

Appendix A. Whole rock and zircon geochemistry for granites from the Palms pluton

Table A1. Whole rock major oxide analyses of granites in wt. %.

Sample ID	Data Source	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Total
J11	Brand	72.45	0.3	15.21	1.49	0.04	0.55	1.88	3.68	4.49		100.09
J16	Brand	72.5	0.26	14.51	1.3	0.03	0.37	1.38	3.38	5.3		99.03
J87	Brand	73.46	0.18	14.5	1.11	0.03	0.32	1.45	3.54	5.09		99.68
J88	Brand	72.45	0.26	14.32	1.33	0.025	0.38	1.34	3.51	5.13		98.75
J6	Brand	75.79	0.1	13.2	0.63	0.05	0.17	1.03	3.67	4.62		99.26
J12	Brand	75.14	0.08	13.76	0.6	0.04	0.15	0.96	3.61	4.91		99.25
J50	Brand	74.6	0.15	14.05	1.02	0.05	0.27	1.27	3.54	4.77		99.72
04-561	Wooden and Barth	72.3	0.21	14.16	1.33	0.061	0.42	1.77	3.46	4.08	0.07	97.86
JW-341	Wooden and Barth	70.68	0.21	14.56	1.21	0.032	0.31	1.49	3.57	4.85	0.06	96.97
JW93-224	Wooden and Barth	73.13	0.21	14.61	1.22	0.094	0.47	1.87	3.76	3.89	0.09	99.34
JW93-223	Wooden and Barth	73.03	0.13	14.06	0.87	0.05	0.17	1.05	3.41	5.24	0.03	98.04
JW93-221	Wooden and Barth	70.52	0.33	15.98	1.93	0.039	0.55	2.94	3.99	2.88	0.09	99.25
03-501	Wooden and Barth	73.82	0.19	14.16	1.12	0.03	0.25	1.27	3.19	5.08	0.06	99.17
03-515	Wooden and Barth	74.08	0.12	14.5	0.97	0.076	0.19	1.93	3.44	4.11	0.05	99.47
03-516	Wooden and Barth	73.36	0.07	12.63	0.39	0.029	0.02	0.77	3.19	4.79	0.01	95.26
JR08-32	Roell	71.06	0.38	15.11	2.26	0.04	0.59	2.23	3.72	3.97	0.14	99.5
JR08-34	Roell	75.07	0.14	13.72	1.05	0.02	0.14	0.97	3.37	5.11	0.04	99.63
JR08-35	Roell	72.88	0.24	14.54	1.69	0.03	0.34	1.32	3.41	5.04	0.07	99.56

Table A1 continued.

Sample ID	Data Source	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	Total
JR08-36A	Roell	71.3	0.25	14.5	1.7	0.03	0.39	1.37	3.51	5.03	0.07	98.15
JR08-37	Roell	72.38	0.24	14.6	1.6	0.02	0.33	1.41	3.25	5.4	0.07	99.3
JR08-38	Roell	70.84	0.36	15.01	2.36	0.04	0.6	2.13	3.55	4.14	0.12	99.15
JR08-39	Roell	68.76	0.55	15.77	2.96	0.05	0.96	2.49	3.84	3.78	0.2	99.36
JR08-40	Roell	74.18	0.16	14.22	1.43	0.03	0.28	1.66	3.5	4.21	0.05	99.72
JR08-41	Roell	73.37	0.2	14.6	1.42	0.03	0.31	1.6	3.65	4.2	0.06	99.44
JR08-42	Roell	72.78	0.22	14.74	1.93	0.04	0.49	2.36	3.85	2.99	0.08	99.48
JR08-43A	Roell	73.8	0.16	14.26	1.64	0.04	0.33	1.69	3.5	4.03	0.06	99.51
JR08-44	Roell	70.01	0.32	15.96	2.36	0.04	0.59	3.04	4.26	2.5	0.1	99.18
JR08-46	Roell	67.96	0.6	16.03	3.12	0.04	0.9	2.68	3.89	4.01	0.19	99.42

Table A2. Whole rock trace element analyses of granites in ppm.

Sample ID	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	Ga	Pb	Th	Hf	U
J11	5.4	0.4			209	303	15.7	151	19.9	730	18.2	27.3	20.2	4.4	3.9
J16					251	262				930					
J87					217	232				872					
J88	5.6	1.6			227	247	13.1	168	27.7	711	19.8	31.2	29.9	4.5	2.9
J6	5.1	0.0			212	110	28.7	56.0	21.4	144	14.1	30.5	14.8	2.0	6.8
J12	5.8	2.5			228	114	32.4	54.4	24.3	252	15.1	35.6	13.5	1.9	7.0
J50	5.4	0.3			199	188	22.7	81.7	29.1	461	15.2	32.0	14.4	2.6	4.3
04-561					171	269	42	114	15	752					
JW-341					219	258	40	151	13	766					
JW93-224					179	244	41	109	14	642					
JW93-223					239	138	56	81	19	376					
JW93-221					91	684	20	220	9	1210					
03-501					244	199	43	147	14	674					
03-515					91	631	25	76	5	745		40	2.73	3	1.6
03-516					196	77	37	30	9	114		40	26.8	1.6	2.27
JR08-32	Bd	Bd	35	60	163	429	Bd	219	Bd	997					
JR08-34	Bd	Bd	30	18	215	122	31	112	24	333					
JR08-35	Bd	Bd	30	38	245	229	Bd	207	Bd	916					
JR08-36A	Bd	Bd	27	45	243	225	Bd	197	18	827					
JR08-37	Bd	Bd	39	36	282	243	Bd	188	Bd	900					

Table A2 continued.

Sample ID	Cr	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	Ga	Pb	Th	Hf	U
JR08-38	Bd	Bd	27	56	178	416	12	189	Bd	1136					
JR08-39	122	Bd	33	73	216	473	17	293	19	1331					
JR08-40	Bd	Bd	27	35	176	341	25	142	Bd	787					
JR08-41	Bd	Bd	31	35	166	294	16	137	Bd	787					
JR08-42	Bd	Bd	31	41	139	401	10	157	Bd	1051					
JR08- 43A	Bd	Bd	27	35	127	353	17	153	Bd	1187					
JR08-44	Bd	Bd	29	62	105	662	Bd	231	Bd	983					
JR08-46	Bd	Bd	67	106	174	601	Bd	281	Bd	1491					

Table A3. SHRIMP U-Pb zircon data for Palms intrusive suite.

	238U/206Pb	Error	207Pb/206Pb	Error	206Pb*/238U age (Ma)	Error (Ma)	207Pb*/206Pb* age (Ma)	Error (Ma)
Granite of west entrance station	Needy et al., 2009							
JW221-1	3.16	0.5	0.1081	0.7	1775.3	9.3	1762.0	12.4
JW221-2	24.85	0.6	0.0540	2.0	253.5	1.5		
JW221-3	81.40	0.5	0.0469	2.2	78.8	0.4		
JW221-4	78.36	0.7	0.0489	3.0	81.6	0.6		
JW221-5	79.58	0.6	0.0478	2.3	80.5	0.5		
JW221-6	83.55	1.2	0.0511	4.8	76.4	0.9		
JW221-7	81.70	1.0	0.0457	4.2	78.6	0.8		
JW221-8	3.56	0.4	0.0991	3.3	1596.7	8.2	1604.8	61.7
JW221-9	81.42	0.7	0.0484	2.7	78.6	0.5		
JW221-10	83.14	1.2	0.0479	5.0	77.0	1.0		
JW221-12.1	3.39	0.7	0.1054	1.1	1662.0	12.1	1682.3	26.7
JW221-13.1	82.20	0.8	0.0503	2.5	77.7	0.6		
JW221-14.1	28.20	1.2	0.0505	3.3	224.6	2.7		
JW221-15.1	3.39	0.4	0.1072	0.5	1656.8	6.1	1753.0	9.3
JW221-16.1	89.45	3.6	0.0573	11.2	70.8	2.6		
JW221-17.1	4.13	0.6	0.0874	1.1	1399.9	8.6	1356.6	22.6
JW221-18.1	3.35	0.6	0.1054	0.8	1681.1	9.3	1715.4	15.6
JW221-19.1	3.26	0.6	0.1072	0.9	1724.1	9.8	1747.6	16.4
JW221-20.1	65.95	1.0	0.0468	3.5	97.2	1.0		
JW221-21.1	46.00	1.1	0.0514	3.4	138.2	1.5		

Table A3 continued.

	238U/206Pb	Error	207Pb/206Pb	Error	206Pb*/238U age (Ma)	Error (Ma)	207Pb*/206Pb* age (Ma)	Error (Ma)
JW221-22.1	74.87	1.0	0.0497	3.4	85.3	0.9		
JW221-23.1	81.60	3.5	0.0559	10.6	77.7	2.7		
JW221-24.1	89.25	2.8	0.0589	9.0	70.8	2.1		
JW221-25.1	3.20	0.7	0.1102	0.9	1748.3	11.8	1803.4	16.3
JW221-26.1	3.38	0.3	0.1083	0.5	1658.0	5.2	1770.2	9.0
JW221-27.1	3.25	0.2	0.1030	0.3	1736.7	3.2	1678.1	5.4
JW221-28.1	3.08	0.4	0.1102	3.7	1816.0	10.8	1801.6	67.6
JW221-29.1	23.50	0.7	0.0518	2.2	268.6	2.0	275.8	50.0
JW221-30.1	81.42	1.2	0.0517	3.9	78.3	1.0		
Granodiorite, Indian Cove stream boulder	Needy et al., 2009							
JW222-5	82.81	1.5	0.0522	4.8	76.9	1.2		
JW222-6	82.63	1.4	0.0497	4.2	77.3	1.1		
JW222-7	3.25	0.9	0.1009	1.0	1740.9	14.6	1613.3	22.9
JW222-8	78.50	1.7	0.0517	5.3	81.2	1.4		
JW222-9	80.93	1.8	0.0461	6.0	79.3	1.5		
JW222-10	86.55	2.4	0.0494	7.3	73.9	1.8		
JW222-11	81.36	1.1	0.0483	3.5	78.7	0.9	1165.0	51.0
JW222-12	81.36	2.2	0.0526	7.4	78.2	1.7		
Granite west of Indian Cove	Needy et al., 2009, and this study							
JW224-1	3.40	0.4	0.1037	0.7	1660.1	6.0	1692.6	12.2
JW224-2	80.56	1.6	0.0538	6.2	78.9	1.3		

Table A3 continued.

	238U/206Pb	Error	207Pb/206Pb	Error	206Pb*/238U age (Ma)	Error (Ma)	207Pb*/206Pb* age (Ma)	Error (Ma)
JW224-3	79.29	0.5	0.0465	2.2	80.9	0.4		
JW224-4	79.35	1.1	0.0482	4.5	80.7	0.9		
JW224-5	79.28	0.7	0.0459	2.8	81.0	0.6		
JW224-6	3.02	0.3	0.1081	0.3	1851.2	6.0	1766.7	6.3
JW224-7	79.22	0.6	0.0487	2.4	80.8	0.5		
JW224-8	80.03	1.4	0.0482	5.6	80.0	1.1		
JW224-9	80.11	0.8	0.0494	3.5	79.8	0.7		
JW224-10	3.15	0.3	0.1037	0.3	1784.9	4.9	1690.5	6.1
JW224-11	2.53	0.4	0.1247	0.4	2166.6	8.5	2025.6	7.3
JW224-1.1	3.41	0.4	0.1061	2.2	1650.0	7.5	1725.5	40.3
JW224-2.1	3.11	0.5	0.1081	0.6	1800.9	8.1	1757.9	11.6
JW224-2.2	3.39	0.4	0.1073	1.0	1656.9	7.2	1754.8	17.5
JW224-2.3	3.20	2.2	0.1058	1.0	1755.3	38.5	1704.3	24.5
JW224-3.1	3.91	1.4	0.1018	2.4	1450.2	20.1	1535.4	74.4
JW224-3.2	3.64	0.3	0.0981	0.5	1561.1	4.5	1587.0	9.4
JW224-4.1	3.10	0.4	0.1088	0.6	1807.6	6.9	1778.8	10.6
JW224-5.1	3.19	0.2	0.1068	0.4	1757.4	3.6	1745.7	7.5
JW224-5.2	3.31	0.4	0.1013	0.6	1708.0	6.6	1648.5	11.4
JW224-6.1	3.18	0.4	0.1090	0.6	1762.8	6.8	1781.7	10.7
JW224-7.1	3.51	0.5	0.0978	0.8	1617.3	7.7	1582.2	14.8
JW224-8.1	73.44	1.0	0.0503	3.2	86.9	0.9		
JW224-9.1	3.65	0.4	0.1023	0.6	1551.7	6.0	1665.5	10.4
JW224-10.1	3.11	0.2	0.1081	0.3	1800.8	3.2	1767.1	5.8

Table A3 continued.

	$^{238}\text{U}/^{206}\text{Pb}$	Error	$^{207}\text{Pb}/^{206}\text{Pb}$	Error	$^{206}\text{Pb}^*/^{238}\text{U}$ age (Ma)	Error (Ma)	$^{207}\text{Pb}^*/^{206}\text{Pb}^*$ age (Ma)	Error (Ma)
JW224-11.1	2.76	0.5	0.1262	0.6	1985.3	9.5	2041.0	11.8
JW224-12.1	3.25	0.3	0.1047	0.7	1733.3	4.9	1704.9	13.0
JW224-13.1	3.40	0.3	0.1054	0.4	1657.9	4.5	1721.0	6.9
JW224-14.1	3.30	0.2	0.1036	0.5	1706.2	4.2	1689.0	9.6
JW224-15.1	3.36	0.4	0.1049	0.6	1676.7	6.3	1705.4	12.0
JW224-16.1	3.11	0.4	0.1073	1.3	1803.8	8.1	1751.0	23.4
JW224-17.1	3.33	0.3	0.1028	1.2	1695.5	5.9	1671.4	21.5
JW224-18.1	3.54	0.5	0.1024	0.9	1595.7	7.8	1667.8	16.9
JW224-19.1	3.31	0.2	0.1062	0.3	1696.5	3.0	1733.2	5.1
JW224-20.1	3.50	1.6	0.1091	1.3	1602.7	25.4	1781.0	23.3
Granite of the Palms pluton (Hidden Valley)	Needy et al., 2009, and this study							
561Z-1	83.14	0.7	0.0495	2.5	76.9	0.5		
561Z-2	82.18	1.1	0.0486	4.0	77.9	0.8		
561Z-3	82.13	0.8	0.0467	2.9	78.1	0.6		
561Z-4	93.60	1.1	0.0680	4.8	66.7	0.8		
561Z-5	84.39	0.7	0.0502	2.5	75.7	0.5		
561Z-6	82.34	0.7	0.0529	2.2	77.3	0.6		
561Z-7	82.49	0.5	0.0466	1.8	77.8	0.4		
561Z-8	83.08	0.7	0.0492	2.7	77.0	0.6		
561Z-9	83.34	1.2	0.0533	4.4	76.3	1.0		
561Z-10	82.93	0.7	0.0486	2.5	77.2	0.5		



Table A3 continued.

	238U/206Pb	Error	207Pb/206Pb	Error	206Pb*/238U age (Ma)	Error (Ma)	207Pb*/206Pb* age (Ma)	Error (Ma)
561-11	3.70	0.3	0.1077	0.4	1522.0	4.5	1752.5	8.5
561-12	84.03	1.5	0.0549	4.6	75.6	1.2		
561-13	71.03	0.2	0.0595	1.7	88.8	0.2		
561-14	76.33	0.4	0.0535	1.3	83.3	0.4		
561-15	3.60	0.7	0.1083	1.2	1562.5	10.9	1766.3	22.4
561-16	3.56	0.2	0.1054	0.4	1585.4	3.9	1720.9	7.7
561-17	3.27	0.3	0.1072	0.4	1716.5	5.7	1748.4	6.6
Granite of the Palms pluton (Hall of Horrors)								
	Barth et al., 2004							
JW341-1	84.19	2.4	0.0499	1.2	75.9	1.8		
JW341-2	84.37	2.4	0.0488	2.1	75.8	1.8		
JW341-3	85.32	2.8	0.0540	5.1	74.5	2.1		
JW341-4	83.65	2.5	0.0472	2.9	76.6	1.9		
JW341-5	84.73	2.5	0.0483	2.9	75.6	1.9		
JW341-6	82.38	2.5	0.0525	3.7	77.3	2.0		
JW341-7	86.04	2.4	0.0488	2.5	74.4	1.8		
JW341-8	86.73	2.5	0.0459	3.1	74.1	1.8		

Table A4. SHRIMP-RG trace element zircon chemistry for Palms intrusive suite. Analyses excluded in graphs are in bold.

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
JW221-16.1	69.32	1.10	17.36	217.30	10615.13	0.58	44.88	54.28		
JW221-24.1	71.52	3.56	41.23	274.07	11196.82	0.66	83.86	98.05		
JW221-30.1	73.05	0.87	19.12	388.93	13472.70	0.56	220.87	453.91		
JW221-23.1	78.83	0.92	12.39	156.73	9803.10	0.73	29.12	50.56		
JW221-13.1	81.66	1.86	42.62	732.46	11742.20	0.40	330.39	1075.08		
JW221-22.1	87.49	0.88	13.76	494.88	14145.25	0.23	29.83	507.81		
JW221-20.1	100.81	0.29	15.39	424.76	14148.13	0.19	125.87	501.15		
JW221-21.1	132.43	0.23	14.81	368.16	11297.27	0.07	103.83	313.24		
JW221-14.1	240.93	0.54	12.96	329.15	9835.57	0.52	49.16	212.37		
JW221-29.1	266.73	0.63	25.90	794.29	10931.43	0.39	81.70	373.94		
JW221-17.1	1582.96	0.27	68.27	586.66	10156.85	0.03	78.07	160.16		
JW221-27.1	2003.97	0.06	5.38	598.13	17950.20	0.17	51.09	2270.37		
JW221-18.1	1914.64	0.27	24.46	389.79	11950.47	0.15	90.27	241.52		
JW221-12.1	2131.19	0.40	14.15	198.62	11080.41	0.30	39.65	109.38		
JW221-19.1	1965.96	1.13	59.11	657.20	10835.28	0.23	74.83	189.44		
JW221-15.1	1855.16	0.50	64.96	607.56	11504.27	0.07	301.19	565.50		
JW221-26.1	1794.11	0.66	78.01	649.06	12072.40	0.08	422.09	617.65		
JW221-28.1	2097.82	0.15	27.27	28.69	14785.85	0.06	105.04	527.46		
JW221-25.1	1938.92	0.13	9.23	185.57	11562.21	0.16	60.34	151.73		
561-14	88.32	202.60	1061.08	11812.49	8666.99	0.49	6555.34	6693.93		
561-12	79.67	11.56	64.78	1560.31	13846.38	0.42	227.18	516.27		
561-13	94.03	111.34	755.54	12889.91	13170.31	0.30	8299.71	12420.80		
561-16	1612.44	2.65	35.71	2331.54	20058.53	0.17	173.76	1572.67		

Table A4 continued.

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
561-11	1959.47	5.94	174.73	4654.10	16382.60	0.09	575.14	1417.25		
561-17	1810.47	5.94	231.43	3914.76	12437.34	0.08	335.48	953.64		
561-15	1712.91	2.48	76.77	1702.19	12295.08	0.11	72.88	184.52		
221-11LGC	89.89	0.77	13.75	161.50	10346.08	0.49	49.08	65.51	33.47	6.81
221-6LGOS	92.00	0.24	8.25	209.39	11054.18	0.35	70.08	142.43	45.39	4.15
221-6C	156.43	0.59	14.33	389.98	10791.76	0.45	81.33	97.99	85.51	6.53
221-7MGC	84.84	0.50	10.17	183.03	10082.56	0.48	225.92	247.06	41.91	6.10
221-10LGI	78.70	0.08	6.76	315.97	13772.41	0.14	83.22	511.83	69.34	5.38
221-9OST	83.40	0.17	4.78	284.62	15733.59	0.40	272.24	765.45	75.64	2.23
221-5OST	82.37	0.28	4.79	202.05	12228.35	0.64	214.53	504.05	53.88	2.57
221-1pCC	2127.35	0.19	23.55	294.63	10962.97	0.09	105.48	238.45	56.19	3.29
221-4OST	79.20	0.17	3.71	181.82	13016.16	0.56	77.72	661.60	48.06	2.79
221-3OST	83.47	0.53	17.01	391.84	15890.60	0.36	272.67	974.52	73.48	2.61
221-7OST	72.65	0.60	24.52	549.66	15123.40	0.30	320.72	1149.73	106.41	2.94
221-2DTriC	1489.00	0.11	5.59	402.96	13806.27	0.25	123.53	1227.90	90.94	16.27
<b>221-3MGC</b>	<b>132.88</b>	<b>1.12</b>	<b>22.82</b>	<b>436.50</b>	<b>11256.05</b>	<b>0.47</b>	<b>119.86</b>	<b>112.98</b>	<b>91.34</b>	<b>17.39</b>
JW341-17.3SE	66.36	0.19	12.02	638.39	16551.65	0.19	217.44	2055.59	126.58	1.85
JW341-12.1LGE	74.96	0.16	4.76	221.86	13293.23	0.40	30.60	232.42	49.05	1.93
JW341-23.2LGZ	72.90	0.14	4.91	130.62	12345.59	0.31	83.65	257.80	26.48	2.44
JW341-17.1LGT	80.22	0.15	6.71	263.58	14395.27	0.29	186.56	737.62	53.61	2.83

Table A4 continued.

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
JW341-4.3MGE	69.35	0.30	8.15	237.51	11026.66	0.40	126.78	395.82	48.94	2.92
JW341-23.4DGE	74.37	0.40	22.34	564.03	13784.97	0.23	547.46	1617.37	110.39	3.44
JW341-3.4LGC	93.91	0.21	7.62	206.61	12128.38	0.30	73.58	143.47	41.39	3.46
JW341-9.2DOSE	77.88	0.46	19.58	457.58	13835.73	0.26	660.22	1786.94	89.93	3.78
JW341-7.2WS	74.67	0.78	14.33	225.46	9542.79	0.58	91.92	126.38	45.44	4.75
JW341-3.1BKE	79.05	0.69	28.37	890.38	15179.85	0.26	627.15	2300.76	173.97	5.00
JW341-12.3SWI	54.67	0.54	5.78	89.41	11457.44	0.70	67.94	114.10	17.77	5.04
JW341-3.5MGE	83.19	2.18	46.27	490.00	10493.01	0.42	459.37	541.53	91.18	5.37
JW341-3.3GOS	76.20	0.88	21.92	315.52	10850.72	0.39	306.49	667.73	64.56	5.60
JW341-5.1LGC	88.20	0.43	7.79	56.98	9867.86	0.48	107.68	225.09	11.13	6.19
JW341-8.1C	1471.84	0.61	24.64	45.72	12685.14	0.20	81.19	213.67	7.20	6.67
JW341-15.3DGE	72.92	0.78	28.87	668.92	16496.63	0.26	567.32	2098.23	129.56	6.79
JW341-23.3DGZ	76.88	0.52	25.64	923.18	17372.71	0.23	419.89	2610.55	177.83	6.82
JW341-1.1MGS	78.17	8.69	104.77	686.25	7420.39	0.68	499.67	306.53	128.69	7.57

Table A4 continued

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
JW341-6.1OSC	91.79	1.41	20.76	142.55	9896.37	0.56	161.37	314.23	29.03	7.91
JW341-20.1C	78.41	0.38	8.73	172.79	12691.84	0.39	120.30	97.10	35.77	8.41
JW341-18.1C	1796.23	0.31	11.29	717.07	12928.49	0.26	144.52	2234.87	151.06	8.89
JW341-1.2WS	75.31	1.15	17.14	295.67	9740.59	0.62	102.63	149.56	59.46	9.44
JW341-22.1C	1850.41	0.44	35.07	452.59	9780.55	0.13	176.18	320.81	83.78	9.52
JW341-15.2WIB	67.16	2.29	35.91	445.71	9914.61	0.55	523.04	408.37	86.87	10.37
JW341-11.1LGB	78.78	1.77	26.66	486.67	7964.06	0.64	189.13	277.06	100.66	10.81
JW341-6.2WE	87.60	0.77	10.88	55.20	10537.02	0.61	64.89	65.46	10.04	10.85
JW341-10.2OSE	164.76	1.88	34.73	218.89	8612.17	0.49	441.22	280.99	39.48	11.32
JW341-15.1DIB	77.45	3.71	70.53	898.56	7691.00	0.53	800.47	648.14	173.13	12.05
JW341-12.2DIRI	72.84	5.82	93.03	1057.54	7831.45	0.61	1316.05	946.65	195.31	13.14
JW341-11.3MGB	70.87	8.82	108.61	912.14	7796.70	0.67	645.71	523.41	170.39	14.12
JW341-2.1C	1558.56	3.21	168.61	452.74	11487.48	0.18	221.52	679.54	66.50	14.23
JW341-19.1C	81.35	2.38	28.62	169.36	9281.09	0.64	50.98	39.17	32.93	14.24

Table A4 continued

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
<b>JW341-2.2BKE</b>	<b>79.07</b>	<b>1.36</b>	<b>30.08</b>	<b>528.20</b>	<b>15690.71</b>	<b>0.34</b>	<b>839.75</b>	<b>2710.16</b>	<b>103.81</b>	<b>15.02</b>
JW341-17.2SC	77.04	5.39	88.31	1110.92	7037.62	0.61	897.81	676.30	214.78	15.24
JW341-4.1DGI	71.97	6.99	116.00	1139.39	7031.49	0.59	1367.98	931.63	211.84	15.27
<b>JW341-1.4BKE</b>	<b>75.12</b>	<b>5.85</b>	<b>63.44</b>	<b>799.35</b>	<b>17353.25</b>	<b>0.50</b>	<b>790.88</b>	<b>2429.15</b>	<b>160.04</b>	<b>15.52</b>
JW341-13.1C	1733.70	0.03	5.28	719.95	12105.88	0.08	80.36	1984.64	167.16	18.34
JW341-10.1C	1724.41	1.37	51.32	505.88	7685.15	0.28	101.32	181.36	96.95	18.50
JW341-7.1DGS	76.47	10.36	180.70	1721.35	6945.99	0.56	2271.17	1148.16	311.73	19.86
JW341-14.1C	1814.75	0.96	24.79	496.08	11998.81	0.29	168.30	1727.06	128.83	20.43
JW341-21.1C	1917.30	0.11	19.52	372.07	11082.80	0.06	27.86	76.40	73.28	21.70
JW341-16.1CSZ	77.76	1.42	42.05	324.21	8751.29	0.30	157.60	100.56	62.08	22.17
<b>JW341-11.2DGB</b>	<b>77.85</b>	<b>9.94</b>	<b>143.17</b>	<b>1358.57</b>	<b>6939.46</b>	<b>0.63</b>	<b>1455.54</b>	<b>976.42</b>	<b>255.99</b>	<b>25.25</b>
JW341-1.3MGT	74.75	3.45	59.13	686.21	8751.83	0.66	583.88	441.74	132.34	25.29
JW341-16.2DSE	70.48	1.81	48.37	349.48	9158.98	0.32	163.95	84.40	67.86	26.60
JW341-16.3LSE	79.53	0.54	15.34	162.86	8408.41	0.31	71.16	55.73	31.54	27.11

Table A4 continued

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
<b>JW341-4.2BKE</b>	<b>77.13</b>	<b>5.72</b>	<b>63.45</b>	<b>1596.50</b>	<b>19474.06</b>	<b>0.53</b>	<b>629.51</b>	<b>5335.52</b>	<b>305.02</b>	<b>29.07</b>
JW341-23.1BKI	76.09	19.27	321.90	2261.84	6768.28	0.57	4434.04	1666.15	382.78	34.36
JW341-9.1C	1356.74	1.01	21.59	208.57	8123.31	0.42	107.73	72.89	41.75	34.66
<b>JW341-3.2BKE2</b>	<b>162.00</b>	<b>16.04</b>	<b>135.20</b>	<b>1345.55</b>	<b>14978.83</b>	<b>0.62</b>	<b>1235.15</b>	<b>3548.18</b>	<b>249.60</b>	<b>83.06</b>
<b>JW341-2.3BKE2</b>	<b>71.21</b>	<b>11.86</b>	<b>110.21</b>	<b>999.41</b>	<b>12260.58</b>	<b>0.56</b>	<b>1648.11</b>	<b>2945.59</b>	<b>195.19</b>	<b>113.49</b>
<b>JW341-14.2DOSE</b>	<b>75.11</b>	<b>15.77</b>	<b>149.23</b>	<b>1968.41</b>	<b>15526.75</b>	<b>0.54</b>	<b>1831.11</b>	<b>4981.48</b>	<b>358.26</b>	<b>145.03</b>
<b>JW341-5.2BKE</b>	<b>61.47</b>	<b>38.31</b>	<b>312.79</b>	<b>3253.79</b>	<b>22225.26</b>	<b>0.64</b>	<b>2588.89</b>	<b>8697.82</b>	<b>601.06</b>	<b>418.73</b>
JW224-5E	80.71	0.20	7.98	244.87	13645.60	0.30	146.69	564.72	46.55	2.51
JW224-8E	75.27	0.39	11.67	318.55	11564.90	0.38	195.82	558.21	61.12	3.09
JW224-1E	124.87	0.19	6.90	143.22	12005.14	0.26	59.81	154.87	28.35	3.69
JW224-8I2	83.04	0.63	9.37	160.96	10561.08	0.64	85.27	156.90	32.45	4.22
JW224-9.1E	85.07	2.63	32.65	273.35	10141.45	0.66	209.24	220.39	51.04	6.21
JW224-15E	98.12	1.76	19.86	245.19	9466.20	0.74	142.73	179.14	48.03	6.74
JW224-1	1951.07	0.14	26.51	168.46	12276.58	0.05	136.25	543.38	25.74	6.78
JW224-2	82.34	1.87	24.20	345.63	8349.22	0.70	180.11	206.57	63.47	7.59
JW224-8	68.77	2.29	31.13	323.12	9128.34	0.64	174.89	200.97	61.75	7.67
JW224-15I	84.70	0.60	6.21	128.94	8266.84	0.79	35.00	54.98	26.98	8.35
JW224-19.1	1976.40	0.02	5.89	527.00	12343.80	0.04	37.12	1277.95	106.07	8.72
<b>JW224-3E</b>	<b>68.13</b>	<b>2.06</b>	<b>14.35</b>	<b>210.01</b>	<b>11166.42</b>	<b>1.00</b>	<b>103.56</b>	<b>191.13</b>	<b>40.24</b>	<b>8.78</b>
JW224-15I2	78.12	3.10	36.22	320.39	9058.41	0.67	205.07	188.67	60.21	9.11

Table A4 continued

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
JW224-8.1	100.20	6.75	68.96	698.69	7648.00	0.74	702.02	897.88	130.01	9.15
JW224-21.1	78.24	2.64	41.03	608.58	8647.30	0.60	377.31	488.28	113.40	9.19
JW224-8I	74.08	1.87	26.12	385.42	8723.56	0.66	193.72	244.69	73.66	9.29
JW224-1C	2058.01	0.36	82.35	305.34	11690.47	0.04	345.28	926.92	47.74	9.45
JW224-5.1	2213.78	0.03	8.48	750.72	12426.93	0.04	44.43	1704.53	145.91	9.54
JW224-14.1	2040.61	0.13	7.52	128.32	10685.69	0.16	94.41	364.66	24.03	9.98
JW224-4	85.53	7.09	77.07	539.79	8240.08	0.69	237.98	290.95	96.37	11.71
JW224-6.1	2215.11	0.18	25.39	447.90	10858.33	0.08	90.96	231.71	80.42	12.06
JW224-5	83.45	6.04	98.87	1001.07	7782.78	0.56	1079.59	867.00	176.48	12.15
JW224-2.2	2419.00	0.21	28.47	596.09	11171.42	0.08	107.96	450.46	106.90	12.45
JW224-10.1	2015.44	0.05	17.00	267.30	9928.39	0.03	252.23	1293.61	91.55	12.56
<b>JW224-9.1C</b>	<b>2158.35</b>	<b>0.05</b>	<b>10.01</b>	<b>124.48</b>	<b>12422.37</b>	<b>0.05</b>	<b>110.40</b>	<b>528.82</b>	<b>22.01</b>	<b>12.79</b>
JW224-4.1C	2172.77	0.24	18.68	288.61	10083.06	0.13	59.59	135.49	51.40	13.55
<b>JW224-13.1</b>	<b>2134.79</b>	<b>0.22</b>	<b>32.32</b>	<b>96.21</b>	<b>13367.31</b>	<b>0.07</b>	<b>14.60</b>	<b>800.33</b>	<b>19.58</b>	<b>14.27</b>
<b>JW224-3.2</b>	<b>1813.29</b>	<b>0.29</b>	<b>17.08</b>	<b>61.58</b>	<b>12649.89</b>	<b>0.18</b>	<b>46.62</b>	<b>520.01</b>	<b>9.46</b>	<b>14.66</b>
<b>JW224-12.1</b>	<b>1905.47</b>	<b>0.70</b>	<b>44.86</b>	<b>91.73</b>	<b>11442.59</b>	<b>0.16</b>	<b>90.66</b>	<b>738.42</b>	<b>14.78</b>	<b>14.95</b>
JW224-9.2I	93.99	10.79	125.00	810.11	7858.27	0.67	735.19	429.86	141.87	16.06
JW224-15.1	1977.84	0.36	20.67	548.72	11122.46	0.17	113.17	802.44	106.59	16.07
<b>JW224-5.2</b>	<b>1859.54</b>	<b>0.07</b>	<b>24.40</b>	<b>216.11</b>	<b>10978.66</b>	<b>0.03</b>	<b>140.80</b>	<b>106.62</b>	<b>36.34</b>	<b>17.42</b>
<b>JW224-16.1</b>	<b>1509.72</b>	<b>0.13</b>	<b>17.07</b>	<b>15.91</b>	<b>12946.76</b>	<b>0.05</b>	<b>42.71</b>	<b>397.86</b>	<b>2.14</b>	<b>17.45</b>
JW224-3	92.25	7.41	106.61	1284.65	7285.19	0.62	1222.62	891.19	232.20	18.35
JW224-2.3	2079.55	0.10	23.64	178.24	11535.94	0.04	215.34	125.26	34.50	18.54
<b>JW224-8T</b>	<b>81.08</b>	<b>6.88</b>	<b>39.69</b>	<b>566.41</b>	<b>12132.03</b>	<b>1.16</b>	<b>474.68</b>	<b>1627.32</b>	<b>104.56</b>	<b>18.95</b>
<b>JW224-21.2</b>	<b>86.71</b>	<b>3.69</b>	<b>34.44</b>	<b>1630.91</b>	<b>25273.24</b>	<b>0.79</b>	<b>136.57</b>	<b>7718.70</b>	<b>317.11</b>	<b>18.97</b>



Table A4 continued

Sample ID	Age Est.	Eu ppm	Gd ppm	Yb ppm	Hf ppm	Eu/Eu*	Th ppm	U ppm	Lu ppm	Ti ppm
JW224-11.1	2497.32	0.14	12.50	164.59	10360.72	0.09	129.30	308.13	31.34	19.22
JW224-1.1C	2166.76	0.10	22.81	17.20	12173.46	0.04	45.30	358.61	2.44	19.29
<b>JW224-7I</b>	<b>80.19</b>	<b>16.73</b>	<b>170.14</b>	<b>874.75</b>	<b>6819.52</b>	<b>0.69</b>	<b>857.25</b>	<b>640.11</b>	<b>154.30</b>	<b>20.16</b>
JW224-7I2	81.48	10.41	143.64	1443.47	6966.05	0.62	1863.08	1766.48	250.69	21.31
<b>JW224-18.1</b>	<b>2327.19</b>	<b>0.14</b>	<b>26.93</b>	<b>27.61</b>	<b>12565.27</b>	<b>0.04</b>	<b>108.32</b>	<b>111.82</b>	<b>3.92</b>	<b>24.91</b>
<b>JW224-7.1</b>	<b>2079.91</b>	<b>0.38</b>	<b>52.12</b>	<b>540.59</b>	<b>11944.83</b>	<b>0.07</b>	<b>218.62</b>	<b>206.21</b>	<b>93.33</b>	<b>26.01</b>
<b>JW224-3.1</b>	<b>1654.84</b>	<b>0.21</b>	<b>4.12</b>	<b>4.21</b>	<b>12322.15</b>	<b>0.32</b>	<b>16.60</b>	<b>24.54</b>	<b>1.02</b>	<b>29.18</b>
<b>JW224-6C</b>	<b>2266.23</b>	<b>0.69</b>	<b>63.74</b>	<b>634.70</b>	<b>9452.06</b>	<b>0.10</b>	<b>223.48</b>	<b>381.40</b>	<b>105.45</b>	<b>37.86</b>