

CONTRASTING CRATONAL PROVENANCES FOR UPPER CRETACEOUS VALLE GROUP QUARTZITE CLASTS, BAJA CALIFORNIA

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ABSTRACT

Late Cretaceous Valle Group forearc-basin deposits on the Vizcaino Peninsula of Baja California Sur are dominated by first-cycle arc-derived volcanic-plutonic detritus derived from the adjacent Peninsular Ranges batholith. Craton-derived quartzite clasts are a minor but ubiquitous component in Valle Group conglomerates. The source of these clasts has implications for tectonic reconstructions and sediment-dispersal paths along the paleo-North American margin. Three strongly contrasting types of quartzite are recognized based on petrology and detrital zircon U-Pb geochronology. The first type is ultramature quartz arenite with well-rounded, highly spherical zircon grains. Detrital zircon ages from this type are nearly all >1.8 Ga with age distributions that closely match the distinctive Middle-Late Ordovician Peace River arch detrital signature of the Cordilleran margin. This type has been previously

recognized from prebatholithic rocks in northeast Baja California (San Felipe quartzite). A second quartzite type is subarkosic sandstone with strong affinity to southwestern North America; important features of the age spectra are ~ 1.0 - 1.2 Ga, 1.42 and 1.66 Ga peaks representing cratonal basement, 500-300 Ma grains interpreted as recycled Appalachian-derived grains, and 284-232 Ma zircon potentially derived from the Early Permian-Middle Triassic east Mexico arc. This quartzite type could have been carried to the continental margin during Jurassic time as outboard equivalents of Colorado Plateau eolianites. The third quartzite type is quartz pebble conglomerate with significant ~ 900 - 1400 Ma and ~ 450 - 650 Ma zircon components, as well as mid- and late Paleozoic grains. The source of this type of quartzite is more problematic but could match either upper Paleozoic strata in the Oaxaca terrane of southern Mexico or a southwestern North America source. The similarity of detrital

zircon spectra in all three Valle Group quartzite types to rocks of the adjacent Cordilleran margin support previous interpretations that Valle Group forearc basin sediments were deposited in proximity to rocks on the mainland of northwest Mexico and southwestern United States.

INTRODUCTION

Baja California plays a central role in the debate over Cretaceous paleogeography and terrane translation models for the western North American Cordillera. This debate, fueled by uncertainties and conflicts between models based on geologic versus paleomagnetic data (Cowan et al., 1997), can be resolved into two separate issues: 1) the displacement history of the main part of the Baja Peninsula which is cored by crystalline basement of the Cretaceous Peninsular Ranges batholith (PRB), and 2) the displacement history of Vizcaino terrane forearc basement on the western outboard edge of Baja California.

Butler et al. (1991) observed that anomalously shallow paleomagnetic inclinations from the PRB and overlying sedimentary strata (e.g. Teissere and Beck, 1973, Beck 1980, 1991; Hagstrum et al., 1985; Lund and Bottjer, 1991), which require ~1200 km of northward transport, might be reconciled by a combination of westward tilting of the batholith together with compaction-induced inclination shallowing in sedimentary units. This idea has gained strong support from subsequent paleomagnetic studies on the batholith (Dickinson and Butler, 1998; Böhnle and Delgado-Argote, 2000; Böhnle et al., 2002) and overlying upper Cretaceous strata (Tan and Kodama, 1998; Kodama and Ward, 2001). The most recent paleomagnetic interpretations for Baja thus require minimal tectonic transport and are supported by independent lines of geologic evidence that indicate simply closing the Gulf of California by ~300 km restores Baja to its original position against northwestern Mexico (e.g., Gastil, 1993; Gehrels et al., 2002).

The translation/accretion history of the Vizcaino terrane has been harder to resolve.

Paleomagnetic data (Smith and Busby, 1993a) and unusual peraluminous Jurassic granite clasts in Aptian-Albian conglomerates (Kimbrough et al., 1987) suggest that the Vizcaino terrane may have been displaced by margin parallel strike-slip faulting relative to the Baja California Peninsula. However, the newest paleomagnetic data indicate that the Vizcaino terrane has moved little with respect to the Peninsular Ranges batholith and cratonic North America since the late Early Cretaceous (Vaughn et al., 2005). These data are consistent with geologic evidence that links an enormous influx of PRB-derived Cenomanian to Turonian coarse-grained sediment into the Vizcaino terrane Valle Group forearc basin (Kimbrough et al., 2001).

On the other hand, an increasingly large body of evidence indicates that the Cretaceous was a period of major margin parallel dextral strike-slip faulting along the western U.S. Cordillera driven by oblique subduction and strain partitioning (e.g. Wright and Wyld, 2006 and references therein). Northward from the Vizcaino terrane in the submerged borderland region of Baja and southern California, western remnants of the Valle Group forearc basin have been dismembered and tectonically removed. Crouch (1979) suggested that dismemberment of the forearc was associated with late Cenozoic strike-slip tectonics associated with initiation of the San Andreas system, and that fragments of the basin are preserved in the northern borderland on San Miguel Island (e.g. Bartling and Abbott, 1983), and also in the Transverse Ranges and Coast Ranges farther north. Cowan et al. (1997) however suggests that the missing forearc basin strata were removed during the Late Cretaceous-Early Cenozoic and translated to northern Washington and British Columbia (the Baja British Columbia hypothesis). The Baja BC hypothesis has gained renewed support from a recent paleomagnetic study that indicates Cretaceous forearc basin strata of the Nainamo Group in British Columbia originated adjacent to the Baja California margin during the Late Cretaceous (Housen and Beck, 1999; Krijgsman and Tauxe, 2006).

This paper provides a test for Baja California terrane translation models and the Baja BC hypothesis via analysis of detrital zircon from minor but ubiquitous quartzite conglomerate clasts in Cretaceous Valle Group strata. Quartzite is durable and can withstand long-distance transport in sediment dispersal systems. Motivation for this work is provided by existing and rapidly expanding detrital zircon data sets from the southwestern United States and elsewhere (e.g. Gehrels and Stewart, 1998; Gillis et al., 2005) that provide a basis for testing possible connections between the Valle Group quartzite clasts and ancestral North America, as well as with potentially correlative displaced units such as the Nainamo Group in British Columbia.

VALLE GROUP STRATIGRAPHY

Forearc basin strata of the Peninsular Ranges of southern and Baja California comprise two main belts of rock; the Rosario Group and the Valle Group (Fig. 1). Along the western margin of the Peninsular Ranges batholith from the Santa Ana Mountains to El Rosario, the Rosario Group comprises relatively thin (1-2 km) sequences of Turonian to Maastrichtian fluvial and shallow- to deep-marine strata that unconformably onlap the eroded western flank of the batholith.

The Valle Group comprises thick successions (3-12 km) of Aptian-Albian to Eocene, mainly deep-marine strata overlying Triassic to Lower Cretaceous ophiolite/volcanic arc basement (e.g., Patterson, 1984; Barnes, 1984; Moore, 1985; Busby-Spera and Boles, 1986; Smith et al., 1993; Smith and Busby, 1993b; Busby et al., 1998; Kimbrough et al., 2001; Kimbrough and Moore, 2003). It can be divided longitudinally along the 200-km-long outcrop belt into at least three distinct sub-basins, including northern and southern sub-basins on the Vizcaino Peninsula that are separated by a paleo-basement high, and a third sub-basin centered on Cedros Island (Figs. 1, 2).

Each sub-basin contains a thick, early Cenomanian to middle Turonian coarse clastic sequence that represents a rapid and regionally

extensive progradation of coarse clastic detritus into the deep-marine portion of the forearc basin. The thickest and most complete record of the Cenomanian -Turonian progradation is provided by the Campito and Los Indios sections in the northern Vizcaino sub-basin where a basal 150-300-m-thick broad apron of granule to pebble conglomerate overlies basin-plain shales of the Los Chapunes Formation (Patterson, 1984). These deposits are overlain by a thick succession of turbidites that in turn, coarsen upward into channelized sandstone and conglomerate deposited in a slope-proximal submarine fan setting. These deposits may be located in an inner fan valley or distal submarine canyon environment.

Valle Group conglomerate are typically channelized weakly stratified pebble-cobble clast supported conglomerates with outsized boulder clasts. Debris flow conglomerate beds exhibit inverse grading at the base and outsized boulders “float” near the top. Average conglomerate clast size in the Campito section increases upward reaching a maximum in the middle Cenomanian. The coarsest interval contains numerous boulder beds (maximum size of 2.5 m) that we interpret as having been deposited within a steep-gradient inner-fan channel or possibly a submarine canyon axis. This observation indicates that the fan apex had prograded into the basin axis by middle Cenomanian time. Rapid unroofing rates are required to generate high-gradient sediment-transport systems capable of delivering abundant meter-sized boulders and great volumes of sand and gravel to the axis of the deep-marine basin.

Clast Petrology

Valle Group sediments are dominated throughout by first-cycle arc-derived volcanic-plutonic detritus. Table 1 presents conglomerate clast-count data on 2114 clasts from 9 localities in the Valle Group that range from Aptian-Albian to Coniacian in age. Two clast counts are presented for each locality; the first represents the pebble cobble fraction, the second represent the boulder fraction.

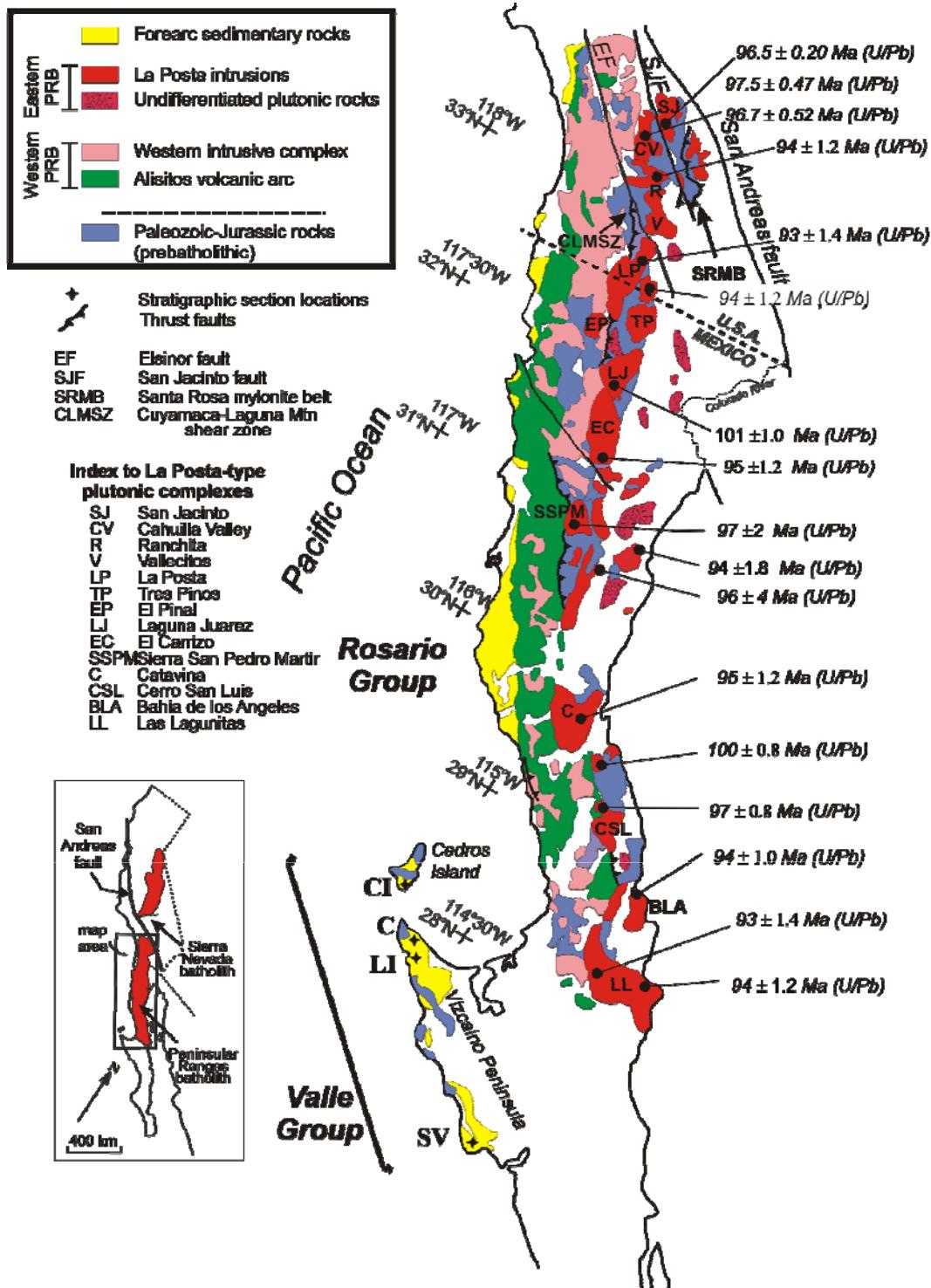


Figure 1. Schematic geologic map of Peninsular Ranges batholith (PRB) and Valle and Rosario Group forearc sedimentary strata. Location of Valle Group stratigraphic columns in Figure 2 are indicated. The inferred source of quartzite clasts in Valle Group strata are prebatholithic units of the PRB shown in blue. Zircon U-Pb ages and uncertainties (2SE) are also shown for La Posta suite intrusions that make up about half the surface exposure of the batholith. The La Posta magmatic flareup is related to rapid batholith erosional denudation and delivery of coarse-grained deep marine sediment into the forearc which carried the quartzite clasts.

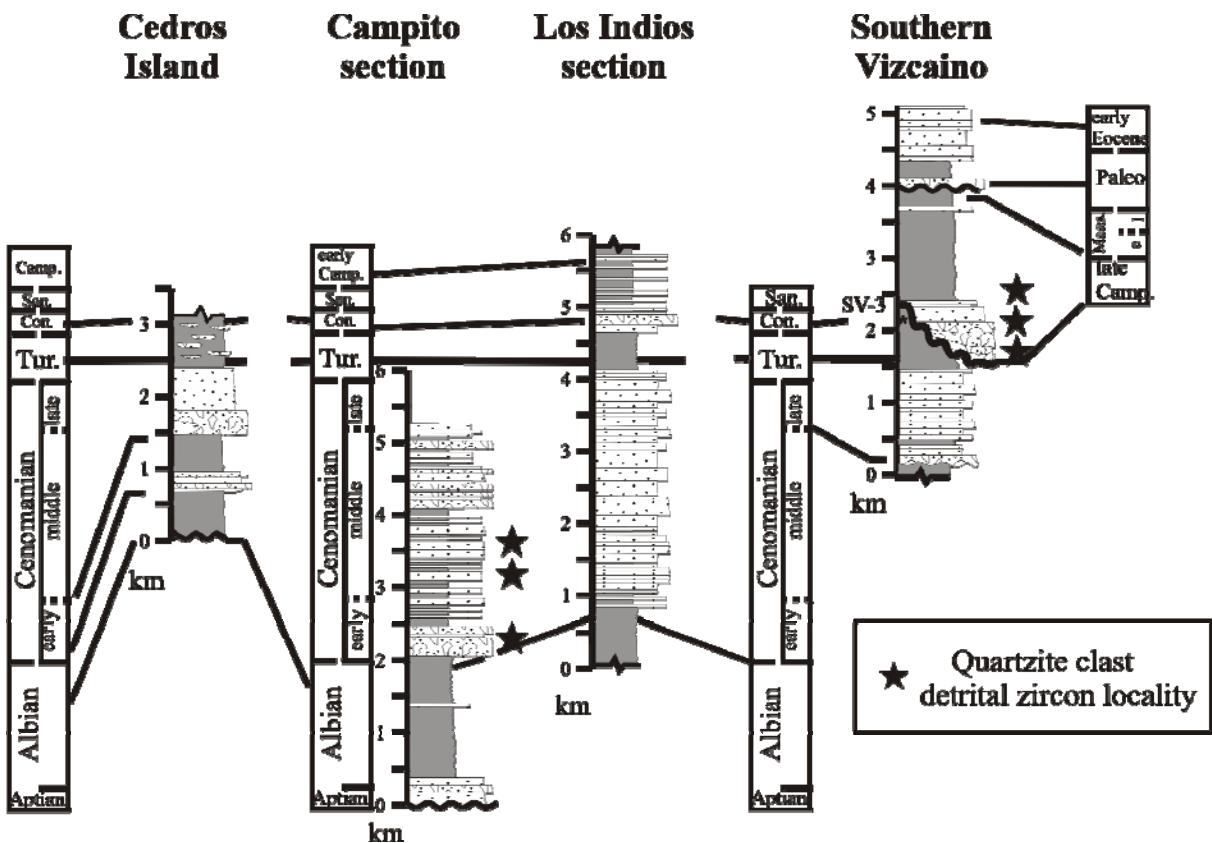


Figure 2. Stratigraphic sections of Valle Group showing quartzite detrital zircon sample localities. Section names refer to Cedros Island, northern (Campito and Los Indios) and southern Vizcaino subbasins the locations of which are shown in Figure 1.

Clast counts document mainly volcanic (73%) and plutonic (13%) rock types. Volcanic types are volcaniclastic and effusive with andesite, dacite and rhyodacite compositions dominating. Plutonic rocks are mainly biotite ± hornblende tonalite, granodiorite and monzogranite. Dioritic and gabbroic compositions are uncommon.

The volcanic-plutonic assemblage is consistent with a continental or mature island arc derivation, supporting earlier sandstone petrology studies (Patterson, 1984; Barnes, 1984). There is no obvious ‘batholith unroofing’ trend evident from these data. The clast category labeled “chert” consists mainly of a dark grey “cherty argillite” lithology. Minor quartzite clasts occur throughout the Valle Group but are locally abundant in the Aptian-Albian Perforada Formation, and conspicuously abundant in Campanian submarine channel deposits around Punta Abreojos. The largest

quartzite clasts encountered were meter-sized boulders in the mid-Cenomanian Campito section.

METHODS

U-Pb geochronological analyses of 328 detrital zircon grains from six Upper Cretaceous Valle Group quartzite clasts are reported here. Sample locations and details are presented in Table 2. Analytical results are presented in Table 3 and plotted in Figure 3. Table 3 can be obtained from the Data Repository link on the Pacific Section, SEPM website (<http://www.sci.sdsu.edu/pacsepm>).

Zircons were separated from quartzite clasts by standard crushing, density and magnetic separation techniques at San Diego State University. Aliquots from bulk zircon separates were mounted along with standards

Table 1: Valle Group conglomerate clast count data

conglomerate locality	depositional age	latitude ¹	longitude	clast size	volcanic	plutonic	quartzite	sedimentary	chert	total clasts counted (n)	mean clast size (cm)	max clast size (cm)	1 std dev clast size (cm)
Canon Malarimo Los Indios section	Coniacian	27.647750	-114.46303	pebble-cobble boulder	64.0%	17.5%	5.9%	3.6%	8.9%	303	6	19	2.4
Arroyo Los Juncos Southern Vizcaino	Campanian	26.817444	-113.51931	pebble-cobble boulder	62.6%	2.4%	16.3%	11.4%	7.3%	123	11	33	6.2
Campo Enmedio Southern Vizcaino	Campanian	26.803055	-113.55008	pebble-cobble boulder	79.8%	1.9%	8.9%	3.3%	6.1%	213	50	18	4.9
Arroyo Pitahaya Southern Vizcaino	late Cenomanian	26.907666	-113.76567	pebble-cobble boulder	77.6%	15.1%	0.0%	1.8%	5.5%	219	6	20	3.7
Campito Lighthouse Campito section	middle Cenomanian	27.826666	-114.85367	pebble-cobble boulder	79.5%	12.7%	1.3%	4.4%	2.2%	229	5	15	2.3
Sierra Campito Campito section	early Cenomanian	27.789555	-114.89261	pebble-cobble boulder	77.2%	9.6%	1.8%	7.9%	3.5%	114	10	20	4
Sierra Queen Campito section	early Cenomanian	27.737305	-114.72258	pebble-cobble boulder	79.0%	18.0%	1.2%	0.6%	1.2%	167	8	24	3.8
Arroyo El Porsen Campito section	early Cenomanian	27.790944	-114.75211	pebble-cobble boulder	82.0%	8.5%	2.0%	2.5%	5.0%	200	5	15	5.3
Perforada Fm Campito section	Aptian-Albian	27.761194	-115.01592	pebble-cobble boulder	61.5%	3.0%	14.5%	16.0%	5.0%	200	8	60	7
					0.0%	0.0%	18.8%	0.0%	0.0%	48	39	120	17.9

InAD27 datum

Table 2: Valle Group quartzite clast, detrital zircon sample descriptions

sample	depositional age	¹ latitude longitude	clast size (cm)	clast color (GSA chart)	clast description	stratigraphic details
CRENE 95-98	late Campanian	26.824444 -133.505555	15	brownish gray 5YR 4/1	fine grained quartzite - qtz sandstone w/ qtz overgrowths; zircons are a mix of very well rounded spherical & more prismatic subrounded grains	uppermost part of Los Juncos submarine cglm channel - late Campanian ammonites bracket cglm bed
CKR94-9	Campanian	26.803055 -113.550083	21	medium bluish gray 5B 5/1	qtz pebble cglm clast - poorly sorted 0.2-2.0 cm subrounded to subangular white & gray gangue qtz, dark chert pebbles & possible silicic volcanics; zircons are a mix of very well rounded & prismatic subrounded grains	basal part of Los Juncos submarine cglm channel - coastal outcrops 3 km NE of Punta Abreojos - weakly stratified pebble-cobble cglm w/ outsized boulder clasts
CKR 94-8	Campanian	26.803055 -113.550083	17	yellowish gray 5Y 8/1	qtz pebble cglm clast - poorly sorted 0.5-2cm rounded to subrounded white gangue qtz and darker chert pebbles, matrix is yellowish gray xtalline qtz, zircons are a mix of very well rounded & prismatic subrounded grains	same as for CKR94-9
CSP94-1	mid-Cenomanian	27.83425 -114.86522	15	light brownish gray 5YR 6/1	fine grain sugary textured quartzite sandstone; homogeneous zircon population of well sorted very well rounded spherical grains	poorly sorted close-packed boulder rich pebble-cobble-boulder cglm
CSC 94-19	early Cenomanian	27.790944 -114.752111	11	dark gray N3	fine grained quartzite w/ white qtz veins - subangular moderately sorted grains; zircons are a mix of spherical & prismatic subrounded grains	basal Cenomanian cglm deposited across basin-plain turbidites of the Los Chapunes Fm
CSC94-11	early Cenomanian	27.790944 -114.752111	11	pale yellowish brown 10YR 6/2	fine-grained qtzite ss w/ qtz veining; homogeneous zircon population of well sorted very well rounded spherical grains	same as for CSC 94-19

¹NAD27 datum

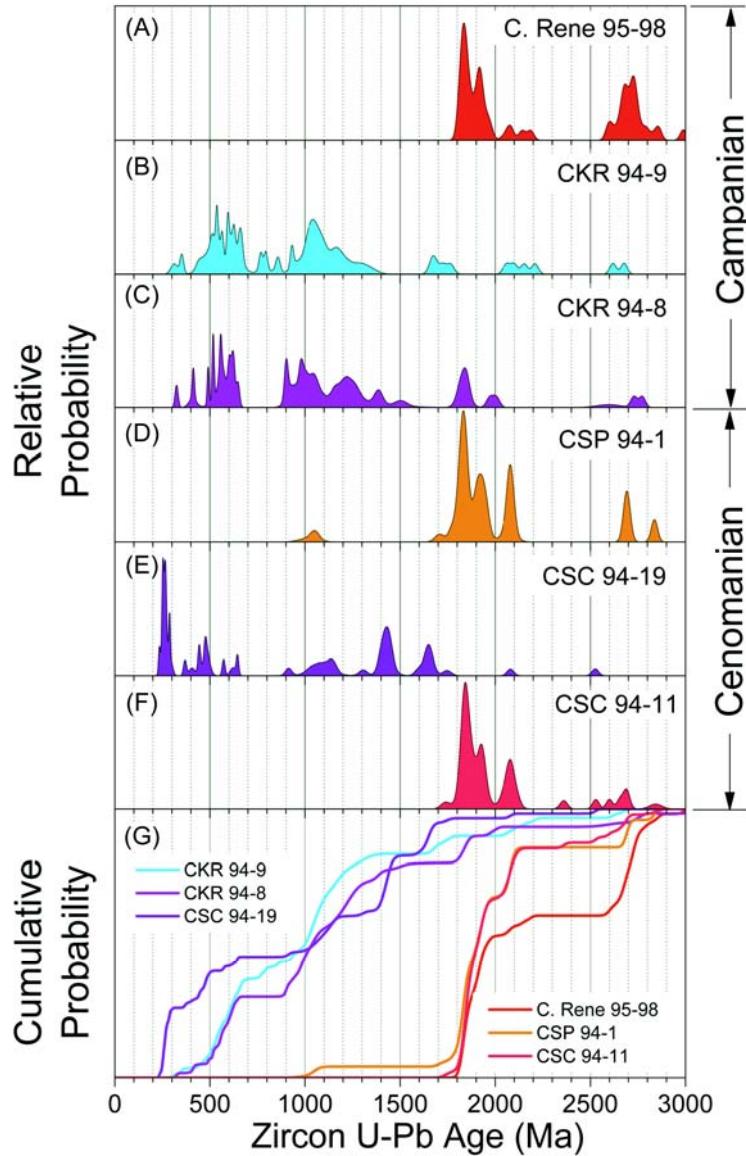


Figure 3. Zircon U-Pb relative age probability plots and cumulative probability plot for Valle Group quartzite clasts.

in 1" diameter epoxy plugs and polished with 3000 grit sandpaper.

Zircons were analyzed at the University of Arizona LaserChron Center using a Multicollector Inductively Coupled Plasma Mass Spectrometer (GVI Isoprobe) coupled to a 193 nm Excimer laser ablation system (New Wave Instruments). Analyses were conducted in static mode with a laser beam diameter of 35 microns. Inter-element fractionation was monitored by reference to a

concordant Sri Lanka zircon standard with a known (ID-TIMS) age of 564 ± 4 Ma (Gehrels, unpublished data). The standard zircon was analyzed once for every five unknowns. A protocol was established to ensure random selection of grains. In this study, interpreted ages are based on $^{206}\text{Pb}/^{207}\text{Pb}$ ratios for grains >1000 Ma, and $^{206}\text{Pb}/^{238}\text{U}$ ratios for grains <1000 Ma. Refer to Dickinson and Gehrels (2003) and Gillis et al. (2005) for additional analytical details.

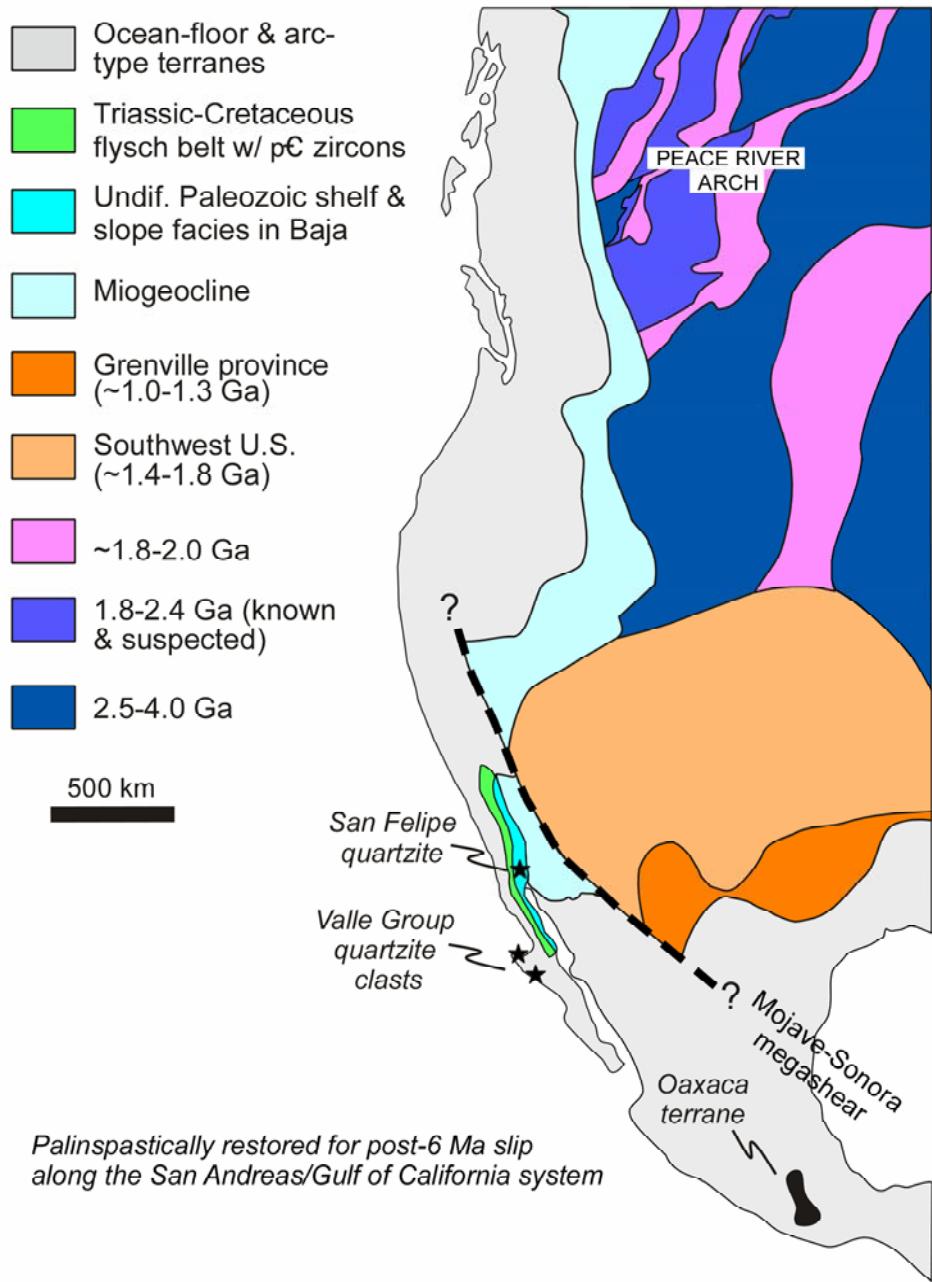


Figure 4. Schematic map showing Baja California in its restored pre-Neogene position along the southwestern Cordilleran margin. Base map adapted from Hoffman (1989), Stewart et al. (1990) and Gastil (1993).

DISCUSSION

The enormous influx of Cenomanian to early Turonian coarse-grained Peninsular Ranges volcanic-plutonic debris into the Valle forearc basin indicates that significant uplift and erosion of the Peninsular Ranges batholith

was virtually synchronous with massive intrusion of the eastern PRB at this time (Kimbrough et al., 2001). Rapid unroofing rates are required to generate high-gradient sediment-transport systems capable of delivering abundant meter-sized boulders and great volumes of sand and gravel to the deep-

marine axis of the basin. High relief and steep gradients must have persisted for at least 5 million years. Sustained Cenomanian to early Turonian denudation at mean rates of 1.0 km/m.y. is also evident in the northern Peninsular Ranges batholith (Lovera et al., 1999; Grove, 2003); clearly indicating that magmatic inflation of the batholith at 95 ± 3 Ma was strongly coupled with arc exhumation and sediment delivery to the forearc basin.

Whatever the ultimate origin of quartzite clasts in the Valle Group strata may be, during the Late Cretaceous they must have been derived from erosional denudation of Peninsular Ranges batholith wallrock sequences. To date, there is no evidence for extra-regional sediment dispersal systems feeding into the Valle basin.

Peace River arch type clasts

Three clasts analyzed in this study match the distinctive age spectra for Middle-Late Ordovician Eureka quartzite of the Cordilleran miogeocline (Fig. 3). The Eureka quartzite represents a blanket of mature sand eroded from Cambrian sandstone formerly covering the Peace River-Athabaska arch in northern Alberta (Ketner, 1968). The sand was swept southward by longshore currents along the length of the Cordilleran margin (Fig. 4).

A good local match for the Valle Group ‘Peace River arch-type’ quartzite is the San Felipe quartzite exposed on the northeastern margin of Baja California (Fig. 4). The San Felipe quartzite was previously correlated with basal Cambrian strata of the mainland (Proveedora Quartzite of Sonora, Zabriskie Quartzite of California and Nevada) based on stratigraphic similarities (Anderson, 1993; Gastil, 1993). However, Gehrels et al. (2002) demonstrated that the detrital zircon age distribution from the San Felipe quartzite is a close match to both the miogeoclinal and eugeoclinal Middle-Late Ordovician ‘Peace River arch’ detrital signature. The zircon spectra for Valle quartzite sample CSP94-1 (Fig. 3D), as well as the San Felipe quartzite, matches best with the “higher” Ordovician

eugeosynclinal reference spectra which contain a small Grenville age component. This match is consistent with accumulation of these rocks in either outer-shelf or off-shelf basins along the Cordilleran margin (cf. Gehrels et al., 2002). The zircon spectra for Valle quartzite samples CSC94-1 and CRene95-98 (Fig. 3A, F) appear to match better the Ordovician miogeoclinal reference curve.

Southwest North American clast type

A single clast of subarkose (CSC 94-19; Fig 3E) analyzed from the basal Cenomanian progradational package represents a southwest North American clast type in the Valle Group. Grenville age, 1.42 and 1.66 Ga spikes in the detrital zircon spectra indicate a strong affinity to southwestern North America basement sources. Early Paleozoic grains may reflect an Appalachian provenance transported westward across the Laurentian craton by Permian and Triassic transcontinental river systems (Dickinson and Gehrels, 2003). The distinct Late Permian peak suggests derivation from a circum-Pacific arc sequence such as the Early Permian-Middle Triassic (284-232 Ma) east Mexico arc (Torres et al., 1999) which may extend into southern California (Barth et al., 2001). Four grains with well-determined ages clustering between 251-253 Ma represent a solid maximum depositional age for the sample; the youngest grain is 234 Ma. Most clastic detritus in arc-type terranes in the Cordillera was generated during contemporaneous or slightly older magmatism so we assume an early Mesozoic stratigraphic age for this sample.

This lithology may have reached the continental margin during early Mesozoic time as outboard marine equivalents of the well known Colorado Plateau eolianites where they now reside as part of the Peninsular Ranges prebatholithic “flysch belt” (Gastil, 1993).

Quartz pebble conglomerate clasts

Detrital zircons from the two quartz pebble conglomerate clasts collected from the

Campanian submarine canyon at Punta Abreojos yield similar distinctive age distributions. Large components of Pan African (515-750 Ma), Grenville (1000-1350 Ma), and late Mesoproterozoic (800-1000 Ma) zircon dominate, accompanied by smaller early to mid-Paleozoic peaks and older Meso- and Paleoproterozoic peaks. The source of these clasts is more problematic. They may represent a North American source, or alternatively, Paleozoic cover of the Oaxaca complex in Mexico. The Oaxaca complex of southern Mexico is the largest exposure of Precambrian and Paleozoic rocks in Mexico and is believed to represent part of the Oaxaquia terrane basement that underlies most of eastern Mexico (Keppie et al., 2001).

CONCLUSIONS

Reconnaissance U-Pb detrital zircon dating of quartzite clasts in the Late Cretaceous Valle Group of Baja California defines three different clast types. Two of these clast types are firmly linked to local southwestern North American basement sources based on detrital zircon age distributions. Distinctive Middle-Late Ordovician ‘Peace River arch’ type quartzite is locally known from wall rock sequences in the northeastern Peninsular Ranges batholith (San Felipe quartzite). Early Mesozoic quartzite sands have a detrital signature that can be related to the southwestern Cordillera and could represent equivalents of Colorado Plateau early Mesozoic fluvial and eolian deposits transported into offshore basins as turbidites. This clast type was presumably derived from the prebatholithic flysch belt of the Peninsular Ranges batholith. A third type is more problematic but can be related to either southwestern Cordilleran Laurentian basement sources or perhaps Paleozoic cover of Gondwana Oaxaquia terrane basement that underlies most of eastern Mexico.

The similarity of detrital zircon spectra in the Valle Group quartzite clasts to rocks of the adjacent Cordilleran margin support previous interpretations that Valle Group

forearc basin sediments were deposited in proximity to rocks on the mainland of northwest Mexico and southwest US, and have not experienced significant Late Cretaceous to early Eocene offset relative to the Peninsular Ranges batholith. These data further provide a basis for testing possible connections between the Valle Group forearc basin succession with potentially correlative displaced units such as the Nainamo Group in British Columbia.

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TABLE 3: ZIRCON U-Pb ANALYSES: SEPM Pacific Section Data Repository (<http://www.sci.sdsu.edu/pacsepm>)

Analysis ID	U	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}^*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
	(ppm)			Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
C. RENE 95-98_23	309	79266	2.6	1842	33	1831	19	1818	18	1818	18
C. RENE 95-98_22	251	56615	0.7	1867	16	1845	12	1819	18	1819	18
C. RENE 95-98_43	126	34590	2.5	1764	21	1791	14	1823	18	1823	18
C. RENE 95-98_47	86	16782	0.8	1761	26	1791	17	1825	18	1825	18
C. RENE 95-98_09	258	50116	1.0	1836	34	1831	20	1825	18	1825	18
C. RENE 95-98_56	146	25531	2.1	1774	23	1800	15	1830	18	1830	18
C. RENE 95-98_26	59	17956	1.1	1808	45	1819	25	1831	18	1831	18
C. RENE 95-98_16	106	21070	1.0	1882	16	1859	12	1833	18	1833	18
C. RENE 95-98_53	162	41311	1.9	1807	20	1822	14	1838	18	1838	18
C. RENE 95-98_52	108	23750	1.5	1889	39	1865	22	1839	18	1839	18
C. RENE 95-98_37	148	31017	0.8	1718	49	1774	28	1841	18	1841	18
C. RENE 95-98_42	95	43706	2.0	1824	23	1835	15	1849	18	1849	18
C. RENE 95-98_17	152	37871	5.7	1918	45	1885	25	1849	18	1849	18
C. RENE 95-98_28	133	30406	1.2	1805	29	1826	18	1849	18	1849	18
C. RENE 95-98_44	60	23401	2.8	1852	28	1860	19	1869	26	1869	26
C. RENE 95-98_36	85	20584	0.7	1898	27	1888	16	1877	18	1877	18
C. RENE 95-98_30	224	12173	1.7	1738	71	1803	40	1878	21	1878	21
C. RENE 95-98_41	98	23282	2.7	1751	110	1810	62	1879	27	1879	27
C. RENE 95-98_10	146	27926	2.1	1946	41	1930	23	1912	18	1912	18
C. RENE 95-98_57	240	51913	1.4	1924	27	1919	17	1914	18	1914	18
C. RENE 95-98_38	193	53214	1.2	1910	23	1913	15	1917	18	1917	18
C. RENE 95-98_46	104	24958	1.1	1840	17	1877	12	1919	18	1919	18
C. RENE 95-98_21	135	27681	1.2	1804	89	1858	49	1920	18	1920	18
C. RENE 95-98_13	405	93238	2.6	1942	18	1933	13	1924	18	1924	18
C. RENE 95-98_32	75	19142	1.2	1818	41	1870	24	1928	20	1928	20
C. RENE 95-98_45	55	9240	0.5	1685	88	1798	52	1932	32	1932	32
C. RENE 95-98_24	120	18729	2.2	1788	34	1868	21	1959	18	1959	18
C. RENE 95-98_07	65	17156	0.6	2014	42	1993	23	1971	18	1971	18
C. RENE 95-98_03	58	14499	0.5	1997	41	2029	24	2062	24	2062	24
C. RENE 95-98_48	172	42157	1.3	2098	18	2089	13	2081	18	2081	18
C. RENE 95-98_50	195	55030	3.0	2129	82	2136	41	2142	17	2142	17
C. RENE 95-98_54	176	31705	2.1	2176	47	2181	25	2186	17	2186	17
C. RENE 95-98_12	161	52765	1.6	2514	68	2558	32	2593	17	2593	17
C. RENE 95-98_51	183	49027	4.2	2644	24	2624	14	2609	17	2609	17
C. RENE 95-98_39	74	26684	1.1	2603	42	2624	21	2640	17	2640	17
C. RENE 95-98_18	218	74872	0.9	2686	25	2676	14	2668	17	2668	17
C. RENE 95-98_02	122	37986	0.8	2683	66	2674	30	2668	17	2668	17
C. RENE 95-98_14	236	67276	1.2	2664	54	2670	25	2675	17	2675	17
C. RENE 95-98_19	59	16277	1.0	2633	45	2663	22	2686	17	2686	17
C. RENE 95-98_06	97	32362	0.7	2736	51	2708	23	2686	17	2686	17
C. RENE 95-98_33	43	35277	0.9	2633	50	2667	24	2692	17	2692	17
C. RENE 95-98_15	54	18919	1.0	2715	53	2711	25	2709	17	2709	17
C. RENE 95-98_29	65	20687	0.8	2712	47	2715	22	2718	16	2718	16
C. RENE 95-98_20	81	27931	1.5	2702	42	2716	20	2726	16	2726	16
C. RENE 95-98_31	101	40161	0.8	2834	119	2772	50	2727	16	2727	16
C. RENE 95-98_49	66	23836	1.3	2603	23	2674	14	2727	16	2727	16
C. RENE 95-98_27	58	31441	1.7	2846	45	2782	21	2735	16	2735	16
C. RENE 95-98_59	196	62306	1.5	2825	54	2776	24	2741	16	2741	16
C. RENE 95-98_04	336	92251	1.0	2750	55	2755	25	2759	16	2759	16

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U (ppm)	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}*/^{238}\text{U}$	$\pm 1\sigma$ (Ma)	$^{207}\text{Pb}*/^{235}\text{U}$	$\pm 1\sigma$ (Ma)	$^{207}\text{Pb}*/^{206}\text{Pb}$	$\pm 1\sigma$ (Ma)	Best	$\pm 1\sigma$ (Ma)
				Age (Ma)		Age (Ma)		Age (Ma)		Age (Ma)	
C. RENE 95-98_55	200	27701	1.5	2568	77	2694	35	2790	16	2790	16
C. RENE 95-98_11	30	11688	2.5	2814	55	2823	27	2830	26	2830	26
C. RENE 95-98_05	92	30544	3.3	2843	59	2852	26	2859	16	2859	16
C. RENE 95-98_08	44	16891	1.0	2940	42	2969	20	2989	16	2989	16
CSC 94-19_13	414	5646	1.5	234	4	239	9	283	84	234	4
CSC 94-19_27	776	6785	1.6	251	6	294	38	647	316	251	6
CSC 94-19_06	131	3430	4.4	252	5	278	21	498	183	252	5
CSC 94-19_19	198	4184	1.8	253	7	265	15	376	129	253	7
CSC 94-19_10	290	4711	1.6	253	4	259	11	315	102	253	4
CSC 94-19_57	570	15400	3.1	259	8	263	8	298	45	259	8
CSC 94-19_16	395	10659	3.7	262	16	264	16	278	64	262	16
CSC 94-19_08	143	3150	3.5	264	6	265	22	272	212	264	6
CSC 94-19_59	185	6188	1.5	265	6	279	11	396	90	265	6
CSC 94-19_32	327	9057	1.6	266	5	271	8	312	60	266	5
CSC 94-19_23	328	9448	3.1	267	7	265	12	248	103	267	7
CSC 94-19_22	215	3878	4.1	269	8	280	8	370	38	269	8
CSC 94-19_29	855	23425	2.0	285	5	286	6	293	38	285	5
CSC 94-19_17	769	18523	2.4	288	3	292	5	319	38	288	3
CSC 94-19_05	1497	29858	3.3	297	9	295	9	285	23	297	9
CSC 94-19_60	360	15257	1.0	369	8	380	11	448	62	369	8
CSC 94-19_04	547	4821	1.1	406	15	433	17	585	67	406	15
CSC 94-19_07	2143	68054	78	444	6	445	6	449	22	444	6
CSC 94-19_40	230	12198	1.8	447	11	451	15	472	73	447	11
CSC 94-19_02	110	4602	1.9	476	7	473	18	458	98	476	7
CSC 94-19_01	129	5974	1.2	480	12	493	23	553	117	480	12
CSC 94-19_31	451	19047	1.8	486	14	493	14	523	39	486	14
CSC 94-19_53	329	16720	2.6	490	16	496	14	524	22	490	16
CSC 94-19_24	437	22928	2.0	572	7	579	7	607	22	572	7
CSC 94-19_35	225	17647	1.7	621	15	612	17	580	61	621	15
CSC 94-19_28	77	4547	0.9	645	6	641	23	627	101	645	6
CSC 94-19_43	693	48540	1.7	914	16	932	13	975	20	914	16
CSC 94-19_03	71	5376	0.7	1026	14	1028	14	1030	32	1030	32
CSC 94-19_56	210	20030	0.7	1016	11	1025	11	1043	26	1043	26
CSC 94-19_49	124	13374	1.3	1042	12	1054	11	1078	20	1078	20
CSC 94-19_21	224	6765	1.0	1125	79	1110	62	1082	100	1082	100
CSC 94-19_39	210	22076	7.5	924	45	981	34	1111	20	1111	20
CSC 94-19_42	69	6615	0.4	1015	22	1050	21	1124	43	1124	43
CSC 94-19_18	437	40350	2.7	1133	13	1135	11	1139	20	1139	20
CSC 94-19_09	1136	79952	1.3	985	20	1038	16	1152	20	1152	20
CSC 94-19_15	203	23422	1.3	1330	37	1321	24	1306	21	1306	21
CSC 94-19_11	386	39144	2.7	1392	45	1395	28	1400	19	1400	19
CSC 94-19_12	686	53260	2.1	1396	23	1399	16	1404	19	1404	19
CSC 94-19_44	450	26698	1.7	1227	26	1294	19	1408	19	1408	19
CSC 94-19_38	177	27022	2.2	1397	28	1407	19	1421	19	1421	19
CSC 94-19_55	203	35569	1.9	1456	24	1443	16	1424	19	1424	19
CSC 94-19_50	181	23309	1.8	1498	34	1471	25	1431	37	1431	37
CSC 94-19_52	86	9718	1.5	1433	18	1434	21	1436	43	1436	43
CSC 94-19_14	394	51876	1.4	1441	33	1439	21	1437	19	1437	19
CSC 94-19_47	260	45179	2.2	1362	31	1393	21	1440	19	1440	19

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}^*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
	(ppm)			Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
CSC 94-19_36	404	65693	2.2	1511	44	1483	27	1443	19	1443	19
CSC 94-19_45	153	28531	1.1	1485	30	1468	20	1443	24	1443	24
CSC 94-19_58	344	67278	1.9	1488	28	1470	18	1445	19	1445	19
CSC 94-19_48	822	36003	2.1	1456	20	1514	14	1596	19	1596	19
CSC 94-19_34	790	33642	2.3	1634	28	1632	18	1629	19	1629	19
CSC 94-19_20	270	40383	1.7	1583	42	1609	25	1644	19	1644	19
CSC 94-19_37	231	42472	1.9	1679	70	1666	40	1650	19	1650	19
CSC 94-19_46	556	94618	5.9	1597	20	1621	14	1652	19	1652	19
CSC 94-19_51	120	21153	1.5	1680	20	1668	14	1653	19	1653	19
CSC 94-19_54	492	92327	5.3	1698	45	1687	26	1673	18	1673	18
CSC 94-19_26	127	17732	0.8	1703	43	1722	26	1746	23	1746	23
CSC 94-19_41	200	55618	2.9	2105	28	2092	16	2080	18	2080	18
CSC 94-19_30	259	69203	1.7	2424	60	2480	29	2526	17	2526	17
CKR 94-8_42	212	7564	1.4	325	8	347	19	499	131	325	8
CKR 94-8_50	193	6123	1.0	410	20	484	75	852	397	410	20
CKR 94-8_64	346	11563	1.6	412	6	425	8	497	43	412	6
CKR 94-8_34	385	25354	5.0	490	5	491	7	492	33	490	5
CKR 94-8_17	380	21344	1.2	516	5	522	6	550	24	516	5
CKR 94-8_18	163	10956	1.7	518	5	531	14	587	70	518	5
CKR 94-8_01	14	2050	389	532	35	523	146	484	788	532	35
CKR 94-8_22	372	23069	4.7	557	5	566	9	602	38	557	5
CKR 94-8_44	44	3467	1.4	557	18	583	49	683	224	557	18
CKR 94-8_28	221	13983	1.5	560	19	558	17	552	36	560	19
CKR 94-8_07	574	29992	2.1	561	15	565	13	583	22	561	15
CKR 94-8_48	140	10099	1.0	575	17	581	19	603	68	575	17
CKR 94-8_19	223	13844	0.9	601	7	604	12	614	52	601	7
CKR 94-8_56	65	5726	2.2	611	15	643	28	760	110	611	15
CKR 94-8_16	97	4722	1.5	616	9	657	19	803	75	616	9
CKR 94-8_62	109	5633	0.9	618	21	655	32	786	117	618	21
CKR 94-8_12	95	6078	0.5	625	7	629	23	646	104	625	7
CKR 94-8_03	511	33854	2.5	648	8	648	8	648	22	648	8
CKR 94-8_58	53	5266	1.8	900	8	917	25	959	81	900	8
CKR 94-8_43	158	18977	1.8	903	11	916	12	946	31	903	11
CKR 94-8_54	152	19045	2.2	919	23	919	22	919	51	919	23
CKR 94-8_05	192	18230	5.8	937	35	961	27	1018	30	937	35
CKR 94-8_29	32	11481	253	953	30	945	48	928	145	953	30
CKR 94-8_24	303	12649	1.9	957	28	973	23	1011	34	957	28
CKR 94-8_20	120	16330	2.1	978	10	976	13	972	36	978	10
CKR 94-8_53	67	9614	1.5	990	18	983	26	967	76	990	18
CKR 94-8_40	16	3874	1.6	1000	17	957	113	860	379	1000	17
CKR 94-8_10	203	26039	0.8	1041	29	1036	22	1024	26	1024	26
CKR 94-8_37	1012	65849	4.3	1019	24	1025	19	1039	25	1039	25
CKR 94-8_51	158	23988	4.2	978	9	997	13	1040	37	1040	37
CKR 94-8_13	1004	21316	8.0	970	18	995	14	1049	20	1049	20
CKR 94-8_02	301	5454	1.5	947	17	980	28	1057	79	1057	79
CKR 94-8_11	53	4682	1.4	1064	83	1069	62	1079	80	1079	80
CKR 94-8_47	200	24663	2.0	1048	18	1059	16	1082	32	1082	32
CKR 94-8_52	283	37924	0.8	1177	11	1169	10	1155	20	1155	20
CKR 94-8_45	76	14785	2.2	1082	11	1107	33	1156	95	1156	95

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}^*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
	(ppm)			Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
CKR 94-8_15	198	23000	2.6	1094	17	1125	14	1185	26	1185	26
CKR 94-8_63	113	13028	2.4	1227	21	1220	21	1209	44	1209	44
CKR 94-8_39	231	38357	0.7	1230	22	1223	16	1212	21	1212	21
CKR 94-8_14	97	15103	1.8	1261	28	1253	21	1241	31	1241	31
CKR 94-8_59	138	17040	2.3	1134	60	1174	46	1249	66	1249	66
CKR 94-8_60	104	21304	1.8	1233	21	1241	17	1256	29	1256	29
CKR 94-8_41	475	55619	11.7	1148	29	1189	23	1264	35	1264	35
CKR 94-8_49	48	7216	0.8	1244	26	1258	34	1283	82	1283	82
CKR 94-8_38	682	14875	5.7	1138	51	1225	37	1383	30	1383	30
CKR 94-8_30	124	23113	2.0	1340	12	1359	11	1387	19	1387	19
CKR 94-8_31	29	4905	1.9	1334	17	1379	52	1450	128	1450	128
CKR 94-8_23	82	15824	1.3	1475	15	1487	16	1504	32	1504	32
CKR 94-8_26	74	20618	0.5	1856	60	1836	34	1813	25	1813	25
CKR 94-8_35	473	48297	2.4	1801	59	1808	33	1816	18	1816	18
CKR 94-8_06	229	59188	1.4	1808	16	1823	12	1840	18	1840	18
CKR 94-8_36	157	14930	1.3	1605	29	1711	22	1843	32	1843	32
CKR 94-8_09	55	12469	1.1	1792	23	1818	16	1848	21	1848	21
CKR 94-8_33	190	51491	1.3	1837	16	1843	12	1850	18	1850	18
CKR 94-8_08	207	32314	2.1	1802	69	1882	38	1971	18	1971	18
CKR 94-8_46	130	49826	1.7	2087	28	2046	17	2006	18	2006	18
CKR 94-8_27	11	5617	0.7	2634	62	2613	45	2597	63	2597	63
CKR 94-8_32	76	40085	1.1	2837	30	2775	16	2729	16	2729	16
CKR 94-8_55	97	41082	2.7	2824	109	2794	46	2773	16	2773	16
CKR 94-8_25	177	32865	1.6	2906	155	3172	65	3345	16	3345	16
CSP 94-1_05	93	16144	1.8	1055	20	1044	21	1022	48	1022	48
CSP 94-1_38	138	24742	1.6	1060	22	1057	17	1051	22	1051	22
CSP 94-1_10	93	23735	1.3	1721	17	1715	14	1707	24	1707	24
CSP 94-1_13	379	86985	2.3	1811	16	1793	12	1772	18	1772	18
CSP 94-1_27	60	11512	0.9	1870	35	1839	24	1804	34	1804	34
CSP 94-1_42	59	19257	1.9	1862	42	1836	25	1807	22	1807	22
CSP 94-1_36	74	21349	0.8	1894	27	1857	17	1815	18	1815	18
CSP 94-1_08	137	17992	1.3	1746	25	1779	16	1819	18	1819	18
CSP 94-1_15	66	32532	1.4	1810	49	1814	28	1819	20	1819	20
CSP 94-1_44	105	30973	0.8	1885	18	1858	13	1828	18	1828	18
CSP 94-1_41	166	38454	1.9	1857	72	1844	39	1828	18	1828	18
CSP 94-1_30	104	20378	0.8	1898	18	1865	13	1828	20	1828	20
CSP 94-1_35	84	13839	3.2	1870	20	1852	14	1832	18	1832	18
CSP 94-1_53	84	30162	1.7	1880	46	1858	26	1833	20	1833	20
CSP 94-1_46	78	24773	1.4	1894	17	1868	12	1838	18	1838	18
CSP 94-1_50	81	23136	1.4	1850	39	1847	22	1843	18	1843	18
CSP 94-1_52	98	26946	1.1	1902	31	1874	18	1843	18	1843	18
CSP 94-1_54	117	34590	0.9	1912	51	1879	28	1843	18	1843	18
CSP 94-1_23	47	11268	0.9	1841	52	1842	30	1843	25	1843	25
CSP 94-1_40	196	56319	1.9	1915	38	1884	22	1850	18	1850	18
CSP 94-1_43	54	15712	0.9	1886	39	1870	24	1851	25	1851	25
CSP 94-1_22	175	64081	1.5	1919	18	1904	13	1887	18	1887	18
CSP 94-1_48	219	61832	1.4	1943	26	1923	16	1902	18	1902	18
CSP 94-1_28	67	27788	0.8	1936	17	1923	12	1910	18	1910	18
CSP 94-1_49	82	33638	1.5	1939	18	1925	15	1911	23	1911	23

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}^*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
	(ppm)			Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
CSP 94-1_09	61	17389	1.2	1945	19	1931	17	1916	30	1916	30
CSP 94-1_45	215	79509	1.2	1976	17	1950	12	1922	18	1922	18
CSP 94-1_01	87	21220	0.6	1992	21	1959	14	1923	20	1923	20
CSP 94-1_04	85	17309	0.5	2002	27	1968	19	1932	27	1932	27
CSP 94-1_17	31	10640	0.6	1983	23	1959	27	1933	50	1933	50
CSP 94-1_14	96	22424	0.6	1964	18	1954	13	1944	18	1944	18
CSP 94-1_24	111	31716	0.5	1990	34	1968	20	1945	18	1945	18
CSP 94-1_19	75	26071	1.4	2000	18	1979	13	1957	18	1957	18
CSP 94-1_31	39	13505	1.1	2120	44	2092	25	2065	26	2065	26
CSP 94-1_07	54	16606	0.8	2104	50	2085	33	2067	44	2067	44
CSP 94-1_32	52	18439	1.3	2142	23	2107	14	2073	18	2073	18
CSP 94-1_12	197	47135	0.7	2098	18	2086	13	2074	18	2074	18
CSP 94-1_34	76	22520	1.2	2015	22	2046	14	2077	18	2077	18
CSP 94-1_20	60	23100	1.3	2105	23	2092	14	2079	18	2079	18
CSP 94-1_47	91	34962	0.9	2145	18	2112	13	2080	18	2080	18
CSP 94-1_11	117	36336	1.2	2096	21	2090	14	2085	18	2085	18
CSP 94-1_03	36	9990	0.6	2069	47	2082	25	2094	20	2094	20
CSP 94-1_25	98	36255	0.7	2699	46	2691	22	2686	17	2686	17
CSP 94-1_33	53	24826	1.0	2698	28	2691	15	2686	17	2686	17
CSP 94-1_06	44	17380	0.7	2760	29	2720	16	2691	18	2691	18
CSP 94-1_21	145	68313	1.7	2748	37	2718	18	2696	17	2696	17
CSP 94-1_37	95	29824	0.5	2779	45	2734	21	2701	17	2701	17
CSP 94-1_29	130	63165	2.3	2934	34	2876	17	2836	16	2836	16
CSP 94-1_02	79	29619	1.3	2918	49	2871	22	2838	16	2838	16
CSC 94-11_08	77	15193	5.1	1738	35	1738	22	1739	24	1739	24
CSC 94-11_46	45	12497	1.9	1891	21	1859	18	1824	30	1824	30
CSC 94-11_49	82	17110	1.4	1838	23	1833	19	1828	31	1828	31
CSC 94-11_13	110	36703	1.8	1843	24	1838	16	1831	20	1831	20
CSC 94-11_42	233	43572	0.9	1774	20	1801	14	1832	18	1832	18
CSC 94-11_10	106	30878	2.1	1802	26	1816	16	1833	18	1833	18
CSC 94-11_38	195	43538	1.2	1897	41	1868	23	1835	18	1835	18
CSC 94-11_04	53	15998	0.6	1830	31	1833	20	1837	24	1837	24
CSC 94-11_21	220	55409	3.8	1833	27	1835	17	1837	18	1837	18
CSC 94-11_25	94	27620	2.1	1832	30	1836	18	1842	18	1842	18
CSC 94-11_29	43	12295	1.7	1818	23	1829	18	1842	29	1842	29
CSC 94-11_15	69	22056	1.9	1822	16	1833	16	1846	28	1846	28
CSC 94-11_05	116	29597	1.6	1904	28	1877	18	1847	22	1847	22
CSC 94-11_33	91	24708	2.1	1888	20	1869	14	1848	18	1848	18
CSC 94-11_09	87	20850	0.5	1895	43	1873	25	1848	20	1848	20
CSC 94-11_48	87	20456	1.0	1842	35	1845	21	1848	19	1848	19
CSC 94-11_19	102	17650	0.5	1863	25	1858	16	1851	18	1851	18
CSC 94-11_16	47	12966	2.2	1858	34	1858	24	1859	35	1859	35
CSC 94-11_40	34	9320	0.8	1894	17	1880	17	1865	30	1865	30
CSC 94-11_41	493	21678	2.3	1829	63	1849	35	1871	18	1871	18
CSC 94-11_07	164	38861	1.4	1868	23	1874	15	1880	18	1880	18
CSC 94-11_06	286	66566	2.0	1846	25	1867	16	1891	18	1891	18
CSC 94-11_20	46	15591	1.6	1917	20	1905	21	1893	38	1893	38
CSC 94-11_01	58	23028	1.1	1934	18	1920	18	1905	33	1905	33
CSC 94-11_23	128	33828	0.7	1934	26	1927	16	1919	18	1919	18

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U (ppm)	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
				Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
CSC 94-11_24	55	13303	0.7	1911	17	1917	12	1924	18	1924	18
CSC 94-11_17	86	24936	1.2	2004	25	1966	16	1926	20	1926	20
CSC 94-11_14	193	59915	1.0	1959	17	1943	12	1927	18	1927	18
CSC 94-11_32	56	15879	0.8	1942	22	1936	18	1929	29	1929	29
CSC 94-11_36	132	34478	0.8	1985	26	1961	16	1936	18	1936	18
CSC 94-11_30	409	12607	0.9	1782	28	1856	18	1941	18	1941	18
CSC 94-11_39	64	33172	1.3	2031	58	1996	32	1961	27	1961	27
CSC 94-11_34	53	15336	0.6	2025	25	2030	16	2036	21	2036	21
CSC 94-11_18	135	31875	0.9	2064	19	2059	13	2055	18	2055	18
CSC 94-11_28	121	28699	0.6	2071	36	2072	20	2073	18	2073	18
CSC 94-11_45	167	60554	1.7	2150	55	2111	28	2074	18	2074	18
CSC 94-11_43	21	6841	0.9	2111	34	2094	26	2077	40	2077	40
CSC 94-11_12	64	16768	1.2	2098	30	2088	18	2079	20	2079	20
CSC 94-11_11	53	13566	0.9	2093	37	2091	20	2089	18	2089	18
CSC 94-11_31	37	10004	0.4	2094	18	2092	13	2090	18	2090	18
CSC 94-11_02	142	42488	1.0	2173	18	2144	13	2116	18	2116	18
CSC 94-11_50	44	13074	1.0	2292	42	2328	22	2360	19	2360	19
CSC 94-11_47	71	21144	0.5	2489	45	2511	22	2529	17	2529	17
CSC 94-11_03	107	40275	1.3	2662	22	2627	13	2600	17	2600	17
CSC 94-11_27	53	20539	0.8	2507	57	2590	27	2656	17	2656	17
CSC 94-11_44	98	39486	3.5	2745	35	2712	18	2687	17	2687	17
CSC 94-11_22	127	52848	0.8	2611	54	2658	25	2694	17	2694	17
CSC 94-11_26	69	9954	1.2	2766	45	2811	27	2843	33	2843	33
CKR 94-9_55	303	2561	1.3	313	18	393	58	894	351	313	18
CKR 94-9_44	346	5488	1.6	352	9	361	12	416	64	352	9
CKR 94-9_48	108	5794	1.8	443	17	444	27	450	141	443	17
CKR 94-9_39	415	11054	1.6	485	22	491	20	520	42	485	22
CKR 94-9_59	162	7254	1.7	487	22	501	24	565	85	487	22
CKR 94-9_10	103	9121	1.0	513	11	530	20	603	96	513	11
CKR 94-9_37	228	14082	0.8	517	16	524	14	551	24	517	16
CKR 94-9_33	471	27394	2.5	536	6	533	9	519	38	536	6
CKR 94-9_11	87	9440	0.6	538	9	559	18	645	82	538	9
CKR 94-9_45	307	12410	8.5	539	85	557	75	630	124	539	85
CKR 94-9_56	542	21227	7.3	541	66	560	55	636	29	541	66
CKR 94-9_22	197	12460	3.4	553	12	565	13	614	38	553	12
CKR 94-9_13	118	7452	102	565	7	558	20	529	97	565	7
CKR 94-9_40	271	19465	2.9	594	6	590	8	572	31	594	6
CKR 94-9_21	580	36818	4.1	596	21	601	17	624	26	596	21
CKR 94-9_23	92	6396	0.7	602	12	602	22	604	93	602	12
CKR 94-9_25	55	5140	1.9	616	14	641	40	728	171	616	14
CKR 94-9_58	325	24327	3.9	627	8	630	8	641	26	627	8
CKR 94-9_02	358	37435	7.3	653	26	664	21	703	21	653	26
CKR 94-9_49	833	7548	12	653	28	679	27	765	64	653	28
CKR 94-9_24	64	6197	0.9	656	11	685	19	784	70	656	11
CKR 94-9_42	142	9185	1.0	664	10	682	17	744	64	664	10
CKR 94-9_52	216	20504	2.5	767	10	767	9	766	24	767	10
CKR 94-9_29	212	23622	2.2	794	10	790	11	778	30	794	10
CKR 94-9_03	29	3886	2.4	801	54	778	53	712	139	801	54
CKR 94-9_43	152	15920	0.8	858	12	890	13	973	33	858	12

TABLE 3: ZIRCON U-Pb ANALYSES (continued)

Analysis ID	U	$^{206}\text{Pb}/^{204}\text{Pb}$	U/Th	$^{206}\text{Pb}^*/^{238}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{235}\text{U}$	$\pm 1\sigma$	$^{207}\text{Pb}^*/^{206}\text{Pb}$	$\pm 1\sigma$	Best	$\pm 1\sigma$
	(ppm)			Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)	Age (Ma)	(Ma)
CKR 94-9_20	894	87722	3.9	931	9	934	9	942	20	931	9
CKR 94-9_17	178	15898	3.2	956	28	968	21	996	21	956	28
CKR 94-9_14	413	29514	2.8	968	34	966	24	963	21	968	34
CKR 94-9_09	245	31647	2.9	1016	9	1015	9	1011	20	1011	20
CKR 94-9_07	202	23040	6.1	1081	50	1061	35	1020	30	1020	30
CKR 94-9_04	154	21064	2.3	1048	28	1040	20	1025	20	1025	20
CKR 94-9_31	109	15230	0.9	1046	15	1043	13	1037	29	1037	29
CKR 94-9_05	364	44722	1.9	1005	42	1016	29	1039	20	1039	20
CKR 94-9_51	207	25443	1.9	1038	21	1040	16	1045	20	1045	20
CKR 94-9_60	108	15937	1.1	1047	50	1048	36	1052	40	1052	40
CKR 94-9_18	112	13124	0.5	1037	16	1045	15	1063	34	1063	34
CKR 94-9_41	228	23725	3.0	1065	10	1067	9	1070	20	1070	20
CKR 94-9_35	97	36396	1.7	1033	13	1046	12	1074	23	1074	23
CKR 94-9_46	953	101822	0.8	1075	26	1081	19	1093	20	1093	20
CKR 94-9_38	204	31892	2.6	1083	10	1094	9	1115	20	1115	20
CKR 94-9_47	107	8371	1.8	974	100	1021	72	1124	41	1124	41
CKR 94-9_26	230	40826	1.6	1153	15	1153	12	1153	20	1153	20
CKR 94-9_19	117	23312	3.0	1208	34	1196	23	1175	26	1175	26
CKR 94-9_01	92	11687	1.5	1146	26	1159	20	1184	28	1184	28
CKR 94-9_34	124	8879	1.5	971	123	1041	94	1192	94	1192	94
CKR 94-9_12	111	23335	1.0	1152	22	1176	19	1220	31	1220	31
CKR 94-9_32	81	17593	1.7	1246	22	1244	23	1242	48	1242	48
CKR 94-9_16	73	10269	1.2	1287	21	1288	18	1291	32	1291	32
CKR 94-9_08	184	11889	0.7	1112	64	1193	46	1342	37	1342	37
CKR 94-9_30	447	37763	5.2	1471	136	1556	83	1672	21	1672	21
CKR 94-9_53	89	18617	1.2	1572	25	1617	17	1676	19	1676	19
CKR 94-9_50	320	69489	2.3	1797	37	1763	21	1724	18	1724	18
CKR 94-9_36	155	17966	1.3	1772	76	1769	42	1766	18	1766	18
CKR 94-9_15	324	17199	1.1	1955	19	2006	13	2059	18	2059	18
CKR 94-9_06	125	22931	0.9	2030	89	2064	46	2099	18	2099	18
CKR 94-9_57	105	20313	1.6	2241	40	2195	21	2153	18	2153	18
CKR 94-9_27	119	39114	1.6	2242	19	2225	13	2209	17	2209	17
CKR 94-9_54	210	84504	1.9	2529	39	2579	20	2619	17	2619	17
CKR 94-9_28	330	104420	2.3	2672	29	2675	16	2677	17	2677	17