GSA Data Repository Item 2015111

Contents of Supplementary Files

1. Analytical methods of LA-ICP-MS U/Pb zircon geochronology

2. U/Pb zircon age data tables of samples and associated age plots

3. Information on strain dataset

1. Analytical Methods of LA-ICP-MS U/Pb zircon geochronology

Zircon crystals are extracted from samples by traditional methods of crushing and grinding, followed by separation with a Wilfley table, heavy liquids, and a Frantz magnetic separator. Samples are processed such that all zircons are retained in the final heavy mineral fraction. A split of these grains (generally 50-100 grains) are selected from the grains available and incorporated into a 1" epoxy mount together with fragments of our Sri Lanka standard zircon. The mounts are sanded down to a depth of ~20 microns, polished, imaged, and cleaned prior to isotopic analysis.

U-Pb geochronology of zircons was conducted by laser ablation multicollector inductively coupled plasma mass spectrometry (LA-MC-ICPMS) at the Arizona LaserChron Center (Gehrels et al., 2008). The analyses involve ablation of zircon with a Photon Machines Analyte G2 Excimer laser (or, prior to May 2011, a New Wave UP193HE Excimer laser) using a spot diameter of 30 microns. The ablated material is carried in helium into the plasma source of a Nu HR ICPMS, which is equipped with a flight tube of sufficient width that U, Th, and Pb isotopes are measured simultaneously. All measurements are made in static mode, using Faraday detectors with $3x10^{11}$ ohm resistors for ^{238}U, ^{232}Th, ^{208}Pb-^{206}Pb, and discrete dynode ion counters for ^{204}Pb and ^{202}Hg. Ion yields are ~0.8 mv per ppm. Each analysis consists of one 15-second integration on peaks with the laser off (for backgrounds), 15 one-second integrations with the laser firing, and a 30 second delay to purge the previous sample and prepare for the next analysis. For each analysis, the errors in determining $^{206}Pb/^{238}U$ and $^{206}Pb/^{204}Pb$ result in a measurement error of ~1-2% (at 2-sigma level) in the $^{206}Pb/^{238}U$ age.

For igneous zircon ages, the weighted mean diagrams produced by Isoplot (Ludwig, 2008) show the weighted mean (weighting according to the square of the internal uncertainties), the uncertainty of the weighted mean, and the MSWD of the data set.

For detrital zircon ages, the age-probability diagrams produced Isoplot (Ludwig, 2008) by show each age and its uncertainty (for measurement error only) as a normal distribution, and sum all ages from a sample into a single curve. Composite age probability plots are made from an in-house Excel program (see Analysis Tools for link) that normalizes each curve according to the number of constituent analyses, such that each curve contains the same area, and then stacks the probability curves.

The interpreted ages of sedimentary rocks are gained by calculating the weighted mean of the youngest zircon ages using Isoplot (Ludwig, 2008). Weighted mean (weighting according to the square of the internal uncertainties), the uncertainty of the weighted mean, and the MSWD of the data set are presented.

References

Gehrels, G.E., Valencia, V., Ruiz, J., 2008, Enhanced precision, accuracy, efficiency, and spatial resolution of U-Pb ages by laser ablation–multicollector–inductively coupled plasma–mass spectrometry: Geochemistry, Geophysics, Geosystems, v. 9, Q03017, doi:10.1029/2007GC001805.

Ludwig, K.R., 2008, Isoplot 3.60. Berkeley Geochronology Center, Special Publication No. 4, 77 p.

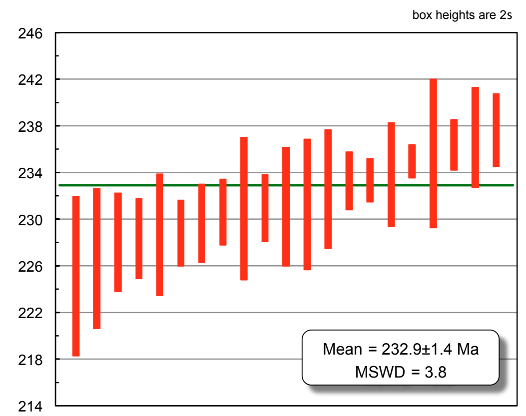
2. U/Pb zircon age data table of individual samples

Sample KS-08-019 (Granodioite)

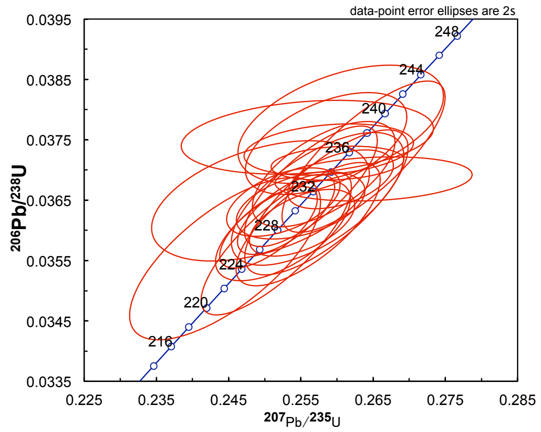
Igneous age sample

						Isotope ratios							Apparent ages (Ma)					
Analysis	U	206Pb	U/Th	206Pb*	±	207Pb*	±	206Pb*	±	error	206Pb*	±	207Pb*	±	206Pb*	±	Best age	±
	(ppm)	204Pb		207Pb*	(%)	235U*	(%)	238U	(%)	corr.	238U*	(Ma)	235U	(Ma)	207Pb*	(Ma)	(Ma)	(Ma)
KS0819-1	424	11568	1.6	19.9694	3.0	0.2585	3.5	0.0374	1.8	0.52	236.9	4.3	233.5	7.4	198.5	70.1	236.9	4.3
KS0819-2	306	8625	1.5	19.8874	3.6	0.2589	3.7	0.0373	0.9	0.25	236.3	2.2	233.8	7.7	208.1	83.1	236.3	2.2
KS0819-3	572	11472	1.6	19.5205	2.0	0.2552	2.3	0.0361	1.3	0.54	228.8	2.8	230.8	4.8	251.1	45.3	228.8	2.8
KS0819-5	376	11004	1.2	19.9074	2.2	0.2526	2.5	0.0365	1.3	0.50	230.9	2.9	228.7	5.2	205.7	51.0	230.9	2.9
KS0819-7	473	13326	2.0	19.1682	4.1	0.2651	4.2	0.0369	0.8	0.19	233.3	1.9	238.8	8.9	292.8	94.3	233.3	1.9
KS0819-8	269	9102	1.6	19.9822	3.9	0.2605	4.5	0.0378	2.1	0.48	238.9	5.0	235.1	9.4	197.0	91.3	238.9	5.0
KS0819-9	437	12735	1.5	19.4459	2.3	0.2585	3.6	0.0365	2.7	0.75	230.9	6.1	233.5	7.4	259.9	54.0	230.9	6.1
KS0819-10	551	16488	1.6	19.7655	1.6	0.2530	2.2	0.0363	1.5	0.69	229.6	3.4	229.0	4.5	222.3	36.6	229.6	3.4
KS0819-11	409	11979	1.3	20.0353	3.2	0.2445	4.4	0.0355	3.1	0.70	225.1	6.8	222.1	8.8	190.9	73.4	225.1	6.8
KS0819-12	199	6258	1.3	20.1706	4.4	0.2494	4.9	0.0365	2.2	0.45	231.0	5.1	226.1	10.0	175.2	102.9	231.0	5.1
KS0819-13	378	10770	1.6	19.6755	2.8	0.2601	2.9	0.0371	0.6	0.21	234.9	1.4	234.7	6.1	232.9	65.2	234.9	1.4
KS0819-15	388	11877	1.8	19.5694	2.9	0.2573	3.8	0.0365	2.5	0.65	231.2	5.6	232.5	7.9	245.3	66.4	231.2	5.6
KS0819-16	479	13947	1.8	19.7517	1.9	0.2564	2.9	0.0367	2.2	0.76	232.5	5.1	231.8	6.1	223.9	44.2	232.5	5.1
KS0819-17	446	14295	1.9	19.7240	2.5	0.2582	3.1	0.0369	1.9	0.62	233.8	4.4	233.2	6.5	227.2	56.8	233.8	4.4
KS0819-18	754	20031	1.4	19.6559	2.4	0.2525	3.0	0.0360	1.9	0.63	228.0	4.2	228.6	6.2	235.2	54.4	228.0	4.2
KS0819-19	351	9291	1.5	19.4444	2.2	0.2560	3.2	0.0361	2.3	0.72	228.6	5.2	231.4	6.6	260.1	50.4	228.6	5.2
KS0819-20	746	21171	1.2	19.8405	1.6	0.2505	2.2	0.0361	1.5	0.69	228.3	3.4	227.0	4.5	213.6	36.8	228.3	3.4
KS0819-21	286	8415	1.5	19.6062	2.0	0.2516	3.4	0.0358	2.7	0.80	226.6	6.0	227.9	6.9	241.0	47.2	226.6	6.0
KS0819-22	330	9330	1.2	19.5021	2.0	0.2605	2.3	0.0368	1.1	0.47	233.3	2.5	235.1	4.8	253.3	46.6	233.3	2.5
KS0819-23	302	8241	0.9	19.4625	2.2	0.2637	3.5	0.0372	2.8	0.79	235.6	6.4	237.6	7.4	257.9	49.7	235.6	6.4
KS0819-24	603	15228	1.3	19.6910	2.6	0.2550	2.9	0.0364	1.3	0.44	230.6	2.8	230.6	5.9	231.0	59.2	230.6	2.8
KS0819-26	236	7113	1.3	20.2273	5.4	0.2559	5.6	0.0375	1.3	0.24	237.6	3.1	231.4	11.5	168.6	126.6	237.6	3.1

* Radiogenic
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).
Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).



Weighted mean age

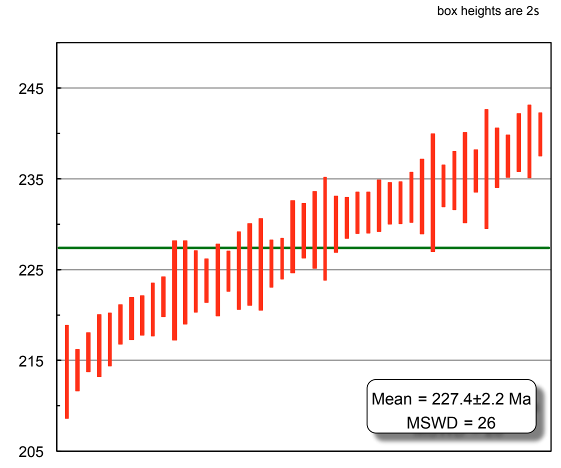


Wetherill concordia diagram

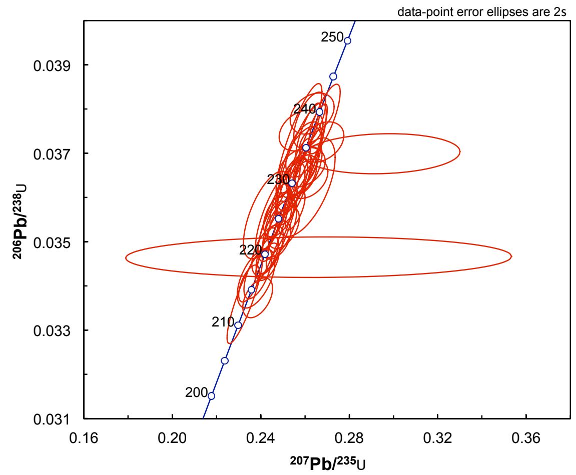
Sample H-07 (Rhyodacite) *Igneous age sample*

						Isotope ratios							Apparent ages (Ma)					
Analysis	U (ppm)	206Pb/204Pb	U/Th	206Pb*/207Pb*	± (%)	207Pb*/235U*	± (%)	206Pb*/238U	± (%)	error corr.	206Pb*/238U*	± (Ma)	207Pb*/235U	± (Ma)	206Pb*/207Pb*	± (Ma)	Best age (Ma)	± (Ma)
H078875-1	803	45015	2.9	19.6664	2.4	0.2580	3.0	0.0368	1.8	0.60	233.0	4.1	233.1	6.2	233.9	55.4	233.0	4.1
H078875-2	638	26345	2.7	19.3180	1.5	0.2615	1.9	0.0366	1.2	0.64	232.0	2.8	235.9	4.1	275.0	34.2	232.0	2.8
H078875-4	973	51380	3.1	19.9826	1.7	0.2573	3.3	0.0373	2.8	0.86	236.0	6.5	232.5	6.8	197.0	39.3	236.0	6.5
H078875-5	571	30765	2.6	20.0298	3.0	0.2582	3.1	0.0375	1.0	0.32	237.4	2.3	233.2	6.5	191.5	69.1	237.4	2.3
H078875-6	670	33475	2.9	19.8248	1.4	0.2510	2.2	0.0361	1.8	0.79	228.6	4.0	227.4	4.6	215.4	31.6	228.6	4.0
H078875-7	403	14605	3.4	19.2168	2.6	0.2613	2.8	0.0364	1.0	0.36	230.6	2.3	235.8	5.9	287.0	60.1	230.6	2.3
H078875-8	1183	34280	2.1	19.5955	1.5	0.2431	1.8	0.0345	1.0	0.56	218.9	2.2	220.9	3.5	242.3	33.7	218.9	2.2
H078875-9	685	23405	2.4	19.7268	1.0	0.2456	2.7	0.0351	2.5	0.92	222.7	5.5	223.0	5.4	226.8	23.9	222.7	5.5
H078875-11	692	26775	2.2	19.1954	3.4	0.2603	4.2	0.0362	2.5	0.60	229.5	5.7	234.9	8.8	289.6	76.7	229.5	5.7
H078875-13	481	30575	2.5	19.2004	2.9	0.2675	3.1	0.0373	1.0	0.33	235.8	2.3	240.7	6.6	289.0	66.2	235.8	2.3
H078875-14	762	41010	2.6	19.9659	1.4	0.2328	2.8	0.0337	2.4	0.87	213.7	5.1	212.5	5.4	198.9	32.3	213.7	5.1
H078875-15	385	18660	2.5	19.8492	2.9	0.2633	3.1	0.0379	1.0	0.32	239.8	2.4	237.3	6.5	212.5	67.5	239.8	2.4
H078875-16	1049	44220	1.8	19.8042	1.7	0.2387	2.1	0.0343	1.4	0.63	217.3	2.9	217.3	4.2	217.8	38.5	217.3	2.9
H078875-17	648	38595	3.5	19.8051	2.4	0.2379	2.9	0.0342	1.6	0.55	216.6	3.4	216.7	5.7	217.7	56.5	216.6	3.4
H078875-18	896	42990	2.2	20.2218	2.7	0.2428	3.6	0.0356	2.3	0.64	225.5	5.0	220.7	7.1	169.3	64.0	225.5	5.0
H078875-19	868	42645	2.9	19.9316	1.2	0.2455	2.3	0.0355	1.9	0.84	224.9	4.2	223.0	4.6	202.9	28.8	224.9	4.2
H078875-20	716	21780	2.7	17.9484	26.8	0.2662	26.8	0.0347	1.1	0.04	219.6	2.3	239.6	57.2	441.0	604.9	219.6	2.3
H078875-21	1173	27690	1.7	19.8613	1.8	0.2621	2.2	0.0378	1.4	0.60	238.9	3.2	236.4	4.7	211.1	41.6	238.9	3.2
H078875-22	1093	24500	2.8	20.0069	1.3	0.2347	1.6	0.0341	1.0	0.61	215.9	2.1	214.1	3.1	194.2	29.9	215.9	2.1
H078875-23	805	43410	1.9	19.4023	1.4	0.2608	1.7	0.0367	1.0	0.59	232.3	2.3	235.3	3.5	265.0	31.0	232.3	2.3
H078875-24	724	21775	2.7	19.7660	1.8	0.2464	2.6	0.0353	1.8	0.70	223.8	3.9	223.7	5.1	222.3	42.4	223.8	3.9
H078875-25	955	36010	2.5	19.6782	1.0	0.2578	1.6	0.0368	1.2	0.77	232.9	2.7	232.9	3.3	232.5	23.1	232.9	2.7
H078875-26	834	118560	2.7	19.4915	2.0	0.2386	2.3	0.0337	1.1	0.47	213.9	2.3	217.3	4.5	254.5	46.7	213.9	2.3
H078875-27	526	43555	2.3	17.3044	9.8	0.2947	9.8	0.0370	1.0	0.10	234.2	2.3	262.3	22.7	521.7	214.4	234.2	2.3
H078875-28	722	38145	2.4	19.5263	1.2	0.2622	2.4	0.0371	2.2	0.88	235.1	5.0	236.5	5.2	250.4	27.0	235.1	5.0
H078875-29	1144	51195	1.7	19.5159	1.4	0.2580	1.7	0.0365	1.0	0.59	231.2	2.3	233.1	3.5	251.6	31.1	231.2	2.3
H078875-30	395	22065	3.4	19.4827	2.0	0.2584	2.2	0.0365	1.0	0.46	231.2	2.3	233.4	4.6	255.5	44.8	231.2	2.3
H078875-31	666	44075	3.6	19.5824	2.0	0.2486	2.5	0.0353	1.5	0.60	223.7	3.4	225.4	5.1	243.8	46.6	223.7	3.4
H078875-32	721	32205	2.4	19.5467	3.1	0.2588	3.3	0.0367	1.0	0.30	232.2	2.3	233.7	6.9	248.0	72.0	232.2	2.3
H078875-34	821	31350	2.2	19.6980	1.4	0.2429	1.7	0.0347	1.0	0.60	219.9	2.2	220.8	3.3	230.2	31.2	219.9	2.2
H078875-35	841	39040	2.7	19.5436	1.9	0.2472	2.1	0.0350	1.0	0.47	222.0	2.2	224.3	4.3	248.4	42.8	222.0	2.2
H078875-36	595	23555	3.1	19.5983	1.7	0.2548	2.5	0.0362	1.9	0.74	229.3	4.2	230.4	5.2	241.9	39.6	229.3	4.2
H078875-37	1578	39830	1.5	19.3831	1.4	0.2687	2.2	0.0378	1.7	0.78	239.0	4.0	241.7	4.7	267.3	31.7	239.0	4.0
H078875-38	757	29945	2.6	19.6859	1.8	0.2543	2.2	0.0363	1.4	0.62	229.9	3.1	230.1	4.6	231.6	40.4	229.9	3.1
H078875-39	1463	57455	1.5	19.7732	1.0	0.2614	1.7	0.0375	1.4	0.82	237.2	3.3	235.8	3.6	221.4	23.2	237.2	3.3
H078875-40	639	23940	2.7	19.7430	2.0	0.2431	2.4	0.0348	1.3	0.56	220.6	2.9	220.9	4.7	225.0	45.7	220.6	2.9
H078875-41	574	30805	2.8	19.7821	2.0	0.2483	2.3	0.0356	1.2	0.51	225.6	2.6	225.2	4.6	220.4	45.8	225.6	2.6
H078875-42	930	33085	2.3	19.8483	1.1	0.2465	1.5	0.0355	1.0	0.66	224.8	2.2	223.7	3.0	212.6	26.3	224.8	2.2
H078875-43	731	27490	3.3	20.0087	1.6	0.2453	2.6	0.0356	2.0	0.79	225.5	4.5	222.8	5.1	194.0	36.4	225.5	4.5
H078875-44	642	24370	2.6	19.7129	2.1	0.2594	2.5	0.0371	1.4	0.54	234.7	3.2	234.2	5.3	228.5	49.3	234.7	3.2
H078875-45	1420	53685	1.8	19.4943	1.0	0.2496	2.3	0.0353	2.1	0.90	223.5	4.6	226.2	4.7	254.2	23.0	223.5	4.6
H078875-46	744	24500	2.1	19.4572	2.1	0.2503	2.3	0.0353	1.1	0.47	223.8	2.4	226.8	4.7	258.6	47.3	223.8	2.4
H078875-47	860	38145	2.0	19.7024	1.7	0.2533	2.2	0.0362	1.3	0.62	229.2	3.0	229.3	4.4	229.7	39.1	229.2	3.0
H078875-48	794	37625	2.4	19.6678	2.1	0.2585	3.5	0.0369	2.8	0.80	233.4	6.5	233.4	7.3	233.8	48.7	233.4	6.5
H078875-49	662	26210	2.4	19.2631	1.0	0.2556	1.4	0.0357	1.0	0.70	226.1	2.2	231.1	3.0	281.5	23.4	226.1	2.2

* Radiogenic
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).
Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).



Weighted mean age



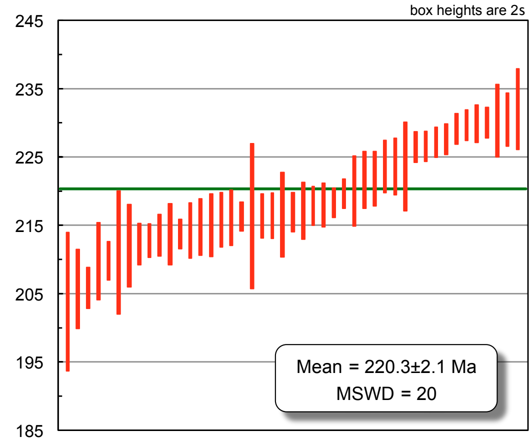
Wetherill concordia diagram

Sample S-20 (Dacite-andesite)

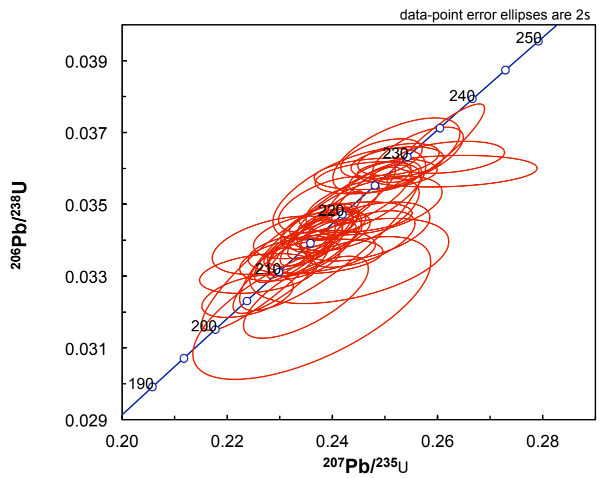
Igneous age sample

Analysis	U (ppm)	206Pb/204Pb	U/Th	206Pb*/207Pb*	± (%)	Isotope ratios: 207Pb*/235U*	± (%)	206Pb*/238U	± (%)	error corr.	Apparent ages (Ma): 206Pb*/238U*	± (Ma)	207Pb*/235U	± (Ma)	206Pb*/207Pb*	± (Ma)	Best age (Ma)	± (Ma)
S208874-1	1295	24850	1.7	19.8976	1.1	0.2367	3.1	0.0342	2.9	0.93	216.5	6.2	215.7	6.1	206.9	26.5	216.5	6.2
S208874-2	1305	21825	2.0	19.9466	2.1	0.2376	2.6	0.0344	1.5	0.59	217.9	3.2	216.5	5.0	201.2	48.1	217.9	3.2
S208874-3	1114	21640	2.0	19.9959	3.2	0.2353	3.6	0.0341	1.5	0.43	216.3	3.3	214.6	6.9	195.4	75.3	216.3	3.3
S208874-4	1053	20130	2.0	19.8301	1.4	0.2370	2.4	0.0341	1.9	0.80	216.0	4.1	215.9	4.6	214.8	33.1	216.0	4.1
S208874-5	1521	32325	1.4	19.8901	1.8	0.2336	2.1	0.0337	1.0	0.50	213.6	2.2	213.2	4.0	207.8	42.0	213.6	2.2
S208874-6	488	23870	4.2	20.0019	3.9	0.2432	4.9	0.0353	3.0	0.60	223.5	6.5	221.1	9.7	194.7	90.5	223.5	6.5
S208874-8	485	24740	4.6	19.8458	1.6	0.2387	2.1	0.0344	1.3	0.64	217.8	2.9	217.4	4.1	212.9	37.0	217.8	2.9
S208874-9	573	22870	3.7	19.1714	3.6	0.2463	4.1	0.0342	2.0	0.48	217.0	4.2	223.5	8.2	292.5	81.5	217.0	4.2
S208874-10	367	20855	4.4	19.9795	3.1	0.2466	3.3	0.0357	1.0	0.31	226.4	2.3	223.8	6.6	197.4	72.5	226.4	2.3
S208874-11	2362	74450	3.1	18.9474	5.7	0.2432	6.4	0.0334	2.9	0.46	211.9	6.0	221.0	12.6	319.2	128.7	211.9	6.0
S208874-12	811	31025	4.7	19.6970	2.3	0.2395	2.6	0.0342	1.4	0.51	216.8	2.9	218.0	5.2	230.3	52.2	216.8	2.9
S208874-13	664	23320	2.7	19.7709	1.0	0.2379	1.4	0.0341	1.0	0.71	216.2	2.1	216.7	2.8	221.7	23.2	216.2	2.1
S208874-14	1273	45410	1.9	19.8900	3.1	0.2320	3.4	0.0335	1.5	0.43	212.2	3.0	211.8	6.5	207.8	70.8	212.2	3.0
S208874-15	701	25785	2.2	20.1887	3.8	0.2259	4.0	0.0331	1.4	0.34	209.8	2.8	206.8	7.5	173.1	88.5	209.8	2.8
S208874-16	1141	33705	3.2	19.4485	3.8	0.2479	4.3	0.0350	1.9	0.45	221.6	4.2	224.9	8.6	259.6	87.6	221.6	4.2
S208874-17	606	22965	4.3	19.5466	3.1	0.2448	3.9	0.0347	2.4	0.61	219.9	5.1	222.4	7.8	248.0	71.2	219.9	5.1
S208874-18	793	24150	4.2	19.1239	2.9	0.2454	3.4	0.0340	1.9	0.55	215.7	4.0	222.8	6.9	298.1	65.5	215.7	4.0
S208874-19	1471	31360	2.1	19.0202	3.0	0.2350	4.1	0.0324	2.9	0.70	205.6	5.8	214.3	8.0	310.5	67.4	205.6	5.8
S208874-20	1380	47930	2.7	19.7920	1.5	0.2377	2.2	0.0341	1.6	0.73	216.3	3.3	216.6	4.2	219.2	34.3	216.3	3.3
S208874-21	515	28625	4.8	19.8568	2.3	0.2391	2.5	0.0344	1.0	0.40	218.2	2.1	217.7	4.8	211.7	52.5	218.2	2.1
S208874-22	741	36995	4.6	19.7613	2.2	0.2366	3.1	0.0339	2.2	0.71	215.0	4.6	215.6	6.0	222.8	50.7	215.0	4.6
S208874-23	993	53755	3.2	19.0947	3.1	0.2622	3.3	0.0363	1.0	0.30	229.9	2.3	236.4	6.9	301.6	71.4	229.9	2.3
S208874-24	424	13690	3.3	18.7540	6.0	0.2361	7.8	0.0321	5.1	0.65	203.7	10.1	215.2	15.2	342.5	135.4	203.7	10.1
S208874-26	994	29730	2.8	19.6652	3.9	0.2361	4.2	0.0337	1.5	0.35	213.5	3.0	215.2	8.1	234.1	90.7	213.5	3.0
S208874-27	809	21990	4.3	19.4130	3.7	0.2383	3.9	0.0335	1.2	0.30	212.7	2.4	217.0	7.6	263.8	85.0	212.7	2.4
S208874-28	855	34785	3.6	19.9800	2.8	0.2239	3.2	0.0324	1.5	0.47	205.8	3.0	205.1	5.9	197.3	65.1	205.8	3.0
S208874-29	842	18390	2.7	19.6312	3.2	0.2396	5.9	0.0341	5.0	0.84	216.3	10.6	218.1	11.6	238.1	72.7	216.3	10.6
S208874-30	685	29555	3.1	20.1602	2.7	0.2393	3.3	0.0350	1.8	0.56	221.7	4.0	217.9	6.4	176.4	63.5	221.7	4.0
S208874-31	1714	36170	1.4	19.6933	1.9	0.2470	2.6	0.0353	1.9	0.71	223.5	4.1	224.2	5.3	230.8	43.0	223.5	4.1
S208874-32	1817	51655	2.2	19.7203	2.2	0.2362	2.9	0.0338	1.9	0.66	214.2	4.0	215.3	5.6	227.6	50.2	214.2	4.0
S208874-33	1003	30830	3.8	20.3386	4.0	0.2296	4.4	0.0339	2.0	0.44	214.7	4.1	209.8	8.4	155.8	92.8	214.7	4.1
S208874-34	1204	41055	2.5	19.9505	1.7	0.2329	2.7	0.0337	2.1	0.78	213.6	4.5	212.6	5.2	200.7	39.0	213.6	4.5
S208874-35	1032	30705	3.2	20.0352	2.2	0.2289	4.9	0.0333	4.4	0.89	210.9	9.0	209.3	9.3	190.9	52.1	210.9	9.0
S208874-36	695	45795	3.6	19.7803	1.0	0.2459	2.0	0.0353	1.8	0.87	223.5	3.8	223.3	4.0	220.6	23.2	223.5	3.8
S208874-37	1840	81825	2.1	18.9169	5.3	0.2618	5.3	0.0359	1.0	0.19	227.5	2.2	236.1	11.3	322.9	119.3	227.5	2.2
S208874-38	495	26845	4.0	19.7903	2.3	0.2526	2.5	0.0363	1.0	0.40	229.5	2.3	228.7	5.1	219.4	53.0	229.5	2.3
S208874-39	476	31975	4.7	19.9126	3.7	0.2482	3.9	0.0358	1.0	0.26	227.1	2.2	225.1	7.8	205.1	86.4	227.1	2.2
S208874-40	603	36865	5.3	20.0646	2.2	0.2493	2.5	0.0363	1.2	0.48	229.7	2.8	226.0	5.2	187.5	52.0	229.7	2.8
S208874-42	367	8910	2.3	19.8789	3.1	0.2522	3.9	0.0364	2.4	0.60	230.2	5.3	228.3	8.0	209.1	72.6	230.2	5.3
S208874-43	2619	46700	1.7	19.7844	1.9	0.2304	3.3	0.0331	2.7	0.82	209.7	5.6	210.6	6.3	220.1	43.5	209.7	5.6
S208874-44	1206	28510	2.1	19.5735	2.1	0.2563	2.8	0.0364	1.7	0.63	230.4	3.9	231.7	5.7	244.9	49.3	230.4	3.9
S208874-45	1290	33225	1.8	19.4511	1.3	0.2597	2.9	0.0366	2.6	0.89	231.9	5.9	234.4	6.1	259.3	30.6	231.9	5.9
S208874-46	967	30225	3.2	19.7945	1.7	0.2491	1.9	0.0358	1.0	0.52	226.5	2.2	225.8	3.9	218.9	38.2	226.5	2.2
S208874-47	609	16765	3.6	19.5410	3.4	0.2444	3.6	0.0346	1.0	0.28	219.5	2.2	222.0	7.2	248.7	79.3	219.5	2.2
S208874-49	373	28000	3.7	19.7594	2.7	0.2523	2.8	0.0362	1.0	0.35	229.0	2.2	228.5	5.8	223.0	61.6	229.0	2.2

* Radiogenic
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).
Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).



Weighted mean age



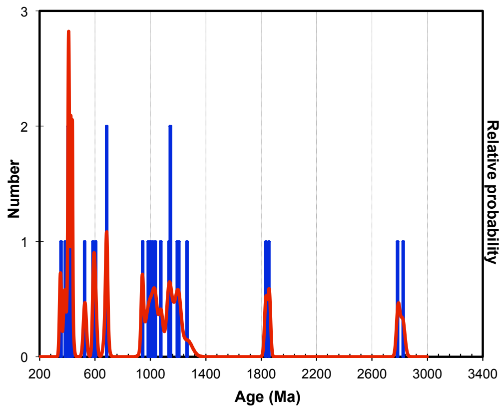
Wetherill concordia diagram

Sample S08-15b (Metasedimentary rock)

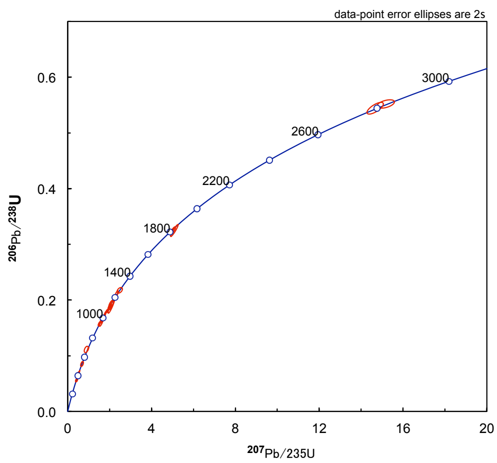
Detrital age sample

							Isotope ratios						Apparent ages (Ma)					
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)
S0815B-1	86	6942	0.7	13.7016	2.4	1.6635	4.0	0.1653	3.3	0.81	986.2	29.9	994.7	25.6	1013.5	47.9	1013.5	47.9
S0815B-2	403	11186	1.4	17.8411	1.9	0.5007	3.9	0.0648	3.4	0.87	404.7	13.3	412.2	13.2	454.3	42.7	404.7	13.3
S0815B-4	671	24082	1.4	17.6024	1.4	0.5428	5.1	0.0693	4.9	0.96	431.9	20.3	440.3	18.1	484.2	31.9	431.9	20.3
S0815B-5	112	5868	0.9	16.6376	3.1	0.7941	4.3	0.0958	3.0	0.69	589.9	16.7	593.5	19.3	607.3	67.2	589.9	16.7
S0815B-6	100	3544	0.7	16.7252	8.0	0.8078	8.7	0.0980	3.6	0.41	602.6	20.5	601.2	39.7	596.0	173.1	602.6	20.5
S0815B-7	218	6372	1.1	18.2916	3.9	0.5274	4.2	0.0700	1.5	0.37	436.0	6.4	430.1	14.6	398.7	86.7	436.0	6.4
S0815B-8	167	8718	3.3	15.8943	1.4	0.9715	2.6	0.1120	2.2	0.85	684.3	14.4	689.2	13.1	705.4	29.3	684.3	14.4
S0815B-9	173	5604	0.8	18.8115	5.9	0.4856	6.2	0.0663	1.8	0.29	413.5	7.2	401.9	20.6	335.6	134.6	413.5	7.2
S0815B-10	119	20352	0.7	8.7993	1.0	5.0890	2.9	0.3248	2.7	0.93	1813.0	43.0	1834.3	24.7	1858.5	18.7	1858.5	18.7
S0815B-11	115	9712	1.8	12.8988	1.6	2.0236	2.7	0.1893	2.1	0.80	1117.6	21.9	1123.5	18.1	1134.7	31.9	1134.7	31.9
S0815B-12	108	5914	1.6	17.1700	6.8	0.6841	8.1	0.0852	4.3	0.54	527.0	22.0	529.2	33.5	538.8	150.0	527.0	22.0
S0815B-13	82	6854	3.2	13.8244	3.2	1.6033	5.1	0.1608	4.1	0.79	961.0	36.2	971.5	32.2	995.4	64.4	995.4	64.4
S0815B-14	237	18774	1.4	13.5470	1.6	1.7280	5.1	0.1698	4.9	0.95	1010.9	45.4	1019.0	32.8	1036.4	32.0	1036.4	32.0
S0815B-15	178	16232	1.0	12.5280	2.5	2.0850	6.2	0.1894	5.7	0.92	1118.4	58.5	1143.9	42.6	1192.6	48.6	1192.6	48.6
S0815B-16	112	11480	2.5	12.8246	3.2	2.0675	4.5	0.1923	3.1	0.69	1133.8	31.9	1138.1	30.5	1146.2	64.0	1146.2	64.0
S0815B-17	168	3788	2.8	18.2567	8.3	0.4224	9.2	0.0559	4.2	0.45	350.8	14.2	357.8	27.9	403.0	185.1	350.8	14.2
S0815B-18	559	7674	1.2	17.9596	3.1	0.4671	5.8	0.0608	4.8	0.84	380.7	17.8	389.2	18.6	439.6	69.9	380.7	17.8
S0815B-19	248	7414	2.1	18.5728	3.2	0.4853	3.6	0.0654	1.7	0.47	408.2	6.8	401.7	12.1	364.4	72.2	408.2	6.8
S0815B-20	65	3180	1.0	17.2558	8.1	0.8897	9.1	0.1113	4.2	0.46	680.5	27.0	646.2	43.7	527.9	178.6	680.5	27.0
S0815B-21	222	14856	2.6	13.2846	1.4	1.8676	2.0	0.1799	1.3	0.68	1066.7	13.2	1069.7	13.0	1075.8	28.8	1075.8	28.8
S0815B-22	198	28412	1.4	8.9160	1.1	5.0289	1.9	0.3252	1.6	0.81	1815.0	25.0	1824.2	16.5	1834.7	20.5	1834.7	20.5
S0815B-23	81	5348	1.1	13.9272	2.6	1.6782	3.0	0.1695	1.5	0.51	1009.4	14.4	1000.3	19.4	980.3	53.6	980.3	53.6
S0815B-24	160	34830	0.9	5.1151	1.5	14.6714	2.2	0.5443	1.6	0.73	2801.4	35.9	2794.2	20.7	2789.0	24.6	2789.0	24.6
S0815B-25	72	7612	0.5	5.0150	2.0	15.1733	2.3	0.5519	1.1	0.49	2833.0	25.4	2826.2	21.5	2821.3	32.0	2821.3	32.0
S0815B-26	271	6932	6.2	18.3322	3.4	0.5131	3.8	0.0682	1.5	0.40	425.4	6.2	420.5	12.9	393.8	77.2	425.4	6.2
S0815B-27	150	8202	2.7	12.8039	3.0	2.0106	3.6	0.1867	1.9	0.54	1103.5	19.6	1119.1	24.4	1149.4	60.2	1149.4	60.2
S0815B-28	110	5374	1.9	14.3911	1.9	1.5069	2.7	0.1573	2.0	0.71	941.7	17.1	933.2	16.7	913.2	39.6	941.7	17.1
S0815B-29	186	11122	1.5	12.4488	1.9	2.3440	2.7	0.2116	1.9	0.72	1237.5	21.6	1225.7	19.0	1205.1	36.6	1205.1	36.6
S0815B-30	82	6312	1.3	12.0708	3.7	2.4838	4.2	0.2174	1.9	0.45	1268.4	21.6	1267.3	30.1	1265.5	72.6	1265.5	72.6

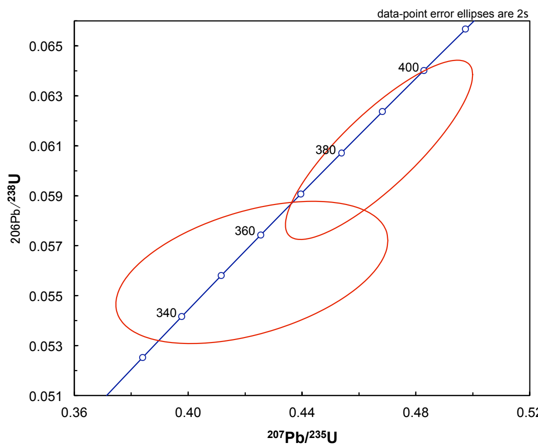
* Radiogenic
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).
Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).



Probability density diagram



Wetherill concordia diagram



Wetherill concordia diagram for two youngest detrial zircon ages: 350.8 Ma and 380.7 Ma

Sample K-34 (Volcaniclastic conglomerate)   *Detrital age sample*

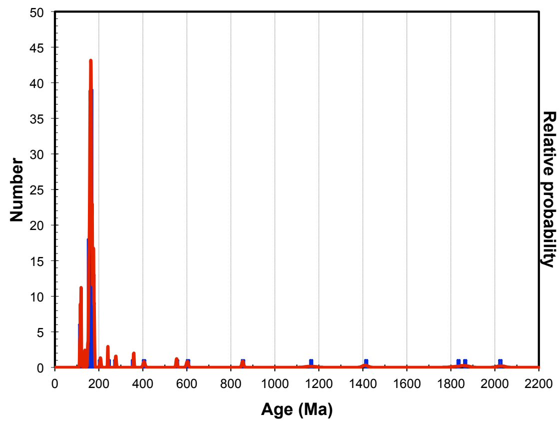
						Isotope ratios							Apparent ages (Ma)					
Analysis	U (ppm)	206Pb 204Pb	U/Th	206Pb* 207Pb*	± (%)	207Pb* 235U*	± (%)	206Pb* 238U	± (%)	error corr.	206Pb* 238U*	± (Ma)	207Pb* 235U	± (Ma)	206Pb* 207Pb*	± (Ma)	Best age (Ma)	± (Ma)
K348873-1	1805	17370	3.0	18.5980	3.7	0.1813	5.3	0.0245	3.8	0.72	155.7	5.9	169.2	8.3	361.4	83.3	155.7	5.9
K348873-2	755	16680	1.2	17.7175	1.6	0.4446	1.9	0.0571	1.0	0.54	358.1	3.5	373.5	5.8	469.7	34.6	358.1	3.5
K348873-3	718	14490	2.8	19.1095	5.1	0.1863	5.5	0.0258	2.0	0.36	164.3	3.2	173.5	8.7	299.8	116.6	164.3	3.2
K348873-4	905	14495	3.7	18.1989	5.5	0.2055	5.7	0.0271	1.8	0.31	172.5	3.0	189.8	9.9	410.1	122.1	172.5	3.0
K348873-5	456	6375	2.8	19.6103	7.9	0.1270	8.0	0.0181	1.0	0.13	115.4	1.1	121.4	9.1	240.5	182.5	115.4	1.1
K348873-6	443	7955	2.6	19.1086	2.6	0.1991	2.8	0.0276	1.0	0.36	175.5	1.7	184.4	4.7	299.9	59.6	175.5	1.7
K348873-7	66	8490	1.7	14.7210	3.1	1.3257	3.3	0.1415	1.0	0.31	853.4	8.0	857.0	18.9	866.4	64.6	853.4	8.0
K348873-9	2259	14060	2.3	17.8205	8.5	0.1961	8.8	0.0253	2.0	0.23	161.4	3.3	181.8	14.6	456.9	189.8	161.4	3.3
K348873-8	1466	20255	1.4	20.1586	1.9	0.1738	3.1	0.0254	2.5	0.79	161.8	3.9	162.7	4.7	176.6	43.9	161.8	3.9
K348873-10	443	30780	8.6	17.8723	2.8	0.5003	3.6	0.0649	2.3	0.62	405.1	8.8	411.9	12.3	450.5	63.1	405.1	8.8
K348873-11	783	6830	0.8	18.8334	5.0	0.1792	5.7	0.0245	2.8	0.49	155.9	4.3	167.3	8.8	332.9	112.3	155.9	4.3
K348873-12	428	6260	2.3	19.7609	9.0	0.1841	9.1	0.0264	1.2	0.13	167.9	2.0	171.6	14.3	222.9	208.5	167.9	2.0
K348873-13	331	4210	2.0	17.0210	10.5	0.2048	10.5	0.0253	1.3	0.12	160.9	2.1	189.2	18.2	557.9	228.7	160.9	2.1
K348873-14	1311	7680	2.0	18.1225	5.4	0.1885	5.9	0.0248	2.5	0.43	157.8	4.0	175.4	9.6	419.5	120.1	157.8	4.0
K348873-16	1089	26610	2.2	19.4089	4.4	0.1844	4.6	0.0260	1.0	0.22	165.2	1.6	171.9	7.2	264.3	102.2	165.2	1.6
K348873-17	156	24800	4.4	12.7123	2.4	2.0362	2.8	0.1877	1.4	0.50	1109.1	14.3	1127.7	19.0	1163.7	48.0	1163.7	48.0
K348873-18	851	26920	2.6	20.4624	2.1	0.1696	4.2	0.0252	3.6	0.86	160.2	5.6	159.0	6.1	141.6	49.8	160.2	5.6
K348873-19	564	17715	2.0	20.5341	3.6	0.1897	3.9	0.0283	1.4	0.37	179.6	2.6	176.4	6.3	133.4	85.3	179.6	2.6
K348873-20	85	7335	6.1	16.1240	3.5	0.7662	3.6	0.0896	1.1	0.31	553.2	5.9	577.6	16.0	674.8	74.1	553.2	5.9
K348873-21	1094	13970	3.7	18.3321	6.9	0.2007	7.0	0.0267	1.0	0.14	169.8	1.7	185.7	11.9	393.8	155.8	169.8	1.7
K348873-22	1044	42920	3.5	19.2269	1.8	0.3145	2.4	0.0439	1.6	0.68	276.7	4.4	277.7	5.9	285.8	41.0	276.7	4.4
K348873-23	355	9210	2.8	19.8486	2.6	0.1947	2.8	0.0280	1.0	0.35	178.2	1.8	180.7	4.7	212.6	61.1	178.2	1.8
K348873-24	527	11525	3.6	19.9244	4.2	0.1478	4.7	0.0214	2.2	0.46	136.2	3.0	139.9	6.2	203.8	96.9	136.2	3.0
K348873-25	308	34140	3.1	11.1994	1.2	2.3286	1.6	0.1891	1.0	0.63	1116.7	10.3	1221.0	11.3	1410.4	23.8	1410.4	23.8
K348873-26	27	6935	1.3	8.9307	3.5	5.2048	3.7	0.3371	1.4	0.36	1872.8	22.1	1853.4	31.9	1831.7	63.2	1831.7	63.2
K348873-27	767	13400	3.2	20.4827	2.7	0.1217	4.1	0.0181	3.1	0.75	115.5	3.6	116.6	4.5	139.3	63.5	115.5	3.6
K348873-28	518	9365	2.8	18.3997	17.6	0.1411	18.1	0.0188	4.0	0.22	120.2	4.8	134.0	22.7	385.5	398.5	120.2	4.8
K348873-29	310	5815	2.8	18.9352	5.3	0.1365	5.4	0.0187	1.0	0.18	119.7	1.2	129.9	6.6	320.7	120.8	119.7	1.2
K348873-30	1370	7755	2.9	18.3183	3.7	0.1862	5.2	0.0247	3.6	0.69	157.6	5.6	173.4	8.2	395.5	83.5	157.6	5.6
K348873-31	1108	32040	2.4	20.5037	2.5	0.1577	3.2	0.0234	2.0	0.63	149.4	2.9	148.7	4.4	136.8	57.9	149.4	2.9
K348873-32	581	8510	2.6	18.4327	3.3	0.1922	3.5	0.0257	1.2	0.33	163.5	1.9	178.5	5.8	381.5	74.5	163.5	1.9
K348873-33	517	15350	3.6	19.0111	8.9	0.2007	8.9	0.0277	1.2	0.14	175.9	2.1	185.7	15.2	311.6	201.8	175.9	2.1
K348873-34	1404	11415	3.3	18.0813	3.3	0.1843	3.6	0.0242	1.5	0.41	154.0	2.3	171.8	5.7	424.6	73.4	154.0	2.3
K348873-35	430	10060	2.4	19.0227	2.4	0.2756	2.6	0.0380	1.0	0.39	240.6	2.4	247.2	5.7	310.2	54.1	240.6	2.4
K348873-36	405	8095	2.2	20.0408	3.3	0.1717	3.6	0.0250	1.5	0.42	158.9	2.4	160.9	5.4	190.2	75.9	158.9	2.4
K348873-37	443	8485	2.0	20.0629	5.6	0.1669	5.9	0.0243	1.9	0.33	154.7	2.9	156.7	8.6	187.7	130.2	154.7	2.9
K348873-38	328	20010	1.7	16.2525	2.5	0.8302	2.9	0.0979	1.5	0.52	601.9	8.7	613.7	13.3	657.8	53.0	601.9	8.7
K348873-40	1106	9650	1.9	18.1188	8.4	0.2100	8.5	0.0276	1.0	0.12	175.5	1.7	193.6	14.9	420.0	187.7	175.5	1.7
K348873-41	159	54515	2.6	8.0063	1.9	6.3771	2.2	0.3703	1.2	0.54	2030.8	20.7	2029.1	19.5	2027.4	33.1	2027.4	33.1
K348873-42	438	12005	3.0	19.7642	4.0	0.1769	4.4	0.0254	1.8	0.41	161.4	2.8	165.4	6.7	222.5	92.4	161.4	2.8
K348873-43	587	16445	2.0	19.9010	2.2	0.1789	3.3	0.0258	2.5	0.75	164.3	4.1	167.1	5.1	206.5	50.8	164.3	4.1
K348873-44	405	11830	2.7	20.5996	4.7	0.1676	5.4	0.0250	2.5	0.47	159.4	4.0	157.3	7.8	125.9	111.1	159.4	4.0
K348873-45	354	9015	2.3	19.9230	2.9	0.1906	3.0	0.0275	1.0	0.33	175.2	1.7	177.2	4.9	203.9	66.7	175.2	1.7
K348873-46	488	11170	2.2	19.3262	5.8	0.1855	5.9	0.0260	1.0	0.17	165.5	1.6	172.8	9.4	274.1	133.4	165.5	1.6
K348873-47	305	7980	2.5	19.8152	3.1	0.1787	3.4	0.0257	1.4	0.42	163.5	2.3	167.0	5.2	216.5	70.8	163.5	2.3
K348873-48	1193	9635	2.0	17.7856	3.9	0.2109	4.0	0.0272	1.0	0.25	173.0	1.7	194.3	7.1	461.3	85.6	173.0	1.7
K348873-49	987	14885	3.5	18.3213	2.4	0.1965	2.8	0.0261	1.5	0.53	166.2	2.4	182.2	4.7	395.1	53.9	166.2	2.4
K348873-50	2801	61745	2.3	19.8126	1.4	0.1797	2.0	0.0258	1.5	0.72	164.3	2.4	167.8	3.1	216.8	32.4	164.3	2.4
K348873-51	465	10795	2.0	19.8980	3.8	0.1772	4.1	0.0256	1.4	0.34	162.8	2.2	165.7	6.2	206.8	88.6	162.8	2.2
K348873-52	1254	9955	2.4	18.3402	3.8	0.1914	4.1	0.0255	1.3	0.32	162.1	2.1	177.8	6.6	392.8	86.3	162.1	2.1
K348873-53	628	16760	1.6	19.9422	2.7	0.1875	3.1	0.0271	1.4	0.45	172.5	2.3	174.5	4.9	201.7	63.5	172.5	2.3
K348873-54	1510	43740	3.2	19.3196	5.6	0.1945	5.7	0.0273	1.0	0.17	173.4	1.7	180.5	9.5	274.8	129.3	173.4	1.7
K348873-55	1242	33690	3.3	19.4070	4.5	0.2316	5.3	0.0326	2.6	0.50	206.8	5.4	211.5	10.0	264.5	104.3	206.8	5.4
K348873-56	547	17335	2.4	19.5681	3.0	0.1875	3.2	0.0266	1.0	0.32	169.3	1.7	174.5	5.1	245.5	69.1	169.3	1.7
K348873-59	1543	21230	2.9	19.1922	2.8	0.1865	3.1	0.0260	1.3	0.41	165.3	2.0	173.7	4.9	290.0	64.0	165.3	2.0
K348873-60	2135	32695	2.0	19.7920	5.2	0.1753	5.4	0.0252	1.6	0.30	160.2	2.5	164.0	8.2	219.2	119.7	160.2	2.5
K348873-61	1141	17855	1.8	18.3692	10.4	0.1996	10.5	0.0266	1.8	0.17	169.2	3.0	184.8	17.8	389.2	232.9	169.2	3.0
K348873-63	598	9460	1.3	20.7203	3.8	0.1176	4.3	0.0177	1.9	0.43	112.9	2.1	112.9	4.6	112.1	90.6	112.9	2.1
K348873-62	750	19300	2.1	19.7000	2.4	0.1794	2.6	0.0256	1.0	0.39	163.1	1.6	167.5	4.0	230.0	54.6	163.1	1.6
K348873-64	1052	12420	2.4	18.2296	4.2	0.2018	4.8	0.0267	2.4	0.50	169.7	4.0	186.6	8.2	406.3	93.2	169.7	4.0
K348873-65	2667	65800	2.0	20.0178	2.5	0.1739	3.2	0.0253	2.1	0.64	160.8	3.3	162.8	4.9	192.9	57.7	160.8	3.3
K348873-67	881	25510	3.2	19.2901	3.7	0.1706	5.9	0.0239	4.5	0.77	152.1	6.8	160.0	8.7	278.3	85.1	152.1	6.8
K348873-69	322	8875	1.4	20.2328	4.4	0.1696	4.5	0.0249	1.0	0.22	158.5	1.6	159.1	6.7	168.0	102.9	158.5	1.6
K348873-70	2129	25375	2.7	19.6384	2.4	0.1728	2.9	0.0246	1.5	0.53	156.8	2.4	161.9	4.3	237.2	56.4	156.8	2.4
K348873-71	182	57950	1.9	8.7799	2.1	5.1344	2.4	0.3269	1.0	0.43	1823.6	16.2	1841.8	20.1	1862.5	38.5	1862.5	38.5
K348873-72	1399	8265	3.2	18.4951	4.5	0.1796	4.8	0.0241	1.7	0.36	153.5	2.6	167.8	7.5	373.9	101.3	153.5	2.6
K348873-73	1238	28700	4.0	19.9268	4.0	0.1714	5.1	0.0248	3.2	0.62	157.8	5.0	160.7	7.6	203.5	93.2	157.8	5.0
K348873-74	1485	31105	2.4	19.8047	3.9	0.1795	4.6	0.0258	2.4	0.52	164.1	3.9	167.6	7.1	217.7	90.6	164.1	3.9
K348873-75	460	9585	2.3	19.2756	4.6	0.1868	4.7	0.0261	1.0	0.21	166.2	1.6	173.9	7.5	280.1	105.3	166.2	1.6
K348873-77	749	21325	3.4	19.8655	3.8	0.1778	4.0	0.0256	1.4	0.34	163.0	2.2	166.1	6.2	210.6	88.1	163.0	2.2
K348873-78	674	18930	2.3	19.4863	1.4	0.1840	3.6	0.0260	3.3	0.92	165.5	5.4	171.5	5.7	255.1	31.8	165.5	5.4
K348873-79	723	4535	2.5	15.2546	16.9	0.1677	16.9	0.0186	1.0	0.06	118.5	1.2	157.5	24.7	792.2	356.6	118.5	1.2
K348873-80	254	3900	1.9	19.7489	11.9	0.1287	12.0	0.0184	1.6	0.13	117.7	1.9	122.9	13.8	224.3	274.8	117.7	1.9
K348873-82	1804	33190	2.6	20.0080	1.5	0.1735	1.8	0.0252	1.0	0.54	160.3	1.6	162.5	2.8	194.0	35.8	160.3	1.6
K348873-83	648	13050	1.5	20.1200	1.8	0.1697	2.4	0.0248	1.6	0.68	157.7	2.6	159.2	3.5	181.1	41.1	157.7	2.6
K348873-84	341	8825	2.1	20.6299	3.8	0.1724	3.9	0.0258	1.2	0.29	164.2	1.9	161.5	5.9	122.4	88.5	164.2	1.9
K348873-85	1266	16205	1.9	19.1975	2.7	0.1867	3.6	0.0260	2.4	0.67	165.4	3.9	173.8	5.7	289.3	60.8	165.4	3.9
K348873-86	522	15520	2.5	19.7166	3.2	0.1775	4.2	0.0254	2.6	0.63	161.6	4.2	165.9	6.4	228.0	74.9	161.6	4.2
K348873-87	778	12555	1.3	19.2212	4.0	0.1799	4.1	0.0251	1.0	0.24	159.7	1.6	168.0	6.3	286.5	90.9	159.7	1.6
K348873-88	867	18020	3.1	19.7345	3.5	0.1821	3.9	0.0261	1.7	0.43	165.9	2.8	169.9	6.1	225.9	81.6	165.9	2.8
K348873-90	2163	56810	2.8	20.4148	1.6	0.1694	2.5	0.0251	1.9	0.76	159.7	3.0	158.9	3.7	147.0	38.5	159.7	3.0
K348873-89	1027	14435	3.1	18.8941	4.0	0.2043	4.5	0.0280	1.9	0.44	178.0	3.4	188.7	7.7	325.6	91.1	178.0	3.4
K348873-91	1013	21210	3.1	19.7359	3.2	0.1837	3.5	0.0263	1.4	0.40	167.3	2.3	171.2	5.6	225.8	75.0	167.3	2.3
K348873-92	627	7620	2.0	17.5968	11.1	0.2000	11.4	0.0255	3.0	0.26	162.5	4.8	185.2	19.4	484.9	244.6	162.5	4.8
K348873-93	937	14970	2.1	19.2521	3.6	0.1922	3.7	0.0268	1.0	0.27	170.8	1.7	178.5	6.1	282.9	82.4	170.8	1.7
K348873-94	2326	48845	2.0	19.8806	2.3	0.1719	3.5	0.0248	2.7	0.76	157.8	4.1	161.0	5.2	208.9	53.1	157.8	4.1
K348873-95	379	7660	2.5	19.2439	3.7	0.1839	4.1	0.0257	1.8	0.43	163.4	2.8	171.4	6.4	283.8	84.1	163.4	2.8
K348873-96	243	5025	2.2	20.0531	4.6	0.1676	5.0	0.0244	2.0	0.40	155.2	3.1	157.3	7.3	188.8	107.0	155.2	3.1
K348873-97	3054	11945	1.1	18.1726	6.9	0.1916	7.1	0.0253	1.9	0.27	160.8	3.0	178.0	11.6	413.3	153.6	160.8	3.0
K348873-98	644	16760	3.8	19.8645	2.4	0.1918	4.0	0.0276	3.3	0.81	175.8	5.7	178.2	6.6	210.7	54.6	175.8	5.7
K348873-99	1988	36820	2.3	19.6446	2.4	0.1857	2.8	0.0265	1.3	0.49	168.3	2.2	173.0	4.4	236.5	55.6	168.3	2.2
K348873-100	722	17350	2.6	19.5325	2.9	0.1876	3.1	0.0266	1.0	0.32	169.1	1.7	174.6	5.0	249.7	67.6	169.1	1.7

* Radiogenic

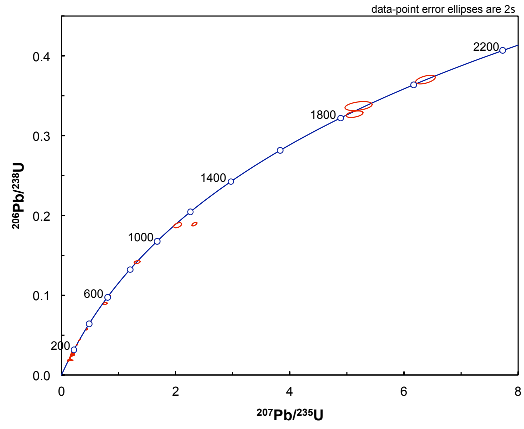
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).

Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).

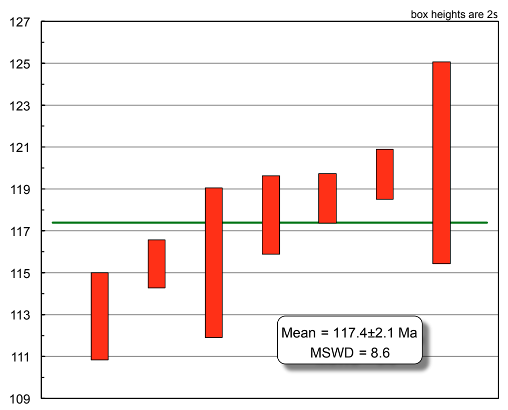
Sample K-34 (Volcaniclastic conglomerate)



Probability density diagram



Wetherill concordia diagram



Weighted mean age of youngest detrital zircons

Sample K-57 (Conglomerate)

Detrital age sample

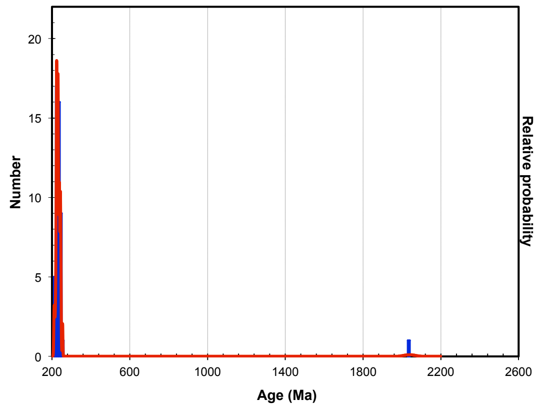
Analysis	U (ppm)	206Pb / 204Pb	U/Th	206Pb* / 207Pb*	± (%)	Isotope ratios 207Pb* / 235U*	± (%)	206Pb* / 238U	± (%)	error corr.	206Pb* / 238U*	± (Ma)	Apparent ages (Ma) 207Pb* / 235U	± (Ma)	206Pb* / 207Pb*	± (Ma)	Best age (Ma)	± (Ma)
K578872-1	722	55075	2.5	19.4745	2.8	0.2609	4.6	0.0368	3.7	0.80	233.2	8.5	235.4	9.8	256.5	63.9	233.2	8.5
K578872-2	2132	104880	2.2	19.5250	3.1	0.2735	4.0	0.0387	2.6	0.65	245.0	6.3	245.5	8.8	250.6	70.7	245.0	6.3
K578872-3	354	23610	2.9	19.6194	3.0	0.2480	3.3	0.0353	1.5	0.46	223.6	3.4	225.0	6.7	239.4	68.3	223.6	3.4
K578872-4	337	19580	2.5	19.4968	3.8	0.2523	4.2	0.0357	2.0	0.46	226.0	4.3	228.5	8.7	253.9	86.8	226.0	4.3
K578872-5	827	52095	1.7	19.7722	2.8	0.2507	4.8	0.0360	3.9	0.81	227.7	8.8	227.1	9.8	221.5	65.0	227.7	8.8
K578872-6	759	42280	2.2	19.5045	1.6	0.2567	1.9	0.0363	1.0	0.53	229.9	2.3	232.0	3.9	253.0	36.6	229.9	2.3
K578872-7	711	28030	1.9	18.9103	3.4	0.2793	3.6	0.0383	1.2	0.34	242.3	2.9	250.1	7.9	323.7	76.6	242.3	2.9
K578872-8	1623	60280	1.9	19.5893	2.2	0.2687	3.4	0.0382	2.5	0.75	241.5	6.0	241.6	7.3	243.0	51.4	241.5	6.0
K578872-9	1179	28470	2.7	18.9760	3.3	0.2796	3.4	0.0385	1.0	0.30	243.4	2.4	250.3	7.6	315.8	74.5	243.4	2.4
K578872-10	523	29735	2.9	19.8789	9.2	0.2430	9.4	0.0350	1.8	0.19	222.0	4.0	220.9	18.6	209.1	213.9	222.0	4.0
K578872-11	151	12165	1.8	20.2801	5.7	0.2737	5.8	0.0403	1.1	0.20	254.4	2.8	245.6	12.6	162.5	132.2	254.4	2.8
K578872-12	2815	92100	0.4	19.2656	3.3	0.2725	5.0	0.0381	3.8	0.75	240.9	8.9	244.7	10.9	281.2	76.2	240.9	8.9
K578872-13	1123	74870	1.9	19.9933	3.2	0.2449	3.4	0.0355	1.2	0.34	224.9	2.6	222.4	6.7	195.7	73.5	224.9	2.6
K578872-14	463	25025	2.8	19.3114	3.7	0.2602	3.9	0.0364	1.2	0.31	230.8	2.7	234.9	8.2	275.8	85.0	230.8	2.7
K578872-15	504	34010	3.4	20.1955	5.2	0.2390	5.5	0.0350	1.8	0.33	221.8	4.0	217.6	10.7	172.3	120.5	221.8	4.0
K578872-16	570	53445	2.8	19.9781	2.4	0.2549	2.6	0.0369	1.0	0.38	233.8	2.3	230.6	5.4	197.5	56.7	233.8	2.3
K578872-17	1236	88185	1.5	19.5779	3.1	0.2362	3.5	0.0335	1.6	0.46	212.7	3.3	215.3	6.7	244.3	71.0	212.7	3.3
K578872-18	588	44830	3.5	19.4016	6.2	0.2589	6.3	0.0364	1.0	0.16	230.7	2.3	233.8	13.1	265.1	141.7	230.7	2.3
K578872-19	875	39250	2.8	19.7428	3.5	0.2505	4.2	0.0359	2.4	0.56	227.2	5.3	227.0	8.6	225.0	81.6	227.2	5.3
K578872-20	919	37440	2.0	19.5627	2.2	0.2658	3.1	0.0377	2.2	0.71	238.7	5.1	239.4	6.6	246.1	50.0	238.7	5.1
K578872-21	589	27690	2.1	19.8776	1.6	0.2402	3.5	0.0346	3.1	0.88	219.4	6.6	218.6	6.8	209.2	38.1	219.4	6.6
K578872-22	582	24500	2.7	19.9108	2.9	0.2539	3.8	0.0367	2.4	0.63	232.2	5.5	229.8	7.8	205.4	68.1	232.2	5.5
K578872-23	891	43410	1.9	19.8914	1.8	0.2531	3.1	0.0365	2.5	0.82	231.2	5.8	229.1	6.4	207.6	41.1	231.2	5.8
K578872-24	491	21775	1.9	19.6534	2.5	0.2324	2.9	0.0331	1.6	0.53	210.1	3.2	212.2	5.6	235.5	57.8	210.1	3.2
K578872-25	690	36010	3.6	19.7211	4.0	0.2444	4.9	0.0350	2.8	0.58	221.5	6.2	222.0	9.8	227.5	92.2	221.5	6.2
K578872-26	1428	70100	2.6	19.6071	2.0	0.2688	3.6	0.0382	3.0	0.84	241.9	7.1	241.8	7.7	240.9	45.0	241.9	7.1
K578872-27	465	33015	3.0	19.8116	3.9	0.2465	4.0	0.0354	1.0	0.25	224.3	2.2	223.7	8.1	216.9	89.9	224.3	2.2
K578872-28	343	19080	2.6	19.1770	5.8	0.2645	6.1	0.0368	1.7	0.28	232.9	3.9	238.3	12.9	291.8	133.1	232.9	3.9
K578872-29	785	24125	2.7	19.4798	3.6	0.2421	4.6	0.0342	2.8	0.61	216.8	6.1	220.1	9.1	255.9	83.8	216.8	6.1
K578872-30	920	49435	2.0	19.7324	3.7	0.2514	4.4	0.0360	2.4	0.54	227.9	5.3	227.7	9.0	226.2	85.3	227.9	5.3
K578872-31	3323	121990	1.5	19.7901	4.5	0.2670	5.1	0.0383	2.4	0.46	242.4	5.6	240.3	10.9	219.4	105.1	242.4	5.6
K578872-32	909	38330	1.5	19.7325	2.2	0.2476	2.9	0.0354	1.9	0.65	224.4	4.1	224.6	5.8	226.2	50.4	224.4	4.1
K578872-33	1100	27160	2.6	18.6707	3.5	0.2730	5.5	0.0370	4.2	0.77	234.0	9.7	245.1	11.9	352.6	78.5	234.0	9.7
K578872-34	797	48900	2.1	19.5301	3.5	0.2479	3.8	0.0351	1.6	0.42	222.5	3.5	224.9	7.7	250.0	80.1	222.5	3.5
K578872-35	411	24390	3.7	19.1928	2.8	0.2543	2.9	0.0354	1.0	0.34	224.2	2.2	230.1	6.0	289.9	62.9	224.2	2.2
K578872-36	418	16755	2.1	19.9434	3.1	0.2664	3.4	0.0385	1.5	0.43	243.7	3.5	239.8	7.3	201.5	71.5	243.7	3.5
K578872-37	739	21415	2.0	19.2368	1.6	0.2593	2.1	0.0362	1.3	0.63	229.1	2.9	234.1	4.3	284.7	36.9	229.1	2.9
K578872-38	883	22505	1.2	19.3878	2.2	0.2655	3.0	0.0373	2.0	0.66	236.3	4.6	239.1	6.4	266.8	51.4	236.3	4.6
K578872-39	930	36010	2.3	19.4812	2.7	0.2436	5.8	0.0344	5.1	0.88	218.2	10.9	221.4	11.5	255.7	63.1	218.2	10.9
K578872-40	1194	39670	1.5	19.9015	1.9	0.2604	2.2	0.0376	1.0	0.47	237.8	2.4	235.0	4.5	206.4	44.3	237.8	2.4
K578872-41	488	118560	2.7	7.9533	3.2	6.6250	4.6	0.3822	3.3	0.72	2086.3	59.5	2062.7	41.0	2039.1	57.1	2039.1	57.1
K578872-42	985	43555	1.2	19.7635	3.1	0.2606	3.4	0.0374	1.3	0.40	236.4	3.1	235.1	7.1	222.6	71.5	236.4	3.1
K578872-43	346	36270	3.3	20.4069	5.1	0.2456	5.8	0.0364	2.6	0.45	230.2	5.9	223.0	11.5	147.9	120.4	230.2	5.9
K578872-44	487	17665	1.8	19.1875	2.3	0.2711	2.5	0.0377	1.0	0.39	238.7	2.3	243.6	5.5	290.5	53.2	238.7	2.3
K578872-45	792	26095	1.9	19.1634	4.5	0.2800	4.6	0.0389	1.0	0.22	246.1	2.4	250.7	10.2	293.4	102.4	246.1	2.4
K578872-46	351	6120	2.2	18.2148	4.0	0.2774	4.1	0.0366	1.0	0.24	232.0	2.3	248.6	9.1	408.2	89.2	232.0	2.3
K578872-47	671	23235	1.7	19.1566	1.9	0.2530	2.7	0.0352	1.9	0.69	222.7	4.1	229.0	5.5	294.2	44.3	222.7	4.1
K578872-49	578	21765	2.0	19.1025	5.8	0.2621	6.6	0.0363	3.2	0.48	229.9	7.2	236.3	14.0	300.7	132.6	229.9	7.2
K578872-50	616	19620	1.7	18.9933	3.3	0.2638	4.2	0.0363	2.5	0.59	230.1	5.6	237.7	8.8	313.7	76.2	230.1	5.6

* Radiogenic

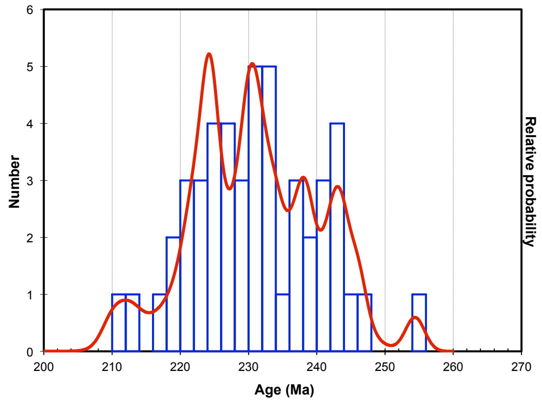
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).

Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).

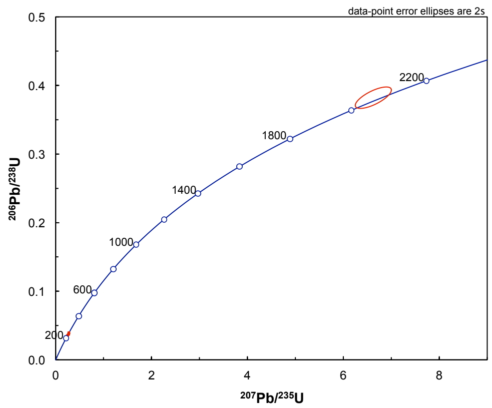
Sample K-57 (Conglomerate)



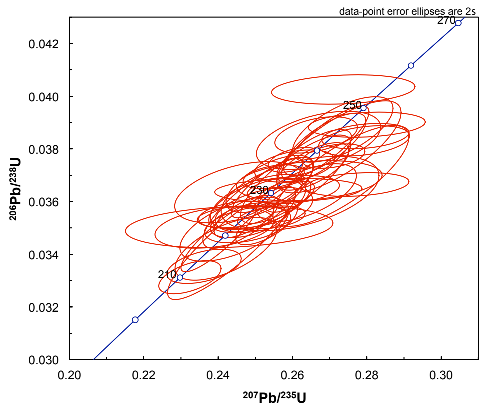
Probability density diagram for all ages



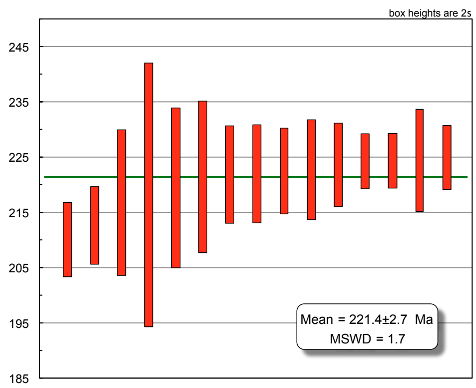
Probability density diagram for Mesozoic ages



Wetheiall concordia diagram for all ages



Wetherill concordia diagram for Mesozoic ages



Weighted mean age of youngest detrital zircons

Sample S-33 (Siltstone)

Detrital age sample

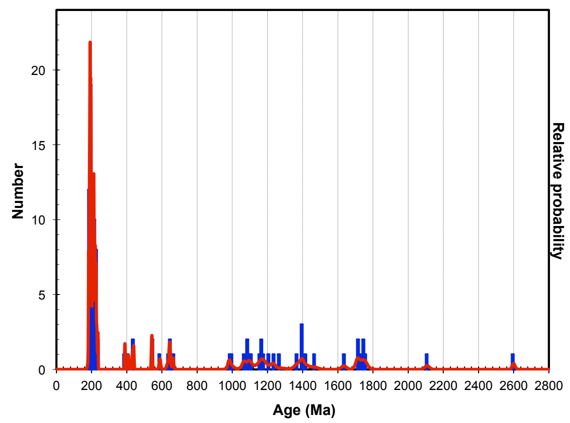
							Isotope ratios							Apparent ages (Ma)					
Analysis	U	206Pb	U/Th	206Pb*	±	207Pb*	±	206Pb*	±	error	206Pb*	±	207Pb*	±	206Pb*	±	Best age	±
	(ppm)	204Pb		207Pb*	(%)	235U*	(%)	238U	(%)	corr.	238U*	(Ma)	235U	(Ma)	207Pb*	(Ma)	(Ma)	(Ma)
S338877-1	149	60590	2.4	12.0579	3.7	2.3440	3.8	0.2050	1.0	0.26	1202.1	11.0	1225.7	27.0	1267.6	71.5	1267.6	71.5
S338877-2	1058	52620	1.8	19.4858	2.2	0.2419	2.4	0.0342	1.0	0.42	216.7	2.1	220.0	4.7	255.2	49.4	216.7	2.1
S338877-3	468	32640	1.8	19.5345	3.9	0.2183	4.0	0.0309	1.0	0.25	196.3	1.9	200.5	7.3	249.4	88.9	196.3	1.9
S338877-4	190	99070	2.7	7.6525	1.5	6.5404	2.3	0.3630	1.8	0.77	1996.4	30.2	2051.3	20.1	2107.1	25.4	2107.1	25.4
S338877-5	56	16835	1.9	13.1202	2.7	1.8110	3.2	0.1723	1.6	0.51	1024.9	15.2	1049.4	20.7	1100.8	54.6	1100.8	54.6
S338877-6	1076	46015	2.1	19.8798	1.2	0.2287	1.8	0.0330	1.4	0.77	209.1	2.9	209.1	3.5	209.0	27.1	209.1	2.9
S338877-7	205	33645	2.4	17.2193	2.0	0.7039	2.3	0.0879	1.0	0.44	543.1	5.2	541.1	9.5	532.5	44.7	543.1	5.2
S338877-8	229	5970	1.3	19.3763	5.4	0.2126	5.6	0.0299	1.6	0.29	189.7	3.1	195.7	10.0	268.1	123.2	189.7	3.1
S338877-9	126	34840	0.7	11.3170	2.7	2.9116	2.9	0.2390	1.2	0.40	1381.4	14.5	1384.9	22.0	1390.4	51.1	1390.4	51.1
S338877-10	106	37750	1.6	10.8819	2.3	3.2315	2.9	0.2550	1.8	0.62	1464.4	23.6	1464.8	22.6	1465.2	43.5	1465.2	43.5
S338877-11	58	5065	0.8	16.1223	6.1	0.8846	6.5	0.1034	2.4	0.37	634.5	14.5	643.4	31.1	675.0	129.6	634.5	14.5
S338877-12	526	18035	1.2	19.8933	2.6	0.2411	5.7	0.0348	5.1	0.89	220.4	11.1	219.3	11.3	207.4	60.0	220.4	11.1
S338877-13	501	84560	1.0	5.7377	1.0	11.8681	1.4	0.4939	1.0	0.71	2587.4	21.3	2594.1	13.2	2599.2	16.7	2599.2	16.7
S338877-14	1697	56395	0.9	19.8887	1.3	0.2414	1.8	0.0348	1.3	0.70	220.6	2.8	219.6	3.6	207.9	30.4	220.6	2.8
S338877-15	343	11880	1.3	20.0108	3.9	0.2212	4.4	0.0321	2.0	0.45	203.7	4.0	202.9	8.1	193.7	91.2	203.7	4.0
S338877-16	509	30455	2.5	19.8135	9.0	0.2200	9.5	0.0316	3.0	0.32	200.6	6.0	201.9	17.4	216.7	209.2	200.6	6.0
S338877-17	935	55185	1.1	20.2920	2.0	0.2049	2.2	0.0302	1.0	0.45	191.5	1.9	189.3	3.9	161.2	47.1	191.5	1.9
S338877-18	418	29615	1.6	19.8838	5.9	0.2265	5.9	0.0327	1.0	0.17	207.2	2.0	207.3	11.1	208.5	136.0	207.2	2.0
S338877-19	167	69110	3.1	9.3503	2.3	4.7002	2.9	0.3187	1.8	0.62	1783.6	28.0	1767.3	24.2	1748.0	41.4	1748.0	41.4
S338877-20	202	13215	1.9	20.7337	4.4	0.1968	4.6	0.0296	1.6	0.35	188.0	3.0	182.4	7.8	110.6	102.9	188.0	3.0
S338877-21	445	16545	2.6	20.1658	2.6	0.2206	2.8	0.0323	1.2	0.41	204.7	2.3	202.4	5.2	175.7	60.3	204.7	2.3
S338877-22	202	47020	1.2	9.5390	1.0	4.4323	2.4	0.3066	2.2	0.91	1724.1	33.0	1718.4	19.9	1711.4	18.4	1711.4	18.4
S338877-23	366	11665	1.7	20.0299	3.5	0.2127	4.5	0.0309	2.8	0.62	196.2	5.3	195.9	8.0	191.5	81.8	196.2	5.3
S338877-24	467	11945	0.9	19.7453	3.8	0.2153	4.3	0.0308	1.9	0.44	195.8	3.7	198.0	7.7	224.7	88.9	195.8	3.7
S338877-25	2327	64965	2.2	19.7897	2.0	0.2338	2.2	0.0336	1.1	0.48	212.7	2.3	213.3	4.3	219.5	45.6	212.7	2.3
S338877-26	699	31305	1.8	18.7141	2.3	0.4587	2.5	0.0623	1.0	0.41	389.3	3.8	383.3	7.9	347.3	50.9	389.3	3.8
S338877-27	1092	85510	6.0	13.3540	1.0	1.8278	1.6	0.1770	1.2	0.77	1050.7	11.7	1055.5	10.3	1065.4	20.1	1065.4	20.1
S338877-28	167	4250	0.7	19.7926	11.3	0.2107	11.4	0.0302	1.8	0.15	192.1	3.3	194.1	20.2	219.1	262.2	192.1	3.3
S338877-29	62	11465	1.4	12.4442	2.0	2.3026	2.2	0.2078	1.0	0.45	1217.2	11.1	1213.1	15.7	1205.8	39.0	1205.8	39.0
S338877-30	225	44670	1.4	11.4550	1.7	2.7142	2.3	0.2255	1.6	0.68	1310.8	18.4	1332.4	16.9	1367.1	32.0	1367.1	32.0
S338877-31	236	122700	1.7	11.3064	2.5	3.0459	2.8	0.2498	1.2	0.43	1437.3	15.1	1419.2	21.0	1392.2	47.8	1392.2	47.8
S338877-32	1168	43485	2.4	19.6945	1.8	0.2433	2.1	0.0348	1.0	0.49	220.2	2.2	221.1	4.1	230.6	41.6	220.2	2.2
S338877-33	231	72105	1.9	12.6791	2.0	2.1786	2.9	0.2003	2.1	0.73	1177.2	22.8	1174.2	20.2	1168.9	39.2	1168.9	39.2
S338877-34	234	43280	0.8	11.2860	1.0	2.9126	2.0	0.2384	1.7	0.86	1378.4	20.8	1385.2	14.8	1395.6	19.2	1395.6	19.2
S338877-35	2804	75905	2.5	19.8736	1.3	0.2318	1.8	0.0334	1.2	0.68	211.9	2.5	211.7	3.4	209.7	30.8	211.9	2.5
S338877-37	205	6380	0.9	19.5062	4.7	0.2087	5.4	0.0295	2.7	0.50	187.6	5.0	192.5	9.4	252.8	107.1	187.6	5.0
S338877-36	1677	439710	36.6	9.4629	2.3	4.1922	4.2	0.2877	3.5	0.84	1630.1	51.0	1672.5	34.5	1726.1	41.7	1726.1	41.7
S338877-38	137	63355	1.9	9.3630	2.5	4.6363	2.7	0.3148	1.0	0.37	1764.5	15.4	1755.8	22.4	1745.5	45.6	1745.5	45.6
S338877-39	179	76300	2.5	12.7536	2.7	2.1717	2.9	0.2009	1.0	0.35	1180.0	10.8	1172.0	20.0	1157.2	53.4	1157.2	53.4
S338877-40	132	17295	1.3	16.2235	3.6	0.8968	3.7	0.1055	1.0	0.27	646.7	6.2	650.0	17.7	661.6	76.2	646.7	6.2
S338877-41	113	6700	2.5	19.5144	10.1	0.2204	10.3	0.0312	1.7	0.16	198.0	3.3	202.2	18.8	251.8	233.7	198.0	3.3
S338877-42	508	28460	1.9	18.7491	4.0	0.2615	4.2	0.0356	1.2	0.28	225.3	2.6	235.9	8.8	343.1	91.4	225.3	2.6
S338877-43	192	9155	2.7	19.7387	5.3	0.2159	5.5	0.0309	1.3	0.24	196.2	2.6	198.5	9.9	225.5	122.7	196.2	2.6
S338877-44	303	14615	2.0	19.8080	4.2	0.2130	4.3	0.0306	1.1	0.26	194.3	2.1	196.0	7.7	217.3	96.7	194.3	2.1
S338877-45	1552	62035	2.1	19.8463	1.6	0.2343	2.4	0.0337	1.8	0.75	213.8	3.7	213.8	4.6	212.9	35.9	213.8	3.7
S338877-46	367	53895	1.5	13.1370	1.2	1.9222	1.6	0.1831	1.0	0.64	1084.1	10.0	1088.8	10.4	1098.2	23.8	1098.2	23.8
S338877-47	175	5975	1.4	21.2599	9.7	0.1888	10.0	0.0291	2.4	0.24	185.0	4.4	175.6	16.2	51.1	233.0	185.0	4.4
S338877-48	283	8710	1.2	20.3287	5.9	0.2071	5.9	0.0305	1.0	0.17	193.9	1.9	191.1	10.4	157.0	137.3	193.9	1.9
S338877-49	141	6490	1.6	19.7850	4.2	0.2178	4.8	0.0312	2.3	0.48	198.4	4.5	200.0	8.8	220.0	98.3	198.4	4.5
S338877-50	496	17165	1.2	19.9635	2.1	0.2086	2.4	0.0302	1.3	0.52	191.8	2.4	192.4	4.2	199.2	47.9	191.8	2.4
S338877-51	455	57720	2.1	16.3822	2.3	0.8818	2.5	0.1048	1.0	0.40	642.3	6.1	642.0	12.0	640.7	49.9	642.3	6.1
S338877-52	197	38365	1.4	13.2285	1.9	1.8637	2.2	0.1788	1.0	0.46	1060.5	9.8	1068.3	14.3	1084.3	38.5	1084.3	38.5
S338877-53	794	30855	2.1	19.8077	1.8	0.2327	2.1	0.0334	1.0	0.48	212.0	2.1	212.5	4.0	217.4	41.9	212.0	2.1
S338877-54	304	58270	4.5	12.7250	2.0	2.0677	2.7	0.1908	1.7	0.65	1125.9	18.0	1138.2	18.2	1161.7	39.9	1161.7	39.9
S338877-55	85	23955	0.7	9.9441	1.5	3.9580	1.8	0.2855	1.0	0.56	1618.8	14.3	1625.6	14.6	1634.5	27.7	1634.5	27.7
S338877-57	409	11805	1.6	19.6027	6.7	0.2025	8.5	0.0288	5.1	0.61	183.0	9.2	187.3	14.5	241.4	155.1	183.0	9.2
S338877-58	398	12570	2.1	20.5225	2.4	0.2010	3.1	0.0299	1.9	0.62	190.0	3.6	185.9	5.2	134.7	56.7	190.0	3.6
S338877-59	90	9375	0.8	16.5018	1.9	0.7983	2.5	0.0955	1.7	0.66	588.2	9.3	595.9	11.3	625.0	40.6	588.2	9.3
S338877-60	951	33985	2.3	19.7893	1.7	0.2337	2.2	0.0335	1.5	0.65	212.7	3.1	213.3	4.3	219.5	39.2	212.7	3.1
S338877-61	545	70925	0.6	16.0639	1.6	0.9289	2.1	0.1082	1.3	0.64	662.4	8.4	667.1	10.1	682.7	33.8	662.4	8.4
S338877-62	935	39405	1.9	19.7559	2.7	0.2479	2.9	0.0355	1.1	0.36	225.0	2.3	224.9	5.9	223.4	63.4	225.0	2.3
S338877-63	262	13595	3.7	19.8486	3.4	0.2591	3.5	0.0373	1.1	0.30	236.1	2.5	234.0	7.4	212.6	78.3	236.1	2.5
S338877-64	122	16275	2.0	16.4942	3.2	0.7331	3.4	0.0877	1.1	0.33	541.9	5.8	558.3	14.4	626.0	68.2	541.9	5.8
S338877-65	579	19485	1.5	19.0657	2.8	0.2113	3.8	0.0292	2.7	0.69	185.6	4.8	194.6	6.8	305.1	62.9	185.6	4.8
S338877-66	229	35370	1.6	13.9270	1.4	1.6281	2.1	0.1644	1.5	0.74	981.5	13.9	981.1	12.9	980.3	27.9	981.5	13.9
S338877-67	413	28680	1.2	17.8193	1.9	0.5380	2.3	0.0695	1.2	0.54	433.3	5.1	437.1	8.0	457.1	42.2	433.3	5.1
S338877-68	263	41255	1.3	12.2710	1.2	2.3717	2.2	0.2111	1.9	0.84	1234.5	20.8	1234.1	15.7	1233.3	23.2	1233.3	23.2
S338877-69	770	39770	1.3	18.0139	1.0	0.5399	1.4	0.0705	1.0	0.71	439.4	4.2	438.4	5.0	432.9	22.3	439.4	4.2
S338877-70	1470	42675	1.6	19.8913	2.6	0.2311	3.8	0.0333	2.8	0.73	211.4	5.8	211.1	7.3	207.6	60.1	211.4	5.8
S338877-71	149	5610	1.1	20.5999	5.4	0.2140	5.8	0.0320	2.1	0.36	202.9	4.2	196.9	10.4	125.8	127.2	202.9	4.2
S338877-72	2724	62990	0.7	19.7452	1.0	0.2379	1.6	0.0341	1.2	0.77	216.0	2.6	216.7	3.1	224.7	23.1	216.0	2.6
S338877-73	164	47585	1.8	11.1587	2.1	2.9851	3.3	0.2416	2.6	0.79	1394.9	33.0	1403.8	25.4	1417.3	39.4	1417.3	39.4
S338877-74	191	9700	4.2	18.8369	3.2	0.2008	3.7	0.0289	1.8	0.48	183.6	3.2	185.8	6.2	214.0	74.4	183.6	3.2
S338877-75	189	8885	1.2	20.3298	4.3	0.2038	4.6	0.0301	1.5	0.33	190.9	2.8	188.4	7.8	156.8	100.8	190.9	2.8
S338877-76	1125	29215	1.7	19.5352	1.6	0.2483	1.9	0.0352	1.0	0.52	222.9	2.2	225.2	3.9	249.4	37.7	222.9	2.2
S338877-78	888	209275	2.9	9.3275	1.6	4.1043	2.2	0.2777	1.6	0.72	1579.5	22.6	1655.2	18.4	1752.5	28.7	1752.5	28.7
S338877-79	172	5695	1.0	19.8692	4.0	0.2074	4.8	0.0299	2.6	0.55	189.8	4.9	191.3	8.4	210.2	92.8	189.8	4.9
S338877-80	456	18275	2.6	20.0734	1.8	0.2328	2.3	0.0339	1.4	0.61	214.9	2.9	212.5	4.4	186.4	42.1	214.9	2.9
S338877-81	17	4030	1.1	13.2137	5.5	1.8645	6.3	0.1787	3.0	0.47	1059.8	28.9	1068.6	41.5	1086.6	110.9	1086.6	110.9
S338877-82	459	17865	1.2	20.0570	2.6	0.2078	3.2	0.0302	1.8	0.56	192.0	3.4	191.7	5.6	188.4	61.5	192.0	3.4
S338877-83	3720	44885	2.2	19.1668	1.0	0.2131	1.4	0.0296	1.0	0.70	188.2	1.9	196.1	2.5	293.0	23.0	188.2	1.9
S338877-84	871	32575	2.4	19.8361	1.1	0.2137	2.0	0.0307	1.7	0.85	195.2	3.3	196.7	3.6	214.1	24.6	195.2	3.3
S338877-85	178	7280	1.5	17.8303	33.4	0.2307	33.6	0.0298	3.0	0.09	189.5	5.5	210.8	64.0	455.7	761.3	189.5	5.5
S338877-86	266	9915	1.9	20.4707	4.2	0.2038	4.6	0.0303	1.8	0.38	192.2	3.3	188.3	7.9	140.6	99.5	192.2	3.3
S338877-87	1012	32620	1.5	19.7662	1.5	0.2094	2.3	0.0300	1.8	0.77	190.7	3.4	193.1	4.1	222.2	34.0	190.7	3.4
S338877-88	2231	48935	2.2	19.3671	1.4	0.2468	2.0	0.0347	1.4	0.70	219.7	3.0	224.0	3.9	269.2	31.9	219.7	3.0
S338877-89	256	14025	1.3	17.2389	1.3	0.5241	2.2	0.0655	1.7	0.80	409.2	6.9	427.9	7.6	530.1	28.8	409.2	6.9
S338877-90	408	12900	2.3	19.5660	4.2	0.2290	4.3	0.0325	1.0	0.23	206.2	2.0	209.4	8.2	245.7	96.7	206.2	2.0
S338877-91	143	8790	1.6	20.8862	5.7	0.1904	5.9	0.0288	1.3	0.23	183.3	2.4	176.9	9.6	93.3	136.1	183.3	2.4
S338877-92	358	22265	1.1	19.9192	3.3	0.2165	3.4	0.0313	1.0	0.29	198.6	2.0	199.0	6.2	204.4	76.0	198.6	2.0
S338877-93	500	116460	1.8	12.6498	1.5	2.0249	2.9	0.1858	2.5	0.86	1098.4	25.1	1123.9	19.7	1173.4	29.1	1173.4	29.1
S338877-94	281	11435	1.7	19.7575	3.5	0.2147	3.6	0.0308	1.0	0.28	195.4	1.9	197.5	6.5	223.3	80.7	195.4	1.9
S338877-95	34	7710	1.9	13.8025	3.3	1.6658	4.3	0.1668	2.7	0.64	994.2	25.2	995.6	27.2	998.6	66.9	994.2	25.2
S338877-96	336	120820	2.8	9.5154	1.8	4.0449	2.1	0.2791	1.0	0.48	1587.0	14.1	1643.3	17.1	1715.9	33.8	1715.9	33.8
S338877-97	1297	52780	1.8	19.7290	3.0	0.2131	3.4	0.0305	1.5	0.44	193.6	2.8	196.1	6.0	226.6	69.6	193.6	2.8
S338877-98	1465	95165	4.0	19.5770	1.9	0.2544	2.8	0.0361	2.1	0.73	228.7	4.6	230.1	5.8	244.4	44.7	228.7	4.6
S338877-99	411	27650	2.9	19.6861	1.8	0.2461	4.0	0.0351	3.6	0.89	222.6	7.8	223.4	8.0	231.6	42.2	222.6	7.8
S338877-10(	375	38975	3.4	19.2319	2.4	0.2607	3.2	0.0364	2.1	0.65	230.3	4.7	235.3	6.7	285.3	55.7	230.3	4.7

* Radiogenic

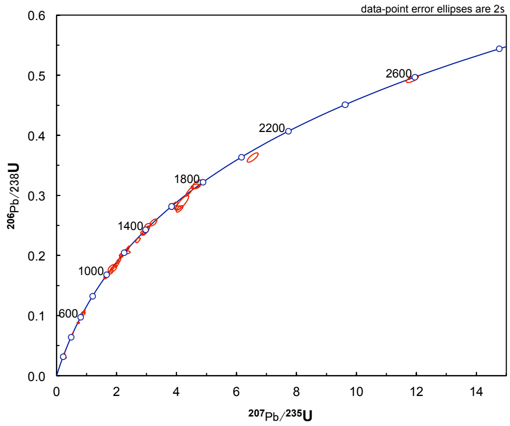
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).

Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).

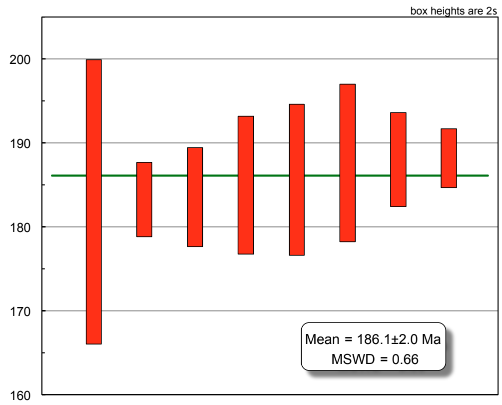
Sample S-33 (Siltstone)



Probability density diagram



Wetherill concordia diagram



Weighted mean age of youngest detrital zircons

Sample S-40 (Siltstone)

Detrital age sample

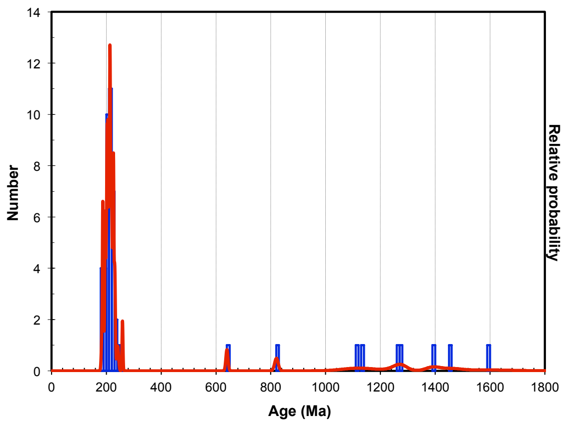
						Isotope ratios							Apparent ages (Ma)					
Analysis	U (ppm)	206Pb/204Pb	U/Th	206Pb*/207Pb*	± (%)	207Pb*/235U*	± (%)	206Pb*/238U	± (%)	error corr.	206Pb*/238U*	± (Ma)	207Pb*/235U	± (Ma)	206Pb*/207Pb*	± (Ma)	Best age (Ma)	± (Ma)
S408876-1	448	10960	1.9	18.5686	4.0	0.3044	4.2	0.0410	1.3	0.31	259.0	3.4	269.8	10.0	364.9	90.8	259.0	3.4
S408876-2	213	6340	4.5	19.8050	11.0	0.2354	11.2	0.0338	1.7	0.15	214.4	3.6	214.6	21.6	217.7	256.2	214.4	3.6
S408876-3	325	8880	4.7	18.1371	3.5	0.2762	4.1	0.0363	2.1	0.52	230.1	4.8	247.6	8.9	417.7	77.4	230.1	4.8
S408876-4	266	8355	2.3	19.8478	3.1	0.2147	3.9	0.0309	2.4	0.62	196.2	4.6	197.5	7.0	212.7	70.8	196.2	4.6
S408876-5	2104	42775	1.5	19.6499	1.6	0.2490	3.6	0.0355	3.2	0.89	224.8	7.1	225.8	7.3	235.9	37.4	224.8	7.1
S408876-6	296	8445	2.3	19.8282	7.2	0.2061	7.3	0.0296	1.5	0.20	188.3	2.8	190.3	12.7	215.0	165.9	188.3	2.8
S408876-7	551	16415	2.1	19.7940	3.1	0.2459	4.2	0.0353	2.8	0.67	223.7	6.2	223.3	8.4	219.0	72.1	223.7	6.2
S408876-8	140	3430	2.5	21.7871	10.7	0.1998	10.9	0.0316	2.2	0.20	200.3	4.3	184.9	18.4	-7.7	258.4	200.3	4.3
S408876-9	193	2590	2.2	15.9318	3.8	0.2689	4.5	0.0311	2.3	0.52	197.3	4.5	241.8	9.6	700.3	81.1	197.3	4.5
S408876-10	2006	55345	2.9	20.1850	2.6	0.2331	3.2	0.0341	1.9	0.59	216.3	4.1	212.7	6.2	173.5	60.5	216.3	4.1
S408876-12	284	6605	2.1	21.1177	6.1	0.2096	6.2	0.0321	1.5	0.23	203.7	2.9	193.2	11.0	67.1	144.2	203.7	2.9
S408876-11	455	10275	3.0	19.2175	7.4	0.2116	8.2	0.0295	3.7	0.44	187.4	6.7	194.9	14.6	287.0	168.8	187.4	6.7
S408876-13	861	15670	2.9	19.2468	3.0	0.2732	4.1	0.0381	2.8	0.69	241.3	6.7	245.2	9.0	283.5	68.6	241.3	6.7
S408876-15	1070	21690	2.1	19.6860	1.9	0.2404	2.8	0.0343	2.1	0.75	217.5	4.6	218.7	5.6	231.6	43.2	217.5	4.6
S408876-16	252	14825	2.7	19.5086	5.6	0.2175	5.7	0.0308	1.0	0.18	195.4	1.9	199.8	10.3	252.5	128.9	195.4	1.9
S408876-17	1097	29515	2.7	19.1413	1.7	0.2300	2.0	0.0319	1.0	0.51	202.7	2.0	210.2	3.8	296.0	38.9	202.7	2.0
S408876-18	253	56245	4.6	12.0191	2.2	2.3892	2.4	0.2083	1.0	0.42	1219.6	11.1	1239.4	17.2	1273.9	42.5	1273.9	42.5
S408876-19	140	5235	3.9	19.9111	12.4	0.2035	12.4	0.0294	1.2	0.10	186.7	2.3	188.1	21.3	205.3	287.7	186.7	2.3
S408876-20	186	22120	4.1	14.3116	2.7	1.3079	3.2	0.1358	1.7	0.53	820.6	13.3	849.2	18.6	924.6	56.1	820.6	13.3
S408876-22	288	20260	4.2	19.9250	3.3	0.2253	3.5	0.0326	1.1	0.31	206.6	2.2	206.3	6.5	203.7	76.8	206.6	2.2
S408876-21	263	10775	3.4	19.3101	6.9	0.2079	7.6	0.0291	3.1	0.41	185.0	5.6	191.8	13.3	276.0	159.1	185.0	5.6
S408876-23	410	13335	4.2	19.3203	3.9	0.2264	4.3	0.0317	1.8	0.41	201.3	3.5	207.2	8.1	274.8	90.0	201.3	3.5
S408876-24	205	7075	3.4	18.4066	11.9	0.2474	11.9	0.0330	1.0	0.08	209.4	2.1	224.4	24.0	384.7	267.8	209.4	2.1
S408876-25	301	12275	4.3	20.0210	3.1	0.2322	3.4	0.0337	1.5	0.44	213.7	3.2	212.0	6.5	192.5	71.5	213.7	3.2
S408876-26	1049	22820	1.9	19.3539	2.2	0.2468	2.6	0.0346	1.4	0.53	219.6	3.0	224.0	5.3	270.8	51.2	219.6	3.0
S408876-27	270	3945	1.3	18.9584	3.9	0.2310	4.6	0.0318	2.5	0.54	201.5	5.0	211.0	8.8	317.9	88.9	201.5	5.0
S408876-28	974	17870	1.8	19.1415	3.5	0.2390	5.1	0.0332	3.6	0.72	210.4	7.5	217.6	9.9	296.0	80.1	210.4	7.5
S408876-29	91	1545	0.8	16.9523	12.7	0.2898	12.8	0.0356	1.0	0.08	225.7	2.2	258.4	29.1	566.7	278.2	225.7	2.2
S408876-30	233	3210	1.1	17.1191	7.6	0.2748	8.1	0.0341	2.6	0.32	216.3	5.5	246.5	17.7	545.3	167.3	216.3	5.5
S408876-31	58	11175	1.1	10.9470	4.1	3.2668	4.2	0.2594	1.0	0.24	1486.6	13.3	1473.2	32.8	1453.9	78.0	1453.9	78.0
S408876-32	644	16520	2.3	18.8595	3.3	0.2546	3.7	0.0348	1.9	0.50	220.7	4.0	230.3	7.7	329.8	73.8	220.7	4.0
S408876-33	1019	39560	4.0	19.2154	3.3	0.2407	4.2	0.0335	2.6	0.62	212.7	5.5	219.0	8.3	287.2	75.5	212.7	5.5
S408876-34	1157	13945	2.5	18.0454	2.9	0.2303	5.8	0.0301	5.1	0.87	191.4	9.6	210.4	11.1	429.0	63.6	191.4	9.6
S408876-35	368	40980	1.4	12.0973	3.2	2.3209	4.7	0.2036	3.5	0.73	1194.8	37.7	1218.7	33.7	1261.3	63.3	1261.3	63.3
S408876-36	773	20350	2.4	18.9909	2.8	0.2410	4.5	0.0332	3.5	0.78	210.5	7.2	219.3	8.8	314.0	63.5	210.5	7.2
S408876-37	23	4355	1.8	13.0389	5.6	1.8447	5.8	0.1744	1.4	0.25	1036.6	13.8	1061.5	38.0	1113.2	111.7	1113.2	111.7
S408876-38	125	18260	2.7	12.8903	6.6	1.8533	6.8	0.1733	1.6	0.23	1030.0	15.0	1064.6	44.6	1136.1	130.9	1136.1	130.9
S408876-39	130	25825	2.1	11.3166	2.6	2.8504	3.0	0.2339	1.6	0.53	1355.1	19.6	1368.9	22.8	1390.4	49.5	1390.4	49.5
S408876-40	552	20490	2.0	19.5031	3.1	0.2554	3.7	0.0361	2.1	0.56	228.7	4.7	230.9	7.7	253.1	71.6	228.7	4.7
S408876-41	737	17885	2.4	18.6045	6.2	0.2651	6.3	0.0358	1.0	0.16	226.6	2.2	238.8	13.4	360.6	140.0	226.6	2.2
S408876-42	750	22980	2.8	19.3938	1.5	0.2389	2.0	0.0336	1.3	0.67	213.1	2.7	217.6	3.8	266.1	33.5	213.1	2.7
S408876-43	393	13050	3.9	19.2877	3.8	0.2616	4.1	0.0366	1.6	0.39	231.7	3.7	235.9	8.6	278.6	86.3	231.7	3.7
S408876-44	554	13935	1.2	18.8004	5.0	0.2384	5.1	0.0325	1.0	0.20	206.2	2.0	217.1	9.9	336.9	112.6	206.2	2.0
S408876-45	90	4575	1.3	10.1762	10.0	3.4800	10.1	0.2568	1.6	0.16	1473.6	20.8	1522.7	80.0	1591.5	187.1	1591.5	187.1
S408876-46	373	14925	3.5	19.2413	3.3	0.2407	3.5	0.0336	1.0	0.29	213.0	2.1	219.0	6.8	284.1	76.0	213.0	2.1
S408876-47	382	32775	1.1	16.2830	1.4	0.8839	1.9	0.1044	1.3	0.67	640.0	7.9	643.1	9.1	653.7	30.3	640.0	7.9
S408876-48	1266	39430	3.4	19.2401	3.2	0.2530	3.3	0.0353	1.0	0.30	223.7	2.2	229.0	6.9	284.3	73.0	223.7	2.2
S408876-49	478	17285	3.1	19.5503	2.4	0.2275	2.8	0.0323	1.4	0.49	204.6	2.7	208.1	5.2	247.6	55.5	204.6	2.7
S408876-50	1242	48140	3.7	19.4084	2.4	0.2338	3.2	0.0329	2.1	0.65	208.8	4.3	213.4	6.2	264.3	55.6	208.8	4.3

* Radiogenic

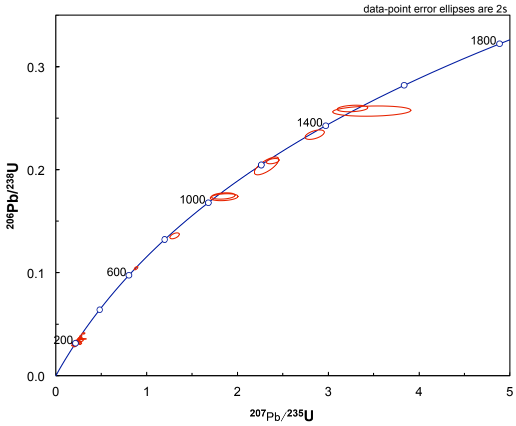
Decay constants: λ 238U=1.55125E-10, λ 235U=9.8485E-10 (Jaffery et al., 1971); 238U/235U = 137.88 (Chen and Wasserberg, 1981).

Uncertainities age are given as ± 2σ. Common Pb correction from measured 206Pb/204Pb. Initial Pb composition is from Stacy and Kramers (1975).

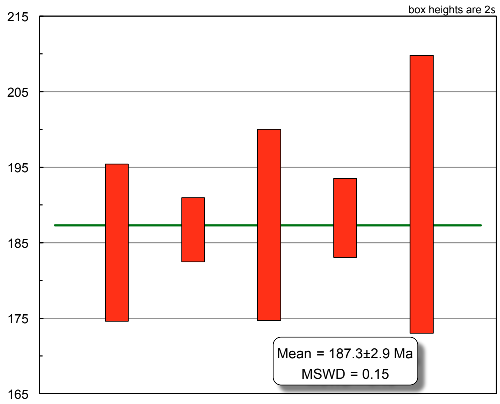
Sample S-40 (Siltstone)



Probability density diagram



Wetherill concordia diagram



Weighted mean age of youngest detrital zircons

3. Information on strain dataset

The strain measurements compiled in Figure 12 have been obtained by a number of different people using several different methods (e.g., Tobisch et al, 1977, 2000; Longiaru, 1987; Paterson et al., 1989, 1998, 2014; Albertz, 2006; Horseman et al., 2008). Here we briefly summarize these methods. A great majority of the strains were determined from clastic objects that can be approximated by ellipsoidal shapes (e.g., pebbles in conglomerates, lithic fragments in volcanics, sand grains in sandstones). These were analyzed using one of the following two approaches:

1. When logistically feasible, oriented samples with clastic objects were collected and brought back to the lab. Three perpendicular surfaces either parallel to principal planes (Tobisch et al, 1977) or arbitrary (Paterson et al., 1989) were cut in each sample and then labeled with sample coordinate axes. In each 2D surface the orientation of the long axis of clasts relative to the sample coordinates axes and the long axis/short axis ratio of least ~25-50 objects per surface were measured (by hand in older studies and digitally from images of the surface in recent studies). Rf/f techniques (e.g., Shimamoto and Ikeda 1976; Lisle 1979, 1985; Miller and Oertel, 1979; Ramsay et al., 1983) were used to determine the shape and orientation of 2D ellipses for each surface and then combined into a single 3D ellipsoid using the techniques of both Shimamoto and Ikeda (1976) and Miller and Oertel (1979). The calculated orientations of the 3D ellipsoids are relative to the sample coordinate axes: thus these orientations were reoriented to true geographic orientations using the sample orientation data. Given sufficient sample sizes, precision errors are in the range of 5-10% (see Miller and Oertel, 1979 for error estimates).

2. When not feasible to collect oriented samples, field measurements of clastic objects were obtained on principal planes, typically defined by tectonic cleavage and mineral or clast lineations. On these surfaces axial ratios and orientations of clastic objects were collected and then averaged. Since each two surfaces share one axis of strain, a 3D ellipsoid ($X \geq Y \geq Z$) can be determined by setting $Z = 1$ and determining the ratios Y and Z from the 2D averages (Ramsay, 1967; Lisle, 1977; Paterson, 1983). Strain ellipsoid orientations are assumed to be parallel to the cleavage (= XY plane of strain) and mineral or clast lineation (= X axis of strain). Precision errors using this approach were in the range of 10-20%.

The above Rf/f approaches assume constant volume strain at the scale of individual clasts. In most cases we see little evidence, at the clast scale, of large volume changes (e.g., fibers in pressure shadows or dissolution of clasts), thus supporting the above assumption. These Rf/f approaches also ignore the existence of any primary fabrics in samples, which may be present if clasts were even weakly aligned during deposition and burial. Lisle (1979), Paterson et al. (1989) and Paterson and Yu (1993) discuss approaches for correcting final strains for the presence of primary fabrics. But since these corrections are only available for some of the data discussed in this paper, we only use and compare uncorrected data. Finally Rf/f techniques assume that there is no difference in the viscosity of clasts and matrix (i.e., they are passive markers) and thus clast strain equals bulk strain of the rock. Any affect of viscosity differences decrease as the percent of clasts in samples increase and as the sample becomes clast supported (i.e., at around >50% clasts). The existence of viscosity contrasts can be evaluated by examining whether the cleavage in the rock is deflected around clasts or passes undeflected through them. Most samples in this study show little evidence of significant viscosity contrasts. Rf/f results from the central Sierra Nevada are presented in references listed below under "references of data sources".

Strains in slate and phyllite samples from the Western Metamorphic Belt were determined by Paterson et al. (1889) using the March method (March, 1932; Oertel, 1983). Details of the full procedure, assumptions, and data interpretation are presented by Oertel (1983) and Paterson et al. (1995). Precision errors are in the range of 5-10%. These samples do record significantly different strains than nearby (at cm to m scale) samples measured by Rf/f techniques and are interpreted to include a significant component of flattening strain formed during burial and dewatering (Oertel, 1983; Paterson et al., 1989, Paterson et al., 1995). Results from the Western Metamorphic Belt are presented by Paterson et al. (1989) and Paterson et al. (1995).

A few of the synthesized strains were determined using the Fry method (Crespi 1986, Erslav, 1988). In this method 3 perpendicular cuts are made in oriented samples and for each face the distance and direction between centers of objects are measured and used to construct an "all-objects-separation plot. The inner cut-off of plotted points is used to determine the ratio and orientation of 2D ellipses. These ellipses are combined into a 3D ellipsoid using both Shimamoto and Ikeda (1976) and Miller and Oertel (1979) techniques. Precision errors for Fry data are in the range of 5-20% depending on the number of objects used (see Crespi, 1986 for error estimates).

References for Strain Methods

Crespi, J. M., 1986, Some guidelines for the practical application of Fry's method of strain analysis: Journal of Structural Geology, v. 8, p. 799-808.

Erslav. E. A., 1988, Normalized center-to-center strain analysis of packed aggregates: Journal of Structural Geology, v. 10, p.201-210.

Lisle, R. J., 1977, Estimation of the tectonic strain ratio from the mean shape of deformed elliptical markers: Geologie en Mijnbouw, v. 56, p. 140-144.

Lisle, R. J., 1979. Strain analysis using deformed pebbles: The influence of initial pebble shape, Tectonophysics, v.60, p.263-277.

Lisle, R. J., 1985, Geological strain analysis: a manual for the Rf/f technique. Pergamon Press, 99 pg.

March, A., 1932, Mathematische Theorie der Regelung nach der Korngestalt bei affiner Deformation: Z. Kristallogr, v. 81, p. 285-297.

Miller, D. M., & Oertel, G., 1979, Strain determination from the measurement of pebble shapes: a modification: Tectonophysics, v. 55, T11-T13.

Oertel, G., 1983. The relationship of strain and preferred orientation of phyllosilicate grains in rocks: a review: Tectonophysics, v. 100, p. 413-447.

Paterson, S.R., 1983, A comparison of methods used in measuring finite strains from ellipsoidal objects: Journal of Structural Geology, v. 5, p. 611-618.

Paterson, S.R., Yu, H. 1993, Microstructures and primary grain-shape fabrics in sandstones: implications for depositional processes and strain analyses: Journal of Structural Geology, v. 16, p. 505-517.

Ramsay, J. G., 1967, Folding and fracturing of rocks. International series in the Earth and Planetary Sciences, McGraw-Hill, 568 pg.

Ramsay, J.G., Huber, M.I., and Lisle, R.J., 1983, The Techniques of Modern Structural Geology, Vol. 1. London: Academic, 1983. Print.

Shimamoto, T., & Ikeda, Y., 1976, A simple algebraic method for strain estimation from deformed ellipsoidal objects. 1, basic theory: Tectonophysics, v. 36, p.315-337.

Tobisch, O. T., Fiske, R. S., Sacks, S., and Taniguchi, D., 1977, Strain in metamorphosed volcaniclastic rocks and its bearing on the evolution of orogenic belts: Geological Society of America Bulletin, v. 88, p. 23-40.

References of data sources

Albertz, M., 2006, Relationships between melt-induced rheological transitions and finite strain: Observations from host rock pendants of the Tuolumne Intrusive Suite, Sierra Nevada, California: Journal of Structural Geology, v. 28, p. 1422-1444.

Albertz, M., Paterson, S.R., and Okaya, D., 2005, Fast strain rates during pluton emplacement: Magmatically folded leucocratic dikes in aureoles of the Mount Stuart Batholith,Washington, and the Tuolumne Intrusive Suite, California: Geological Society of America Bulletin, v. 117, p. 450–465.

Horsman, E., Tikoff, B., & Czeck, D., 2008, Rheological implications of heterogeneous deformation at multiple scales in the Late Cretaceous Sierra Nevada, California: Geological Society of America Bulletin, v. 120, p. 238–255.

Longiaru, S., 1987, Tectonic evolution of Oak Creek volcanic roof pendant, eastern Sierra Nevada, California [Ph.D. thesis]: Santa Cruz, University of California, 242 p.

Paterson, S. R., Tobisch, O. T., Bhattacharyya, T., 1989, Regional structural and strain analyses of terranes in the Western Metamorphic belt, central Sierra Nevada, California: Journal of Structural Geology, v. 11, p. 255-273.

Paterson, S.R., and Wainger, L., 1991, The Melones Fault zone: a terrane bounding stretching

fault: Tectonophysics, v. 194, p. 69-90.
Paterson, S.R., Tobisch, O.T., and Vernon, R.H., 1991, Emplacement and deformation of granitoids during volcanic arc construction in the Foothills terrane, central Sierra Nevada, California: Tectonophysics, v. 191, p. 89-110.
Paterson, S.R., Memeti, V., Anderson, L., Wenrong Cao, Lackey, J.S., Putirka, K.D., Miller, R.B., Miller, J.S., and Mundil, R., 2014, Day 6: Overview of arc processes and tempos, in Memeti, V., Paterson, S.R., and Putirka, K.D., eds., Formation of the Sierra Nevada Batholith: Magmatic and Tectonic Processes and Their Tempos: Geological Society of America Field Guide 34, p. 87–116.
Paterson, S.R., Yu, H., and Oertel, G., 1995, Primary and tectonic fabric intensities in mudrocks: Tectonophysics, v. 247, p. 105-119.
Tobisch, O. T., Fiske, R. S., Sacks, S., and Taniguchi, D., 1977, Strain in metamorphosed volcaniclastic rocks and its bearing on the evolution of orogenic belts: Geological Society of America Bulletin, v. 88, p. 23-40.
Tobisch, O. T., Saleeby, J. B., and Fiske, R. S., 1986, Structural history of continental volcanic arc rocks, eastern Sierra Nevada, California: A case for extensional tectonics: Tectonics, v. 5, p. 65–94.
Tobisch, O.T., Paterson, S.R., Longiaru, S., Bhattacharyya, T., 1987, Extent of the Nevadan orogeny, central Sierra Nevada, California: Geology, v. 15, p. 132-135.
Tobisch, O.T., Fiske, R.S., Saleeby, J.B., Holt, E., and Sorensen, S.S., 2000, Steep tilting of metavolcanic rocks by multiple mechanisms, central Sierra Nevada, California: Geological Society of America Bulletin, v. 112, p. 1043-1058.