

168913: dacite, Gallop Well

Location and sampling

NULLAGINE (SF 51-5)

MGA Zone 51, 193680E 7623860N

Sampled on 21 September 1999

The sample was taken from the base of a low rocky cliff on the southern side of the bed of Sandy Creek, 150 m east of the site where the track crosses the creek, 150 m west of the site of sample 168914, and 3 km west of Gallop Well.

Tectonic unit/relations

This sample is from a dark-grey, fine- and even-grained dacite that contains rare 2–3 mm-diameter, dark chert fragments and sparse feldspar phenocrysts. The sample taken also had several ≤ 2 mm-thick silicic veins. The dacite occurs as a 1 m-thick lens interbedded with felsic agglomerate, 150 m below the stratigraphic top of a roughly 1 km-thick unit previously correlated with the Duffer Formation of the Warrawoona Group (Hickman, 1983).

Petrographic description

This sample consists principally of schistose sericite, less abundant quartz, leucoxene and/or clinozoisite within a very fine grained groundmass (90–93 vol.%), with minor dispersed leucoxene and/or clinozoisite (7–10 vol.%), chlorite (trace), tourmaline (trace), and zircon (trace). This is a plagioclase-porphyritic andesite or dacite lava, with alteration involving quartz, sericite, and clinozoisite. The sample has been cut by a quartz–feldspar vein, with a clinozoisite-rich alteration selvage. There is an indistinct foliation that in thin section is seen mostly as fine quartz–sericite schist, with minor disseminated clouded clinozoisite. Larger patches, up to 4 mm long, rich in clouded clinozoisite are scattered throughout the rock. These are partly rectilinear and have replaced feldspar phenocrysts, probably plagioclase, but include more irregular areas of uncertain origin. Minor very fine quartz, chlorite, and, rarely, blue-green tourmaline, occur in these aggregates. There are no quartz phenocrysts in this sample, which may be andesitic rather than dacitic in composition. The groundmass consists of very fine, schistose sericite, less abundant quartz, and minor dispersed leucoxene, and/or clinozoisite, indicating that the groundmass was felsic and possibly a minor mafic composition, but has been altered and undergone low-grade metamorphism. There is a crosscutting vein, up to 1.5 mm wide, which is rich in weakly deformed quartz with grains of albite, muscovite, and reddened plagioclase, rare epidote, and rare chlorite. Adjacent to this vein there is an alteration envelope rich in patches of clouded clinozoisite.

Zircon morphology

The zircons isolated from this sample are commonly pale to dark yellow-brown, euhedral, elongate, and commonly rectangular (in profile) fragments or with subrounded terminations, and are typically between $20 \times 100 \mu\text{m}$ and $50 \times 200 \mu\text{m}$ in size. Many grains are strongly zoned or striated, and fluid and mineral inclusions are common.

Analytical details

The sample was analysed on 25 January 2000. The counter deadtime was 32 ns. Six analyses of the CZ3 standard obtained during the analysis session indicated a Pb^*/U

Table 43. Ion microprobe analytical results for sample 168913: dacite, Gallop 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	300	526	312	0.061	0.29077	0.00069	0.44530	0.00118	0.6951	0.0126	27.867	0.519	99	3 422	4
2.1	427	641	433	0.040	0.29165	0.00057	0.37807	0.00088	0.7040	0.0128	28.309	0.523	100	3 426	3
3.1	212	198	201	0.131	0.29172	0.00084	0.23435	0.00106	0.7183	0.0132	28.893	0.546	102	3 427	4
4.1	314	348	304	0.043	0.29111	0.00066	0.28284	0.00088	0.7122	0.0130	28.586	0.532	101	3 424	4
5.1	80	74	76	0.322	0.29270	0.00142	0.22852	0.00205	0.7184	0.0136	28.994	0.582	102	3 432	8
6.1	108	96	103	0.111	0.29330	0.00112	0.22955	0.00140	0.7295	0.0136	29.502	0.573	103	3 435	6
7.1	634	512	512	0.091	0.28410	0.00049	0.20073	0.00058	0.6296	0.0114	24.661	0.453	93	3 386	3
8.1	477	852	493	0.037	0.29174	0.00054	0.44911	0.00092	0.6876	0.0125	27.659	0.510	98	3 427	3
9.1	214	277	212	0.069	0.29173	0.00083	0.32700	0.00119	0.7083	0.0130	28.490	0.538	101	3 427	4
10.1	102	48	90	0.188	0.29121	0.00126	0.12009	0.00143	0.7222	0.0135	28.997	0.570	102	3 424	7
11.1	63	38	56	0.205	0.29176	0.00158	0.15398	0.00198	0.7080	0.0135	28.483	0.584	101	3 427	8
12.1	428	598	413	0.038	0.29210	0.00058	0.35643	0.00085	0.6790	0.0123	27.347	0.505	97	3 429	3
13.1	285	417	282	0.048	0.29113	0.00070	0.37119	0.00109	0.6899	0.0126	27.693	0.517	99	3 424	4
14.1	219	227	205	0.075	0.29302	0.00082	0.26527	0.00106	0.6946	0.0127	28.063	0.528	99	3 434	4
15.1	128	144	126	0.075	0.29193	0.00104	0.28866	0.00142	0.7230	0.0134	29.100	0.561	102	3 428	6
16.1	143	138	137	0.030	0.29243	0.00098	0.24753	0.00119	0.7192	0.0133	28.997	0.556	102	3 431	5
17.1	364	466	348	0.016	0.29195	0.00061	0.32471	0.00085	0.6862	0.0125	27.623	0.512	98	3 428	3
18.1	92	82	86	0.218	0.29238	0.00129	0.22402	0.00173	0.7132	0.0134	28.753	0.569	101	3 430	7
19.1	125	94	113	0.130	0.29073	0.00112	0.19213	0.00136	0.7057	0.0131	28.288	0.548	101	3 422	6
20.1	54	49	54	0.204	0.28702	0.00174	0.23658	0.00247	0.7493	0.0145	29.651	0.620	106	3 402	9

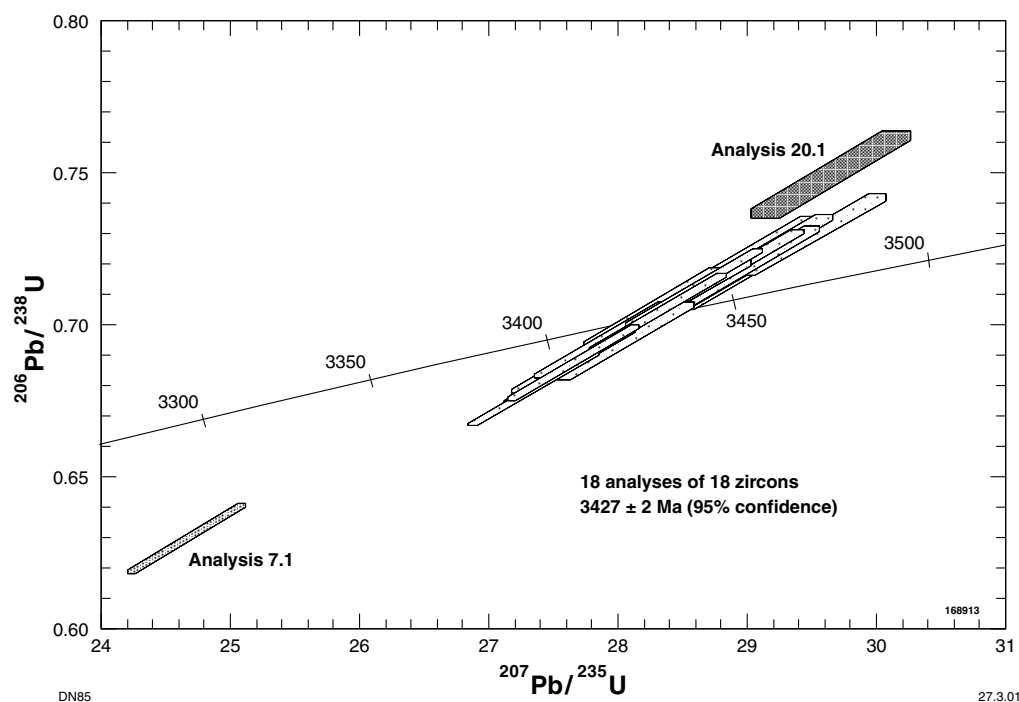


Figure 47. Concordia plot for sample 168913: dacite, Gallop Well

calibration error of 1.79 (1 σ %). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

Results

Twenty analyses were obtained from 20 zircons. Results are given in Table 43 and shown on a concordia plot in Figure 47.

Interpretation

Most analyses are concordant to slightly discordant, with the discordance pattern consistent with several episodes, including at least one a recent episode, of radiogenic-Pb redistribution. Eighteen concordant and slightly discordant analyses of 18 zircons have $^{207}\text{Pb}/^{206}\text{Pb}$ ratios defining a single population and indicating a weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ date of 3427 ± 2 Ma (chi-squared = 0.60). Discordant analyses 7.1 and 20.1 indicate slightly lower $^{207}\text{Pb}/^{206}\text{Pb}$ dates than the main population.

The date of 3427 ± 2 Ma indicated by the weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ ratio of 18 concordant and slightly discordant analyses of 18 zircons is interpreted as providing the time of igneous crystallization of the dacite. The younger $^{207}\text{Pb}/^{206}\text{Pb}$ dates indicated by analyses 7.1 and 20.1 are interpreted to be of sites that have lost some proportion of their accumulated radiogenic Pb 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, 168913: dacite, Gallop Well; in *Compilation of geochronology data, 2000*: Western Australia Geological Survey, Record 2001/2, p. 140–142.

OR

NELSON, D. R., 2001, 168913: dacite, Gallop Well; Geochronology dataset 225; in *Compilation of geochronology data, June 2006 update*: Western Australia Geological Survey.

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