

Ion microprobe (SHRIMP II) U-Th-Pb data for zircons from the Redrock region, southwestern New Mexico

Spot	[U]	[Th]	Th/U	[Pb*]	²⁰⁴ Pb	f _{206c}	²⁰⁶ Pb/ ²³⁸ U	±1σ	²⁰⁷ Pb/ ²³⁵ U	±1σ	²⁰⁷ Pb/ ²⁰⁶ Pb	±1σ	Apparent Ages (±1σ, Ma)			Conc. (%)
	ppm	ppm		ppm	ppb	(%)							²⁰⁶ Pb/ ²³⁸ U	²⁰⁷ Pb/ ²³⁵ U	²⁰⁷ Pb/ ²⁰⁶ Pb	
<i>Red7, Anorthosite</i>																
1.1	573	127	0.23	118	1	0.017	0.2084	0.0011	2.347	0.015	0.0817	0.0002	1220.1±5.9	1226.6±4.6	1237.9±5.8	99.4
2.1	545	363	0.69	127	4	0.075	0.2098	0.0011	2.320	0.017	0.0802	0.0003	1227.5±5.9	1218.4±5.1	1202.2±8.2	102.1
3.1	522	465	0.92	126	1	0.020	0.2064	0.0012	2.308	0.015	0.0811	0.0002	1209.4±6.2	1214.6±4.7	1223.9±5.4	98.8
4.1	529	441	0.86	126	4	0.077	0.2067	0.0011	2.321	0.018	0.0814	0.0004	1210.9±5.9	1218.6±5.4	1232.2±9.5	98.3
5.1	401	38	0.10	79	1	0.030	0.2075	0.0011	2.308	0.016	0.0807	0.0003	1215.3±6.1	1214.8±4.8	1213.9±6.6	100.1
6.1	508	91	0.18	103	0	0.004	0.2076	0.0012	2.322	0.016	0.0811	0.0003	1215.8±6.2	1219.1±4.9	1224.9±6.6	99.3
6.2	1815	900	0.51	103	3	0.058	0.0532	0.0006	0.582	0.009	0.0795	0.0006	333.9±3.7	466.0±5.5	1183.9±15.5	28.2
7.1	484	127	0.27	99	1	0.015	0.2050	0.0011	2.285	0.014	0.0809	0.0002	1202.1±5.9	1207.7±4.5	1217.7±5.2	98.7
8.1	521	130	0.26	107	3	0.062	0.2066	0.0012	2.326	0.015	0.0817	0.0002	1210.5±6.2	1220.2±4.5	1237.2±4.4	97.8
9.1	454	90	0.21	90	44	0.973	0.2007	0.0014	2.255	0.024	0.0815	0.0006	1178.9±7.3	1198.5±7.4	1234.0±14.2	95.5
9.2	1228	1153	0.97	138	13	0.227	0.0946	0.0006	1.062	0.008	0.0814	0.0003	582.7±3.4	734.6±4.1	1230.9±8.1	47.3
10.1	520	194	0.39	111	1	0.024	0.2061	0.0013	2.309	0.017	0.0813	0.0002	1208.0±7.1	1215.1±5.1	1227.9±5.0	98.4
11.1	520	529	1.05	129	3	0.060	0.2065	0.0011	2.327	0.016	0.0818	0.0003	1210.0±5.8	1220.6±4.8	1239.5±7.2	97.6
12.1	480	125	0.27	98	1	0.022	0.2050	0.0011	2.294	0.014	0.0812	0.0002	1202.3±5.9	1210.4±4.2	1225.0±4.0	98.1
13.1	559	147	0.27	116	0	0.004	0.2076	0.0012	2.332	0.016	0.0815	0.0002	1216.0±6.4	1222.1±4.8	1232.9±5.6	98.6
<i>NM312, Anorthosite</i>																
1.1	365	198	0.56	80	1	0.017	0.2041	0.0011	2.278	0.015	0.0810	0.0003	1197.2±5.7	1205.4±4.6	1220.2±6.7	98.1
2.1	279	145	0.54	61	0	0.010	0.2045	0.0012	2.318	0.023	0.0822	0.0006	1199.4±6.6	1217.8±7.0	1250.5±13.8	95.9
4.1	477	365	0.79	113	1	0.017	0.2088	0.0012	2.333	0.015	0.0811	0.0002	1222.3±6.3	1222.4±4.6	1222.6±4.8	100.0
5.1	288	221	0.79	68	1	0.040	0.2083	0.0011	2.320	0.016	0.0808	0.0003	1219.7±5.7	1218.3±4.9	1215.9±7.7	100.3
6.1	506	150	0.31	104	1	0.017	0.2039	0.0012	2.317	0.016	0.0824	0.0003	1196.5±6.4	1217.7±5.1	1255.4±6.5	95.3
7.1	279	238	0.88	67	0	0.017	0.2069	0.0013	2.312	0.018	0.0810	0.0003	1212.3±7.1	1215.9±5.5	1222.3±7.4	99.2
8.1	320	249	0.81	76	1	0.017	0.2073	0.0016	2.329	0.020	0.0815	0.0003	1214.4±8.4	1221.1±6.2	1233.0±6.8	98.5
9.1	281	250	0.92	68	4	0.148	0.2077	0.0013	2.294	0.017	0.0801	0.0003	1216.5±6.9	1210.4±5.3	1199.5±7.1	101.4
<i>NM19, Hornblende granite</i>																
1.1	318	113	0.37	68	4	0.109	0.2101	0.0022	2.342	0.025	0.0809	0.0002	1229.4±11.6	1225.2±7.7	1217.7±3.8	101.0
2.1	261	98	0.39	55	0	0.003	0.2039	0.0012	2.282	0.015	0.0812	0.0002	1196.0±6.4	1206.8±4.7	1226.1±5.0	97.5
3.1	113	70	0.64	25	2	0.177	0.2049	0.0014	2.265	0.021	0.0802	0.0004	1201.5±7.6	1201.5±6.6	1201.6±10.9	100.0
4.1	182	110	0.62	41	1	0.037	0.2069	0.0015	2.308	0.022	0.0809	0.0004	1212.1±7.9	1214.8±6.6	1219.5±10.4	99.4
6.1	145	60	0.43	31	1	0.069	0.2050	0.0013	2.287	0.018	0.0809	0.0003	1201.9±7.2	1208.4±5.7	1220.0±7.5	98.5
7.1	308	95	0.32	64	0	0.003	0.2052	0.0013	2.303	0.018	0.0814	0.0003	1202.9±6.7	1213.1±5.4	1231.1±7.8	97.7
8.1	100	66	0.68	14	1	0.104	0.1241	0.0074	1.415	0.093	0.0827	0.0017	754.3±42.7	895.4±39.7	1262.0±39.9	59.8
9.1	73	32	0.46	15	1	0.130	0.2021	0.0016	2.214	0.021	0.0794	0.0003	1186.5±8.8	1185.3±6.7	1183.2±8.1	100.3
7.2	249	94	0.39	54	0	0.016	0.2091	0.0012	2.354	0.030	0.0817	0.0009	1224.0±6.6	1228.7±9.1	1237.1±20.7	98.9
10.1	180	84	0.48	25	94	7.655	0.1279	0.0016	1.352	0.034	0.0766	0.0015	776.1±9.3	868.2±14.8	1111.2±40.8	69.8
11.1	106	66	0.64	23	2	0.151	0.2038	0.0018	2.256	0.027	0.0803	0.0006	1195.7±9.7	1198.7±8.5	1204.2±14.0	99.3
12.1	107	62	0.60	23	1	0.140	0.2002	0.0024	2.234	0.044	0.0809	0.0012	1176.6±12.6	1191.7±13.8	1219.3±28.1	96.5
13.1	139	79	0.59	27	2	0.132	0.1747	0.0013	1.969	0.024	0.0817	0.0007	1038.1±7.1	1104.9±8.2	1238.8±17.2	83.8
14.1	188	116	0.64	41	0	0.006	0.1992	0.0013	2.218	0.020	0.0808	0.0004	1170.9±7.0	1186.8±6.2	1215.7±10.3	96.3
<i>NM52, Rapakivi granite</i>																
1.1	585	410	0.72	95	198	4.462	0.1463	0.0011	1.834	0.031	0.0909	0.0013	880.1±6.1	1057.6±11.0	1444.7±26.9	60.9
2.1	269	137	0.53	60	19	0.661	0.2113	0.0015	2.674	0.026	0.0918	0.0006	1235.5±8.1	1321.3±7.3	1463.3±11.4	84.4
1.2	297	231	0.80	81	14	0.395	0.2395	0.0026	2.999	0.058	0.0908	0.0014	1384.1±13.5	1407.4±14.9	1442.9±28.5	95.9
2.2	469	175	0.39	109	51	0.973	0.2256	0.0006	2.792	0.029	0.0898	0.0009	1311.1±2.9	1353.5±7.9	1421.1±19.1	92.3
4.2	461	193	0.43	119	12	0.212	0.2482	0.0018	3.134	0.048	0.0916	0.0012	1429.4±9.3	1441.1±11.8	1458.5±24.0	98.0
5.1	799	482	0.62	102	238	5.080	0.1123	0.0013	1.341	0.038	0.0866	0.0021	685.9±7.6	863.5±16.5	1351.8±47.3	50.7
6.1	662	268	0.42	113	123	2.177	0.1684	0.0012	2.060	0.048	0.0887	0.0019	1003.1±6.7	1135.5±15.9	1398.3±41.0	71.7
7.1	340	391	1.19	105	3	0.068	0.2485	0.0014	3.192	0.035	0.0932	0.0008	1430.7±7.1	1455.2±8.4	1491.0±16.5	96.0
8.1	477	90	0.19	114	28	0.479	0.2436	0.0015	3.073	0.041	0.0915	0.0010	1405.3±7.7	1425.9±10.2	1456.8±21.1	96.5
9.1	477	253	0.55	100	63	1.308	0.2022	0.0013	2.675	0.082	0.0959	0.0028	1187.4±7.0	1321.6±23.0	1546.5±56.1	76.8
10.1	465	186	0.41	112	34	0.640	0.2288	0.0013	2.983	0.059	0.0946	0.0017	1328.2±6.7	1403.3±15.0	1519.2±34.6	87.4
<i>NM141, Minette</i>																
1.1	980	405	0.43	123	140	2.456	0.1150	0.0010	1.436	0.020	0.0906	0.0009	701.8±5.7	904.2±8.4	1437.4±19.3	48.8
2.1	469	261	0.57	83	64	1.673	0.1608	0.0011	2.036	0.027	0.0918	0.0010	961.4±5.8	1127.6±9.1	1463.6±20.7	65.7
3.1	6122	12119	2.05	201	3929	43.173	0.0171	0.0003	0.208	0.018	0.0883	0.0072	109.2±1.7	191.8±15.0	1388.7±165.9	7.9
4.1	7911	14539	1.90	97	969	28.432	0.0062	0.0001	0.086	0.004	0.1004	0.0035	40.08±0.8	84.0±3.4	1630.6±65.7	2.5
5.1	271	72	0.28	65	11	0.339	0.2394	0.0020	3.029	0.069	0.0918	0.0019	1383.6±10.3	1415.0±17.5	1462.6±38.8	94.6
6.1	366	111	0.31	56	130	4.789	0.1425	0.0015	1.837	0.071	0.0935	0.0034	858.5±8.5	1058.9±25.8	1498.9±69.7	57.3
7.1	290	152	0.54	64	26	0.857	0.2071	0.0020	2.556	0.066	0.0895	0.0020	1213.4±10.5	1288.2±18.9	1415.1±44.1	85.7
1.2	239	91	0.39	61	2	0.054	0.2483	0.0024	3.168	0.051	0.0925	0.0011	1429.7±12.2	1449.3±12.6	1478.3±23.0	96.7
9.1	428	214	0.52	106	14	0.282	0.2304	0.0022	2.961	0.046	0.0932	0.0010	1336.4±11.7	1397.7±11.9	1492.5±21.0	89.5
10.1	562	44	0.08	134	13	0.193	0.2487	0.0013	3.164	0.030	0.0923	0.0007	1431.9±6.7	1448.5±7.3	1472.9±13.6	97.2
<i>NM311, Diabase</i>																
1.1	459	425	0.96	157	0	0.006	0.2865	0.0016	3.968	0.025	0.1004	0.0002	1624.2±8.0	1627.6±5.0	1632.2±4.0	99.5
2.1	549	536	1.01	190	1	0.014	0.2868	0.0016	3.985	0.034	0.1008	0.0006	1625.7±8.1	1631.1±7.1	1638.1±11.0	99.2
3.1	301	272	0.93	101	3	0.067	0.2832	0.0017	3.899	0.028	0.0999	0.0003	1607.4±8.5	1613.6±5.8	1621.6±6.0	99.1
4.1	424	400	0.98	145	0	0.005	0.2857	0.0016	3.962	0.031	0.1006	0.0005	1620.1±8.2	1626.5±6.4	1634.8±8.7	99.1
4.2	187	142	0.78	62	7	0.276	0.2920	0.0020	4.034	0.039	0.1002	0.0006	1651.6±9.9	1641.2±7.9	1627.8±11.4	101.5
5.1	231	176	0.79	74	2	0.075	0.2821	0.0017	3.852	0.027	0.0990	0.0003	1602.1±8.7	1603.7±5.6	1605.9±4.8	99.8
6.1	203	166	0.85	66	2	0.055	0.2802	0.0023	3.894	0.045						

Table DR3.
Elemental geochemical data for the mafic rocks of the Redrock region, southwestern New Mexico

Sample	SiO ₂	Rb	Ba	Th	K	Nb	La	Ce	Sr	Nd	P	Sm	Zr	Ti	Y
Diabase															
NM102/98	45.2	89	502	1.2	10792	6	5.2	12.7	148	9.3	524	2.8	79	6894	25
NM104/98	48.4	24	430	4.6	9546	9	26.3	56.9	641	30.1	1396	6.3	201	8933	24
NM108/98	48.0	39	164	2.8	6724	6	16.1	40.0	281	27.9	1832	8.2	200	12290	45
NM118/98	48.9	38	142	2.1	6558	5	15.9	39.2	319	28.3	1876	8.0	196	12170	46
Anorthosite xenoliths															
Red1	50.2	220	326	1.55	17434	<1	6.0	13.5	430	7.95	480	1.75	31	3057	8
Red7	49.3	257	319	2.0	12286	<1	9.4	22.0	490	14.8	1484	3.8	67	8153	19
Red11	50.5	201	205	0.7	11706	<1	4.0	8.9	482	5.4	350	1.4	27	2518	7
NM85/98	50.2	175	241	1.9	13366	<1	5.8	13.6	478	8.2	436	2.0	41	2938	9
Minette*															
NM109/98	58.6	180	2257	54.9	42338	13	83.3	177	498	87.7	2836	15.9	435	6295	31
NM128/98	60.1	177	1626	63.9	48232	15	283	630	205	226	3666	28.8	472	7254	20
NM141/98	52.9	413	3723	61.7	58276	15	115	286	541	157	7462	31	769	10611	46
NM149/98	60.7	180	1486	46.1	41010	11	46.3	103	204	51.6	2226	9.9	394	5336	21

Note: Contents expressed in wt.% for SiO₂, all other elements in ppm. SiO₂, Rb, Ba, K, Nb, Sr, P, Zr, and Ti analyzed by XRF at the New Mexico Bureau of Geology and Mineral Resources, Socorro, New Mexico (Phil Kyle and Chris McKee analysts; Phillips PW 2400 XRF instrument purchased with funds from NSF grant EAR-9316467); Th, La, Ce, Nd, Sm, and Y analyzed by ICP/MS at the X-Ray Assay Laboratories, Toronto, Canada.

* Some of the minettes are relatively high in silica owing to their variably hybridized nature.

Table DR2.
Nd isotopic data for the Redrock region, southwestern New Mexico

Sample	Location (lat [°N], long [°W])	Sm (ppm)	Nd (ppm)	$^{147}\text{Sm}/$ $^{144}\text{Nd}^*$	$^{143}\text{Nd}/$ $^{144}\text{Nd}^\dagger$	ϵ_{Nd}^\S	T_{DM}^{**} (Ma)
Anorthosite xenoliths (initial ratios @ 1220 Ma)							
Red4 ^{††}	32.754007, 108.701189	0.686	3.23	0.1285	0.512168 ± 16	+ 1.5	1558
Red7 ^{††}	32.748999, 108.717118	3.43	13.91	0.1491	0.512350 ± 10	+ 1.8	1627
Red11 ^{††}	32.7492, 108.718738	1.16	4.95	0.1415	0.512309 ± 8	+ 2.2	1543
NM85 ^{††}	32.74883, 108.7083	1.78	7.43	0.1449	0.512301 ± 7	+ 1.5	1636
NM312	32.752347, 108.700622	3.42	14.16	0.1459	0.512313 ± 7	+ 1.6	1633
Redrock granite (initial ratios @ 1220 Ma)							
NM19 ^{††}	32.74833, 108.7217	13.49	57.54	0.1418	0.512283 ± 9	+ 1.6	1602
NM61 ^{††}	32.750303, 108.726027	20.54	100.5	0.1236	0.512140 ± 8	+ 1.7	1521
NM76 ^{††}	32.74775, 108.7185	7.25	27.03	0.1622	0.512477 ± 8	+ 2.2	1666
NM106 ^{††}	32.74639, 108.7174	9.18	52.92	0.1049	0.511972 ± 10	+ 1.3	1494
Jack Creek rapakivi granite (initial ratios @ 1460 Ma)							
Red17	32.740618, 108.696613	5.94	36.99	0.09705	0.511820 ± 9	+ 2.7	1592
Red18	32.734704, 108.694491	5.54	33.88	0.09890	0.511816 ± 8	+ 2.3	1622
NM52	32.745917, 108.666606	6.95	41.45	0.1014	0.511868 ± 9	+ 2.8	1588
Minette (initial ratios @ 1460 Ma)							
NM109	32.72914, 108.6598	14.61	81.99	0.1077	0.511912 ± 10	+ 2.5	1619
NM128	32.731528, 108.65681	25.40	208.8	0.07354	0.511662 ± 9	+ 4.0	1497
NM141	32.736639, 108.64853	28.54	149.1	0.1157	0.511973 ± 9	+ 2.2	1657
NM149	32.747889, 108.65089	8.86	49.89	0.1074	0.511921 ± 6	+ 2.7	1602
NM154A	32.734569, 108.659439	15.77	88.85	0.1073	0.511919 ± 7	+ 2.7	1603
NM233	32.765667, 108.6295	25.66	163.1	0.09511	0.511797 ± 12	+ 2.6	1595
Diabase (initial ratios @ 1630 Ma)							
NM118	32.742917, 108.71169	7.18	26.34	0.1649	0.512511 ± 9	+ 4.2	1649
NM311	32.74486, 108.704955	12.85	49.30	0.1575	0.512433 ± 7	+ 4.2	1646
Metamorphic rocks (initial ratios @ 1630 Ma)							
NM101 ^{††}	32.740861, 108.70075	10.37	54.69	0.1146	0.511837 ± 7	+ 1.5	1846
NM117 ^{††}	32.739139, 108.71342	7.86	41.56	0.1143	0.511778 ± 14	+ 0.4	1931
NM267	32.778167, 108.5725	13.62	73.16	0.1125	0.511773 ± 11	+ 0.7	1905
NM295	32.701699, 108.513614	4.75	28.28	0.1016	0.511745 ± 13	+ 2.5	1757

* Estimated error for $^{147}\text{Sm}/^{144}\text{Nd}$ is less than 0.5 %.

† $^{143}\text{Nd}/^{144}\text{Nd}$ normalized to $^{146}\text{Nd}/^{144}\text{Nd} = 0.7219$. Within-run error expressed as $2\sigma_m$ in the least significant digits.

§ Initial ϵ_{Nd} values, calculated using $^{143}\text{Nd}/^{144}\text{Nd} = 0.512638$ and $^{147}\text{Sm}/^{144}\text{Nd} = 0.1966$. Maximum error is ± 0.35 ϵ -units.

** Depleted mantle model ages according to the model of DePaolo (1981)

†† Data in McLemore et al. (in press 2002, Geology and geochemistry of the Proterozoic Redrock granite and anorthosite xenoliths in the northern Burro Mountains, Grant County, New Mexico, USA: Bulletin of the Geological Society of Finland, v. 74)

Description of analytical methods: Analyses were performed at the Unit for Isotope Geology, Geological Survey of Finland. Rock powders (150–200 mg) were dissolved in Teflon bombs (silicic rocks) or sealed Teflon beakers (mafic rocks) at 180 °C in a mixture of HNO₃ and HF, dissolved in HCl, and spiked with a ^{149}Sm - ^{150}Nd tracer. Light REE were separated using standard cation exchange chromatography and Sm and Nd were purified by and on quartz columns (Richard et al., 1976, $^{143}\text{Nd}/^{146}\text{Nd}$, a natural tracer: an application to oceanic basalts: Earth and Planetary Science Letters, v. 31, p. 269–278). The total procedural blank was < 300 pg for Nd. Isotope ratios of Sm and Nd were measured on a VG Sector 54 mass spectrometer. Repeated analyses of La Jolla Nd standard gave $^{143}\text{Nd}/^{144}\text{Nd}$ of 0.511851 ± 0.000013 (mean and external 2σ error of 9 measurements); external error in the reported $^{143}\text{Nd}/^{144}\text{Nd}$ is better than 0.003 %.