

# 169082: sandstone, Meteorite Bore

## Location and sampling

MOUNT BRUCE (SF 50-11), ROCKLEA (2352)  
MGA Zone 50, 504970E 7460910N

Sampled on 1 September 2001

The sample was taken from the lowest beds exposed at the southeastern end of an east-west-striking sandstone and conglomerate ridge, 3.8 km south-southeast of Meteorite Bore.

## Tectonic unit/relations

This sample is a dark grey and orange-yellow banded, medium- to coarse- and even-grained, silicified sandstone from the stratigraphically lower part of the Mount McGrath Formation of the Wyloo Group, Ashburton Basin (Thorne and Tyler, 1996). It was taken from a 0.5 m-thick sandstone bed located 10 m stratigraphically higher than the horizon from which sample 169081 (Nelson, this volume) was taken, and was collected to provide a maximum age limit for the lower Mount McGrath Formation.

## Petrographic description

This sample is a gritty, quartz-rich, very coarse grained sandstone, with single-crystal quartz grains and cherty to limonite-rich clasts, minor opaque oxide grains, interstitial quartz-sericite patches, and rare green tourmaline. The sandstone consists of a compact, moderately tightly packed aggregate of single-crystal quartz grains to 1 mm in diameter. These are commonly rimmed by limonite, but optically continuous siliceous overgrowths are rare. Larger, to 2 mm long, angular quartz grains occur, but are rare. Some of the single-crystal quartz grains have deformation lamellae, mostly sub-basal but also prismatic. There are also clasts, to 3 mm long, of polycrystalline quartz (15 vol.%), some of which have formed by the thermal maturation of chalcedony, with lenses of more sparry vein quartz. One clast has a vein of fine-grained quartz passing into more sparry to columnar quartz on either side, indicating derivation from a banded quartz vein. Smaller quartz- to hematite-rich clasts are also common (5 vol.%). Some of these are laminated with quartz- and limonite-rich lamellae. There are leucoxenized grains, to 0.6 mm long, with smaller grains of oxidized opaque oxide, and scattered minor interstitial patches of quartz and sericite, some containing minor green tourmaline. The sandstone is only weakly metamorphosed.

## Zircon morphology

The zircons isolated from this sample are typically pale pink, pinkish-brown or black fragments and whole grains, between 35 × 50 µm and 200 × 250 µm 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 5 August 2002. The counter deadtime during the analysis session was 24 ns. Nine analyses of the CZ3 standard obtained during the analysis session indicated a Pb\*/U calibration uncertainty of 1.47% (1σ). Common-Pb corrections were applied assuming Broken Hill common-Pb isotopic compositions for all analyses.

## Results

Thirty-four analyses were obtained from 34 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 three groups. Eight concordant and slightly discordant analyses of eight zircons (3.1, 7.1, 8.1, 10.1, 15.1, 19.1, 26.1, 28.1), 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  $2462 \pm 22$  Ma (chi-squared = 1.09). Twelve concordant and slightly discordant analyses of 12 zircons (1.1, 4.1, 5.1, 6.1, 11.1, 12.1, 18.1, 21.1, 24.1, 31.1, 33.1, 34.1), 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  $2600 \pm 19$  Ma (chi-squared = 1.30). Six concordant and slightly discordant analyses of six zircons (16.1, 17.1, 20.1, 22.1, 25.1, 29.1), assigned to Group 3, 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  $2705 \pm 22$  Ma (chi-squared = 0.56). The remaining analyses are concordant and indicate generally older  $^{207}\text{Pb}/^{206}\text{Pb}$  dates but cannot be confidently grouped.

The date of  $2462 \pm 22$  Ma indicated by the weighted mean  $^{207}\text{Pb}/^{206}\text{Pb}$  ratio of eight concordant and slightly discordant analyses of eight zircons of 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 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.

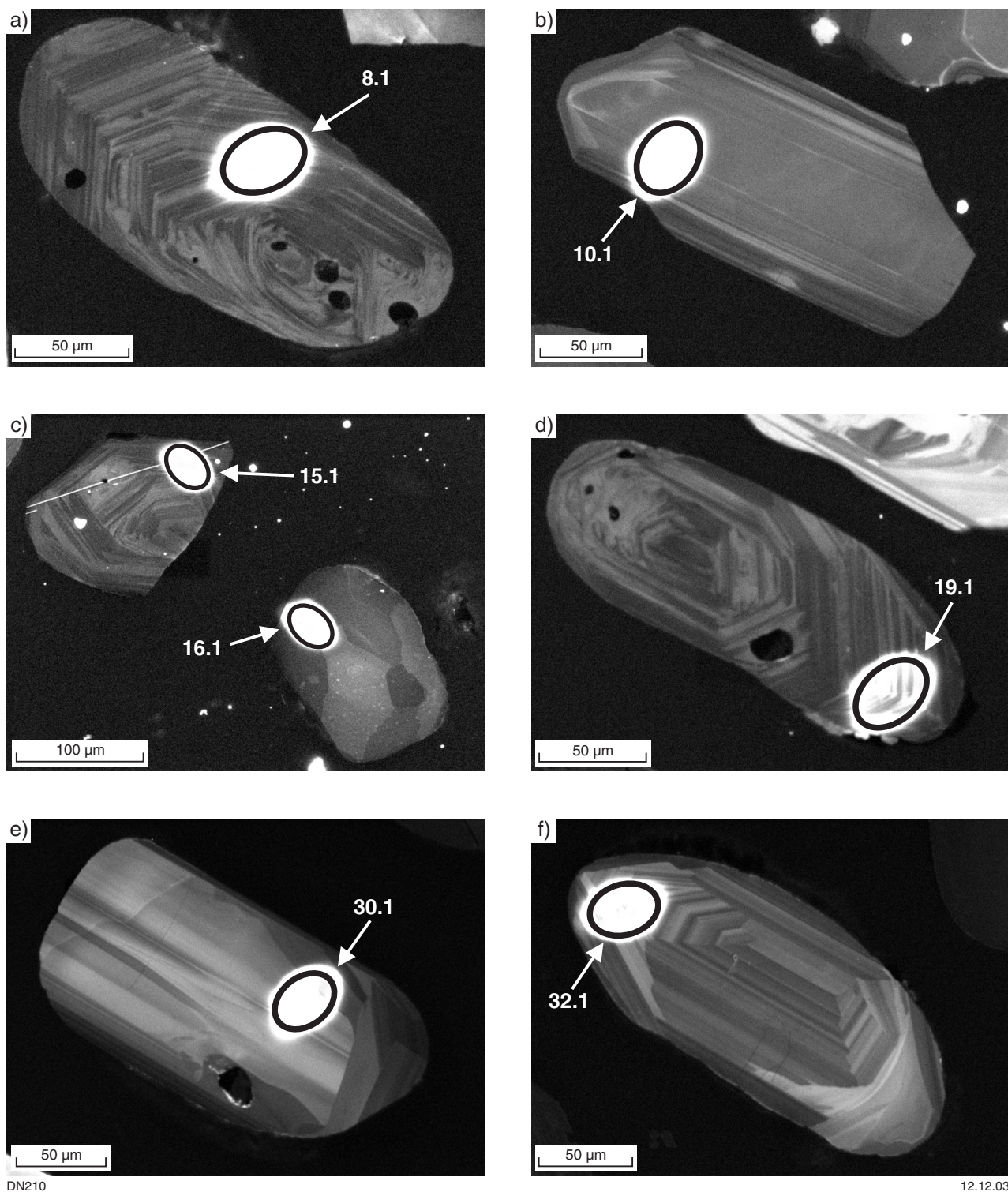


Figure 1. Cathodoluminescence images of representative zircons from sample 169082: sandstone, Meteorite Bore

Recommended reference for this publication:

NELSON, D. R., 2004, 169082: sandstone, Meteorite Bore; Geochronology dataset 42; in Compilation of geochronology data, June 2006 update: Western Australia Geological Survey.

Data obtained: 05/08/2002; Data released: 06/12/2004

**Table 1. Ion microprobe analytical results for sample 169082: sandstone, Meteorite Bore**

<i>Grain spot</i>	<i>U (ppm)</i>	<i>Th (ppm)</i>	<i>Pb (ppm)</i>	<i>f206%</i>	<i><sup>207</sup>Pb/<sup>206</sup>Pb</i>	<i>±1σ</i>	<i><sup>208</sup>Pb/<sup>206</sup>Pb</i>	<i>±1σ</i>	<i><sup>206</sup>Pb/<sup>238</sup>U</i>	<i>±1σ</i>	<i><sup>207</sup>Pb/<sup>235</sup>U</i>	<i>±1σ</i>	<i>% concordance</i>	<i><sup>207</sup>Pb/<sup>206</sup>Pb Age</i>	<i>±1σ</i>
1.1	165	158	100	0.921	0.17135	0.00208	0.26141	0.00421	0.4764	0.0078	11.256	0.242	98	2 571	20
2.1	65	38	50	2.615	0.23132	0.00481	0.14212	0.00954	0.5975	0.0114	19.058	0.570	99	3 061	33
3.1	244	71	119	0.448	0.16039	0.00156	0.07836	0.00261	0.4508	0.0071	9.969	0.195	98	2 460	16
4.1	136	103	84	1.065	0.17933	0.00252	0.20142	0.00494	0.4997	0.0084	12.356	0.287	99	2 647	23
5.1	86	48	49	1.307	0.17324	0.00338	0.14759	0.00658	0.4816	0.0086	11.504	0.322	98	2 589	33
6.1	79	52	49	1.581	0.18184	0.00372	0.18951	0.00746	0.4995	0.0091	12.523	0.364	98	2 670	34
7.1	156	66	76	0.216	0.15976	0.00191	0.12212	0.00320	0.4401	0.0072	9.694	0.209	96	2 453	20
8.1	118	42	59	1.187	0.16421	0.00294	0.10029	0.00559	0.4427	0.0077	10.023	0.265	95	2 499	30
9.1	48	32	40	2.634	0.25009	0.00638	0.18075	0.01292	0.6179	0.0129	21.307	0.745	97	3 185	40
10.1	83	63	50	2.480	0.15767	0.00450	0.21055	0.00970	0.4735	0.0086	10.293	0.368	103	2 431	48
11.1	233	165	133	0.583	0.17291	0.00175	0.20639	0.00333	0.4710	0.0075	11.229	0.224	96	2 586	17
12.1	157	109	87	1.170	0.17171	0.00263	0.19284	0.00531	0.4585	0.0076	10.855	0.260	95	2 574	26
13.1	43	17	31	3.358	0.21569	0.00662	0.10821	0.01338	0.5627	0.0118	16.733	0.657	98	2 949	50
14.1	263	131	172	0.731	0.20464	0.00163	0.13752	0.00273	0.5545	0.0088	15.646	0.290	99	2 864	13
15.1	171	79	92	1.224	0.15991	0.00235	0.12732	0.00457	0.4683	0.0077	10.324	0.241	101	2 455	25
16.1	114	98	72	0.978	0.18443	0.00270	0.24095	0.00535	0.5010	0.0086	12.739	0.304	97	2 693	24
17.1	173	150	109	0.641	0.18820	0.00207	0.23510	0.00397	0.5044	0.0082	13.089	0.272	97	2 727	18
18.1	36	29	25	2.983	0.18526	0.00723	0.23103	0.01553	0.5159	0.0115	13.178	0.623	99	2 701	64
19.1	182	71	93	1.119	0.15859	0.00242	0.10673	0.00474	0.4507	0.0073	9.854	0.233	98	2 441	26
20.1	166	137	105	1.203	0.18399	0.00246	0.21676	0.00496	0.5045	0.0083	12.799	0.288	98	2 689	22
21.1	134	120	81	1.310	0.17273	0.00279	0.24273	0.00581	0.4738	0.0080	11.284	0.279	97	2 584	27
22.1	116	68	72	1.340	0.18508	0.00300	0.16035	0.00585	0.5091	0.0088	12.993	0.326	98	2 699	27
23.1	74	76	55	1.908	0.22017	0.00425	0.27252	0.00878	0.5529	0.0103	16.784	0.478	95	2 982	31
24.1	155	146	96	1.227	0.17425	0.00256	0.25312	0.00533	0.4829	0.0080	11.602	0.272	98	2 599	24
25.1	112	77	69	1.084	0.18316	0.00281	0.18187	0.00541	0.5091	0.0088	12.856	0.314	99	2 682	25
26.1	190	82	102	0.943	0.16543	0.00229	0.11799	0.00448	0.4722	0.0077	10.770	0.243	99	2 512	23
27.1	212	206	127	0.619	0.16799	0.00177	0.26547	0.00357	0.4758	0.0076	11.021	0.223	99	2 538	18
28.1	147	65	73	0.431	0.15837	0.00214	0.11603	0.00372	0.4460	0.0074	9.739	0.220	98	2 438	23
29.1	205	191	132	0.423	0.18663	0.00177	0.25541	0.00339	0.5112	0.0082	13.154	0.258	98	2 713	16
30.1	36	21	28	2.642	0.23361	0.00709	0.17201	0.01440	0.5965	0.0135	19.213	0.770	98	3 077	48
31.1	160	170	99	0.496	0.17621	0.00204	0.28819	0.00411	0.4814	0.0079	11.695	0.249	97	2 618	19
32.1	36	18	24	1.822	0.19892	0.00678	0.13837	0.01383	0.5347	0.0120	14.666	0.632	98	2 817	56
33.1	192	188	119	1.010	0.17372	0.00211	0.26492	0.00433	0.4877	0.0079	11.681	0.251	99	2 594	20
34.1	19	6	14	10.066	0.17458	0.01682	0.06491	0.03698	0.4942	0.0151	11.895	1.245	99	2 602	161

*Geochronology data obtained in 2002*

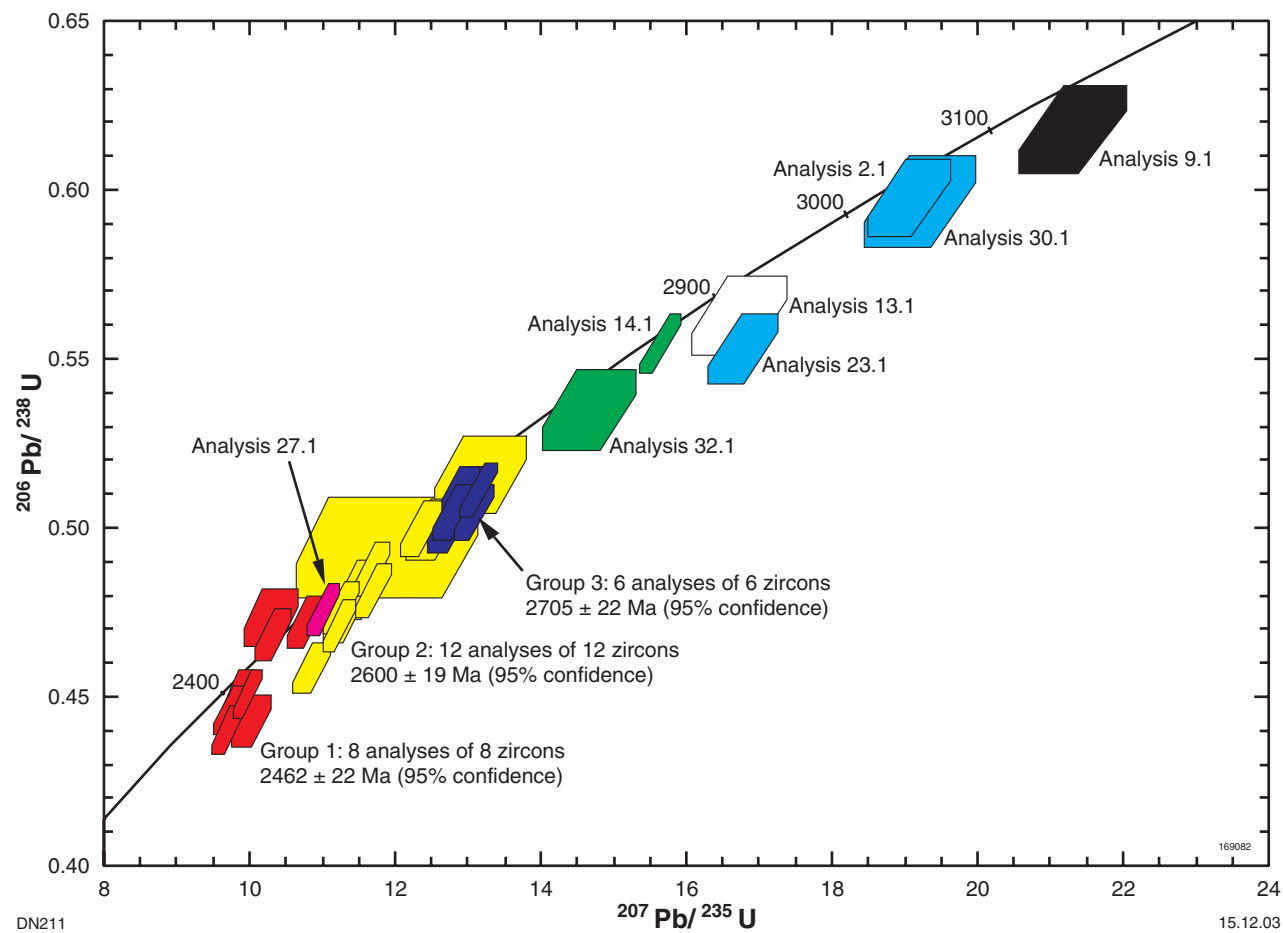


Figure 2. Concordia plot for sample 169082: sandstone, Meteorite Bore

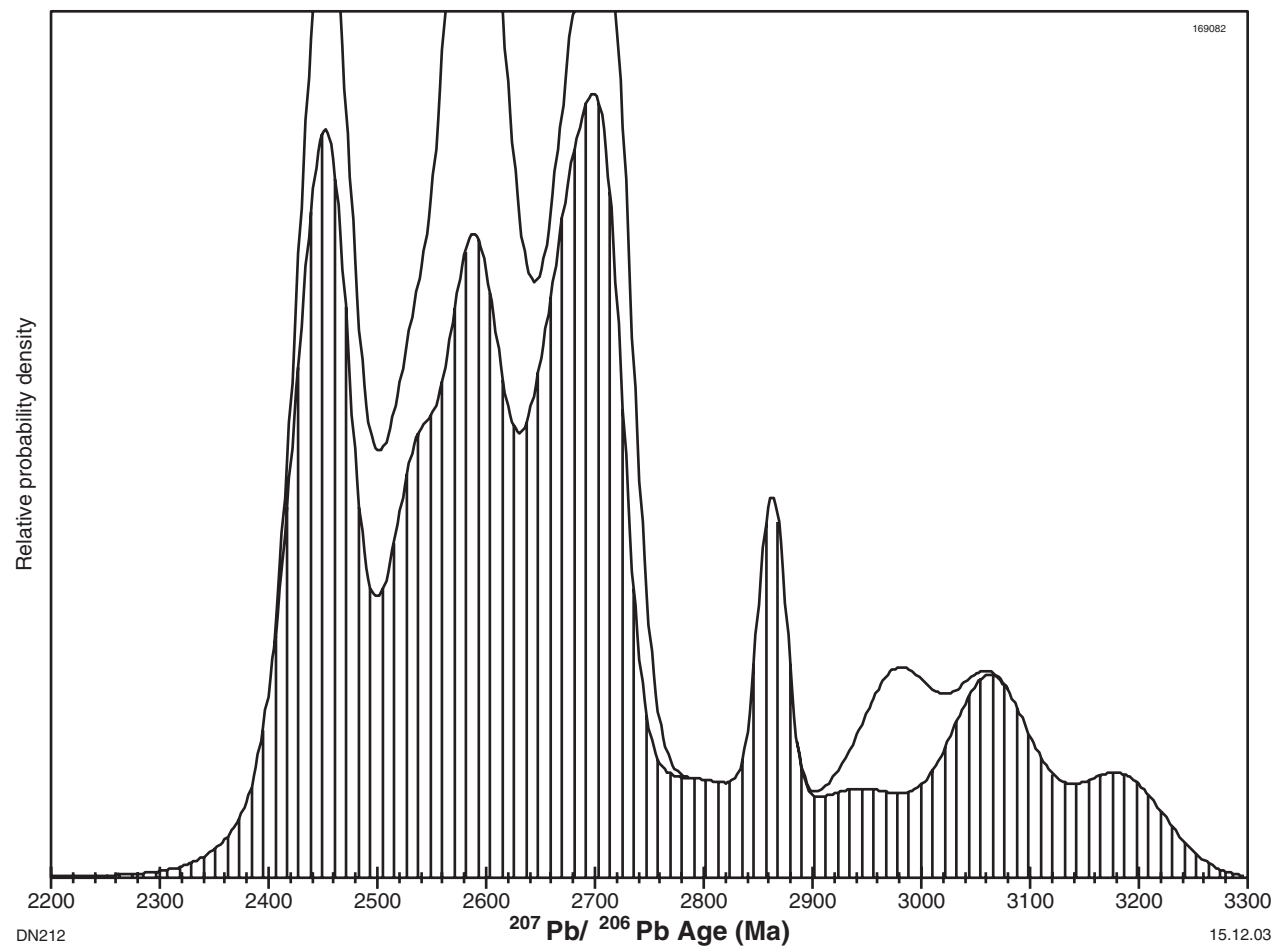


Figure 3. Gaussian-summation probability density plot for sample 169082: sandstone, Meteorite Bore