168915: rhyolite, Warrery Gap

Location and sampling

MARBLE BAR (SF 50-8) MGA Zone 50, 783070E 7612460N

Sampled on 21 September 1999

The sample was taken from a site on the eastern side of a minor northerly trending gully, 200 m from the site where the gully joins with the west bank of the Coongan River, and 1 km west of the eastern entrance to Warrery Gap.

Tectonic unit/relations

This sample is from a dark-grey, fine- and even-grained rhyolite that contains rare, 1 mm-diameter quartz phenocrysts and several ≤1 mm-thick quartz veins. The sample is from a 1–2 km-thick felsic agglomerate unit on the western side of the Corunna Downs Granitoid Complex. The agglomerate unit is overlain by chert and mafic and ultramafic volcanic rocks, and was previously correlated with the Duffer Formation of the Warrawoona Group (Hickman, 1983). The agglomerate has been intruded by granitic rocks of the Corunna Downs Granitoid Complex.

Petrographic description

This sample is of a quartz- and K-feldspar-rich rhyolite, with a layers 5–7 mm wide that are poor in alkali feldspar but with lenses rich in plagioclase. It is a banded, fine-grained quartz–microcline–biotite–plagioclase–hornblende schist, with scattered, relict quartz phenocrysts. It includes a quartz-rich band, rare pyrite, and crosscutting adularia stringers. Relict quartz phenocrysts, from 0.3 to 3 mm long, are scattered in vague layers to form 7–10 vol.% of the rock. Rarer lenses of recrystallized microcline up to 2 mm long may represent former phenocrysts of K-feldspar. Most of the host rock to these phenocrysts is now a fine schist rich in microcline (60 vol.%), with less abundant quartz, schistose biotite, and/or chlorite. Lenses rich in microgranular plagioclase also occur commonly with sericite and/or epidote, and there is rare hornblende. The quartz-rich layers have similar textures to the rest of the rock, with quartz instead of K-feldspar, but lensoidal quartz areas, possibly representing deformed quartz veins, occur in the more microcline-rich zones. Lenses rich in microcrystalline opaque oxides are disseminated. There is rare pyrite in this sample, and crosscutting, narrow sericite stringers, as well as stringers of low-temperature K-feldspar, apparently adularia. There are alteration envelopes rich in sericite where these veins cut plagioclase-rich lenses. The abundance of K-feldspar (= 60 vol.% of the feldspar) suggests an original rhyolite rather than a dacite protolith for this sample.

Zircon morphology

The zircons isolated from this sample are commonly pale pink to dark yellow-brown, subhedral, slightly elongate and commonly with subrounded terminations, and are typically between 20 × 40 μm and 50 × 150 μm in size. Many grains are strongly zoned or striated, and fluid and mineral inclusions are common. Most grains contain irregular opaque spots and inclusions.

Analytical details

The sample was analysed on 12 January 2000. The counter deadtime was 32 ns. Eight analyses of the CZ3 standard obtained during the analysis session indicated a Pb^*/U

Table 45. Ion microprobe analytical results for sample 168915: rhyolite, Warrery Gap

Grain .spot	*U (ppm)*	*Th (ppm)*	*Pb (ppm)*	*f206%*	$^{207}Pb/^{206}Pb$	*±1σ*	$^{208}Pb/^{206}Pb$	*±1σ*	$^{206}Pb/^{238}U$	*±1σ*	$^{207}Pb/^{235}U$	*±1σ*	*% concordance*	$^{207}Pb/^{206}Pb$ *age*	*±1σ*
1.1	97	49	83	0.101	0.29285	0.00106	0.13061	0.00113	0.6954	0.0134	28.080	0.561	99	3 433	6
2.1	211	78	158	0.029	0.29108	0.00073	0.09507	0.00057	0.6253	0.0118	25.094	0.487	91	3 423	4
3.1	215	182	196	0.041	0.29256	0.00070	0.22114	0.00080	0.6974	0.0132	28.133	0.545	99	3 431	4
4.1	221	57	197	0.198	0.27038	0.00101	0.08179	0.00113	0.7606	0.0143	28.356	0.557	110	3 308	6
5.1	138	64	120	0.019	0.29323	0.00087	0.12204	0.00077	0.7130	0.0136	28.826	0.567	101	3 435	5
6.1	78	29	65	0.036	0.29251	0.00128	0.09308	0.00154	0.6996	0.0136	28.215	0.576	100	3 431	7
7.1	112	226	121	0.032	0.29340	0.00102	0.52461	0.00193	0.6911	0.0133	27.959	0.557	99	3 436	5
8.1	144	68	125	0.037	0.29186	0.00088	0.12124	0.00091	0.7103	0.0135	28.584	0.562	101	3 428	5
9.1	156	76	134	0.044	0.29222	0.00088	0.12787	0.00083	0.7026	0.0134	28.308	0.556	100	3 429	5
10.1	121	102	112	0.065	0.29277	0.00094	0.21821	0.00114	0.7096	0.0136	28.643	0.567	101	3 432	5
11.1	259	150	226	0.014	0.29368	0.00064	0.15024	0.00061	0.7011	0.0132	28.390	0.547	100	3 437	3
12.1	181	79	151	0.049	0.29272	0.00078	0.11487	0.00072	0.6895	0.0131	27.827	0.542	98	3 432	4
13.1	219	103	186	0.033	0.29279	0.00069	0.12075	0.00062	0.6956	0.0132	28.082	0.543	99	3 433	4
14.1	213	85	179	0.024	0.29264	0.00072	0.10296	0.00063	0.6987	0.0132	28.190	0.546	100	3 432	4
15.1	241	81	204	0.016	0.29266	0.00067	0.08712	0.00052	0.7135	0.0135	28.789	0.556	101	3 432	4
16.1	61	30	53	0.108	0.29337	0.00137	0.12546	0.00143	0.7167	0.0141	28.992	0.601	101	3 436	7
17.1	113	42	96	0.082	0.29163	0.00099	0.09349	0.00097	0.7082	0.0136	28.476	0.566	101	3 426	5
18.1	68	31	58	0.163	0.29252	0.00134	0.11630	0.00153	0.7003	0.0137	28.244	0.582	100	3 431	7
19.1	75	29	63	0.101	0.29143	0.00123	0.10002	0.00120	0.6996	0.0136	28.112	0.573	100	3 425	7
20.1	57	26	53	0.045	0.29137	0.00152	0.11988	0.00146	0.7576	0.0151	30.434	0.646	106	3 425	8
21.1	167	64	114	0.002	0.29292	0.00091	0.10100	0.00065	0.5718	0.0109	23.094	0.453	85	3 433	5
22.1	136	78	111	0.025	0.28762	0.00087	0.15195	0.00085	0.6570	0.0125	26.053	0.512	96	3 405	5
23.1	291	119	246	0.022	0.29378	0.00058	0.10512	0.00046	0.7004	0.0132	28.372	0.545	100	3 438	3

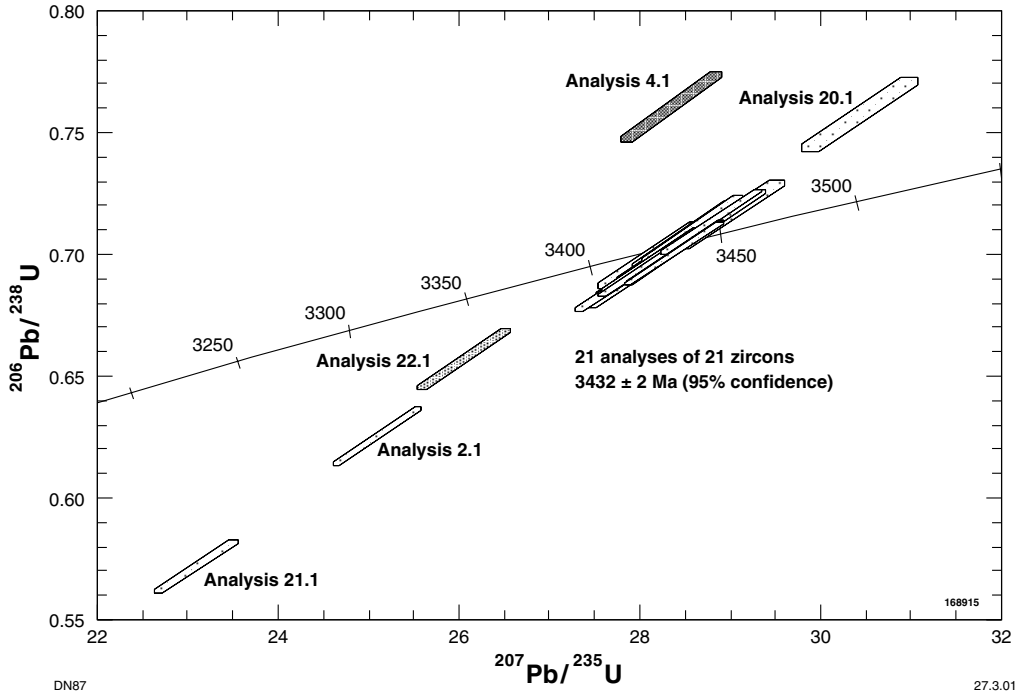

Figure 49. Concordia plot for sample 168915: rhyolite, Warrery Gap

calibration error of 1.86 (1σ%). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

Results

Twenty-three analyses were obtained from 23 zircons. Results are given in Table 45 and shown on a concordia plot in Figure 49.

Interpretation

The analyses are concordant to highly discordant, with the discordance pattern consistent with several episodes, including a recent episode, of radiogenic-Pb redistribution. Twenty-one concordant and slightly discordant analyses of 21 zircons have $^{207}Pb/^{206}Pb$ ratios defining a single population and indicating a weighted mean $^{207}Pb/^{206}Pb$ date of 3432 ± 2 Ma (chi-squared = 0.76). Discordant analyses 4.1 and 22.1 indicate lower $^{207}Pb/^{206}Pb$ dates than the main population.

The date of 3432 ± 2 Ma indicated by the weighted mean $^{207}Pb/^{206}Pb$ ratio of 21 concordant and discordant analyses of 21 zircons is interpreted as providing the time of igneous crystallization of the rhyolite. The younger $^{207}Pb/^{206}Pb$ dates indicated by analyses 4.1 and 22.1 are interpreted to be of sites that have lost some proportion of their accumulated radiogenic Pb, probably during several disturbance events.

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., 2001, 168915: rhyolite, Warrery Gap; in Compilation of geochronology data, 2000: Western Australia Geological Survey, Record 2001/2, p. 146–148.
OR
NELSON, D. R., 2001, 168915: rhyolite, Warrery Gap; Geochronology dataset 212; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

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