

142976: porphyritic granophyre, 26 Mile Well

Location and sampling

MARBLE BAR (SF 50–8)

119°34'19"E 21°23'19"S

Sampled on 26 September 1998

The sample was taken from a low rocky hill located about 30 m north of the old Marble Bar–Hillside Track and about 4 km north-northeast of 26 Mile Well (abandoned).

Tectonic unit/relations

This sample is from a felsic volcanic or subvolcanic unit within the Mount Ada Basalt. The sample was taken from a 20 m-thick felsic lens that can be traced for more than 2 km, and that includes two prominent, 1 m-thick, banded chert units. The sample consisted of a fine, dark-grey matrix with abundant feldspar phenocrysts.

Petrographic description

The principal minerals present in this sample are plagioclase (55 vol.%), quartz (25 vol.%), sericite (10 vol.%), chlorite (5 vol.%), carbonate (2 vol.%), apatite (trace), zircon (trace), and opaques (3 vol.%). This is a porphyritic rock containing dull white to pale grey feldspar phenocrysts up to 2 mm in size disseminated through an aphanitic grey to pink matrix. It consists of plagioclase phenocrysts up to 3 mm in size and quartz phenocrysts up to 1 mm in size disseminated throughout a felsic matrix that has a granophyric texture. The plagioclase phenocrysts exhibit euhedral, prismatic shapes whereas the quartz phenocrysts have anhedral shapes. A small proportion of the quartz phenocrysts have slightly embayed shapes. The rock shows moderate alteration to finely divided sericite that is best developed in the plagioclase phenocrysts, although some sericite forms fine intergrowths with the felsic matrix. Chlorite is disseminated through the rock as flaky patches ranging up to 0.4 mm in size that are intergrown with the felsic matrix. Most of the chlorite patches have irregular shapes, although some have vague prismatic shapes and could represent altered mafic minerals. The chlorite is an intensely pleochroic green variety with low, anomalous birefringence. Intergrown with the chlorite are granular aggregates of carbonate with a typical grain size of 0.1 to 0.2 mm. Traces of apatite and zircon form disseminated crystals. The apatite forms prismatic crystals ranging up to 0.2 mm in size whereas the zircon forms very small, ovoid crystals generally less than 0.1 mm in size. Opaques are disseminated through the rock as anhedral grains and aggregates ranging up to 0.2 mm wide. This is a shallow intrusive rock with a porphyritic texture and a granophyric matrix showing moderate alteration and the development of sericite, chlorite, and carbonate.

Zircon morphology

The zircons isolated from this sample are commonly pale pink to dark yellow-brown, euhedral, equant to slightly elongate and between 150 × 250 µm and 200 × 250 µm in size. Many grains are internally structureless or have structureless cores surrounded by strongly zoned rims. Fluid and mineral inclusions are common.

Analytical details

This sample was analysed on 6 January and 7 March 1999. The counter deadtime during both analysis sessions was 32 ns. During the first session, nine analyses of the CZ3 standard were obtained and indicated a Pb^*/U calibration error of 1.91 (1 σ %). Analyses 1.1 to 7.1 were obtained during the first session. During the second session, six analyses of the CZ3 standard indicated a Pb^*/U calibration error of 1.91 (1 σ %). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

Results

Twenty-eight analyses were obtained from 28 zircons. Results are given in Table 39 and shown on a concordia plot in Figure 45.

Interpretation

Apart from analysis 5.1, which is highly reverse discordant, most analyses are concordant or slightly discordant, with the discordance pattern consistent with a single recent episode of radiogenic-Pb redistribution. Apart from analysis 5.1, which was obtained during a major disturbance of the primary beam intensity and is here regarded as analytically unreliable, the

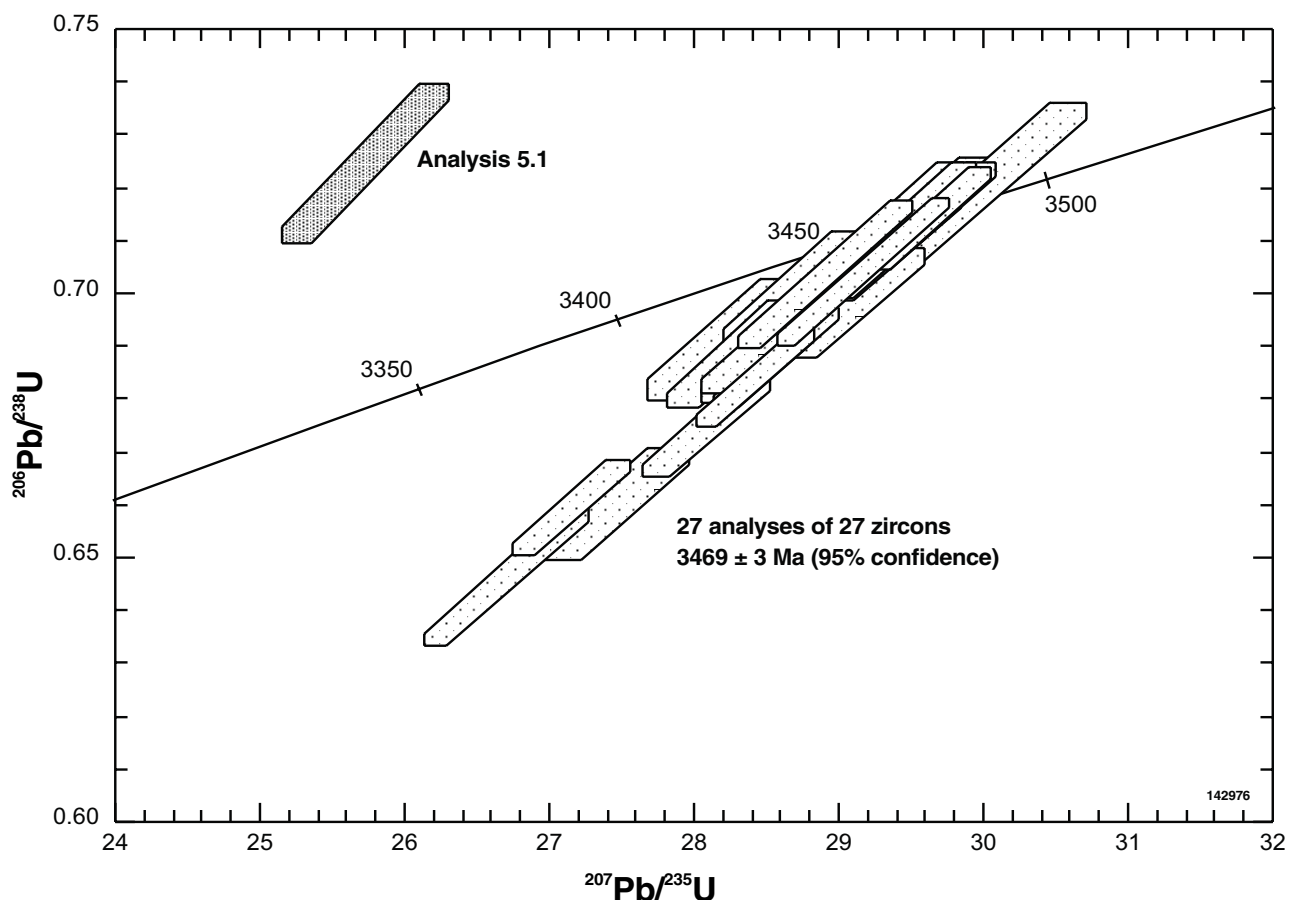


Figure 45. Concordia plot for sample 142976: porphyritic granophyre, 26 Mile Well

Table 39. Ion microprobe analytical results for sample 142976: porphyritic granophyre, 26 Mile Well

<i>Grain spot</i>	<i>U (ppm)</i>	<i>Th (ppm)</i>	<i>Pb (ppm)</i>	<i>f206%</i>	<i>²⁰⁷Pb/²⁰⁶Pb</i>	<i>±1σ</i>	<i>²⁰⁸Pb/²⁰⁶Pb</i>	<i>±1σ</i>	<i>²⁰⁶Pb/²³⁸U</i>	<i>±1σ</i>	<i>²⁰⁷Pb/²³⁵U</i>	<i>±1σ</i>	<i>% concordance</i>	<i>²⁰⁷Pb/²⁰⁶Pb Age</i>	<i>±1σ</i>
1.1	83	73	76	0.100	0.29886	0.00134	0.22895	0.00166	0.6949	0.0139	28.636	0.602	98	3464	7
2.1	135	121	126	0.081	0.30033	0.00105	0.23411	0.00129	0.7039	0.0139	29.148	0.596	99	3472	5
3.1	85	64	71	0.141	0.29948	0.00147	0.20278	0.00182	0.6463	0.0129	26.686	0.565	93	3468	8
4.1	96	73	87	0.152	0.29787	0.00126	0.19964	0.00150	0.7034	0.0140	28.888	0.602	99	3459	7
5.1	58	47	53	0.008	0.25758	0.00161	0.21325	0.00185	0.7243	0.0151	25.722	0.578	109	3232	10
6.1	78	77	74	0.155	0.29893	0.00146	0.26048	0.00199	0.7043	0.0142	29.029	0.619	99	3465	8
7.1	56	57	55	-0.014	0.30191	0.00188	0.27234	0.00225	0.7205	0.0153	29.992	0.684	101	3480	10
8.1	41	40	38	0.312	0.29626	0.00261	0.25262	0.00401	0.6910	0.0116	28.226	0.560	98	3451	14
9.1	174	262	175	0.162	0.30125	0.00120	0.39568	0.00193	0.6838	0.0091	28.404	0.408	97	3477	6
10.1	79	84	77	0.230	0.29959	0.00173	0.27771	0.00247	0.7117	0.0104	29.400	0.480	100	3468	9
11.1	103	60	89	0.160	0.29926	0.00150	0.15051	0.00178	0.6914	0.0096	28.529	0.439	98	3466	8
12.1	43	41	38	0.185	0.30152	0.00232	0.24669	0.00313	0.6600	0.0105	27.439	0.509	94	3478	12
13.1	145	186	135	0.175	0.29850	0.00135	0.33458	0.00202	0.6594	0.0089	27.138	0.400	94	3462	7
14.1	41	38	38	0.223	0.29710	0.00217	0.24019	0.00300	0.7005	0.0108	28.697	0.512	99	3455	11
15.1	57	52	54	0.147	0.30031	0.00177	0.23830	0.00233	0.7086	0.0103	29.339	0.479	99	3472	9
16.1	113	112	109	0.139	0.30081	0.00122	0.26272	0.00166	0.7138	0.0095	29.606	0.424	100	3474	6
17.1	83	61	74	0.118	0.30108	0.00143	0.19268	0.00163	0.6876	0.0094	28.545	0.428	97	3476	7
18.1	52	37	48	0.320	0.30005	0.00194	0.18502	0.00263	0.7148	0.0105	29.570	0.495	100	3470	10
19.1	55	51	51	0.183	0.29789	0.00185	0.24171	0.00253	0.6881	0.0100	28.262	0.468	98	3459	10
20.1	63	49	59	0.050	0.30053	0.00159	0.20856	0.00181	0.7144	0.0101	29.600	0.464	100	3473	8
21.1	62	42	55	0.225	0.29991	0.00169	0.17655	0.00208	0.6887	0.0098	28.478	0.452	97	3470	9
22.1	67	48	61	0.096	0.30007	0.00158	0.19021	0.00191	0.7111	0.0100	29.420	0.459	100	3471	8
23.1	68	51	59	0.088	0.30179	0.00157	0.20094	0.00188	0.6745	0.0094	28.068	0.434	96	3479	8
24.1	75	41	66	0.161	0.29869	0.00150	0.13930	0.00159	0.7088	0.0098	29.190	0.447	100	3463	8
25.1	86	71	80	0.106	0.29836	0.00137	0.21836	0.00165	0.7146	0.0097	29.398	0.437	100	3462	7
26.1	92	48	81	0.103	0.30052	0.00134	0.13962	0.00146	0.7083	0.0095	29.350	0.430	99	3473	7
27.1	63	44	57	0.174	0.30221	0.00185	0.18465	0.00230	0.6979	0.0102	29.081	0.480	98	3482	9
28.1	90	77	85	0.121	0.29935	0.00132	0.22695	0.00162	0.7146	0.0096	29.495	0.431	100	3467	7

remaining twenty-seven analyses have $^{207}\text{Pb}/^{206}\text{Pb}$ ratios defining a single population and indicating a weighted mean date of 3469 ± 3 Ma (chi-squared = 0.72).

The date of 3469 ± 3 Ma indicated by the weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ ratio of twenty-seven analyses is interpreted as providing the time of igneous crystallization of the granophyre.

STRATIGRAPHIC REFERENCE:

VAN KRANENDONK, M. J., HICKMAN, A. H., SMITHIES, R. H., and NELSON, D. R., 2002, Geology and tectonic evolution of the Archaean North Pilbara Terrain, Pilbara Craton, Western Australia: *Economic Geology*, v. 97, p. 695–732.

Recommended reference for this publication:

NELSON, D. R., 2000, 142976: porphyritic granophyre, 26 Mile Well; in *Compilation of geochronology data*, 1999: Western Australia Geological Survey, Record 2000/2, p. 160–163.

OR

NELSON, D. R., 2000, 142976: porphyritic granophyre, 26 Mile Well; Geochronology dataset 280; in *Compilation of geochronology data*, June 2006 update: Western Australia Geological Survey.

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