ANALYTICAL METHODS

Zircon for U-Pb analysis were prepared as mineral separates mounted in epoxy and polished down to expose the grain centres. Cathodoluminescence (CL) images were carried out at the Electron Microscope Unit, The Australian National University with a HITACHI S2250-N scanning electron microscope working at 15 kV, ~60 µA and ~20 mm working distance.

U-Th-Pb analyses were performed using the sensitive, high-resolution ion microprobe (SHRIMP II) at the Research School of Earth Sciences. Instrumental conditions and data acquisition were generally as described by Williams (1998). The data were collected in sets of six scans throughout the masses. The measured $^{206}Pb/^{238}U$ ratio was corrected using reference zircon (417 Ma, Black et al. 2003), whereas the U content of the target was referred to SL13 zircon of know composition. Measured isotopic ratios were corrected for common Pb on the basis of the measured $^{207}Pb/^{206}Pb$ as described in Williams (1998). Age calculation was done using the software Isoplot/Ex (Ludwig 2003) and assuming the common Pb composition predicted by Stacey and Kramers (1975).

In the gneiss sample EL0802 several zircons contain extreme amounts of U. For such analyses, a U correction was applied to measured ratios according to the observation of Butera et al. (2004) and Hermann et al. (2006). The correction amounts to a decrease in 3% for each 1000 ppm of U above 2500 ppm. All tabled and plotted ratios represent corrected values.

Trace element analyses of zircon were performed on the grain mount with a Laser Ablation – ICP-MS at the Research School of Earth Sciences, Canberra, using a pulsed 193 nm ArF Excimer laser with 100 mJ energy at a repetition rate of 5 Hz (Eggins et al. 1998) coupled to an Agilent 7500 quadrupole ICP-MS. External calibration was performed relative to NIST 612 glass and internal standardisation was based on stoichiometry silica. Accuracy of the analyses was evaluated with a BCR-2G secondary glass standard and is always better than 15%. During the time-resolved analysis of minerals, contamination resulting from inclusions, fractures and zones of different composition was monitored by several elements and only the relevant part of the signal was integrated.

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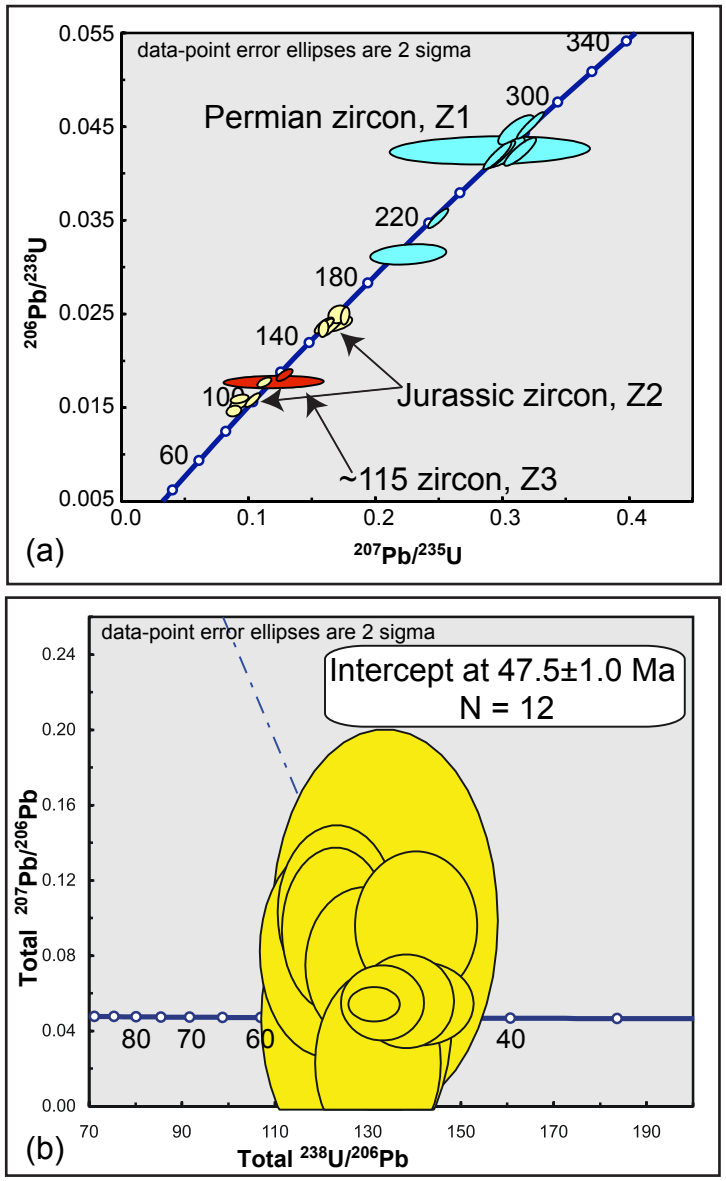
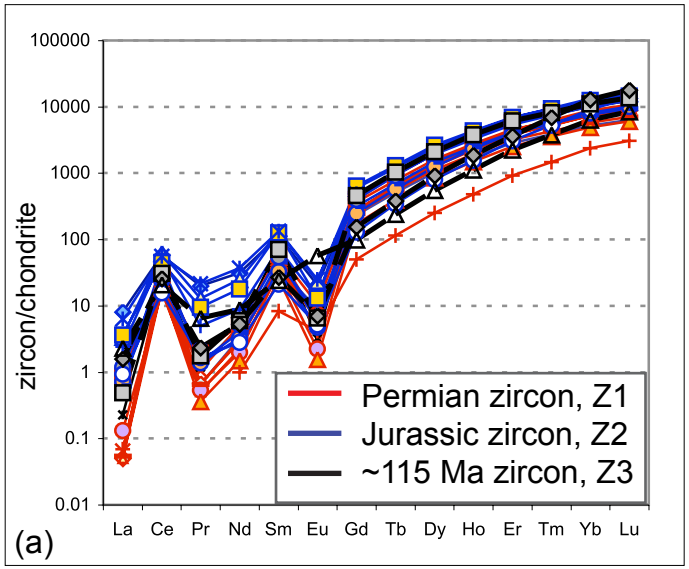

data-point error ellipses are 2 sigma
Permian zircon, Z1
Jurassic zircon, Z2
~115 zircon, Z3
340
300
220
180
140
100
60
0.055
0.045
0.035
0.025
0.015
0.005
0.0
0.1
0.2
0.3
0.4
$^{206}Pb/^{238}U$
$^{207}Pb/^{235}U$
(a)
data-point error ellipses are 2 sigma
Intercept at 47.5±1.0 Ma
N = 12
80
70
60
40
0.24
0.20
0.16
0.12
0.08
0.04
0.00
70
90
110
130
150
170
190
Total $^{207}Pb/^{206}Pb$
Total $^{238}U/^{206}Pb$
(b)


100000
10000
1000
100
10
1
0.1
0.01
zircon/chondrite
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Permian zircon, Z1
Jurassic zircon, Z2
~115 Ma zircon, Z3
(a)

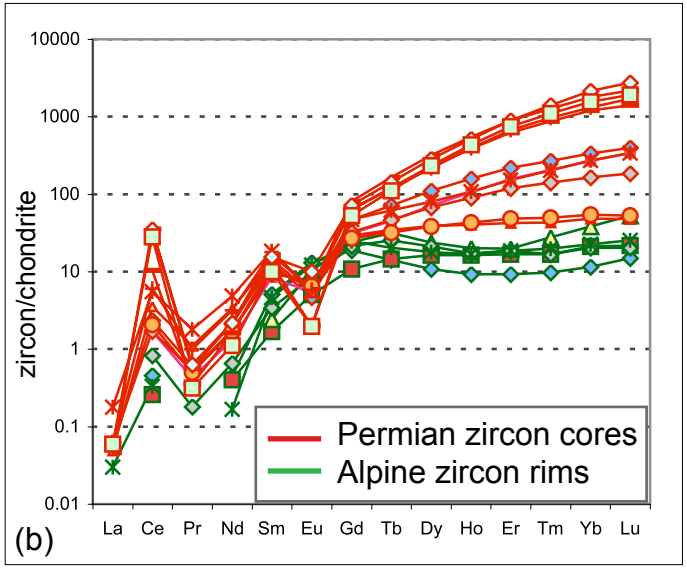

10000
1000
100
10
1
0.1
0.01
zircon/chondrite
La Ce Pr Nd Sm Eu Gd Tb Dy Ho Er Tm Yb Lu
Permian zircon cores
Alpine zircon rims
(b)

Table DR1. SHRIMP U-Pb analyses.

Label	U (ppm)	Th (ppm)	Th/U	%Pb com	$^{206}Pb/^{238}U$ Age (Ma)	err 1 sigma	$^{206}Pb/^{238}U$	1 sigma %	$^{207}Pb/^{235}U$	1 sigma %	err□corr
GNEISS											
Z3, fracture and rims											
EL0802-2.1	5017	175	0.03	4.88	114.8	2.0	0.01798	1.5	0.1191	13.6	0.108
EL0802-1.2	3856	230	0.06	1.84	119.4	1.7	0.01871	1.4	0.1276	2.0	0.691
EL0802-1.1	4430	246	0.06	10.78	120.2	4.1	0.01883	2.0	0.1006	10.0	1.000
Z2, Jurassic											
EL0802-45A	6861	2933	0.43	1.03	95.1	1.5	0.01487	1.6	0.0878	2.6	0.175
EL0802-27.1	7148	3184	0.45	0.31	100.5	2.1	0.01573	1.8	0.0920	3.2	0.563
EL0802-27.1	5493	1837	0.33	0.45	102.4	2.0	0.01602	1.8	0.1025	2.3	0.789
EL0802-44	6224	2874	0.46	0.48	103.4	1.4	0.01618	1.2	0.0923	3.2	0.369
EL0802-38	4945	1796	0.36	0.39	114.5	1.4	0.01793	1.2	0.1116	2.1	0.569
EL0802-40A	4725	1322	0.28	0.34	150.3	2.3	0.02361	1.5	0.1585	1.0	0.211
EL0802-15.2	3697	1687	0.46	0.55	152.7	2.2	0.02397	1.4	0.1590	1.9	0.756
EL0802-40	4251	1194	0.28	0.33	152.9	1.8	0.02401	1.2	0.1609	1.5	0.773
EL0802-26.1	5191	2056	0.40	0.23	153.0	3.2	0.02404	1.9	0.1678	2.1	0.940
EL0802-17.1	3630	148	0.04	2.81	153.7	2.2	0.02414	1.4	0.1696	2.8	0.495
EL0802-47A	5523	808	0.15	0.20	158.7	2.4	0.02496	1.5	0.1755	0.8	0.273
EL0802-53A	4561	1137	0.25	0.80	159.9	2.5	0.02514	1.6	0.1702	1.9	0.192
EL0802-25.1	3409	1086	0.32	0.57	166.3	2.4	0.02614	1.4	0.1772	2.0	0.696
Z1, Permian											
EL0802-41	4255	1556	0.37	0.66	199.7	3.0	0.03149	1.4	0.2258	5.5	0.251
EL0802-31	3867	1367	0.35	0.26	223.4	2.7	0.03529	1.2	0.2488	1.4	0.878
EL0802-36	3743	1393	0.37	0.06	253.4	3.3	0.04012	1.3	0.2816	1.4	0.921
EL0802-12.2	2833	844	0.30	0.29	265.0	3.7	0.04198	1.4	0.2958	1.5	0.905
EL0802-5.1	3133	808	0.26	0.17	265.5	3.7	0.04206	1.4	0.2986	1.5	0.915
EL0802-22.1	1766	512	0.29	0.30	267.4	3.9	0.04236	1.5	0.3041	1.8	0.817
EL0802-19.1	2182	927	0.42	0.03	267.5	3.8	0.04237	1.4	0.3138	1.6	0.868
EL0802-2.2	1043	254	0.24	4.24	268.5	4.1	0.04253	1.4	0.2894	11.2	0.127
EL0802-1.3	1570	546	0.35	0.26	281.9	4.0	0.04470	1.4	0.3109	1.9	0.751
EL0802-30	3343	978	0.29	0.00	284.5	3.6	0.04515	1.3	0.3220	1.3	0.931

Label	U (ppm)	Th (ppm)	Th/U	%Pb com	$^{206}Pb/^{238}U$ Age (Ma)	err 1 sigma	$^{206}Pb/^{238}U$	1 sigma %	Total $^{238}U/^{206}Pb$	1 sigma %	Total $^{207}Pb/^{206}Pb$	1 sigma %
ECLOGITE												
Unzoned rims												
EL0807-30	13	0.0	0.004	6.31	42.8	1.9	0.00666	4.5	140.58	3.8	0.0968	17
EL0807-21	4	0.1	0.026	6.67	44.8	4.2	0.00697	9.4	133.85	7.5	0.0997	41
EL0807-22.1	20	0.9	0.046	1.12	44.9	1.5	0.00698	3.5	141.61	3.3	0.0558	16
EL0807-20.2	22	0.1	0.006	1.26	45.8	1.5	0.00714	3.3	138.39	3.0	0.0569	18
EL0807-20.1	32	0.1	0.002	1.16	47.7	1.4	0.00742	2.9	133.16	2.8	0.0561	14
EL0807-31	11	0.1	0.008	3.68	47.8	2.2	0.00745	4.6	129.29	4.0	0.0761	22
EL0807-28	10	0.0	0.003	7.20	48.3	2.4	0.00752	5.0	123.35	4.2	0.1040	18
EL0807-23	108	0.2	0.002	1.06	48.3	0.9	0.00752	1.8	131.48	1.7	0.0554	7
EL0807-27	16	1.2	0.080	6.02	49.0	2.3	0.00763	4.6	123.13	3.9	0.0947	19
EL0807-25.2	11	0.0	0.001	0.00	49.9	2.4	0.00778	4.9	132.22	4.2	0.0246	82
EL0807-26	5	0.0	0.004	0.09	50.2	3.9	0.00783	7.8	127.68	6.6	0.0477	70
EL0807-22	7	0.1	0.018	4.61	50.4	3.0	0.00785	5.9	121.49	5.0	0.0836	27
Magmatic cores												
EL0807-25.1	56	13	0.23	0.09	253.2	3.8	0.04006	1.5	24.94	1.5	0.0520	4
EL0807-24	227	68	0.31	0.00	263.9	3.5	0.04178	1.4	23.94	1.4	0.0513	2

%Pb com = percent of common Pb

Table DR2. LA-ICPMS analyses. Element abundances are in ppm.

Gneiss EL0802

	Zir2R	Zir1R	Zir1	Zir44	Zir45	Zir53	Zir40	Zir15	Zir26	Zir27	Zir25	Zir47	Zir41	Zir36	Zir 30	Zir31	Zir22	Zir19	Zir5	Zir12	Zir2C	Zir1C
SHRIMP Age (Ma)	115	119	120	104	96	160	152	153	153	103	166	158	199	254	285	223	267	267	266	265	270	282
P	608	1071	1825	3503	1614	1125	1382	866	1299	1246	2438	858	1035	549	1333	2116	1554	1294	1976	602	197	647
Ti	--	17.7	3.9	8.7	10.8	21.5	15.3	18.0	6.3	6.6	7.1	6.2	10.8	2.6	1.2	9.7	1.8	1.7	1.6	1.4	10.6	2.7
Sr	23.9	12.4	2.97	20.6	6.98	14.1	7.39	3.70	2.49	9.32	3.82	5.33	1.91	0.71	0.88	6.20	0.91	1.00	1.28	0.69	0.48	0.90
Y	2058	3200	6150	6040	7040	3969	6300	4124	7186	5438	5890	2840	5831	2933	3973	5918	3795	4526	4421	2523	887	3195
Nb	66.9	75.7	39.2	82.1	159.3	75.4	97.1	54.3	40.5	94.1	41.6	67.0	29.0	22.6	23.4	50.2	21.6	18.0	32.1	36.8	7.82	33.2
La	0.55	0.38	0.12	1.91	0.79	0.17	0.57	0.15	0.87	1.51	0.28	0.22	0.05	<0.01	0.01	0.21	0.01	0.02	0.03	<0.01	0.02	0.01
Ce	12.8	15.8	19.1	35.7	37.7	14.9	32.3	26.8	27.8	34.0	15.8	9.7	18.7	17.9	13.8	18.9	11.0	15.2	9.9	11.6	11.2	20.4
Pr	0.61	0.22	0.16	1.85	1.19	0.13	0.47	0.13	0.89	1.99	0.20	0.15	0.11	0.06	0.06	0.18	0.05	0.10	0.05	0.03	bdl	0.06
Nd	4.07	2.43	2.73	14.40	11.51	1.50	4.06	1.83	8.23	16.81	2.39	1.29	2.17	1.49	1.33	2.31	1.01	2.32	0.90	0.69	0.46	1.40
Sm	3.57	4.01	10.51	16.73	19.28	4.86	10.66	6.74	18.70	19.70	8.07	3.15	11.92	5.58	6.11	8.71	4.72	8.85	4.92	3.74	1.23	5.22
Eu	3.21	0.40	0.37	1.15	1.32	0.27	0.73	0.43	0.74	1.40	0.31	0.29	0.18	0.50	0.33	0.35	0.26	0.60	0.13	0.09	0.24	0.39
Gd	19.6	30.8	91.8	97.5	118	49.3	91.0	62.8	128	97.4	79.6	25.8	93.5	46.1	55.0	80.2	48.6	73.5	53.9	34.3	10.0	49.5
Tb	8.61	13.9	37.5	36.4	43.8	20.9	36.4	25.1	46.8	34.7	33.1	12.4	38.6	18.3	22.9	33.5	20.7	28.3	23.6	14.3	4.17	19.8
Dy	136	226	520	488	598	307	517	359	648	470	489	196	539	253	328	482	309	394	358	209	62	277
Ho	60.7	101	206	191	231	127	203	137	237	178	193	85	197	95	128	190	123	151	144	81	26	106
Er	361	582	982	906	1100	635	992	657	1113	865	944	493	917	456	623	926	610	724	710	406	148	512
Tm	93.4	171	201	195	234	138	211	138	230	183	201	130	188	95	130	195	130	149	155	88	36	106
Yb	1018	2056	1775	1776	2148	1296	1924	1223	2005	1623	1769	1455	1627	839	1193	1798	1185	1347	1417	791	385	930
Lu	207	439	334	330	389	248	352	230	356	302	326	333	302	156	216	335	221	244	263	150	76	173
Hf	13781	33964	10834	10546	11803	10803	11977	10863	11444	10782	10243	27680	14021	9697	10353	9933	10591	10486	12774	10566	11562	10321
Ta	50.1	500	16.9	17.9	33.2	21.8	18.9	14.2	9.02	21.3	10.1	205	13.4	6.78	6.64	11.5	6.30	5.23	14.1	11.7	4.6	9.8
Th	556	342	1324	1839	3713	1128	2544	1760	1522	1735	1261	348	1090	581	635	1323	579	765	708	464	259	1054
U	4311	4717	3494	4814	7401	3975	5355	3746	3726	4734	3887	4362	3065	1508	2036	4026	1972	2131	2998	1867	962	2382
Th/U	0.13	0.07	0.38	0.38	0.50	0.28	0.48	0.47	0.41	0.37	0.32	0.08	0.36	0.38	0.31	0.33	0.29	0.36	0.24	0.25	0.27	0.44
Eu/Eu*	0.93	0.08	0.02	0.07	0.07	0.03	0.05	0.04	0.03	0.08	0.02	0.07	0.01	0.07	0.04	0.03	0.03	0.05	0.01	0.02	0.14	0.05
Lu_N/Gd_N	86	115	29	27	27	41	31	30	23	25	33	105	26	27	32	34	37	27	39	35	62	28

Eclogite EL0807

Zir23	Zir30	Zir29	Zir28	Zir20	Zir25C	Zir22C	Zir35C	Zir36C	Zir32C	Zir44C	Zir32C1	Zir4C	Zir8C	Zir1C	Zir9C
48	43	43	48	48	253	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
30.5	24.8	31.4	46.8	539	252	164	171	235	245	190	377	334	180	253	299
5.40	10.0	8.23	3.66	1.80	42.7	23.4	24.8	41.0	25.8	48.1	19.9	5.37	6.87	7.85	10.2
0.20	0.23	0.22	0.17	1.05	0.19	0.22	0.21	0.20	0.51	0.21	0.32	0.37	0.24	0.33	0.31
17.4	30.1	34.0	30.3	30.6	260	173	63.5	148	178	70	633	933	644	901	722
0.25	0.26	0.21	0.39	0.23	0.73	0.54	0.89	0.68	1.31	1.04	5.16	4.32	1.87	2.94	2.96
<0.005	<0.005	<0.005	<0.005	0.007	0.013	<0.005	0.012	0.015	0.042	<0.005	0.015	0.011	<0.005	<0.005	0.014
0.28	0.16	bdl	0.51	0.20	1.44	1.05	2.18	1.04	3.37	1.27	3.73	21.84	6.37	21.39	17.22
<0.006	<0.006	<0.006	0.02	<0.006	0.06	0.04	0.10	0.05	0.17	0.05	0.09	0.05	0.03	0.06	0.03
0.20	0.18	bdl	0.30	0.08	0.96	0.60	1.52	0.81	2.21	0.77	1.45	0.99	0.74	0.99	0.51
0.76	0.25	0.36	0.51	0.68	1.95	1.25	2.10	1.39	2.71	1.56	2.64	2.45	1.84	2.29	1.48
0.74	0.28	0.58	0.47	0.68	0.26	0.30	0.30	0.43	0.32	0.37	0.33	0.33	0.11	0.56	0.11
3.76	2.14	4.80	4.27	4.89	9.24	6.21	5.79	6.44	9.36	5.37	12.7	16.2	12.6	14.3	10.5
0.51	0.52	1.14	0.92	0.74	2.57	1.64	1.24	1.67	2.24	1.16	4.26	5.92	4.36	5.14	3.97
2.64	4.02	5.81	5.18	4.39	27.1	17.6	9.58	16.6	19.8	9.44	52.9	78.5	56.6	69.5	57.3
0.51	0.89	1.10	0.94	0.92	8.61	5.77	2.20	4.91	5.88	2.34	21.5	30.0	21.0	27.9	23.7
1.48	2.70	3.18	2.98	2.98	34.9	24.9	6.8	19.1	24.4	7.7	107	144	99.9	143	119
0.24	0.42	0.68	0.41	0.49	6.66	5.05	1.06	3.49	4.99	1.23	23.8	31.2	21.5	34.5	27.0
1.87	3.42	6.18	3.27	3.65	54.2	43.5	7.7	26.6	44.1	8.78	213	288	193	346	252
0.37	0.53	1.30	0.50	0.62	9.77	8.40	1.18	4.56	8.35	1.30	41.8	53.8	34.7	67.5	47.1
12276	13717	12896	11884	12916	9571	9592	11713	8237	12568	9496	11208	11015	9623	10253	11048
0.10	0.10	0.05	0.26	0.11	0.36	0.27	0.52	0.30	1.01	0.48	2.32	2.42	1.01	1.46	1.48
0.18	0.07	0.14	5.46	0.07	18.7	11.5	15.5	4.6	138	62.7	99	159	69	166	120
63.2	5.99	11.4	33.3	68.2	77.5	48.5	48.3	23.8	310	199	383	383	231	244	174
0.00	0.01	0.01	0.16	0.00	0.24	0.24	0.32	0.19	0.45	0.32	0.26	0.42	0.30	0.68	0.69
1.09	0.81	0.77	0.67	0.83	0.16	0.27	0.25	0.36	0.17	0.35	0.14	0.12	0.05	0.23	0.06
1	2	2	1	1	9	11	2	6	7	2	27	27	22	38	36