

169084: ferruginous sandstone, Miringee Well

Location and sampling

WYLOO (SF 50-10), HARDEY (2252) MGA Zone 50,
456710E 7478460N

Sampled on 1 September 2001

The sample was taken from a 0.5 m-diameter block about half way up a prominent hill on the eastern side of an unnamed creekbed, 8 km west-northwest of Miringee Well.

Tectonic unit/relations

The sample is a purple-red, medium-grained, ferruginous quartzite containing rare clasts, up to 1 cm long, of red jasper and chert. It was taken from the reference section of the Beasley River Quartzite of the Wyloo Group, Ashburton Basin (Seymour et al., 1988). The sandstone unit is stratigraphically above a distinctive conglomerate unit that contains tabular pebbles, up to 20 cm long, of banded iron-formation and banded chert. The sample was collected to provide a maximum age limit for the Beasley River Quartzite.

Petrographic description

This is a massive, medium- to very coarse grained (hematitic) quartz-rich sandstone gradational to granule conglomerate. It includes beds rich in small clasts of chert and banded iron-formation, within a fine- to medium-grained siliceous sandstone with grains of chert, clouded polycrystalline quartz, single-crystal quartz grains, and widespread interstitial hematite. There are numerous rounded or flaggy lithic clasts, including iron-free chert (25 vol.%), and less abundant (7–8 vol.%) laminated quartz-hematite facies, probably low-grade banded iron-formation. These clasts are locally over 4 mm long, and thus constitute granules or small pebbles, and tend to occur in poorly defined interbeds. There are also relatively few larger clasts with silt-sized angular quartz grains scattered through earthy hematite (2–3 vol.%). The smaller grains dominating the quartz-rich sandstone host to these clasts measure up to 0.5 mm in diameter. They include chert (15 vol.%) as well as coarser-grained polycrystalline quartz clasts, mostly clouded and possibly of acid volcanic origin (20 vol.%), and more normal single-crystal quartz grains (20 vol.%). The single-crystal quartz grains are mostly less than 0.25 mm in diameter and have possibly stylolitic grain boundaries. Elongate masses of hematite are common (10 vol.%) and as much as 2 mm long, but are largely interstitial and could be partly authigenic. The sample has a sparse network of quartz veins to 0.5 mm wide with rare sericite and limonite. There is no obvious evidence of metamorphism.

Zircon morphology

The zircons isolated from this sample are typically colourless, pale yellowish- or pinkish-brown or black fragments and whole grains, between $35 \times 50 \mu\text{m}$ and $200 \times 250 \mu\text{m}$ in size, and equant to elongate and rounded. Many grains are internally structureless and most have pitted terminations, consistent with detrital transport. Cathodoluminescence images of representative zircons are given in Figure 1.

Analytical details

This sample was analysed on 30 July 2002. The counter deadtime during the analysis session was 32 ns. Seven analyses of the CZ3 standard obtained during the analysis session indicated a Pb^*/U calibration uncertainty of 1.30% (1σ). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

Results

Twenty-nine analyses were obtained from 29 zircons. Results are given in Table 1, and shown on concordia and Gaussian-summation probability density plots in Figures 2 and 3, respectively.

Interpretation

The analyses are concordant to slightly discordant, with the discordance pattern consistent with a dominant recent episode of radiogenic-Pb redistribution. On the basis of their $^{207}\text{Pb}/^{206}\text{Pb}$ ratios, many analyses can be assigned to one of two groups. Sixteen concordant and slightly discordant analyses of 16 zircons (1.1, 5.1, 7.1, 8.1, 11.1, 14.1, 15.1, 16.1, 18.1, 20.1, 21.1, 22.1, 23.1, 24.1, 25.1, 29.1), assigned to Group 1, 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 $2446 \pm 8 \text{ Ma}$ (chi-squared = 0.91). Concordant analyses 2.1, 6.1, 26.1, 27.1, and 28.1, assigned to Group 2, 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 $2541 \pm 21 \text{ Ma}$ (chi-squared = 0.55). Apart from discordant analysis 3.1, the remaining analyses are concordant and indicate older $^{207}\text{Pb}/^{206}\text{Pb}$ dates but cannot be confidently grouped.

The date of $2446 \pm 8 \text{ Ma}$ indicated by the weighted mean $^{207}\text{Pb}/^{206}\text{Pb}$ ratio of the 16 concordant and slightly discordant analyses of 16 zircons assigned to Group 1 is interpreted as a maximum age for deposition of the sandstone. The older dates provided by the remaining analyses are interpreted to be of detrital zircons. Possible

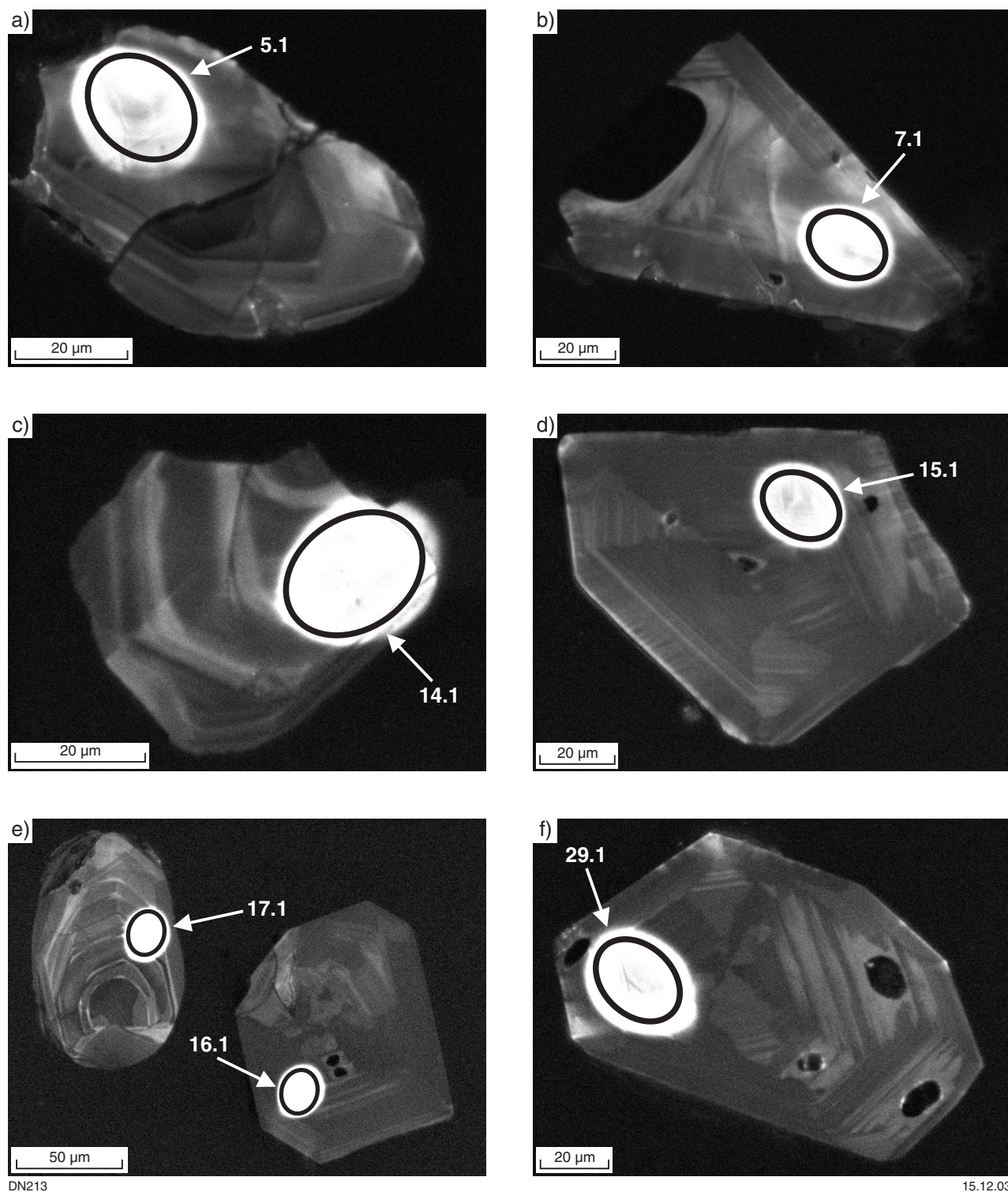


Figure 1. Cathodoluminescence images of representative zircons from sample 169084: ferruginous sandstone, Miringee Well

source rocks within the western part of Australia having ages matching those of the zircons within this sample include those of the Pilbara and Yilgarn Cratons.

Recommended reference for this publication:

NELSON, D. R., 2004, 169084: ferruginous sandstone, Miringee Well; Geochronology dataset 43; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 30/07/2002; Data released: 06/12/2004

Table 1. Ion microprobe analytical results for sample 169084: ferruginous sandstone, Miringee Well

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	585	536	305	0.316	0.15761	0.00090	0.25440	0.00176	0.4245	0.0057	9.225	0.141	94	2 430	10
2.1	98	51	55	0.356	0.16998	0.00238	0.14533	0.00425	0.4909	0.0076	11.505	0.255	101	2 557	23
3.1	58	27	38	0.483	0.20244	0.00310	0.12183	0.00496	0.5670	0.0097	15.827	0.385	102	2 846	25
4.1	198	82	141	0.203	0.23661	0.00158	0.11007	0.00195	0.6087	0.0087	19.859	0.329	99	3 097	11
5.1	259	191	133	0.168	0.16119	0.00128	0.20521	0.00222	0.4351	0.0061	9.670	0.163	94	2 468	13
6.1	238	155	131	0.132	0.16938	0.00128	0.17927	0.00200	0.4730	0.0066	11.046	0.185	98	2 552	13
7.1	165	69	83	0.446	0.15746	0.00178	0.11185	0.00300	0.4521	0.0067	9.814	0.193	99	2 429	19
8.1	191	48	88	0.114	0.16047	0.00144	0.06860	0.00183	0.4350	0.0062	9.624	0.172	95	2 461	15
9.1	87	43	60	0.709	0.22301	0.00298	0.12975	0.00519	0.5813	0.0093	17.875	0.394	98	3 003	21
10.1	147	57	97	0.569	0.22328	0.00208	0.09913	0.00313	0.5688	0.0084	17.510	0.323	97	3 005	15
11.1	205	85	104	0.371	0.15931	0.00150	0.11418	0.00239	0.4587	0.0065	10.075	0.182	99	2 448	16
12.1	149	28	107	0.341	0.25429	0.00195	0.04991	0.00243	0.6328	0.0094	22.187	0.389	98	3 212	12
13.1	293	147	142	0.388	0.15365	0.00130	0.13568	0.00219	0.4301	0.0060	9.113	0.156	97	2 387	14
14.1	259	157	119	0.602	0.15874	0.00166	0.16349	0.00312	0.3955	0.0055	8.657	0.160	88	2 442	18
15.1	266	154	141	0.409	0.15903	0.00135	0.15907	0.00233	0.4631	0.0065	10.153	0.175	100	2 445	14
16.1	216	98	112	0.638	0.15671	0.00171	0.12336	0.00310	0.4623	0.0066	9.990	0.189	101	2 420	18
17.1	127	90	79	0.475	0.18899	0.00202	0.19676	0.00346	0.5141	0.0077	13.397	0.261	98	2 733	18
18.1	166	68	84	0.370	0.16076	0.00182	0.11354	0.00308	0.4542	0.0065	10.068	0.195	98	2 464	19
19.1	58	57	59	0.749	0.31173	0.00345	0.24806	0.00534	0.7411	0.0129	31.854	0.693	101	3 530	17
20.1	196	81	100	0.353	0.15684	0.00162	0.11841	0.00274	0.4589	0.0065	9.923	0.185	101	2 422	18
21.1	195	84	100	0.319	0.16047	0.00154	0.11759	0.00248	0.4619	0.0066	10.220	0.186	99	2 461	16
22.1	261	145	136	0.319	0.15983	0.00133	0.15603	0.00223	0.4541	0.0064	10.007	0.171	98	2 454	14
23.1	262	150	136	0.348	0.16040	0.00143	0.15815	0.00254	0.4523	0.0063	10.004	0.175	98	2 460	15
24.1	208	93	108	0.326	0.15819	0.00148	0.12259	0.00243	0.4647	0.0066	10.136	0.183	101	2 436	16
25.1	220	74	112	0.331	0.15852	0.00149	0.09265	0.00236	0.4686	0.0066	10.242	0.184	102	2 440	16
26.1	125	209	87	0.558	0.16666	0.00245	0.46096	0.00585	0.4886	0.0074	11.228	0.251	102	2 524	25
27.1	193	108	105	0.333	0.16797	0.00164	0.15548	0.00283	0.4723	0.0068	10.937	0.201	98	2 538	16
28.1	192	219	120	0.400	0.16673	0.00160	0.30237	0.00328	0.4888	0.0070	11.237	0.205	102	2 525	16
29.1	231	105	119	1.266	0.16005	0.00200	0.13128	0.00390	0.4459	0.0063	9.840	0.197	97	2 456	21

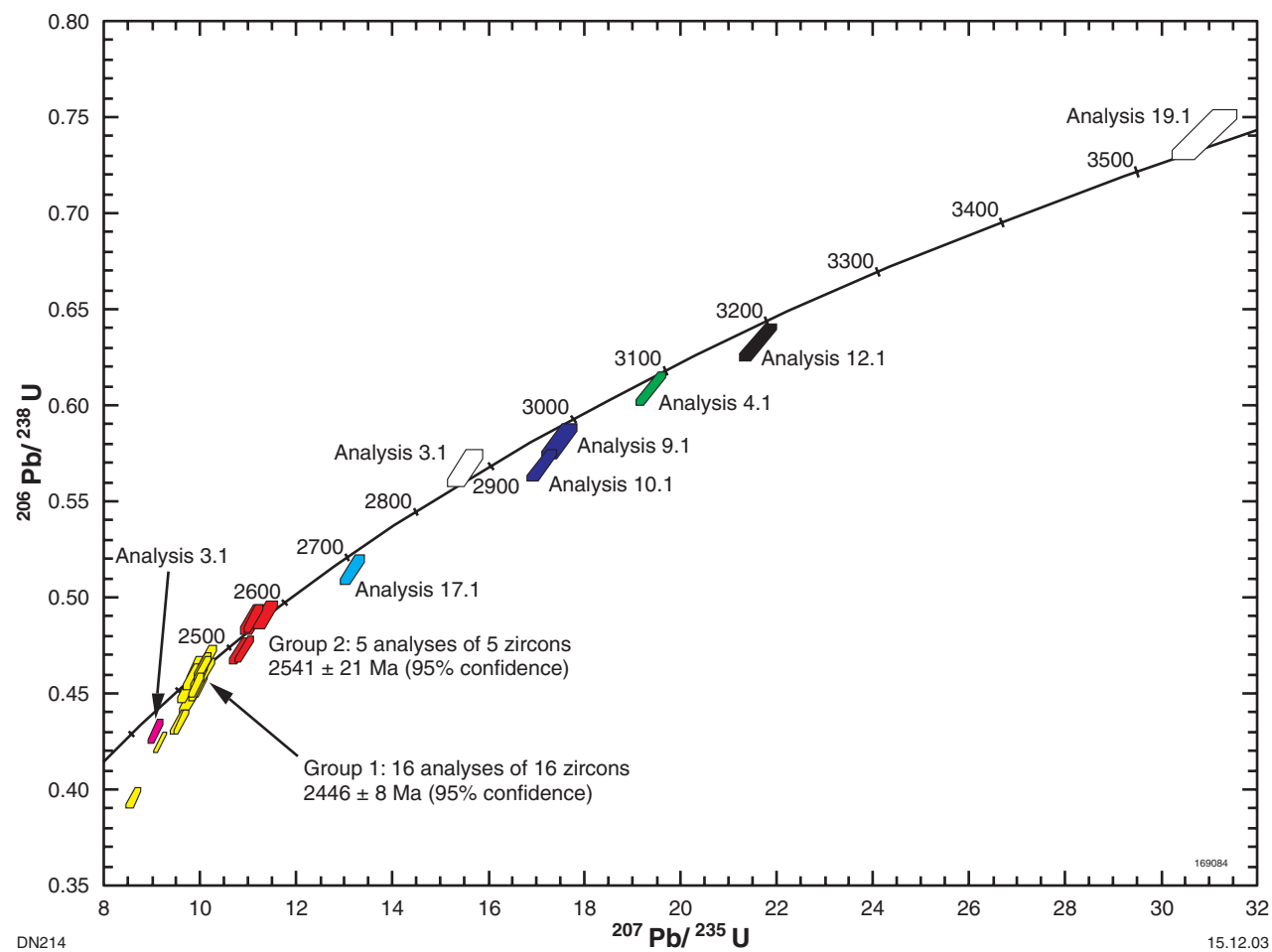


Figure 2. Concordia plot for sample 169084: ferruginous sandstone, Miringee Well

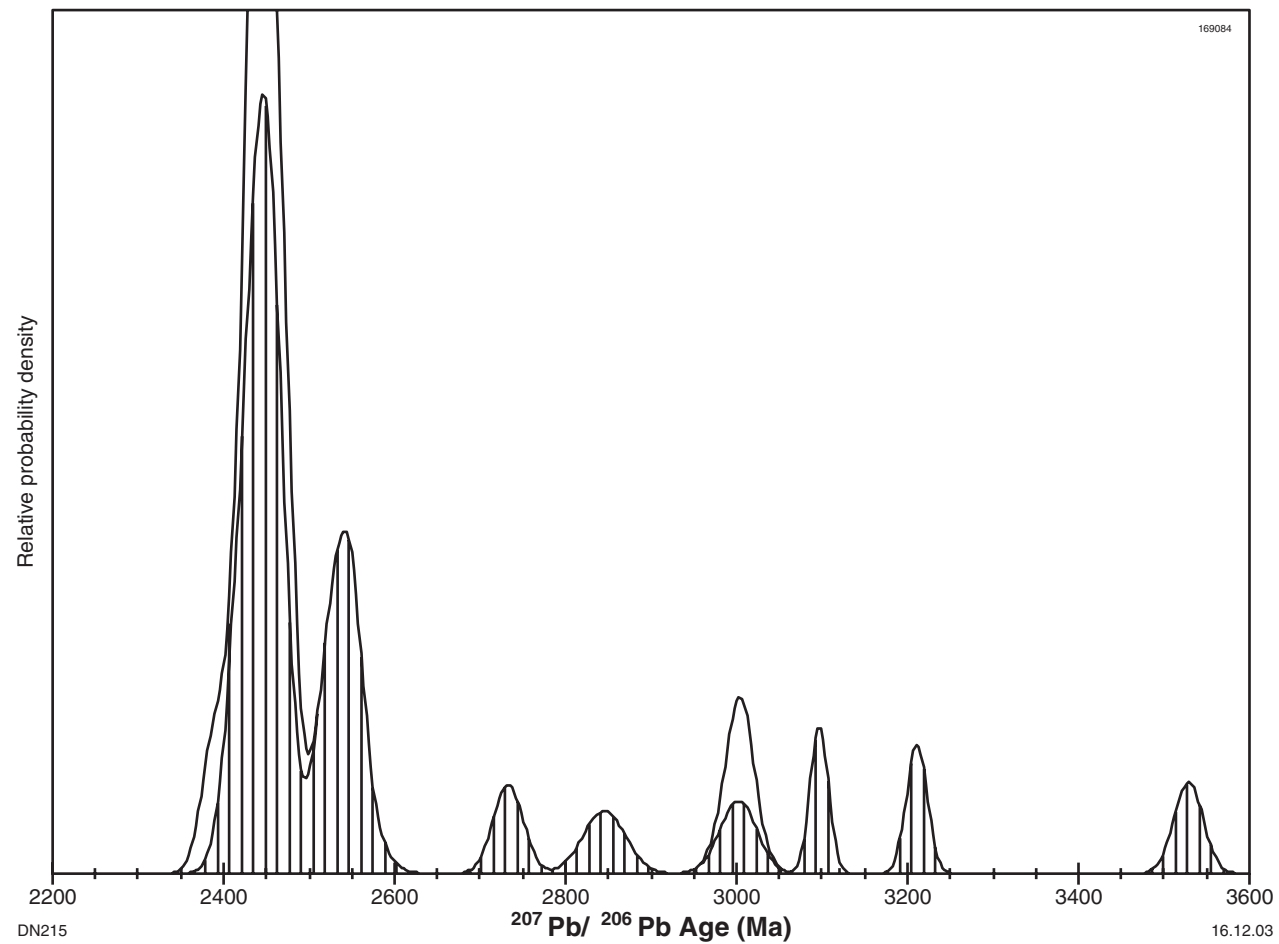


Figure 3. Gaussian-summation probability density plot for sample 169084: ferruginous sandstone, Miringee Well