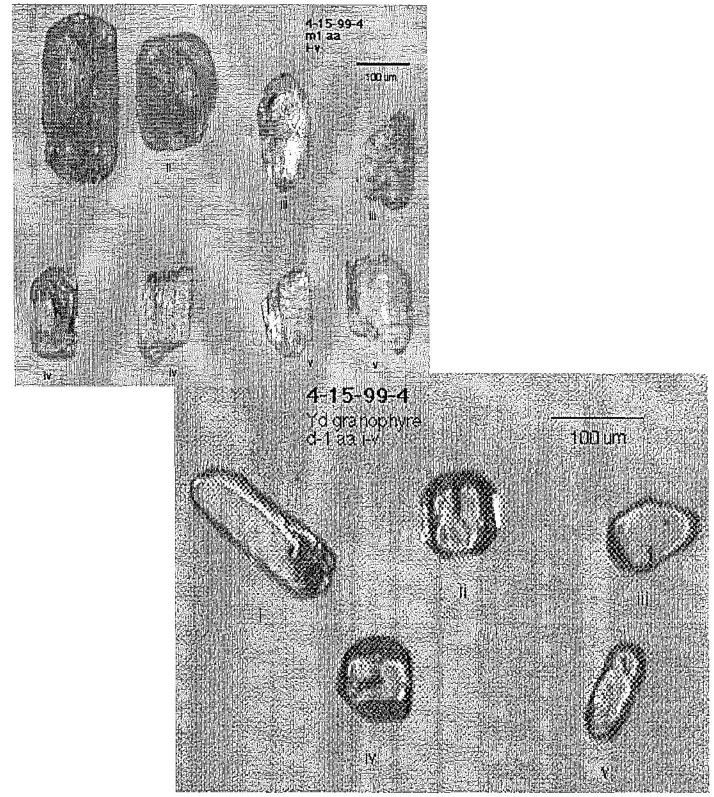
CAF-02-3730		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa i	0.0087	163.07	42.46	1555.79	0.100	0.24775	(.23)	3.08420	(.24)	0.09029	(.07)	**1426.9**	**1428.8**	**1431.6**	0.950	14.6
d-1aa ii	0.0057	191.92	53.83	639.82	0.135	0.24633	(.30)	3.06639	(.35)	0.09028	(.17)	**1419.5**	**1424.3**	**1431.5**	0.870	27.7
d-1aa iii	0.0074	567.27	149.43	10550.3	0.133	0.24980	(.15)	3.12699	(.16)	0.09079	(.06)	**1437.4**	**1439.4**	**1442.2**	0.934	6.4
d-1aa iv	0.0049	757.65	185.92	3930.99	0.043	0.24902	(.16)	3.10335	(.17)	0.09039	(.06)	**1433.4**	**1433.5**	**1433.7**	0.937	15.1
d-1aa v	0.0085	361.91	90.69	2865.08	0.082	0.24477	(.66)	3.02598	(.75)	0.08966	(.33)	**1411.5**	**1414.2**	**1418.3**	0.897	16.9
d-1aa vi	0.0067	487.76	128.86	1219.17	0.087	0.24914	(.14)	3.12565	(.17)	0.09099	(.09)	**1434.0**	**1439.0**	**1446.4**	0.857	43.3

Notes: Regression is on single grain analyses only.

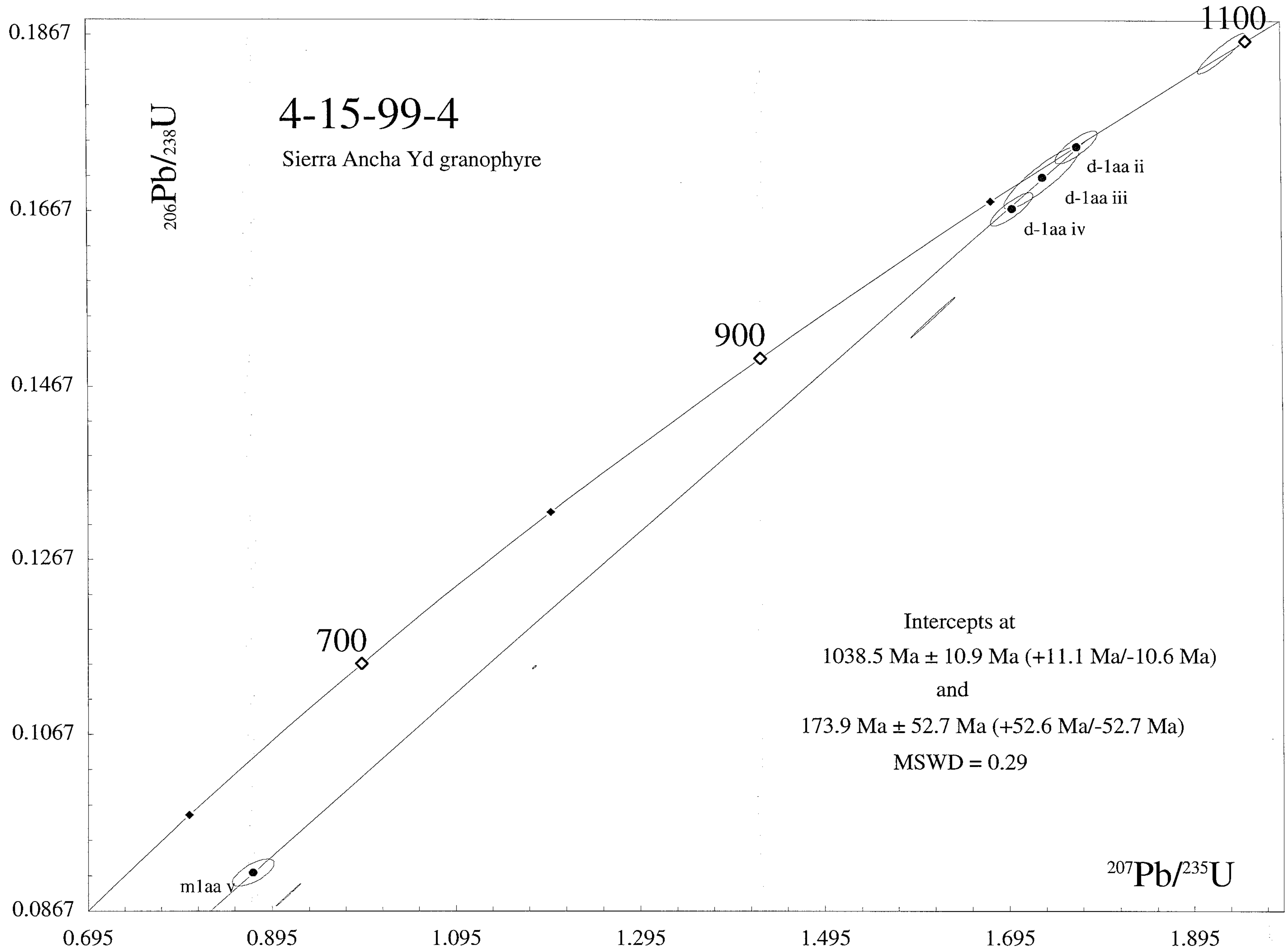


BLACK MTN.
CAF-02-
3730
$^{206}Pb/^{238}U$
$^{207}Pb/^{235}U$
0.2523
0.2503
0.2483
0.2463
0.2443
0.2423
0.2403
2.923
2.973
3.023
3.073
3.123
3.173
1440
1420
1400
d-1aa iv
d-1aa i
d-1aa ii
Intercepts at
1433.5 Ma ± 1.6 Ma (+2.1 Ma/-1.2 Ma)
and
441.8 Ma ± 364 Ma (+371.4 Ma/-356.7 Ma)
MSWD = 0.86

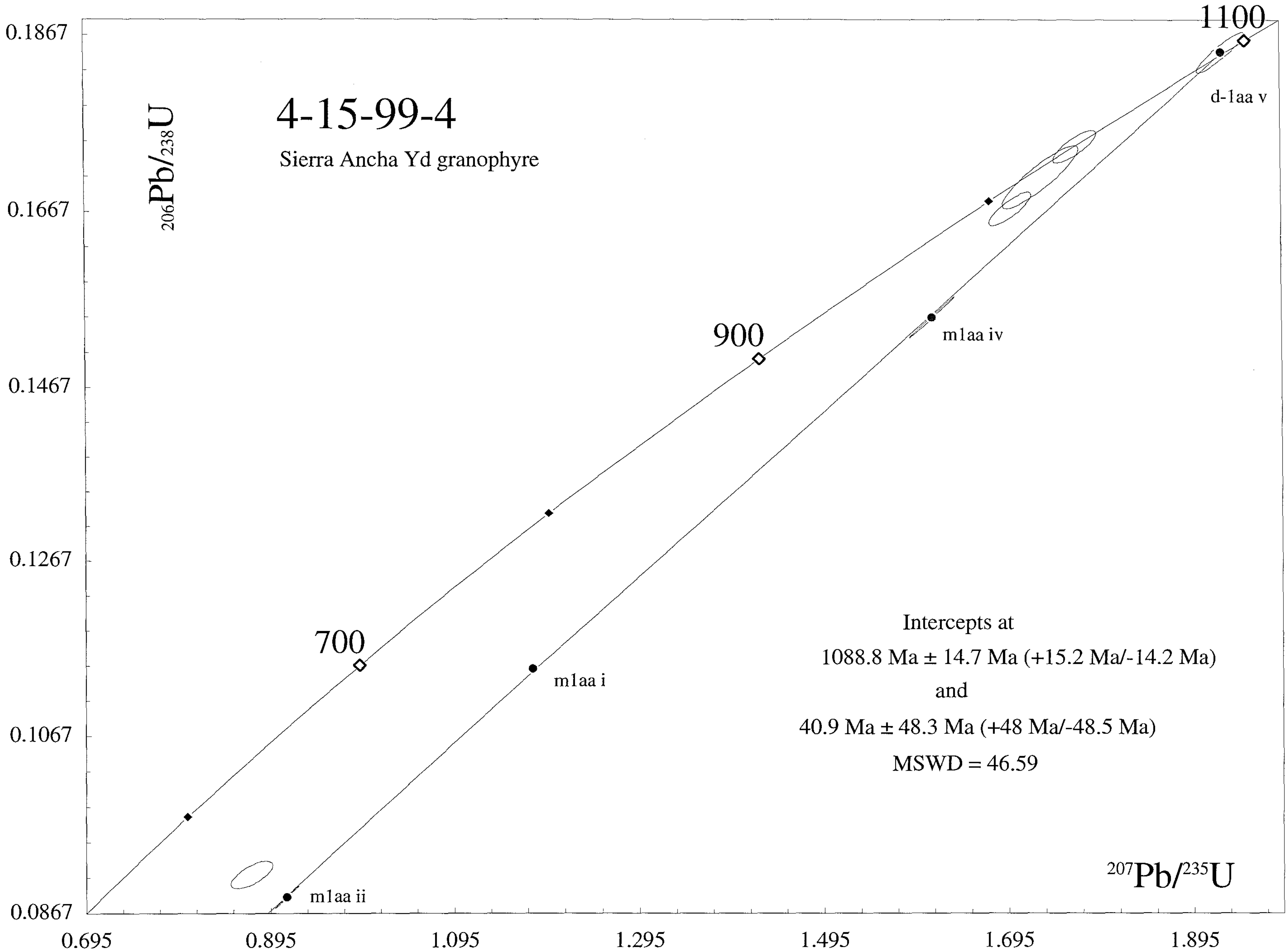




4-15-99-4		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err	207 Pb / 235 U	% err	207 Pb / 206 Pb	% err	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)				(2s)		(2s)		(2s)				coef.	(pg)
d-1aa ii	0.0009	381.45	73.92	714.57	0.183	0.17403	(1.07)	1.76989	(1.30)	0.07376	(.74)	**1034.3**	**1034.5**	**1034.9**	0.825	5.4
d-1aa iii	0.0013	427.11	102.25	189.57	0.190	0.17056	(2.10)	1.73272	(2.37)	0.07368	(1.04)	**1015.2**	**1020.8**	**1032.7**	0.899	33.4
d-1aa iv	0.0010	324.13	62.95	521.36	0.209	0.16695	(1.14)	1.69980	(1.36)	0.07384	(.72)	**995.3**	**1008.5**	**1037.1**	0.846	6.7
d-1aa v	0.0008	301.02	70.51	249.90	0.181	0.18472	(1.25)	1.92839	(1.36)	0.07572	(.49)	**1092.7**	**1091.0**	**1087.6**	0.932	11.8
m1aa i	0.0187	984.25	134.34	864	0.231	0.11432	(.19)	1.18055	(.21)	0.07490	(.08)	**697.8**	**791.6**	**1065.7**	0.914	150.3
m1aa ii	0.0122	1059.04	106.66	1610	0.206	0.08852	(1.45)	0.91270	(1.45)	0.07478	(.09)	**546.8**	**658.5**	**1062.7**	0.998	43.6
m1aa iv	0.0089	612.98	103.79	2304.81	0.171	0.15459	(1.52)	1.61416	(1.52)	0.07573	(.08)	**926.7**	**975.7**	**1087.9**	0.998	22.5
m1aa v	0.0095	706.74	73.15	761.40	0.164	0.09100	(1.69)	0.87455	(2.59)	0.06970	(1.86)	**561.5**	**638.0**	**919.5**	0.699	49.8



4-15-99-4
Sierra Ancha Yd granophyre
$^{206}Pb/^{238}U$
$^{207}Pb/^{235}U$
1100
900
700
d-1aa ii
d-1aa iii
d-1aa iv
m1aa v
Intercepts at
1038.5 Ma ± 10.9 Ma (+11.1 Ma/-10.6 Ma)
and
173.9 Ma ± 52.7 Ma (+52.6 Ma/-52.7 Ma)
MSWD = 0.29
0.1867
0.1667
0.1467
0.1267
0.1067
0.0867
0.695
0.895
1.095
1.295
1.495
1.695
1.895


4-15-99-4
Sierra Ancha Yd granophyre
$_{206}Pb/_{238}U$
$^{207}Pb/^{235}U$
0.1867
0.1667
0.1467
0.1267
0.1067
0.0867
0.695
0.895
1.095
1.295
1.495
1.695
1.895
700
900
1100
d-1aa v
m1aa iv
m1aa i
m1aa ii
Intercepts at
1088.8 Ma ± 14.7 Ma (+15.2 Ma/-14.2 Ma)
and
40.9 Ma ± 48.3 Ma (+48 Ma/-48.5 Ma)
MSWD = 46.59

U-Pb analytical data for Jurassic rocks collected by Nancy Riggs.

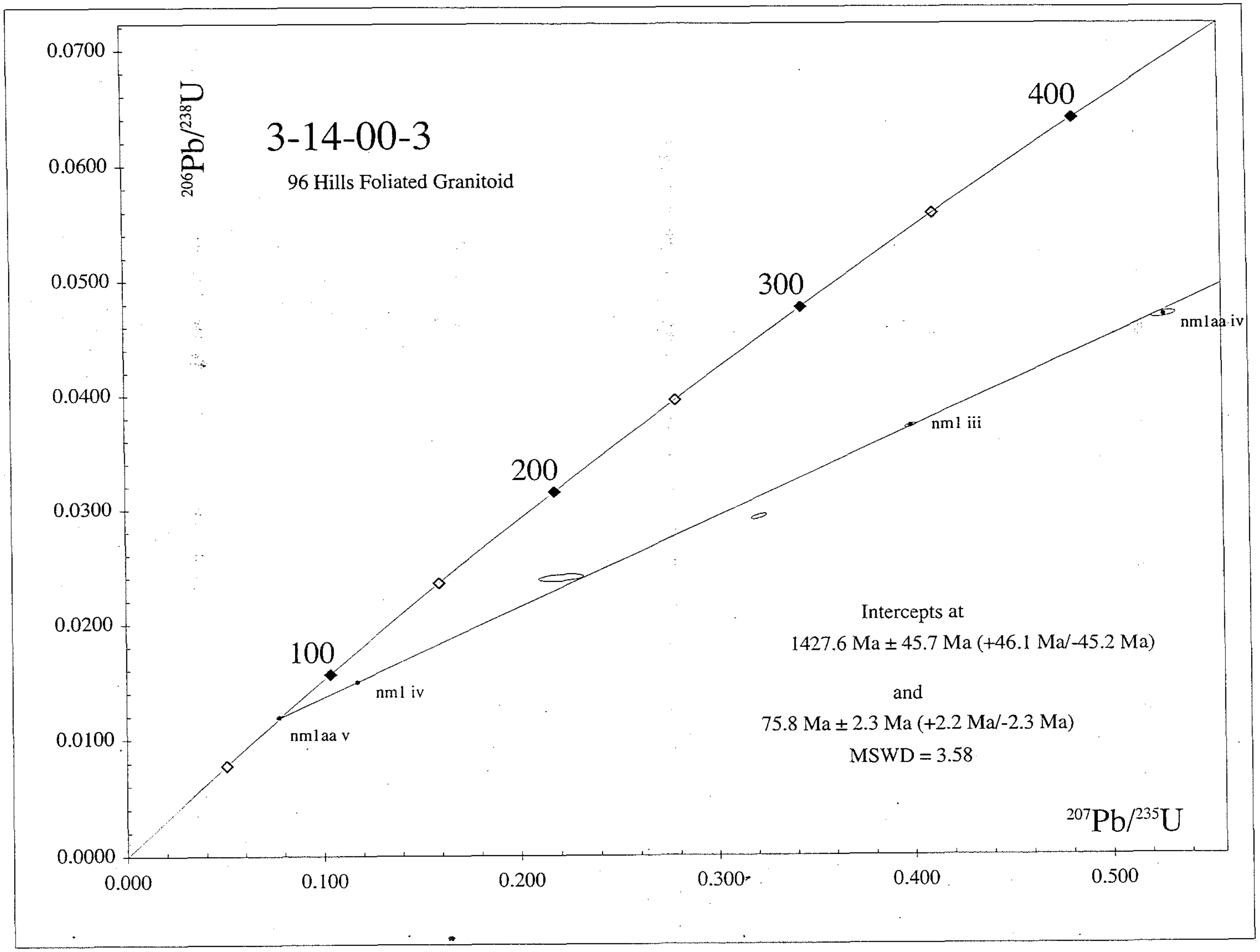
Sample Jg 89-21 (Durazno Granite)

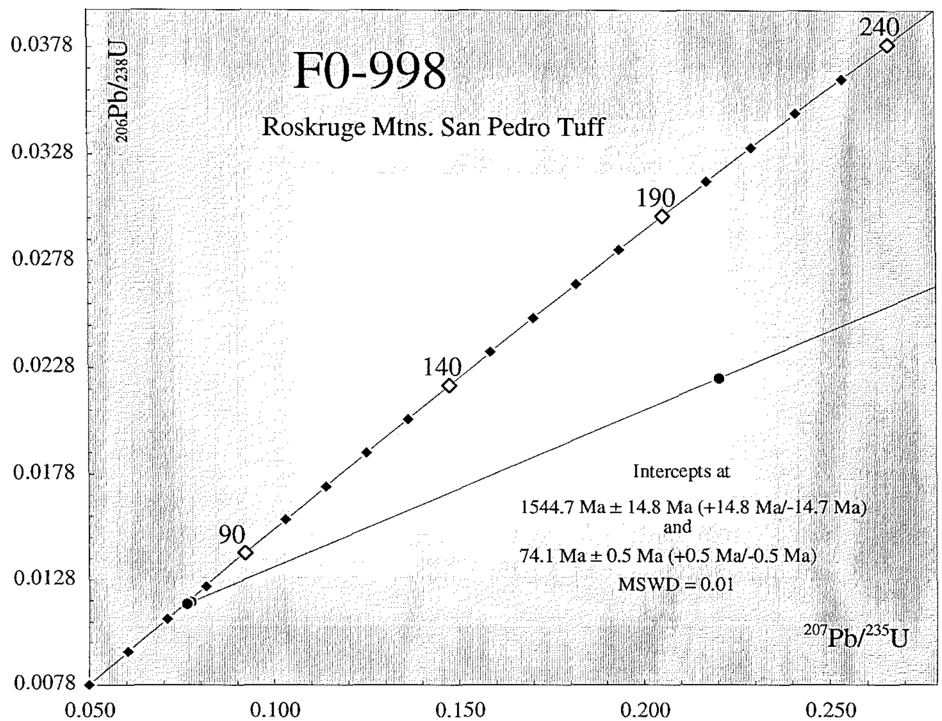
	Concentrations		Measured ratios		Corrected ratios						Age (Ma)		
Fractions	U-238 (ppm)	Pb-206* (ppm)	206 Pb / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2 sig.)	207 Pb / 235 U	% err (2 sig.)	207* Pb / 206* Pb	% err (2 sig.)	206 Pb / 238 U	207 Pb / 235 U	207* Pb / 206* Pb
>150 mesh	91.7	2.22	2587.4		0.0280412		0.191940		0.049644		178.28	178.28	178.4
150-200 mesh	116.9	3.02	12957.9		0.0298756		0.205008		0.049768		189.77	189.35	184.2
<200 mesh	108	2.77	15249.2		0.0296060		0.202201		0.049534		188.08	186.99	173.2

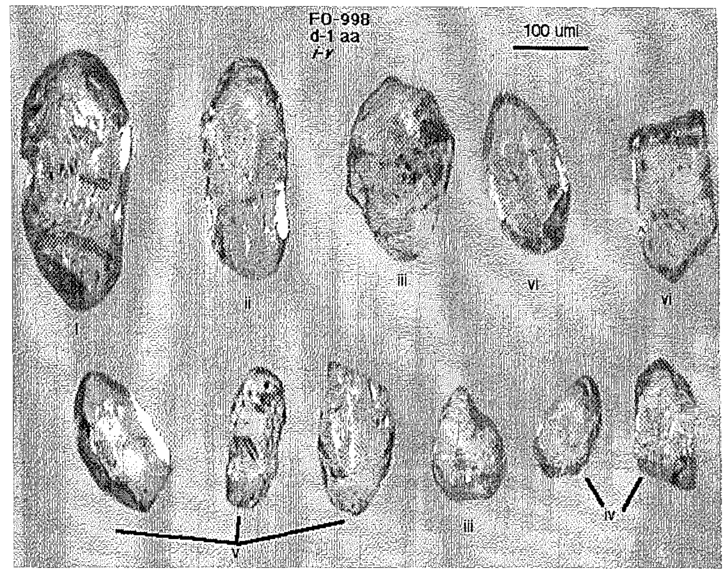
Sample Riggs HRM (Harris Ranch Monzonite)

	Concentrations		Measured ratios		Corrected ratios						Age (Ma)		
Fractions	U-238 (ppm)	Pb-206* (ppm)	206 Pb / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2 sig.)	207 Pb / 235 U	% err (2 sig.)	207* Pb / 206* Pb	% err (2 sig.)	206 Pb / 238 U	207 Pb / 235 U	207* Pb / 206* Pb
100-150c	128.0	3.03	6631.1		0.0273951	(.30)	0.185821	(.30)	0.049195	(.05)	174.2	173.1	157.1
100-150f	96.9	2.37	7579.1		0.0282330	(.30)	0.193318	(.30)	0.049661	(.04)	179.5	179.5	179.1
<200	798.7	18.47	476.5		0.0267275	(.30)	0.181119	(.54)	0.049148	(.45)	170.0	169.0	154.9

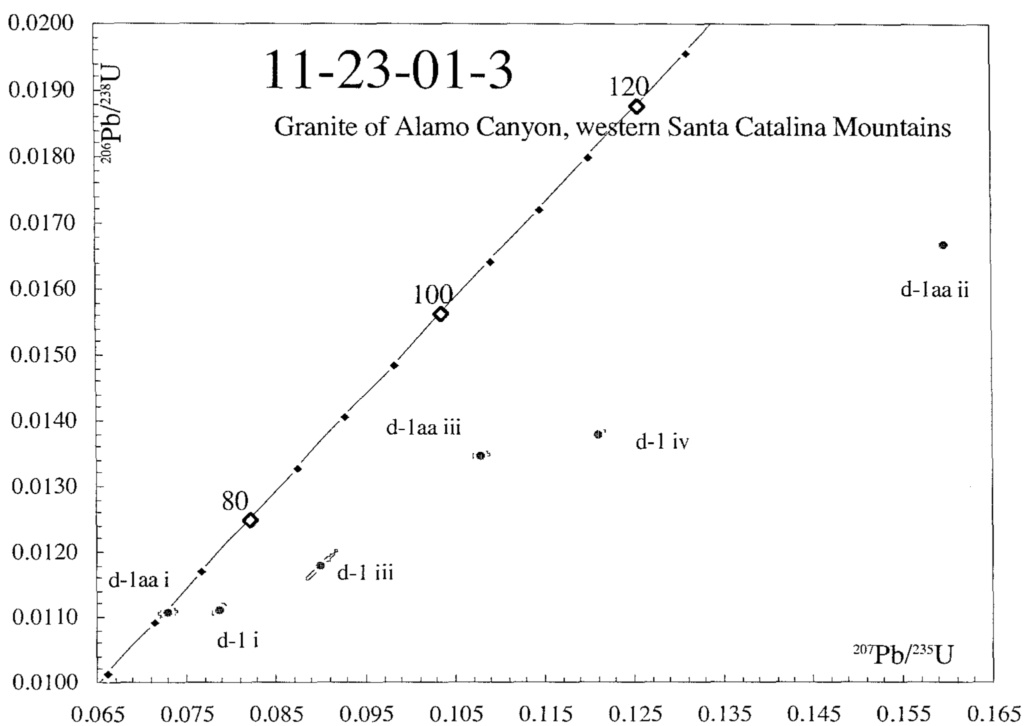
3-14-00-3		Concentrations										Age (Ma)				common	est. Pb
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb	Blank
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2σ)	235 U	(2σ)	206 Pb	(2σ)	238 U	235 U	206 Pb	coef.	(pg)	(pg)
nml aa iv	0.0094	515.7	27.5	544.1	0.128	0.04689	(.63)	0.52794	(1.15)	0.08165	(.94)	**295.4**	**430.4**	**1237.2**	0.578	25.4	3.5
nml iii	0.0010	9397.0	383.0	997.4	0.141	0.03723	(.54)	0.39930	(.72)	0.07779	(.47)	**235.6**	**341.1**	**1141.5**	0.759	21.3	5.0
nml aa ii	0.0137	489.2	15.8	712.9	0.125	0.02927	(.85)	0.32154	(1.20)	0.07967	(.82)	**186.0**	**283.1**	**1188.9**	0.736	16.8	3.5
nml iv	0.0010	10204.4	173.4	375.4	0.112	0.01493	(.49)	0.11715	(.59)	0.05690	(.29)	**95.6**	**112.5**	**487.5**	0.873	25.2	5.0
nml aa v	0.0095	543.9	7.4	332.0	0.132	0.01191	(.87)	0.07761	(1.78)	0.04727	(1.52)	**76.3**	**75.9**	**63.0**	0.526	11.7	3.5
nml i	0.0010	3933.7	98.9	553.8	0.082	0.02397	(1.34)	0.22087	(5.14)	0.06682	(4.71)	**152.7**	**202.6**	**832.3**	0.435	10.7	5.0

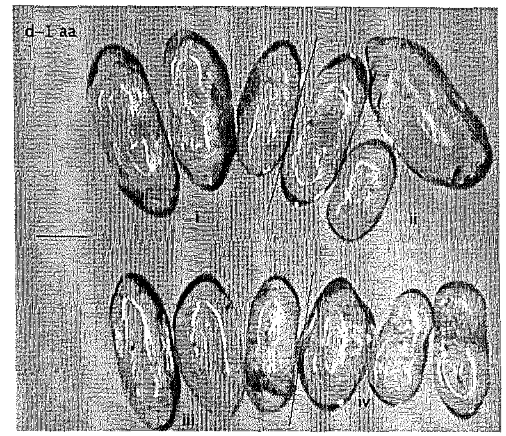


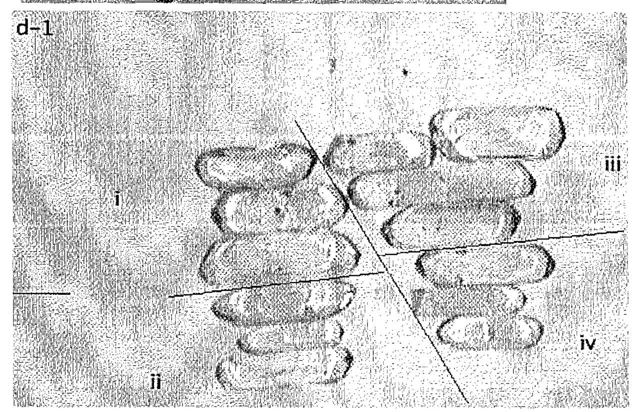




F0-998		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa v	0.0158	523.30	12.57	978.14	0.125	0.02230	(.36)	0.22070	(.58)	0.07178	(.44)	**142.2**	**202.5**	**979.8**	0.652	12.2
d-1aa iii	0.0141	477.47	7.02	236.37	0.124	0.01172	(.63)	0.07774	(.89)	0.04812	(.61)	**75.1**	**76.0**	**105.1**	0.728	23.0
d-1aa ii	0.0121	488.68	6.53	371.40	0.135	0.01165	(.76)	0.07672	(1.51)	0.04777	(1.23)	**74.7**	**75.1**	**87.8**	0.579	12.4

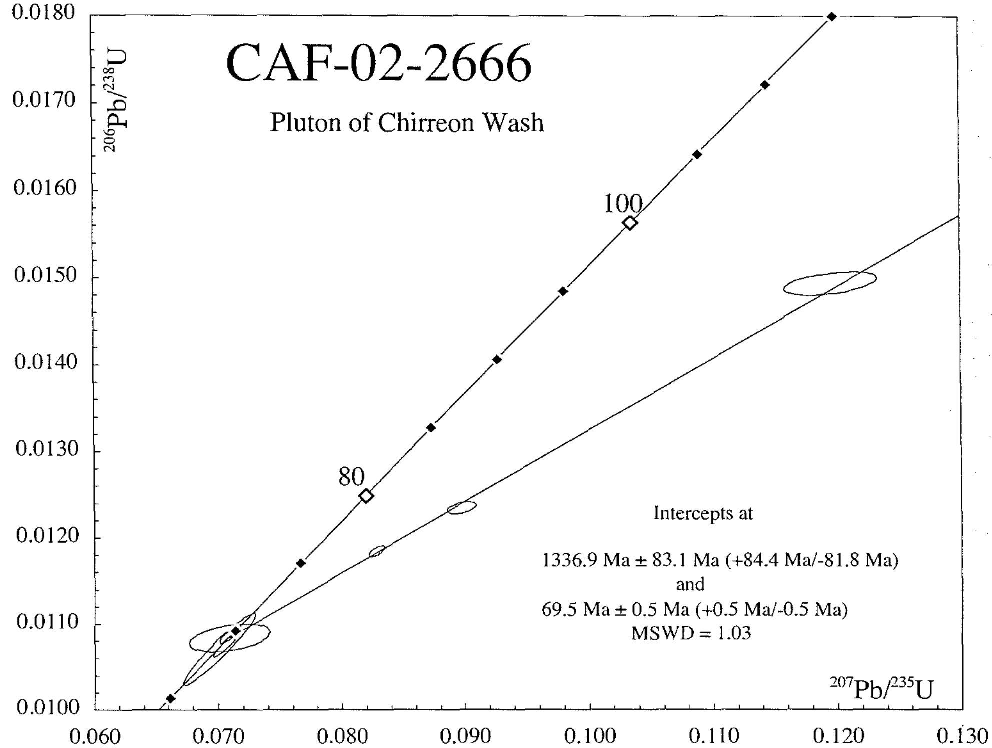


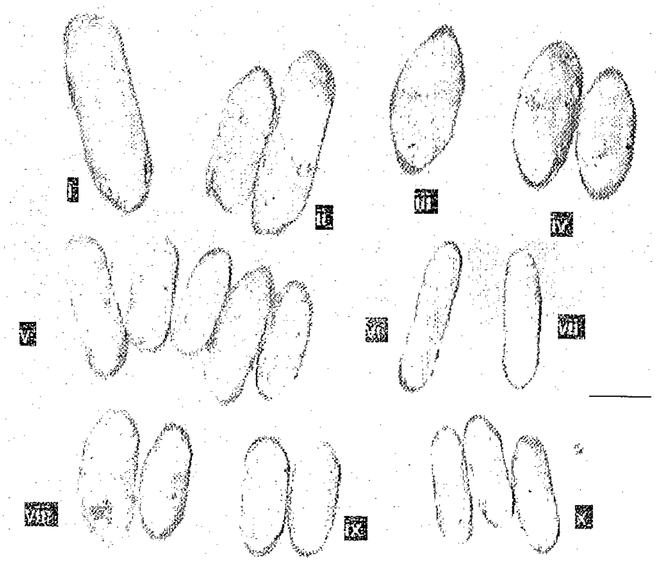




3-14-00-3		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa i	0.0380	508.04	5.66	1688.75	0.104	0.01107	(.55)	0.07289	(1.42)	0.04774	(1.30)	**71.0**	**71.4**	**86.4**	0.402	8.2
d-1aa ii	0.0408	627.61	11.13	1971.05	0.143	0.01666	(.20)	0.15983	(.23)	0.06956	(.10)	**106.5**	**150.6**	**915.4**	0.898	14.0
d-1aa iii	0.0313	772.27	10.58	2291.9	0.109	0.01348	(.36)	0.10796	(.89)	0.05809	(.81)	**86.3**	**104.1**	**533.2**	0.410	9.2
d-1 i	0.0077	1241.91	13.82	1214.55	0.103	0.01112	(.75)	0.07858	(1.01)	0.05124	(.66)	**71.3**	**76.8**	**251.5**	0.754	5.8
d-1 iii	0.0103	278.67	3.34	524.00	0.125	0.01180	(1.89)	0.09006	(1.94)	0.05536	(.36)	**75.6**	**87.6**	**426.9**	0.983	4.3
d-1 iv	0.0040	2536.51	35.08	2133.60	0.103	0.01378	(.46)	0.12113	(.59)	0.06377	(.37)	**88.2**	**116.1**	**733.9**	0.784	4.2

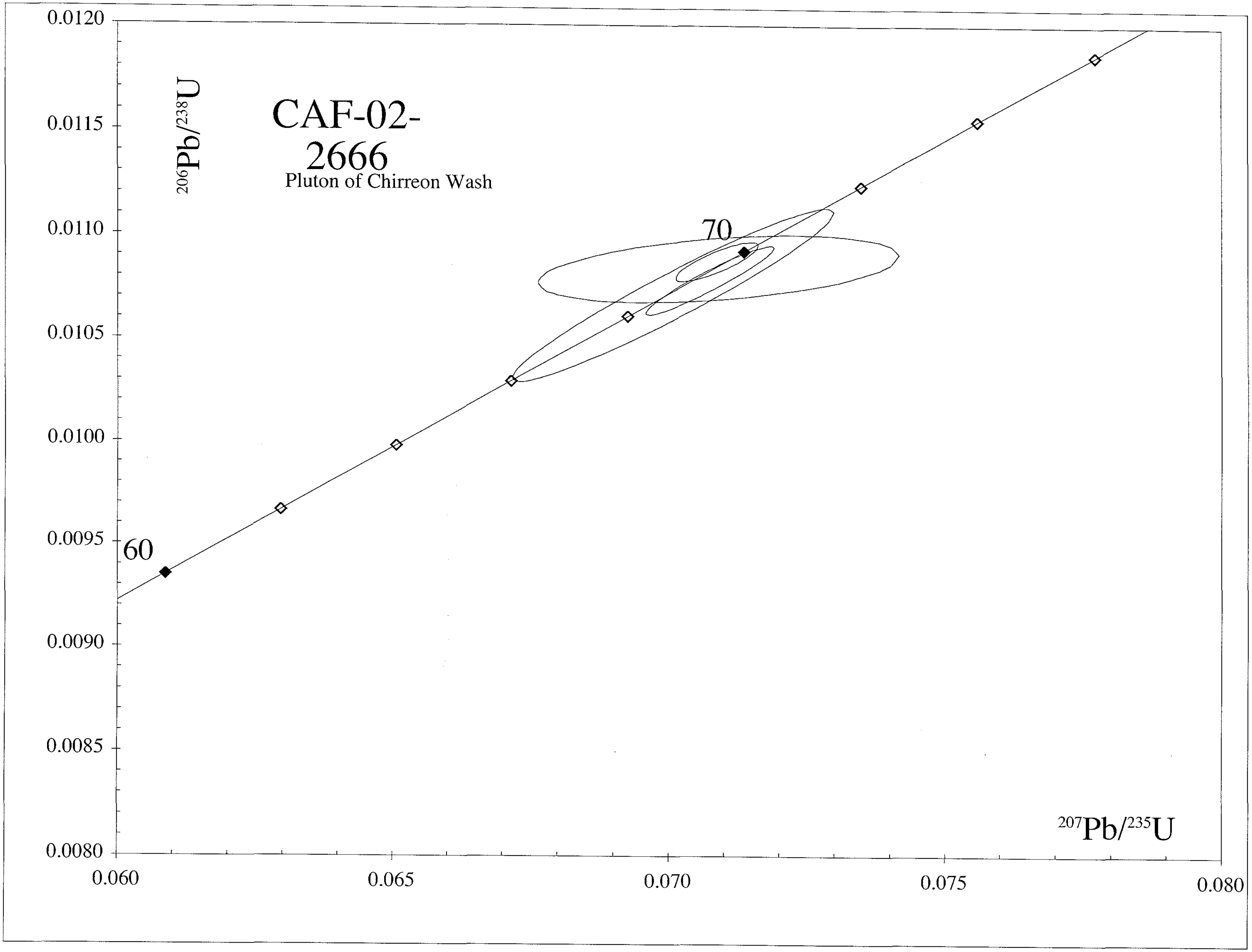
Notes: Best age is 71 ± 1 Ma with ca. 1.7 Ga inheritance



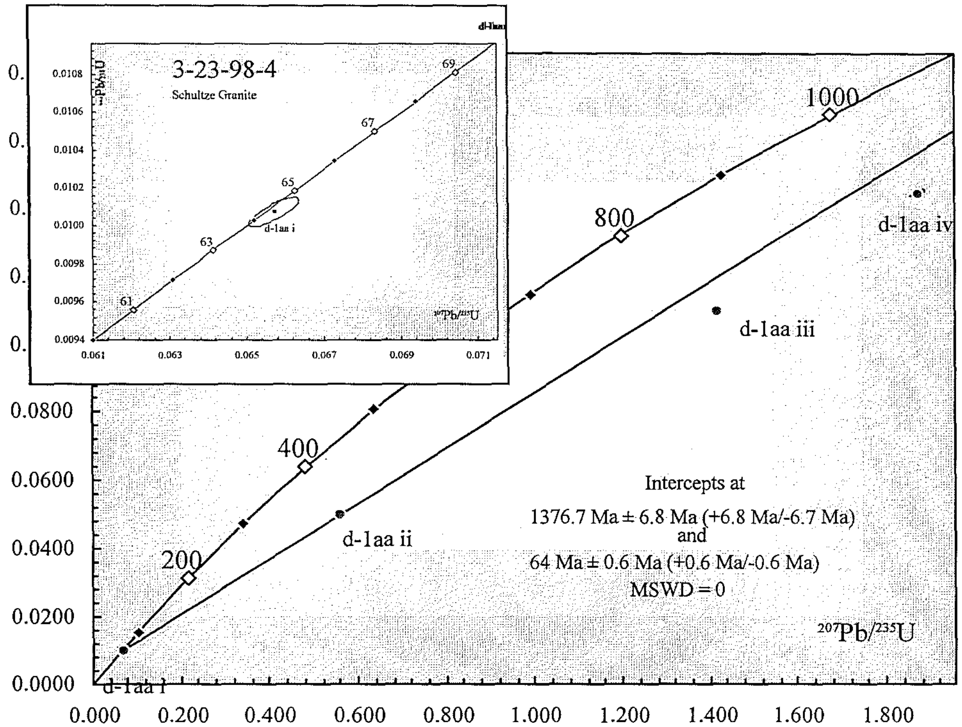


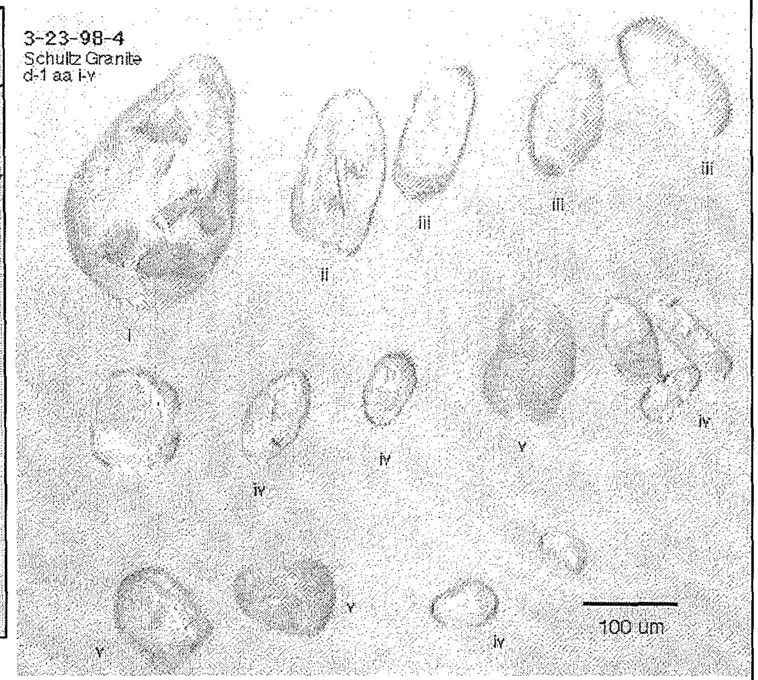
CAF-02-2666		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa iv	0.0056	1341.13	33.21	1226.38	0.133	0.02299	(.43)	0.28795	(.44)	0.09085	(.09)	**146.5**	**256.9**	**1443.5**	0.978	9.2
d-1aa viii	0.0043	1367.06	22.37	393.07	0.083	0.01494	(.90)	0.11958	(3.15)	0.05807	(2.82)	**95.6**	**114.7**	**532.3**	0.485	15.1
d-1aa i	0.0042	2267.31	29.19	2008.4	0.159	0.01235	(.57)	0.08978	(1.32)	0.05274	(1.18)	**79.1**	**87.3**	**317.7**	0.434	3.8
d-1aa v	0.0075	1611.46	19.66	1210.60	0.125	0.01184	(.54)	0.08283	(.78)	0.05072	(.55)	**75.9**	**80.8**	**228.3**	0.708	7.7
d-1aa x	0.0028	2016.01	22.24	610.61	0.106	0.01084	(1.51)	0.07091	(4.59)	0.04746	(4.18)	**69.5**	**69.6**	**72.6**	0.426	6.6
d-1aa ii	0.0049	2043.17	22.70	1354.99	0.139	0.01087	(.88)	0.07088	(1.05)	0.04730	(.57)	**69.7**	**69.5**	**64.2**	0.839	5.2
d-1aa ix	0.0029	1506.25	17.37	418.38	0.132	0.01078	(1.55)	0.07075	(1.64)	0.04760	(.52)	**69.1**	**69.4**	**79.4**	0.949	7.6
d-1aa vi	0.0010	1506.09	17.35	262.47	0.202	0.01071	(3.94)	0.07009	(4.15)	0.04747	(1.19)	**68.7**	**68.8**	**73.0**	0.958	4.1

Notes: Best age is 71 ± 1 Ma with ca. 1.7 Ga inheritance


CAF-02-
2666
Pluton of Chirreon Wash
206Pb/238U
207Pb/235U
60
70
0.0120
0.0115
0.0110
0.0105
0.0100
0.0095
0.0090
0.0085
0.0080
0.060
0.065
0.070
0.075
0.080

SCHULTZE

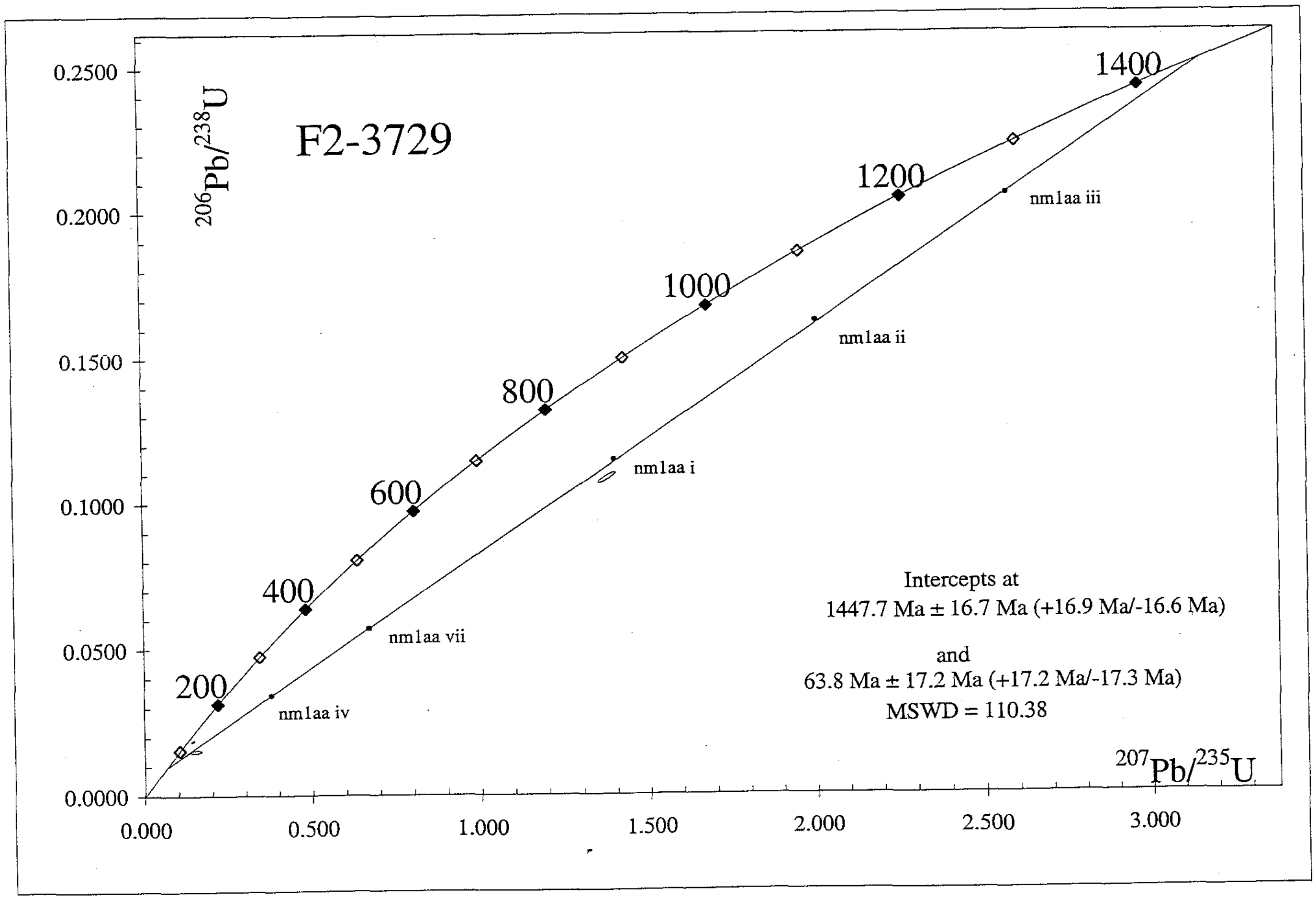




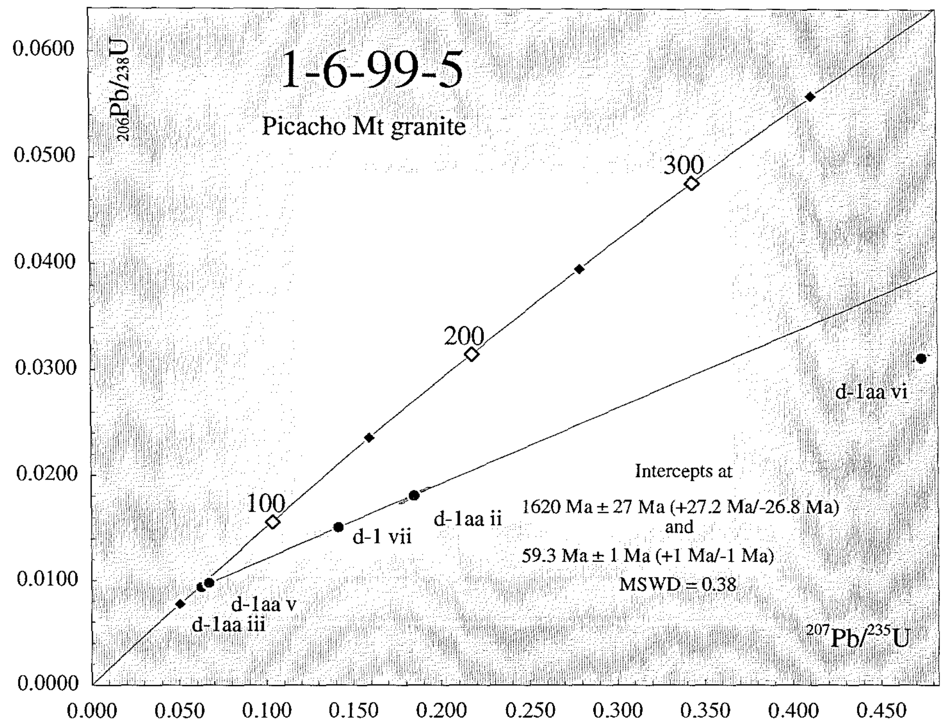
3-23-98-4		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)
d-1aa i	0.0202	493.70	5.25	431.17	0.065	0.01002	(.78)	0.06558	(.98)	0.04746	(.56)	**64.3**	**64.5**	**72.4**	0.820	15.5
d-1aa ii	0.0031	508.63	30.09	603.81	0.242	0.04991	(1.09)	0.55783	(1.13)	0.08106	(.28)	**314.0**	**450.1**	**1223.0**	0.968	8.6
d-1aa iii	0.0061	779.59	92.98	5495.51	0.164	0.10998	(.26)	1.41903	(.33)	0.09358	(.21)	**672.6**	**897.0**	**1499.6**	0.781	6.1
d-1aa iv	0.0035	774.97	111.92	4909.19	0.067	0.14459	(.68)	1.87298	(.78)	0.09395	(.39)	**870.6**	**1071.6**	**1507.1**	0.867	5.2

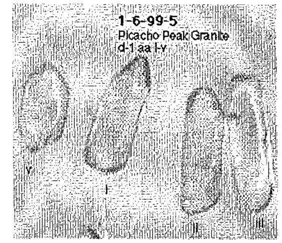
LITTLE HILL STOCK

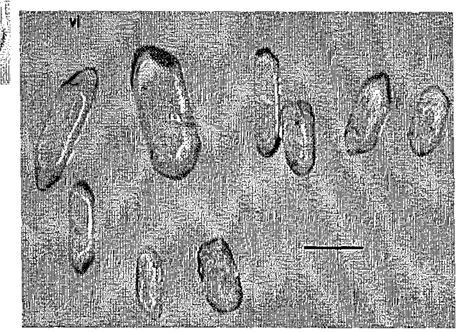
Fractions	Weight (mg)	Concentrations U (ppm)	Pb (ppm)	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2s)	207 Pb / 235 U	% err (2s)	207 Pb / 206 Pb	% err (2s)	Age (Ma) 206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	common Pb (pg)	est. Pb Blank (pg)
nm1aa iii	0.0064	861.0	172.5	10019.4	0.041	0.20540	(.11)	2.57306	(.12)	0.09085	(.05)	**1204.3**	**1293.0**	**1443.5**	0.899	7.2	5.0
nm1aa ii	0.0074	370.6	60.2	3138.9	0.063	0.16239	(.22)	2.00319	(.26)	0.08947	(.13)	**970.0**	**1116.6**	**1414.2**	0.858	9.1	5.0
nm1aa i	0.0005	4414.0	575.8	2003.3	0.218	0.11471	(.32)	1.39701	(.33)	0.08833	(.11)	**700.1**	**887.7**	**1389.6**	0.945	8.3	5.0
nm1 iii	0.0055	74.4	8.7	398.9	0.090	0.10859	(1.71)	1.37510	(1.87)	0.09184	(.74)	**664.5**	**878.3**	**1464.2**	0.919	7.5	5.0
nm1aa vii	0.0049	536.9	35.0	852.9	0.191	0.05707	(.51)	0.67066	(.54)	0.08524	(.19)	**357.8**	**521.1**	**1320.9**	0.936	11.5	5.0
nm1aa iv	0.0059	320.0	10.8	1039.3	0.064	0.03441	(.98)	0.37927	(1.00)	0.07994	(.22)	**218.1**	**326.5**	**1195.5**	0.976	4.1	4.1
nm1aa vi	0.0015	1224.3	19.7	292.6	0.076	0.01539	(3.09)	0.15183	(10.53)	0.07155	(10.04)	**98.5**	**143.5**	**973.0**	0.299	6.6	5.0
nm1aa v	0.0016	1123.8	24.4	225.2	0.087	0.01896	(2.10)	0.14314	(3.34)	0.05475	(2.44)	**121.1**	**135.8**	**402.0**	0.685	10.6	5.0

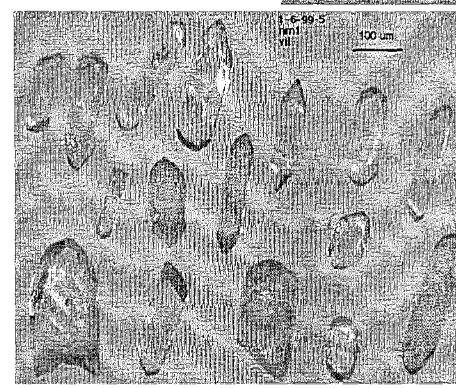


36



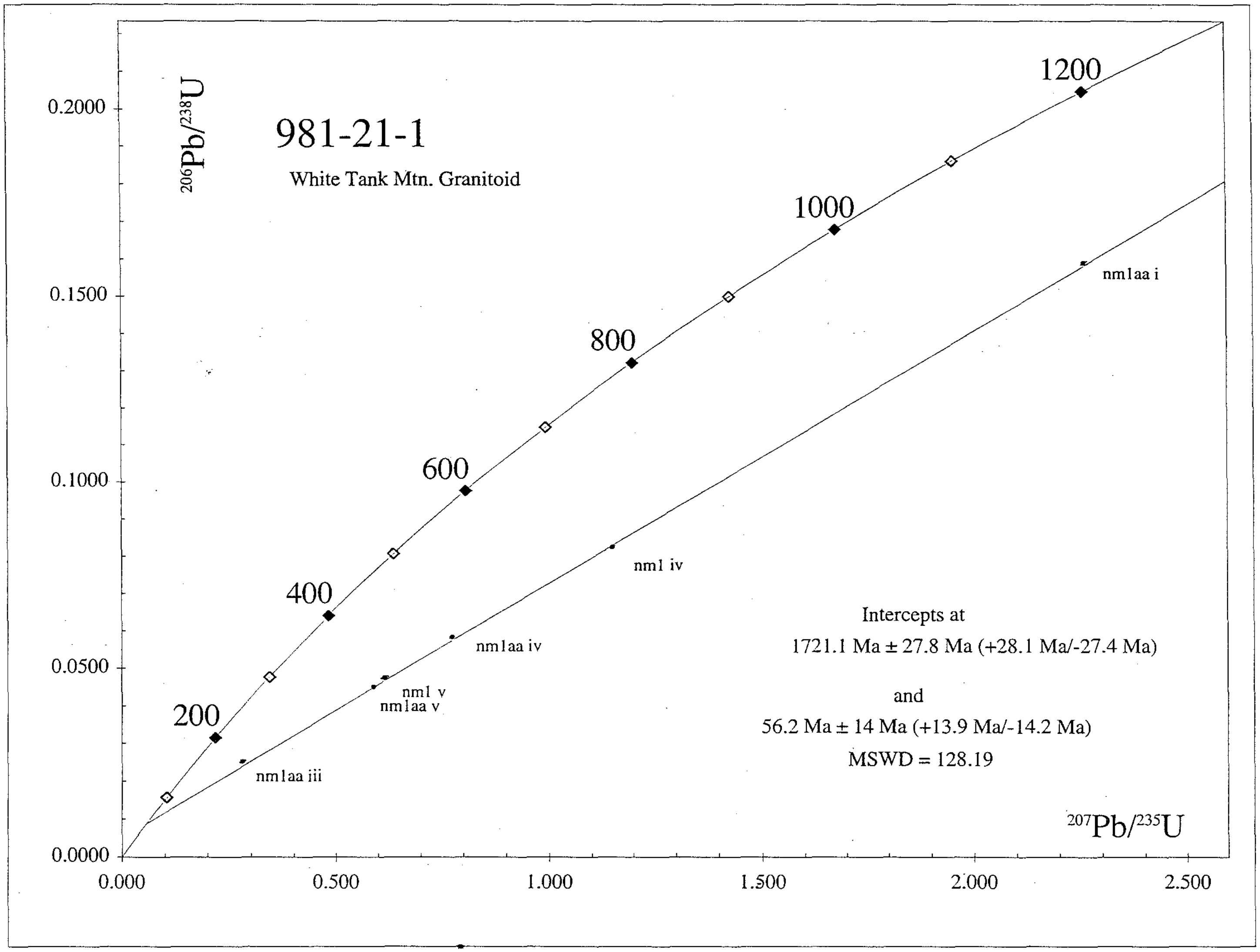




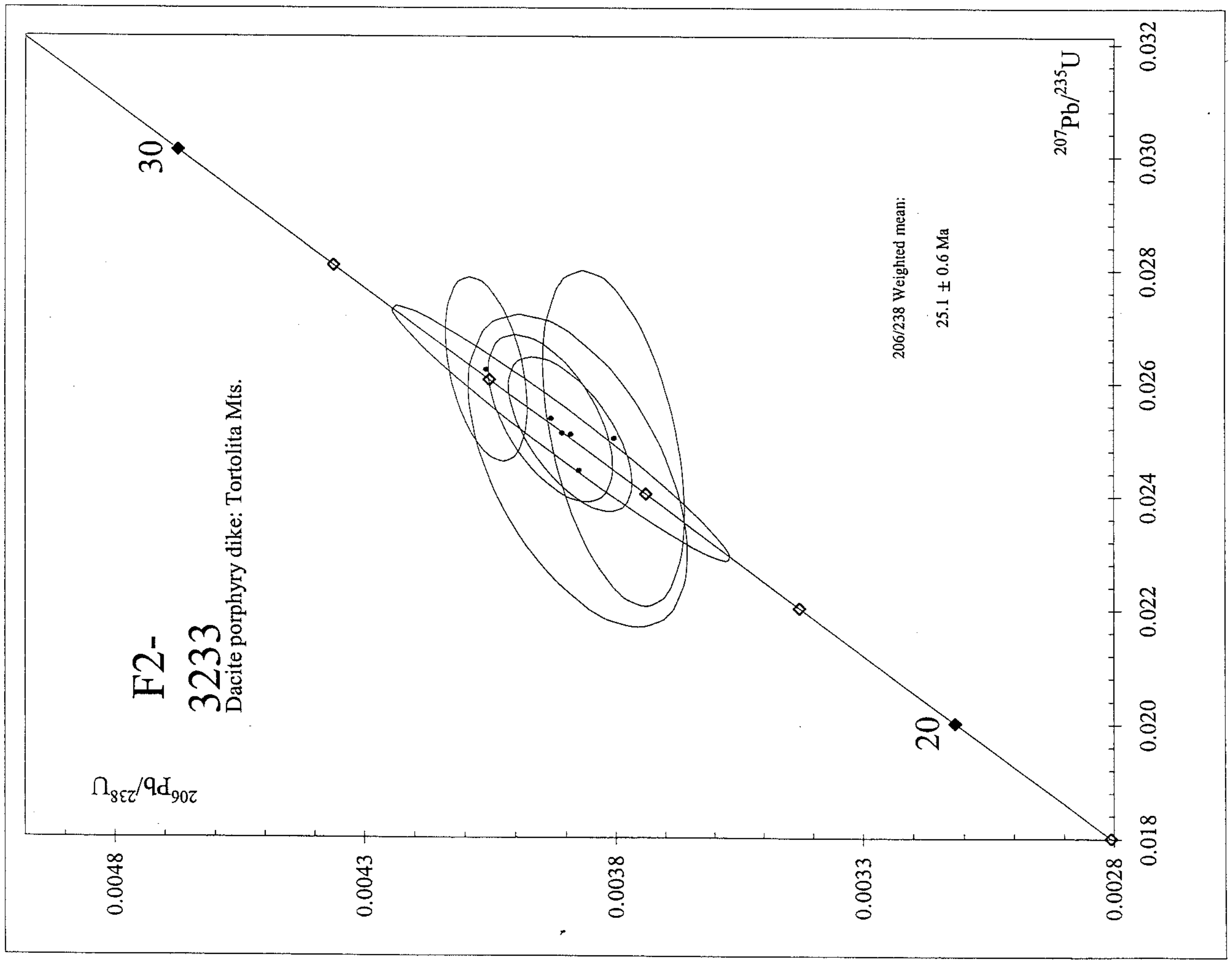


1-6-99-5		Concentrations										Age (Ma)				common
	Weight	U	Pb	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err	207 Pb / 235 U	% err	207 Pb / 206 Pb	% err	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr.	Pb
Fractions	(mg)	(ppm)	(ppm)				(2s)		(2s)		(2s)				coef.	(pg)
d-1aa vi	0.0205	351.12	12.23	1228.73	0.146	0.03119	(1.08)	0.47381	(1.09)	0.11018	(.09)	**198.0**	**393.8**	**1802.5**	0.996	11.6
d-1aa ii	0.0029	312.49	6.17	244.21	0.194	0.01811	(4.64)	0.18506	(4.72)	0.07413	(.76)	**115.7**	**172.4**	**1045.0**	0.987	4.7
d-1 vii	0.0629	635.97	10.16	1324.51	0.117	0.01506	(.33)	0.14154	(.35)	0.06816	(.12)	**96.4**	**134.4**	**873.3**	0.943	28.6
d-1aa v	0.0064	762.02	7.59	424.58	0.075	0.00976	(1.54)	0.06713	(1.93)	0.04989	(1.14)	**62.6**	**66.0**	**189.7**	0.807	7.5
d-1aa iii	0.0034	734.02	6.70	326	0.082	0.00939	(3.12)	0.06279	(3.28)	0.04852	(.93)	**60.2**	**61.8**	**124.8**	0.959	4.9

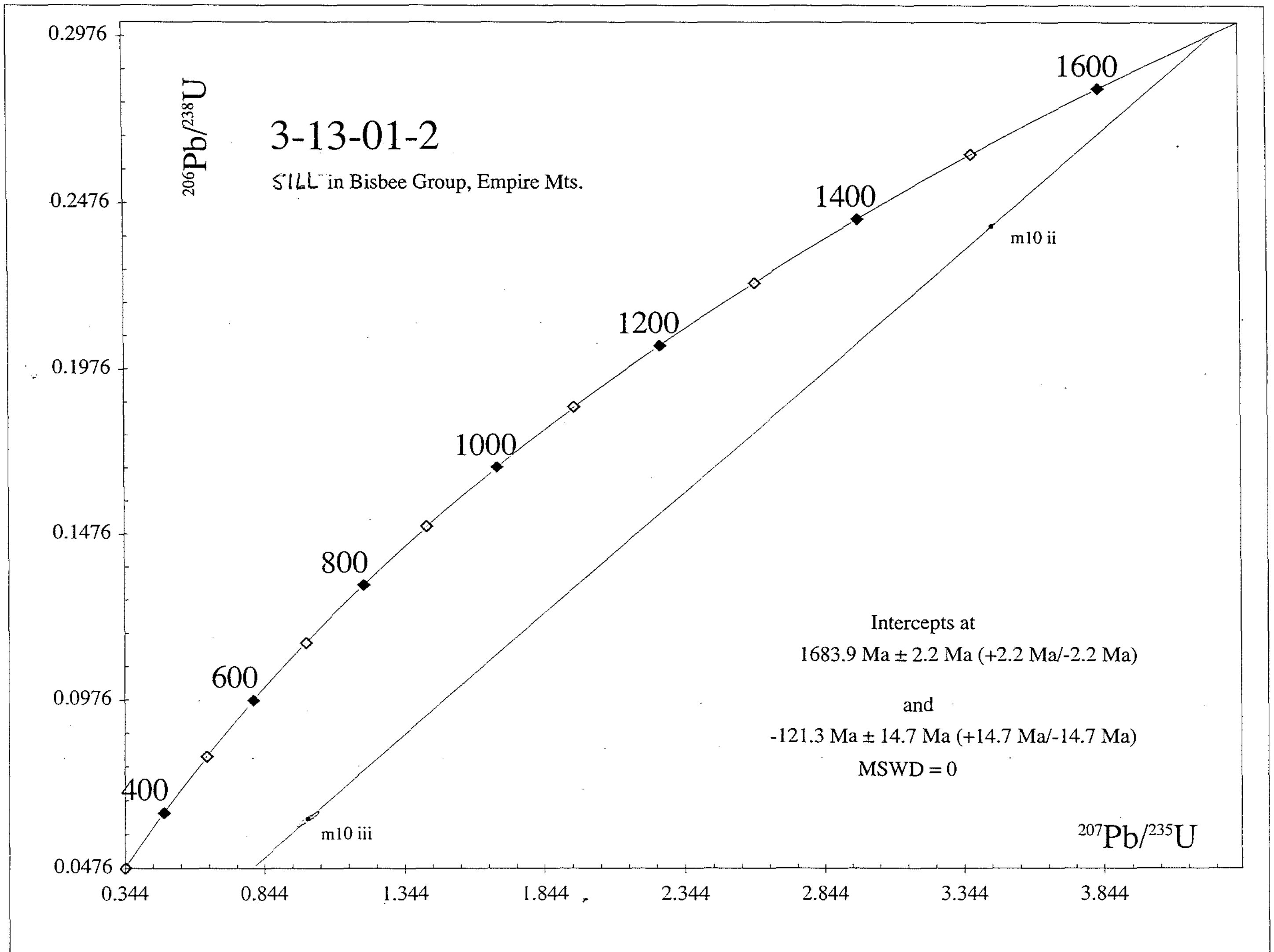
981-21-1		Concentrations										Age (Ma)				common	est. Pb
Fractions	Weight (mg)	U (ppm)	Pb (ppm)	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2σ)	207 Pb / 235 U	% err (2σ)	207 Pb / 206 Pb	% err (2σ)	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	Pb (pg)	Blank (pg)
nm1aa i	0.0070	770.2	124.3	8253.6	0.076	0.15889	(.37)	2.26201	(.38)	0.10325	(.09)	**950.6**	**1200.5**	**1683.4**	0.973	6.5	5.0
nm1 iv	0.0025	722.7	61.2	1678.0	0.088	0.08244	(.52)	1.15176	(.53)	0.10133	(.07)	**510.7**	**778.1**	**1648.6**	0.990	5.7	5.0
nm1aa iv	0.0078	920.8	54.7	2203.8	0.069	0.05831	(.59)	0.77393	(.79)	0.09626	(.52)	**365.4**	**582.0**	**1552.8**	0.752	11.6	5.0
nm1 v	0.0025	694.0	35.8	568.9	0.112	0.04741	(.95)	0.61551	(1.51)	0.09416	(1.08)	**298.6**	**487.0**	**1511.4**	0.701	9.2	5.0
nm1aa v	0.0203	1227.8	55.4	3229.8	0.056	0.04498	(.51)	0.58977	(.52)	0.09509	(.11)	**283.6**	**470.7**	**1529.9**	0.979	20.8	5.0
nm1aa iii	0.0083	339.8	9.5	508.2	0.152	0.02515	(1.67)	0.28119	(2.50)	0.08109	(1.80)	**160.1**	**251.6**	**1223.7**	0.696	8.9	5.0



F2-3233		Concentrations											Age (Ma)			common	est. Pb
	Weight	U	Pb	206 Pb*	208 Pb	206 Pb	% err	207 Pb	% err	207 Pb	% err	206 Pb	207 Pb	207 Pb	corr.	Pb	Blank
Fractions	(mg)	(ppm)	(ppm)	204 Pb	206 Pb	238 U	(2s)	235 U	(2s)	206 Pb	(2s)	238 U	235 U	206 Pb	coef.	(pg)	(pg)
nm1aa x	0.0080	664.8	4.3	104.9	0.301	0.00388	(3.16)	0.02497	(5.48)	0.04667	(4.27)	**25.0**	**25.0**	**32.6**	0.629	15.3	5.0
nm1aa xi	0.0070	820.6	4.6	177.5	0.393	0.00392	(3.15)	0.02525	(5.86)	0.04672	(4.80)	**25.2**	**25.3**	**35.2**	0.576	9.1	5.0
nm1aa xii	0.0070	265.0	1.2	129.5	0.337	0.00390	(8.67)	0.02500	(9.03)	0.04651	(1.96)	**25.1**	**25.1**	**23.9**	0.976	4.2	4.2
nm1aa xiii	0.0162	553.7	3.0	266.1	0.344	0.00405	(2.01)	0.02612	(6.24)	0.04680	(5.70)	**26.0**	**26.2**	**39.0**	0.417	9.4	5.0
nm1aa xiv	0.0100	497.3	2.6	131.4	0.212	0.00379	(3.74)	0.02490	(11.91)	0.04761	(10.77)	**24.4**	**25.0**	**79.7**	0.448	10.7	5.0
nm1aa xv	0.0070	404.4	3.0	71.3	0.322	0.00386	(5.66)	0.02433	(11.35)	0.04566	(9.56)	**24.9**	**24.4**	**-20.1**	0.541	13.4	5.0



3-13-01-2		Concentrations										Age (Ma)					
Fractions	Weight (mg)	U (ppm)	Pb (ppm)	206 Pb* / 204 Pb	208 Pb / 206 Pb	206 Pb / 238 U	% err (2σ)	207 Pb / 235 U	% err (2σ)	207 Pb / 206 Pb	% err (2σ)	206 Pb / 238 U	207 Pb / 235 U	207 Pb / 206 Pb	corr. coef.	common Pb (pg)	est. Pb Blank (pg)
m10 ii	0.0025	310.5	73.9	1839.4	0.039	0.24035	(.43)	3.45082	(.44)	0.10413	(.08)	**1388.5**	**1516.1**	**1699.0**	0.984	6.4	5.0
m10 iii	0.0025	127.9	12.7	125.9	0.376	0.06215	(3.65)	0.99904	(3.85)	0.11659	(1.13)	**388.7**	**703.3**	**1904.5**	0.956	11.1	5.0



Undated samples and samples with missing analytical data.

Sample Number	UTME	UTMN	U-Pb Date	# zircons	Rock unit	Collector	Sample Number	Location	7 ½' Quadrangle
F8-227	412885	3749050		none	Cave Creek felsite	C. Ferguson	F8-227	New River Mesa area	New River Mesa
F0-927	459700	3547615		none	Sharp Peak tuff, Roskruge Mts.	C. Ferguson	F0-927	Roskruge Mts.	San Pedro
4-6-83-1	503935	3750525		many	Tuff in Dripping Spring Quartzite (sample sent to Sam Bowring 1/00)	Ed DeWitt	4-6-83-1	Sierra Ancha	McFadden Peak
4-7-83-1	510080	3708135		many	Tuff in Dripping Spring Quartzite (sample sent to Sam Bowring 1/00)	Ed DeWitt	4-7-83-1	Gerald Hills	Salt River Peak
?	456850	3575950	Jurassic (analytical data missing)	many	Andesite to dacite volcanic breccia of Richard et al. (2000)	Nancy Riggs	?	SE Waterman Mts.	Waterman Peak