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APPENDIX 2. $^{40}\text{Ar}/^{39}\text{Ar}$ Dating: Mineral Separation, Analytical Methodology, and Age Calculation

Samples were coarsely crushed and sieved to ~20–40 mesh, then run through a magnetic separator to concentrate sanidine, quartz, and plagioclase. These were leached with 5% HF for ~1 h to remove any matrix. Sanidine was then handpicked under a binocular microscope. Samples were irradiated at Texas A&M University for 7 h and analyzed at the New Mexico Geochronology Research Laboratory, using procedures described in McIntosh et al. (2003). Neutron flux was monitored using interlaboratory standard Fish Canyon tuff sanidine FC-1 with an assigned age of 28.02 Ma (Renne et al., 1998). Individual sanidine grains were fused using a CO_2 laser operating at 10 W for 5 s. Extracted gases were purified with SAES GP-50 getters. Argon was analyzed with a Mass Analyzer Products (MAP) model 215-50 mass spectrometer operated in static mode. Variance-weighted mean ages of the nine to 23 grains reported in Table 2 (see text) were calculated by the method of Samson and Alexander (1987), using decay constants of Steiger and Jäger (1977). Individual analyses were discarded, if they were obvious xenocrysts or had low ^{39}Ar contents or radiogenic yields.

$^{40}\text{Ar}/^{39}\text{Ar}$ dating of sanidine is an especially powerful correlation tool (Deino, 1989; McIntosh et al. 1990), especially by the single-crystal method. Ages are typically precise to less than 0.1 Ma 2σ , which is confirmed by multiple dates from single units. The K/Ca ratio of sanidine, an added result of $^{40}\text{Ar}/^{39}\text{Ar}$ dating, is an additional and commonly very useful correlation tool. Although the Bates Mountain Tuffs illustrate these differences, ratios for Caetano Tuff and tuff of Cove Mine were similar.

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⁴⁰Ar/³⁹Ar analytical data, single sanidine, Caetano Tuff and related rocks

ID	⁴⁰ Ar/ ³⁹ Ar	³⁷ Ar/ ³⁹ Ar	³⁶ Ar/ ³⁹ Ar (x 10 ⁻³)	³⁹ Ar _K (x 10 ⁻¹⁵ mol)	K/Ca	⁴⁰ Ar* (%)	Age (Ma)	±1σ (Ma)
05-DJ-14 , Sanidine, J=0.0013834±0.09%, D=1.002±0.001, NM-197H, Lab#=56435								
03	13.70	0.0092	0.2000	16.853	55.7	99.6	33.736	0.055
04	13.75	0.0113	0.3156	17.924	45.2	99.3	33.770	0.054
10	13.69	0.0078	0.0927	24.792	65.2	99.8	33.783	0.050
06	13.70	0.0094	0.0779	23.728	54.2	99.8	33.818	0.047
07	13.77	0.0083	0.2861	22.475	61.8	99.4	33.835	0.049
09	13.94	0.0055	0.8532	18.068	92.8	98.2	33.836	0.055
01	13.73	0.0098	0.1022	22.978	52.3	99.8	33.872	0.058
02	13.78	0.0095	0.2095	35.116	53.7	99.6	33.910	0.048
05	13.79	0.0110	0.2306	15.917	46.5	99.5	33.939	0.060
08	13.77	0.0083	0.1215	17.404	61.5	99.7	33.968	0.055
Mean age ± 2σ	n=10	MSWD=1.91		58.9 ±27.1			33.844	0.076
05-DJ-27 , Sanidine, J=0.0013828±0.11%, D=1.002±0.001, NM-197H, Lab#=56436								
14	13.74	0.0075	0.2814	16.415	67.6	99.4	33.763	0.057
16	13.76	0.0085	0.3356	16.701	59.9	99.3	33.766	0.050
11	13.73	0.0054	0.1912	11.167	95.2	99.6	33.796	0.062
19	13.74	0.0058	0.2181	15.446	88.1	99.5	33.797	0.060
15	13.74	0.0082	0.2071	27.803	62.3	99.6	33.808	0.044
17	13.81	0.0081	0.3522	25.567	63.3	99.3	33.866	0.046
20	14.03	0.0116	1.076	17.190	44.0	97.7	33.888	0.054
13	13.81	0.0103	0.3102	7.303	49.4	99.3	33.914	0.059
18	13.91	0.0105	0.5950	18.262	48.5	98.7	33.948	0.054
12	13.77	0.0092	0.1142	29.375	55.6	99.8	33.952	0.051
Mean age ± 2σ	n=10	MSWD=1.85		63.4 ±33.4			33.850	0.087
06-DJ-13 , Sanidine, J=0.0013818±0.12%, D=1.002±0.001, NM-197H, Lab#=56437								
07	14.20	0.0078	1.518	6.721	65.1	96.8	33.964	0.073
01	13.92	0.0081	0.3831	19.746	62.8	99.2	34.108	0.052
04	13.88	0.0073	0.1820	19.691	69.7	99.6	34.153	0.053
05	13.92	0.0068	0.2566	46.006	75.1	99.5	34.188	0.042
06	13.91	0.0083	0.2115	13.413	61.3	99.6	34.202	0.057
10	13.94	0.0093	0.2032	25.964	54.8	99.6	34.270	0.050
09	13.98	0.0073	0.3164	28.628	70.0	99.3	34.300	0.053
08	14.45	0.0097	1.890	18.407	52.5	96.1	34.303	0.061
03	14.02	0.0073	0.3188	33.369	69.5	99.3	34.378	0.049
02	13.95	0.0072	0.0716	41.099	70.8	99.9	34.406	0.044
Mean age ± 2σ	n=7	MSWD=1.99		63.8 ±16.6			34.21	0.10
05-DJ-8 , Sanidine, J=0.0013834±0.07%, D=1.002±0.001, NM-197H, Lab#=56434								
04	14.07	0.0056	0.9622	10.006	90.7	98.0	34.078	0.070
03	13.87	0.0060	0.1703	13.868	85.5	99.6	34.156	0.055
06	14.35	0.0062	1.774	11.297	82.1	96.4	34.176	0.070
05	14.09	0.0076	0.8679	19.061	67.4	98.2	34.202	0.053
09	14.01	0.0058	0.5649	35.844	88.6	98.8	34.233	0.047
07	13.89	0.0064	0.1439	17.074	79.4	99.7	34.245	0.053
10	13.88	0.0065	0.0701	18.241	78.9	99.9	34.264	0.056
02	13.93	0.0067	0.2083	18.357	75.9	99.6	34.288	0.054
08	14.06	0.0062	0.6437	21.377	82.1	98.7	34.295	0.055
01	15.72	0.0063	6.084	36.243	81.6	88.6	34.426	0.062
Mean age ± 2σ	n=9	MSWD=1.29		81.2 ±14.0			34.224	0.063

Notes:

Isotopic ratios corrected for blank, radioactive decay, and mass discrimination, not corrected for interfering reactions.

Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.

Mean age is weighted mean age of Taylor (1982). Mean age error is weighted error of the mean (Taylor, 1982), multiplied by the root of the MSWD where MSWD>1, and also incorporates uncertainty in J factors and irradiation correction uncertainties.

Decay constants and isotopic abundances after Steiger and Jäger (1977).

symbol preceding sample ID denotes analyses excluded from mean age calculations.

Ages calculated relative to FC-2 Fish Canyon Tuff sanidine interlaboratory standard at 27.84 Ma

Decay Constant (LambdaK (total)) = 5.543e-10/a

Correction factors:

$$({}^{39}\text{Ar}/{}^{37}\text{Ar})_{\text{Ca}} = 0.0007 \pm 5\text{e-}05$$

$$({}^{36}\text{Ar}/{}^{37}\text{Ar})_{\text{Ca}} = 0.00028 \pm 1\text{e-}05$$

$$({}^{38}\text{Ar}/{}^{39}\text{Ar})_{\text{K}} = 0.01077$$

$$({}^{40}\text{Ar}/{}^{39}\text{Ar})_{\text{K}} = 0 \pm 0.0004$$

Tru5-4, Sanidine, J=0.0007606±0.05%, D=1.004±0.001, NM-189B, Lab#=55588

06	24.91	0.0038	0.4994	8.789	132.7	99.4	33.658	0.064
05	24.80	0.0064	0.0193	6.272	79.2	100.0	33.711	0.071
02	25.02	0.0059	0.7200	6.469	86.2	99.2	33.717	0.068
04	24.80	0.0035	-0.0422	6.406	146.8	100.1	33.731	0.072
07	24.76	-0.0010	-0.2289	5.095	-	100.3	33.754	0.078
01	24.90	0.0037	0.1477	8.633	136.8	99.8	33.785	0.062
03	24.91	0.0054	0.1734	7.926	94.0	99.8	33.793	0.068
09	24.79	0.0039	-0.2379	5.079	130.8	100.3	33.796	0.088
10	25.07	0.0001	0.6188	3.152	5254.4	99.3	33.83	0.11
08	24.86	0.0065	-0.0842	5.480	79.1	100.1	33.831	0.073
Mean age ± 2σ	n=10	MSWD=0.60			682.2 ±3253.6		33.753	0.056

H03-108, Sanidine, J=0.0007611±0.04%, D=1.004±0.001, NM-189B, Lab#=55589

06	25.76	0.0155	0.1046	12.536	32.9	99.9	34.986	0.054
03	25.81	0.0094	0.2791	3.489	54.0	99.7	34.99	0.11
05	25.78	0.0044	0.1600	13.492	116.9	99.8	34.991	0.056
09	25.87	0.0045	0.3689	6.153	113.2	99.6	35.026	0.082
04	25.82	0.0127	0.1812	11.174	40.3	99.8	35.040	0.056
10	25.88	0.0117	0.3529	11.754	43.6	99.6	35.051	0.059
08	25.82	0.0076	0.1336	6.878	66.9	99.8	35.053	0.075
01	26.41	0.0771	2.040	9.528	6.6	97.7	35.102	0.066
07	25.96	0.0008	0.4355	2.293	632.7	99.5	35.13	0.15
11	26.01	0.0312	0.4946	6.194	16.3	99.4	35.172	0.076
02	26.12	0.0673	0.8052	5.539	7.6	99.1	35.205	0.083
12	25.93	0.0070	0.1037	10.877	73.2	99.9	35.211	0.059
14	25.90	0.0046	-0.0219	13.624	111.0	100.0	35.220	0.056
13	26.08	0.0143	0.4805	6.625	35.7	99.5	35.26	0.12
15	25.93	0.0099	-0.0950	4.949	51.8	100.1	35.296	0.081
Mean age ± 2σ	n=15	MSWD=2.20			93.5 ±306.9		35.102	0.062

H03-96, Sanidine, J=0.0007619±0.04%, D=1.004±0.001, NM-189B, Lab#=55590

05	24.99	0.0080	0.9459	7.954	63.4	98.9	33.656	0.070
08	24.93	0.0106	0.6347	15.911	48.4	99.3	33.696	0.053
07	24.94	0.0039	0.6392	3.884	129.3	99.2	33.71	0.11
14	24.82	0.0065	0.1955	6.603	78.7	99.8	33.723	0.068
03	24.73	-0.0037	-0.1698	3.690	-	100.2	33.74	0.11
01	24.88	0.0084	0.3187	8.434	61.0	99.6	33.756	0.061
02	24.89	0.0062	0.3356	6.588	81.9	99.6	33.761	0.072
09	24.85	0.0057	0.1250	6.328	89.9	99.9	33.782	0.072
12	24.88	0.0058	0.2049	10.410	88.6	99.8	33.790	0.057

11	25.12	0.0056	0.9997	10.362	90.4	98.8	33.803	0.062
15	24.82	0.0035	-0.0343	3.636	144.6	100.0	33.81	0.10
06	24.91	0.0045	0.2695	8.943	113.5	99.7	33.817	0.064
04	24.90	0.0101	0.1573	13.376	50.7	99.8	33.838	0.050
13	24.96	0.0084	0.2757	11.285	60.7	99.7	33.876	0.056
10	24.91	0.0053	0.0369	6.400	96.9	100.0	33.906	0.085
Mean age ± 2σ	n=15		MSWD=1.02		85.6 ±55.5		33.782	0.046

H03-94, Sanidine, J=0.0007626±0.05%, D=1.004±0.001, NM-189B, Lab#=55591

12	24.65	0.0060	0.1214	7.035	84.8	99.9	33.558	0.066
05	24.70	0.0004	0.2501	5.425	1246.2	99.7	33.572	0.081
07	24.77	0.0034	0.1923	6.926	149.4	99.8	33.681	0.072
11	24.77	0.0024	0.1683	4.477	212.8	99.8	33.697	0.091
03	24.76	0.0038	0.1090	3.621	133.7	99.9	33.70	0.11
13	24.71	0.0056	-0.0364	5.373	91.0	100.0	33.698	0.074
04	24.55	-0.0026	-0.6109	2.056	-	100.7	33.71	0.16
15	24.74	0.0035	0.0243	5.002	147.2	100.0	33.711	0.082
06	24.75	0.0040	0.0463	9.408	127.4	99.9	33.713	0.061
16	24.78	0.0055	0.0979	10.291	92.5	99.9	33.730	0.058
14	24.69	0.0002	-0.2320	3.680	3354.4	100.3	33.74	0.11
01	24.81	0.0056	0.1325	11.618	91.6	99.8	33.769	0.056
10	24.88	-0.0030	0.2820	2.240	-	99.7	33.79	0.15
02	24.84	0.0046	0.1606	12.273	110.0	99.8	33.792	0.055
17	24.76	0.0002	-0.1437	3.357	2778.9	100.2	33.80	0.11
08	24.86	0.0047	0.0957	5.587	109.7	99.9	33.848	0.082
09	24.88	0.0000	-0.1629	4.218	-	100.2	33.974	0.091
Mean age ± 2σ	n=14		MSWD=0.39		616.6 ±2132.2		33.743	0.053

H03-89, Sanidine, J=0.0007631±0.06%, D=1.004±0.001, NM-189B, Lab#=55592

04	24.89	2.633	2.361	0.307	0.19	98.1	33.36	0.89
17	24.42	0.0337	-0.2715	3.659	15.1	100.3	33.43	0.11
22	24.57	-0.0099	-0.2234	2.873	-	100.3	33.60	0.13
21	24.64	0.0137	-0.2146	4.505	37.2	100.3	33.690	0.093
12	24.75	0.0044	0.0046	4.707	114.9	100.0	33.752	0.085
01	24.99	0.0049	0.7984	13.559	104.8	99.1	33.760	0.055
18	24.68	0.0022	-0.2578	4.934	232.1	100.3	33.763	0.097
24	24.68	0.0053	-0.3189	6.085	96.8	100.4	33.789	0.079
10	24.73	0.0031	-0.1530	5.035	164.4	100.2	33.790	0.083
05	24.78	0.0056	0.0007	8.836	91.0	100.0	33.795	0.060
29	24.78	0.0098	-0.0133	13.775	51.8	100.0	33.802	0.058
02	24.79	0.0039	0.0018	6.740	130.6	100.0	33.804	0.074
03	24.77	0.0054	-0.0673	5.221	94.1	100.1	33.805	0.080
08	24.71	0.0042	-0.2582	5.184	120.9	100.3	33.810	0.084
07	24.86	-0.0094	0.1757	2.038	-	99.8	33.83	0.16
15	24.82	0.0057	0.0009	13.906	89.6	100.0	33.852	0.054
06	24.82	0.0030	-0.0393	6.108	168.6	100.0	33.865	0.080
25	24.77	0.0133	-0.2049	6.354	38.4	100.2	33.868	0.084
23	24.80	0.0033	-0.1341	5.804	156.4	100.2	33.873	0.084
19	24.77	0.0072	-0.2575	5.367	71.3	100.3	33.881	0.089
26	24.84	0.0086	-0.0506	11.516	59.5	100.1	33.897	0.056
14	24.81	0.0010	-0.1781	4.059	536.2	100.2	33.902	0.098
20	24.76	-0.0032	-0.4189	5.302	-	100.5	33.929	0.084
16	24.76	0.0123	-0.3933	4.803	41.6	100.5	33.932	0.094
11	24.87	0.0042	-0.3310	2.491	122.6	100.4	34.05	0.14
13	25.31	0.0006	0.4791	3.668	911.2	99.4	34.32	0.12
Mean age ± 2σ	n=21		MSWD=0.61		126.3 ±212.4		33.826	0.051

H03-88B, Sanidine, J=0.000763±0.06%, D=1.004±0.001, NM-189B, Lab#=55593

03	24.62	0.0048	-0.3440	6.492	107.0	100.4	33.715	0.084
02	24.82	0.0016	0.3165	5.687	317.6	99.6	33.724	0.078
05	25.02	0.0011	0.9416	6.352	447.8	98.9	33.736	0.076
04	24.96	0.0037	0.7402	10.835	138.4	99.1	33.739	0.061
06	24.76	0.0046	-0.0916	3.765	110.1	100.1	33.799	0.097
10	24.83	0.0031	0.0595	8.038	164.1	99.9	33.835	0.068
07	24.85	0.0046	0.1154	5.659	111.2	99.9	33.848	0.076
08	24.85	0.0036	-0.1500	6.909	141.5	100.2	33.941	0.066
09	25.05	0.0019	0.2756	3.333	267.4	99.7	34.04	0.12
Mean age ± 2σ	n=9	MSWD=1.63		200.5	±237.6		33.809	0.077

H03-87, Sanidine, J=0.0007625±0.06%, D=1.004±0.001, NM-189B, Lab#=55594

07	25.00	0.0040	-0.0606	5.722	126.2	100.1	34.084	0.074
05	25.13	0.0002	0.3292	6.679	3051.5	99.6	34.116	0.068
08	25.09	0.0028	0.0168	4.406	183.6	100.0	34.174	0.092
04	25.13	0.0043	0.1510	13.817	120.0	99.8	34.187	0.054
02	25.10	0.0028	-0.0174	5.463	182.8	100.0	34.213	0.082
06	25.09	0.0005	-0.0863	4.533	1061.6	100.1	34.226	0.090
09	25.14	0.0026	0.0015	7.313	198.5	100.0	34.260	0.067
10	25.26	0.0035	0.3102	6.935	145.1	99.6	34.298	0.074
03	25.22	0.0049	0.0961	8.673	105.1	99.9	34.320	0.061
01	25.25	0.0030	-0.0256	10.723	167.5	100.0	34.416	0.060
Mean age ± 2σ	n=9	MSWD=1.30		574.9	±1953.5		34.212	0.066

H03-84, Sanidine, J=0.0007661±0.04%, D=1.004±0.001, NM-189C, Lab#=55595

01	27.02	0.0034	8.513	6.014	151.0	90.7	33.550	0.091
04	24.67	0.0003	0.5550	4.413	1586.0	99.3	33.551	0.095
10	25.22	0.0026	2.182	6.750	194.6	97.4	33.650	0.072
09	26.72	-0.0012	7.269	6.413	-	92.0	33.652	0.087
02	24.78	0.0045	0.6211	8.290	114.0	99.3	33.674	0.065
03	27.67	-0.0005	10.43	4.586	-	88.9	33.67	0.11
05	27.81	0.0043	10.76	10.901	117.4	88.6	33.722	0.073
08	24.88	0.0043	0.7638	6.887	118.3	99.1	33.757	0.071
07	24.74	0.0017	0.2497	9.406	305.7	99.7	33.781	0.057
06	28.37	0.0021	12.18	7.814	246.9	87.3	33.913	0.086
Mean age ± 2σ	n=10	MSWD=1.66		354.2	±898.8		33.706	0.069

H03-82, Sanidine, J=0.0007657±0.04%, D=1.004±0.001, NM-189C, Lab#=55596

15	24.61	0.0065	0.5024	2.591	78.5	99.4	33.49	0.13
02	24.54	0.0056	0.1777	4.175	91.0	99.8	33.518	0.096
06	24.66	0.0036	0.1346	5.239	141.0	99.8	33.689	0.083
08	25.31	0.0059	2.303	13.162	86.3	97.3	33.708	0.061
11	24.76	0.0054	0.3387	8.921	94.8	99.6	33.745	0.067
09	24.77	0.0038	0.3307	7.273	135.0	99.6	33.770	0.077
12	24.89	0.0047	0.6550	5.934	109.6	99.2	33.792	0.082
01	24.81	0.0027	0.3878	3.585	192.5	99.5	33.79	0.10
05	24.79	0.0025	0.2438	10.340	205.7	99.7	33.827	0.061
13	24.79	0.0064	0.2271	6.448	80.3	99.7	33.834	0.072
04	24.78	0.0005	0.2031	8.144	971.3	99.8	33.836	0.066
07	24.82	0.0048	0.2513	12.729	107.2	99.7	33.862	0.057
14	24.89	0.0002	0.3408	3.245	3047.8	99.6	33.92	0.11
03	24.86	-0.0007	0.2256	7.229	-	99.7	33.927	0.074
10	24.85	0.0044	0.1732	10.706	116.4	99.8	33.938	0.063
Mean age ± 2σ	n=13	MSWD=1.22		440.7	±1646.8		33.819	0.053

00-DJ-34, Sanidine, J=0.0007655±0.04%, D=1.004±0.001, NM-189C, Lab#=55597

03	24.74	0.0013	0.4521	10.677	393.9	99.5	33.663	0.076
10	24.81	0.0047	0.6126	5.421	107.5	99.3	33.695	0.079

04	25.34	0.0033	2.311	14.986	155.2	97.3	33.741	0.058
13	24.78	0.0052	0.3355	6.573	97.3	99.6	33.772	0.070
02	24.80	0.0042	0.3183	8.726	120.4	99.6	33.794	0.068
14	24.86	0.0006	0.5175	4.970	826.6	99.4	33.800	0.083
05	24.96	0.0056	0.8130	10.692	91.2	99.0	33.823	0.056
15	24.79	-0.0069	0.1820	2.045	-	99.8	33.84	0.16
01	25.33	0.0031	1.962	7.072	166.4	97.7	33.859	0.070
06	24.81	0.0010	0.0689	3.071	520.9	99.9	33.91	0.11
08	25.31	0.0053	1.765	9.170	97.1	97.9	33.912	0.067
07	25.19	-0.0089	1.273	2.651	-	98.5	33.95	0.13
11	24.96	0.0005	0.4804	4.368	931.0	99.4	33.956	0.094
12	24.84	-0.0095	-0.0247	1.771	-	100.0	33.99	0.19
Mean age ± 2σ	n=14	MSWD=1.21			318.9 ±550.2		33.810	0.055

H03-73, Sanidine, J=0.0007589±0.09%, D=1.004±0.001, NM-189K, Lab#=55657

02	20.78	0.0258	9.053	4.379	19.8	87.1	24.628	0.092
13	20.58	0.0230	8.321	11.915	22.1	88.1	24.642	0.059
12	18.61	0.0231	1.616	10.004	22.1	97.4	24.660	0.047
15	19.39	0.0217	4.167	18.040	23.6	93.7	24.692	0.045
04	18.85	0.0257	2.258	5.170	19.8	96.5	24.723	0.078
06	18.78	0.0265	2.038	7.507	19.3	96.8	24.726	0.058
03	18.58	0.0169	1.329	3.350	30.3	97.9	24.729	0.098
14	21.04	0.0207	9.661	11.049	24.7	86.4	24.730	0.062
07	19.45	0.0215	4.276	6.165	23.7	93.5	24.731	0.071
08	18.42	0.0124	0.7754	4.569	41.3	98.8	24.738	0.075
10	21.11	0.0111	9.840	4.804	45.9	86.2	24.744	0.092
11	18.99	0.0103	2.635	6.648	49.7	95.9	24.770	0.063
05	18.74	0.0252	1.738	7.479	20.3	97.3	24.786	0.060
01	21.38	0.0243	10.65	2.735	21.0	85.3	24.79	0.14
09	19.52	0.0217	4.339	4.943	23.5	93.4	24.802	0.086
Mean age ± 2σ	n=15	MSWD=0.56			27.1 ±20.1		24.716	0.054

Notes:

Isotopic ratios corrected for blank, radioactive decay, and mass discrimination, not corrected for interfering reactions.

Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.

Mean age is weighted mean age of Taylor (1982). Mean age error is weighted error of the mean (Taylor, 1982), multiplied by the root of the MSWD where MSWD>1, and also incorporates uncertainty in J factors and irradiation correction uncertainties.

Decay constants and isotopic abundances after Steiger and Jäger (1977).

symbol preceding sample ID denotes analyses excluded from mean age calculations.

Ages calculated relative to FC-2 Fish Canyon Tuff sanidine interlaboratory standard at 28.02 Ma

Decay Constant (LambdaK (total)) = 5.543e-10/a

Correction factors:

$$(^{39}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.0007 \pm 5\text{e-}05$$

$$(^{36}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.00028 \pm 1\text{e-}05$$

$$(^{38}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.013$$

$$(^{40}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0 \pm 0.0004$$

00DJ 34 sa, C2:162, single crystal sanidine, J=0.0008224±0.09%, D=1.00707±0.00127, NM-162, Lab#=53899

03	22.79	0.0074	0.3455	19.818	68.9	99.6	33.36	0.17
08	22.92	0.0063	0.6017	17.694	80.4	99.2	33.43	0.19
13	23.00	0.0054	0.4971	22.053	95.3	99.4	33.59	0.11
01	23.22	0.0050	1.012	30.408	101.4	98.7	33.691	0.067
07	23.08	0.0070	0.4729	24.965	72.6	99.4	33.714	0.091
15	23.53	0.0057	1.964	16.065	89.3	97.5	33.730	0.086
06	23.12	0.0056	0.5894	32.793	91.0	99.2	33.735	0.072
10	23.03	0.0081	0.1766	25.303	63.2	99.8	33.773	0.074
05	23.10	0.0087	0.3104	25.287	58.8	99.6	33.814	0.074
02	23.07	0.0087	0.2073	35.846	58.6	99.7	33.815	0.066
12	23.08	0.0081	0.2066	15.654	63.0	99.7	33.830	0.090

09	23.12	0.0065	0.3570	19.600	77.9	99.5	33.831	0.079
14	23.11	0.0050	0.2319	13.088	102.7	99.7	33.869	0.092
11	23.18	0.0079	0.4617	23.122	64.6	99.4	33.870	0.100
04	23.17	0.0050	0.4166	24.884	101.9	99.5	33.879	0.068
Mean age ± 2σ	n=12	MSWD=0.71		78.7	±35.2		33.793	0.077

Notes:

Isotopic ratios corrected for blank, radioactive decay, and mass discrimination, not corrected for interfering reactions.

Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.

Mean age is weighted mean age of Taylor (1982). Mean age error is weighted error

of the mean (Taylor, 1982), multiplied by the root of the MSWD where MSWD>1, and also incorporates uncertainty in J factors and irradiation correction uncertainties.

Decay constants and isotopic abundances after Steiger and Jäger (1977).

symbol preceding sample ID denotes analyses excluded from mean age calculations.

Ages calculated relative to FC-2 Fish Canyon Tuff sanidine interlaboratory standard at 28.02 Ma

Decay Constant (LambdaK (total)) = 5.543e-10/a

Correction factors:

$$(^{39}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.0007 \pm 2\text{e-}05$$

$$(^{36}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.00028 \pm 5\text{e-}06$$

$$(^{38}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.0133$$

$$(^{40}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.0002 \pm 0.0003$$

HOI-137 sa, A4:148, single crystal sanidine, J=0.000759±0.10%, D=1.00712±0.00131, NM-148, Lab#=52873

12	22.06	2.004	3.150	0.647	0.25	96.5	28.96	0.45
11	23.14	1.512	3.010	1.160	0.34	96.7	30.41	0.28
14	22.92	0.1277	0.8500	6.170	4.0	99.0	30.795	0.080
08	23.00	0.0133	0.6690	10.411	38.4	99.1	30.955	0.067
13	22.96	0.0136	0.5280	24.519	37.6	99.3	30.955	0.064
01	23.10	0.0133	0.9200	4.848	38.4	98.8	30.99	0.10
03	22.92	0.0137	0.2600	5.151	37.2	99.7	31.017	0.087
09	23.02	0.0141	0.5890	10.874	36.2	99.3	31.018	0.061
10	23.02	0.0140	0.5520	20.483	36.5	99.3	31.035	0.056
04	22.73	0.0133	-0.5100	3.898	38.4	100.7	31.061	0.099
15	23.09	0.0138	0.7080	17.357	37.1	99.1	31.064	0.065
06	23.27	0.0139	1.070	7.190	36.8	98.6	31.153	0.083
07	22.98	0.0136	-0.0800	8.648	37.5	100.1	31.221	0.072
02	23.87	1.884	3.300	0.587	0.27	96.5	31.31	0.57
05	23.35	1.586	-2.4000	0.640	0.32	103.6	32.85	0.43
Mean age ± 2σ	n=15	MSWD=4.65		25.3	±35.6		31.02	0.11

HOI-138 sa, A9:148, single crystal sanidine, J=0.0007602±0.10%, D=1.00712±0.00131, NM-148, Lab#=52878

15	22.41	0.0169	0.5570	13.561	30.2	99.3	30.250	0.066
12	22.50	0.0157	0.6540	14.437	32.6	99.2	30.337	0.061
13	22.42	0.0170	0.1470	23.217	30.0	99.8	30.430	0.056
07	22.47	0.0190	0.3190	11.948	26.8	99.6	30.433	0.065
10	22.48	0.0165	0.3030	8.004	30.9	99.6	30.445	0.076
05	22.42	0.0147	0.1130	9.327	34.8	99.9	30.449	0.073
06	22.50	0.0157	0.3710	15.094	32.5	99.5	30.454	0.073
14	22.45	0.0178	0.1700	6.132	28.7	99.8	30.454	0.091
11	22.46	0.0156	0.2000	5.285	32.8	99.7	30.461	0.088
04	22.43	0.0167	0.0730	14.915	30.6	99.9	30.477	0.054
08	22.50	0.0159	0.2670	12.597	32.1	99.7	30.489	0.062
09	22.47	0.0159	0.1160	8.363	32.0	99.9	30.505	0.075
01	22.43	0.0166	-0.2400	3.553	30.8	100.3	30.61	0.11
03	22.69	0.0159	0.4520	8.780	32.2	99.4	30.676	0.074
02	22.53	0.0145	-0.2200	5.114	35.2	100.3	30.730	0.094
Mean age ± 2σ	n=15	MSWD=2.43		31.5	±4.3		30.460	0.083

HOI-139 sa, A13:148, single crystal sanidine, J=0.0007585±0.10%, D=1.00712±0.00131, NM-148, Lab#=52882

15	20.00	1.848	0.8000	0.414	0.28	99.6	27.09	0.68
08	21.55	1.617	3.640	0.871	0.32	95.6	28.01	0.33
06	20.90	1.978	0.9600	0.958	0.26	99.4	28.26	0.38
07	21.15	0.0102	0.6800	12.334	49.9	99.1	28.436	0.060
10	21.26	0.0098	0.7440	9.147	52.2	99.0	28.558	0.068
09	21.31	0.0090	0.6880	9.580	56.9	99.1	28.650	0.062
04	21.25	0.0091	0.3570	11.374	55.9	99.5	28.699	0.058
05	21.23	0.0095	0.1220	13.786	53.7	99.8	28.769	0.055
02	21.34	0.0100	0.4790	13.957	50.8	99.3	28.772	0.061
03	21.20	0.1535	-0.1000	5.628	3.3	100.2	28.839	0.076
11	20.77	1.627	-1.1200	0.732	0.31	102.2	28.85	0.31
01	21.24	0.0727	-0.1400	6.250	7.0	100.2	28.898	0.083
14	22.86	1.568	4.900	0.903	0.33	94.2	29.28	0.33
13	21.50	1.763	0.1200	0.952	0.29	100.5	29.37	0.30
12	22.63	1.703	-1.2000	0.469	0.30	102.2	31.40	0.57
Mean age ± 2σ	n=15	MSWD=5.60		22.1	±52.8		28.69	0.12

Notes:

Isotopic ratios corrected for blank, radioactive decay, and mass discrimination, not corrected for interfering reactions.

Ages calculated relative to FC-1 Fish Canyon Tuff sanidine interlaboratory standard at 27.84 Ma.

Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.

Mean age is weighted mean age of Taylor (1982). Mean age error is weighted error of the mean (Taylor, 1982), multiplied by the root of the MSWD where MSWD>1, and also incorporates uncertainty in J factors and irradiation correction uncertainties.

Decay constants and isotopic abundances after Steiger and Jaeger (1977).

symbol preceding sample ID denotes analyses excluded from mean age calculations.

Discrimination = 1.00712 ± 0.00131

Correction factors:

$(^{39}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.0007 \pm 2\text{e-}05$

$(^{36}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.00028 \pm 5\text{e-}06$

$(^{38}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.01077$

$(^{40}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.0002 \pm 0.0003$

H00-53, single crystal sanidine, J=0.000776±0.10%, D=1.00276±0.001, NM-130, Lab#=51720

01	21.68	0.0163	1.089	4.701	31.2	98.5	29.65	0.11
15	24.39	0.0061	0.8171	7.689	83.9	99.0	33.488	0.094
13	24.78	0.0079	1.668	7.108	64.5	98.0	33.68	0.11
17	24.73	0.0088	0.1701	18.670	57.9	99.8	34.220	0.076
16	24.78	0.0077	0.2614	16.348	66.0	99.7	34.253	0.074
18	25.31	0.0086	1.715	20.197	59.6	98.0	34.395	0.069
02	24.90	0.0083	1.872	5.890	61.2	97.8	33.761	0.097
08	24.53	0.0084	-0.0274	7.659	60.6	100.0	34.02	0.10
14	24.71	0.0066	0.5401	7.627	77.4	99.4	34.050	0.094
12	24.66	0.0071	0.3178	8.769	72.1	99.6	34.074	0.078
03	24.67	0.0087	0.2506	18.168	58.5	99.7	34.108	0.067
06	24.78	0.0091	0.4485	6.323	56.1	99.5	34.178	0.093
10	24.74	0.0086	0.1712	19.616	59.0	99.8	34.236	0.064
09	24.75	0.0085	0.1345	16.649	60.1	99.8	34.268	0.079
11	24.80	0.0082	0.2678	15.176	61.9	99.7	34.280	0.067
07	24.76	0.0087	-0.0246	8.028	58.8	100.0	34.339	0.077
04	24.83	0.0087	0.1168	17.773	58.4	99.9	34.385	0.070
05	24.84	0.0132	-0.5801	1.754	38.5	100.7	34.68	0.23
Mean age ± 2σ	n=13	MSWD=2.41		62.0	±12.4		34.23	0.09

H00-78, single crystal sanidine, J=0.0007794±0.10%, D=1.00399±0.00123, NM-130, Lab#=51701

06	18.30	0.0437	1.336	3.160	11.7	97.9	25.00	0.17
02	18.37	0.0658	1.245	6.170	7.8	98.0	25.14	0.11
13	18.10	0.0425	0.2523	6.547	12.0	99.6	25.172	0.096
01	18.15	0.0518	0.3518	12.197	9.9	99.5	25.206	0.075

04	18.24	0.0584	0.6609	15.031	8.7	99.0	25.209	0.057
10	18.23	0.0918	0.5299	8.827	5.6	99.2	25.246	0.077
03	18.18	0.0439	0.2927	14.252	11.6	99.5	25.269	0.053
08	18.15	0.0574	0.1960	10.123	8.9	99.7	25.269	0.070
14	18.14	0.0717	0.1542	5.141	7.1	99.8	25.28	0.11
09	18.29	0.0422	0.5833	7.187	12.1	99.1	25.298	0.086
15	18.19	0.0476	0.2505	10.429	10.7	99.6	25.302	0.071
11	18.19	0.1166	-0.0323	3.888	4.4	100.1	25.42	0.14
12	18.23	0.0378	-0.0233	5.988	13.5	100.1	25.46	0.11
07	18.16	0.0547	-0.3506	3.472	9.3	100.6	25.51	0.13
05	18.45	0.0542	0.0925	3.513	9.4	99.9	25.72	0.13
Mean age ± 2σ	n=15	MSWD=1.94			9.5 ±5.1		25.274	0.078

Notes:

Isotopic ratios corrected for blank, radioactive decay, and mass discrimination, not corrected for interfering reactions.

Errors quoted for individual analyses include analytical error only, without interfering reaction or J uncertainties.

Mean age is weighted mean age of Taylor (1982). Mean age error is weighted error of the mean (Taylor, 1982), multiplied by the root of the MSWD where MSWD>1, and also incorporates uncertainty in J factors and irradiation correction uncertainties.

Decay constants and isotopic abundances after Steiger and Jäger (1977).

symbol preceding sample ID denotes analyses excluded from mean age calculations.

Ages calculated relative to FC-2 Fish Canyon Tuff sanidine interlaboratory standard at 28.02 Ma

Decay Constant (LambdaK (total)) = 5.543e-10/a

Correction factors:

$$(^{39}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.00089 \pm 3\text{e-}05$$

$$(^{36}\text{Ar}/^{37}\text{Ar})_{\text{Ca}} = 0.00028 \pm 1.1\text{e-}05$$

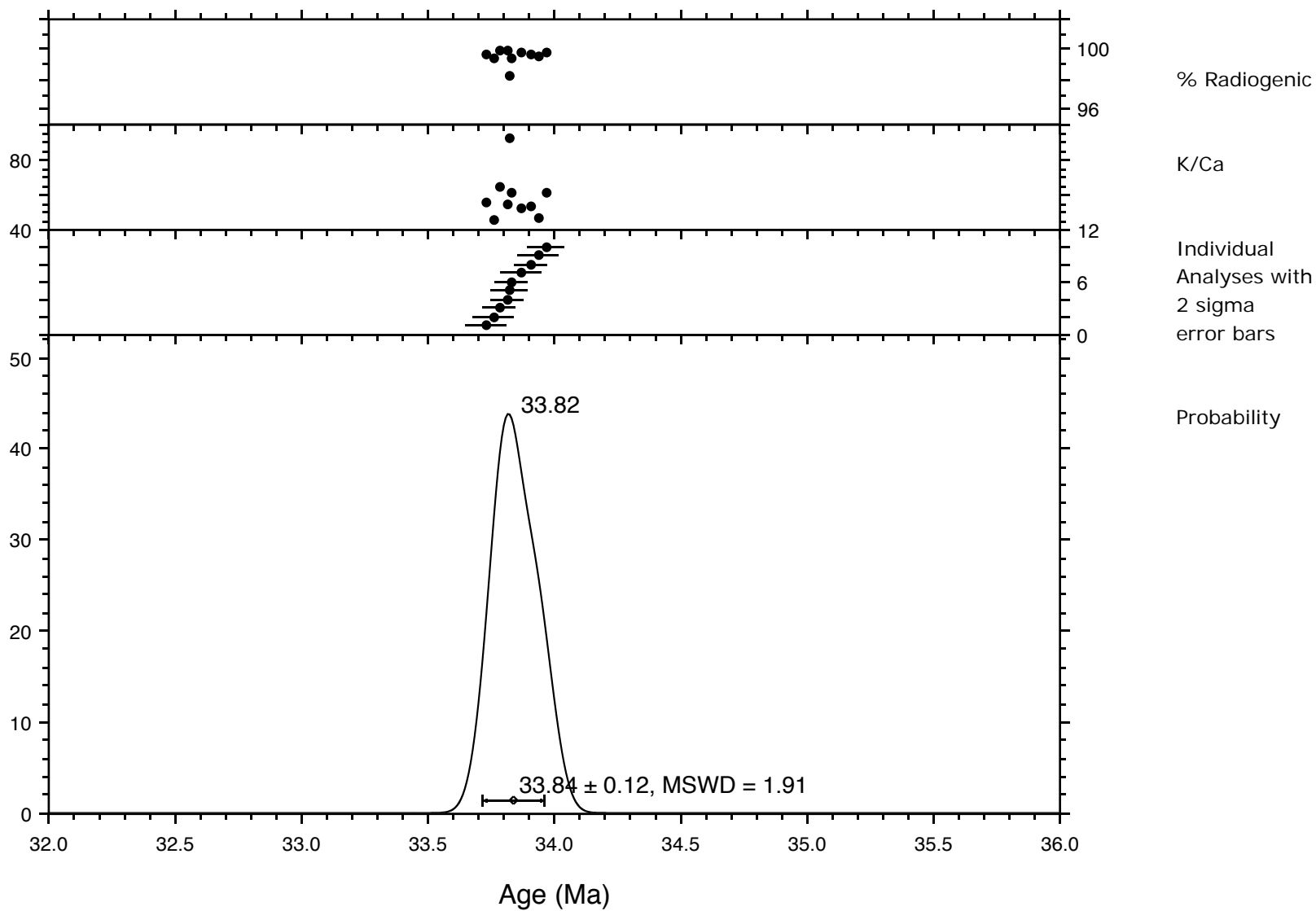
$$(^{38}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.0133$$

$$(^{40}\text{Ar}/^{39}\text{Ar})_{\text{K}} = 0.0002 \pm 0.0003$$

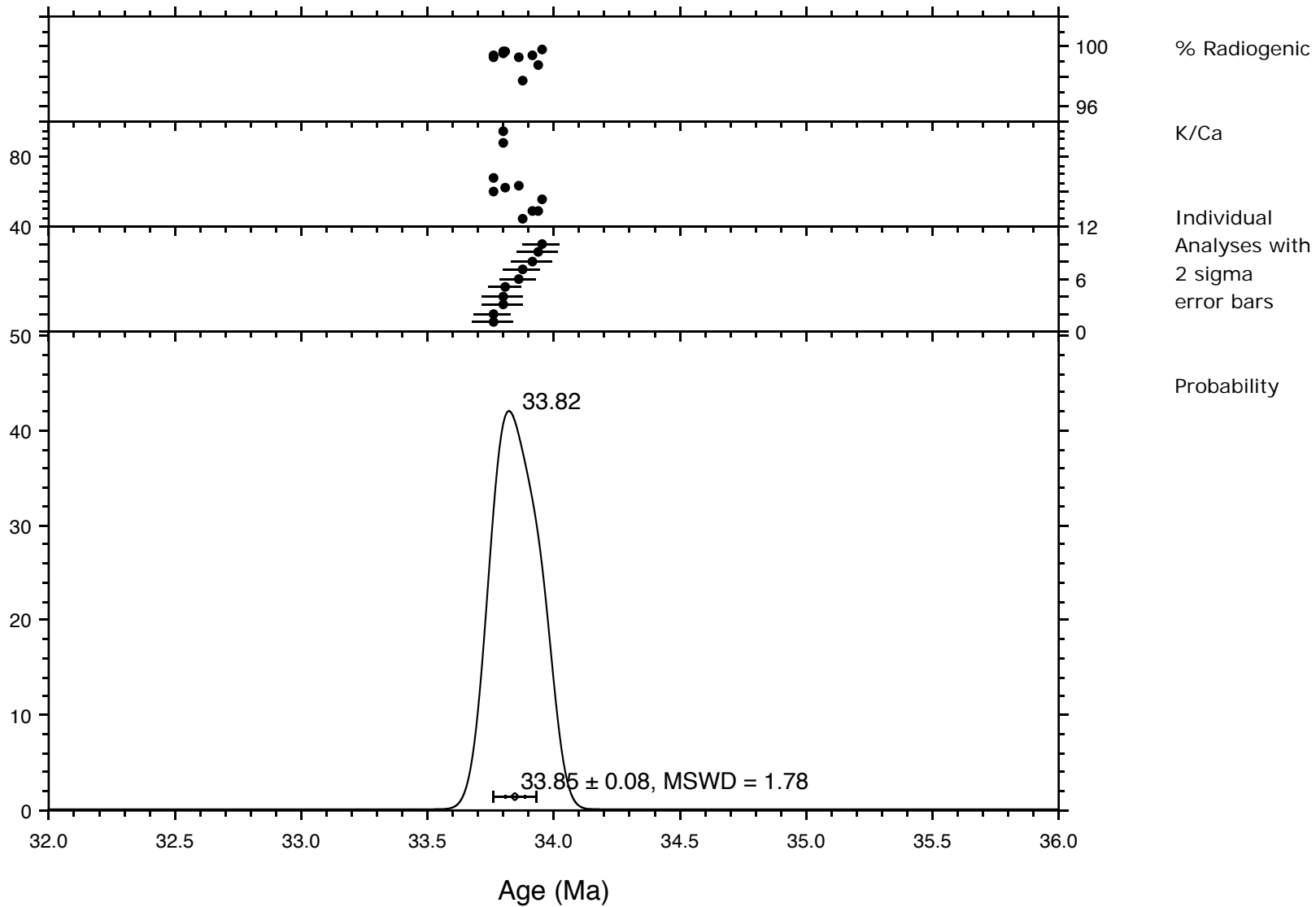
Plots (Ideograms) of $^{40}\text{Ar}/^{39}\text{Ar}$ Analyses of Single Sanidine Grains, Caetano Tuff and Related Rocks

Graphs from, top to bottom, for most plots are %Radiogenic, K/Ca (generally 1 to 100), Individual analyses with 2 sigma error bars, and Probability

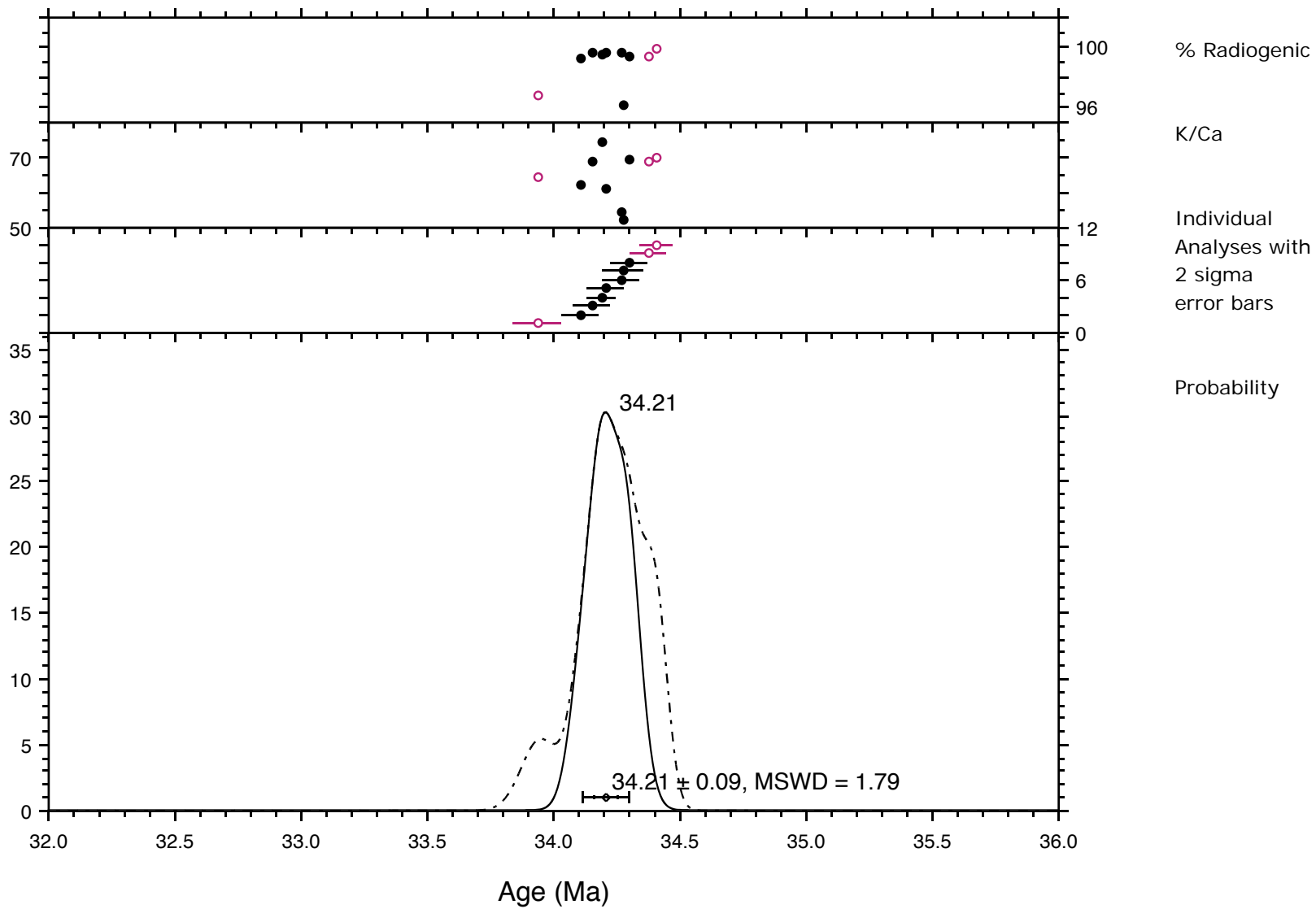
Age-Probability Spectrum for Run 56435 (05-DJ-14)



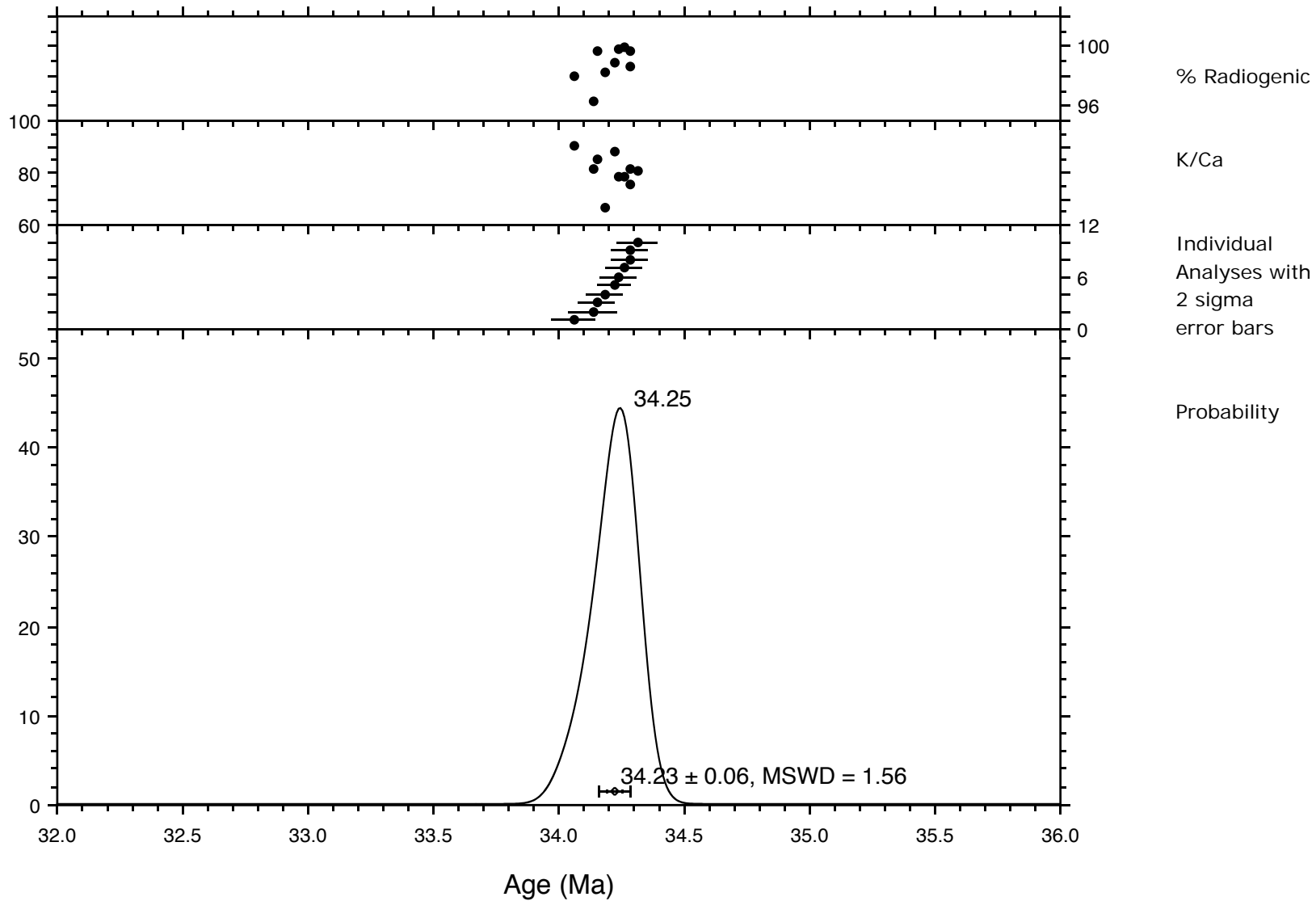
Age-Probability Spectrum for Run 56436 (05-DJ-27)



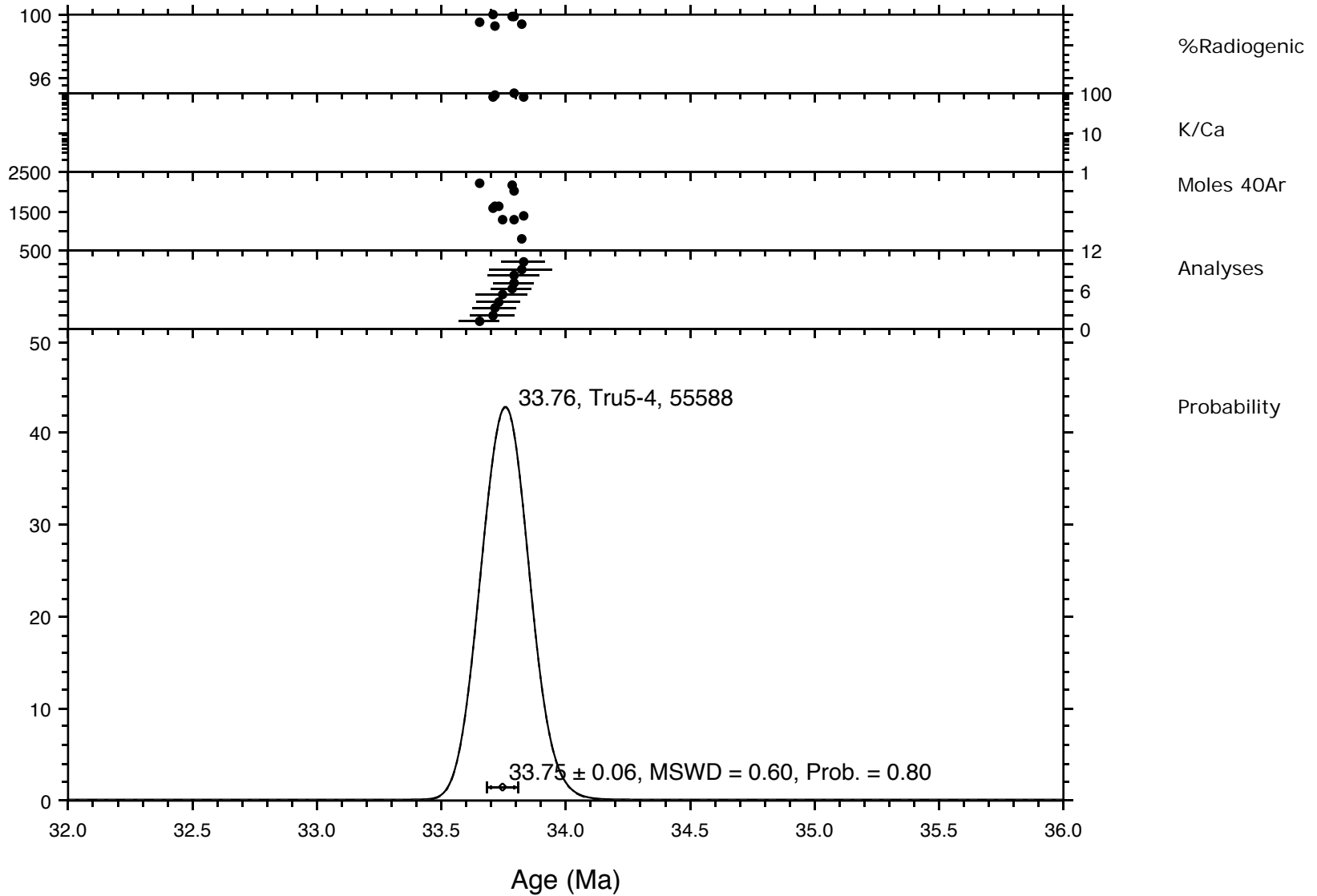
Age-Probability Spectrum for Run 56437 (06-DJ-13)



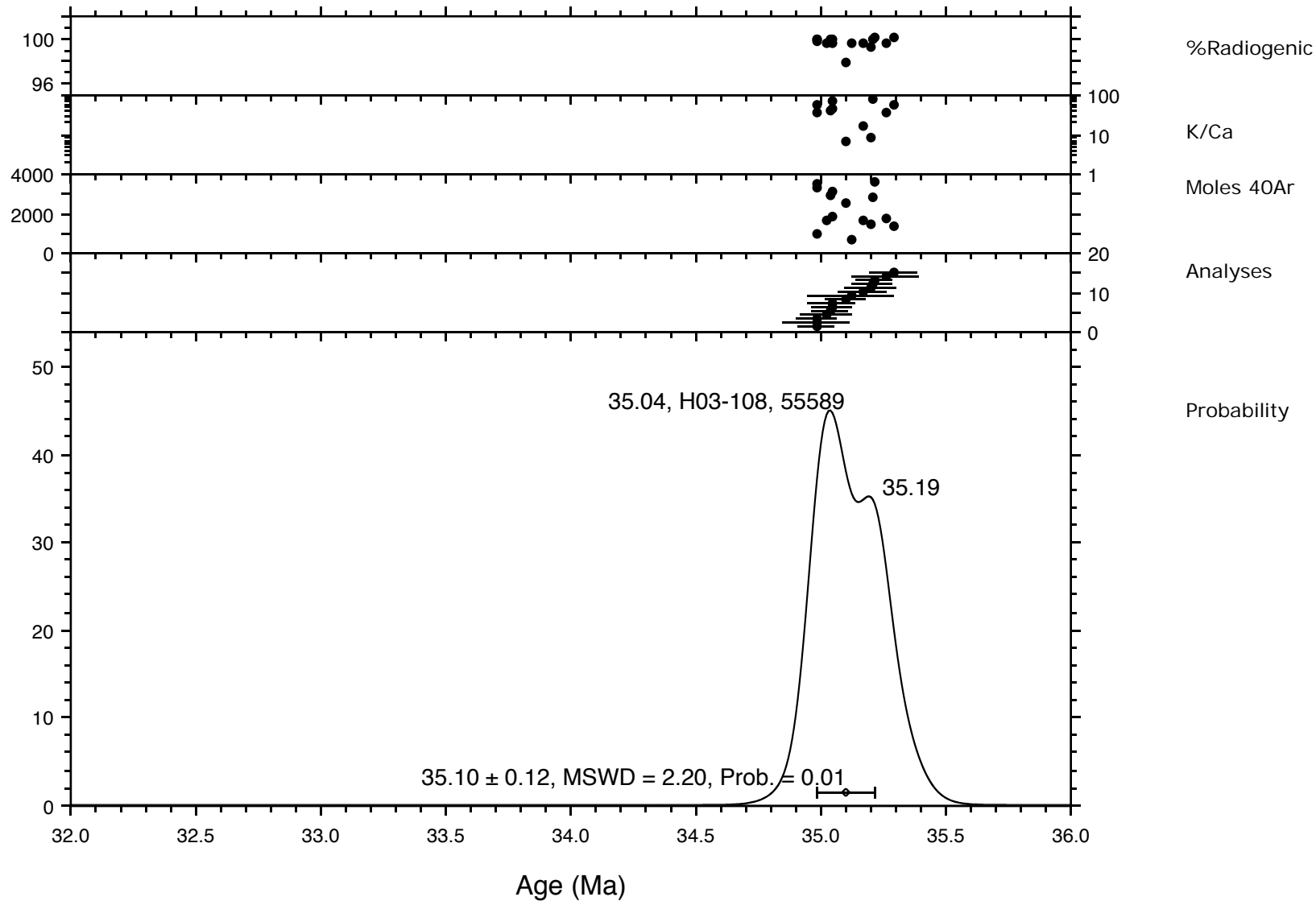
Age-Probability Spectrum for Run 56434 (05-DJ-8)



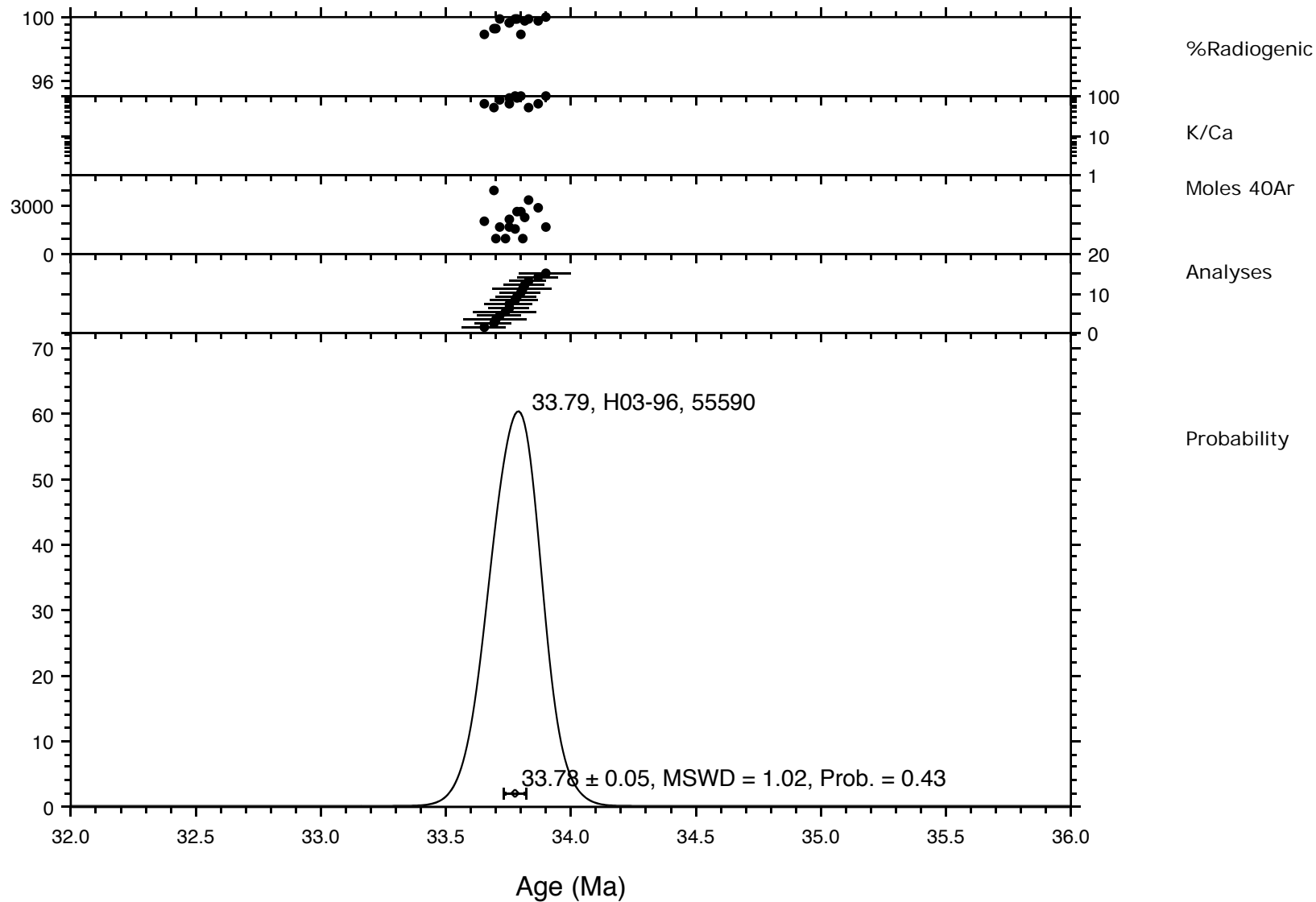
Age-Probability Spectrum for Run 55588 (Tru5-4)



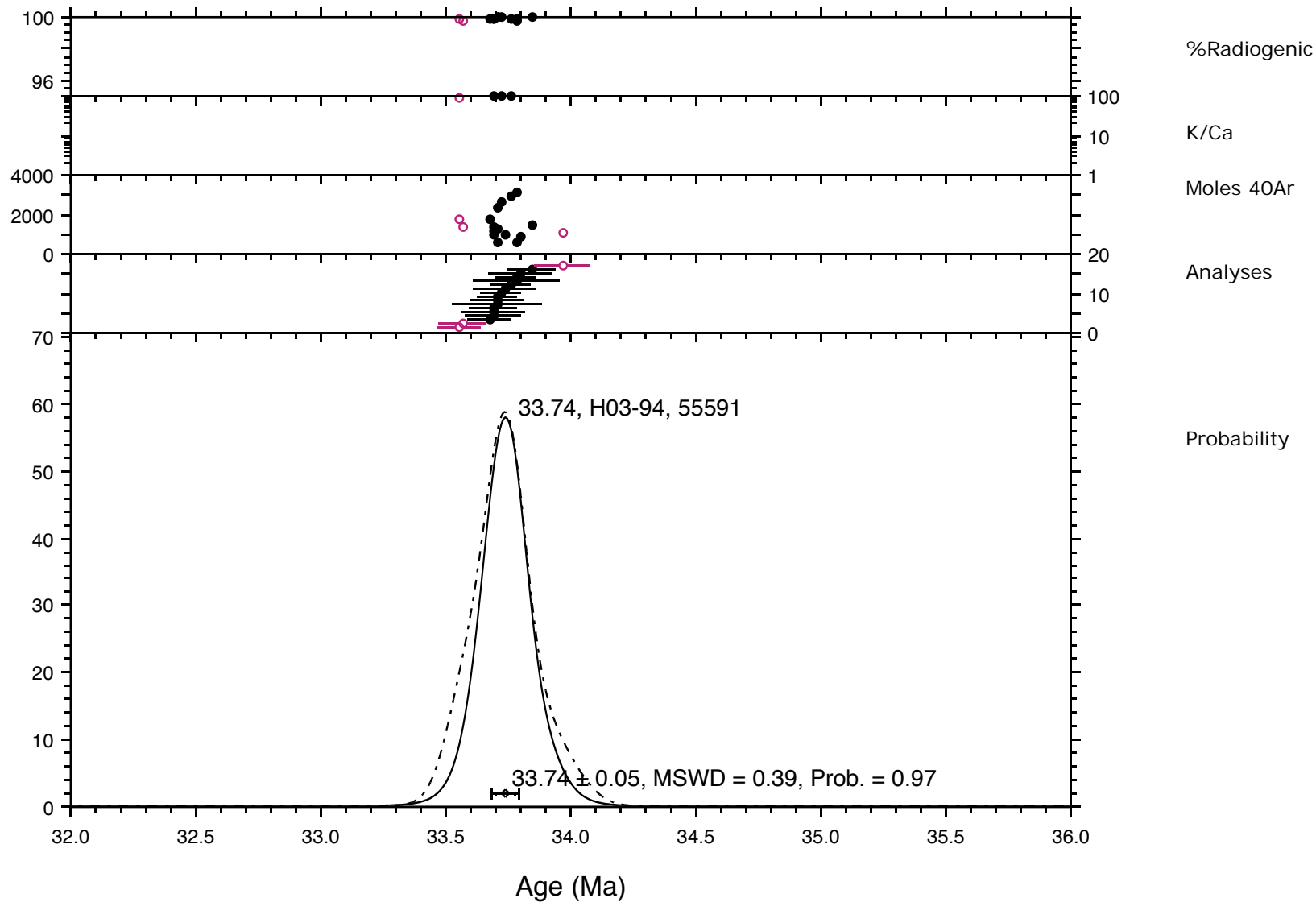
Age-Probability Spectrum for Run 55589 (H03-108)



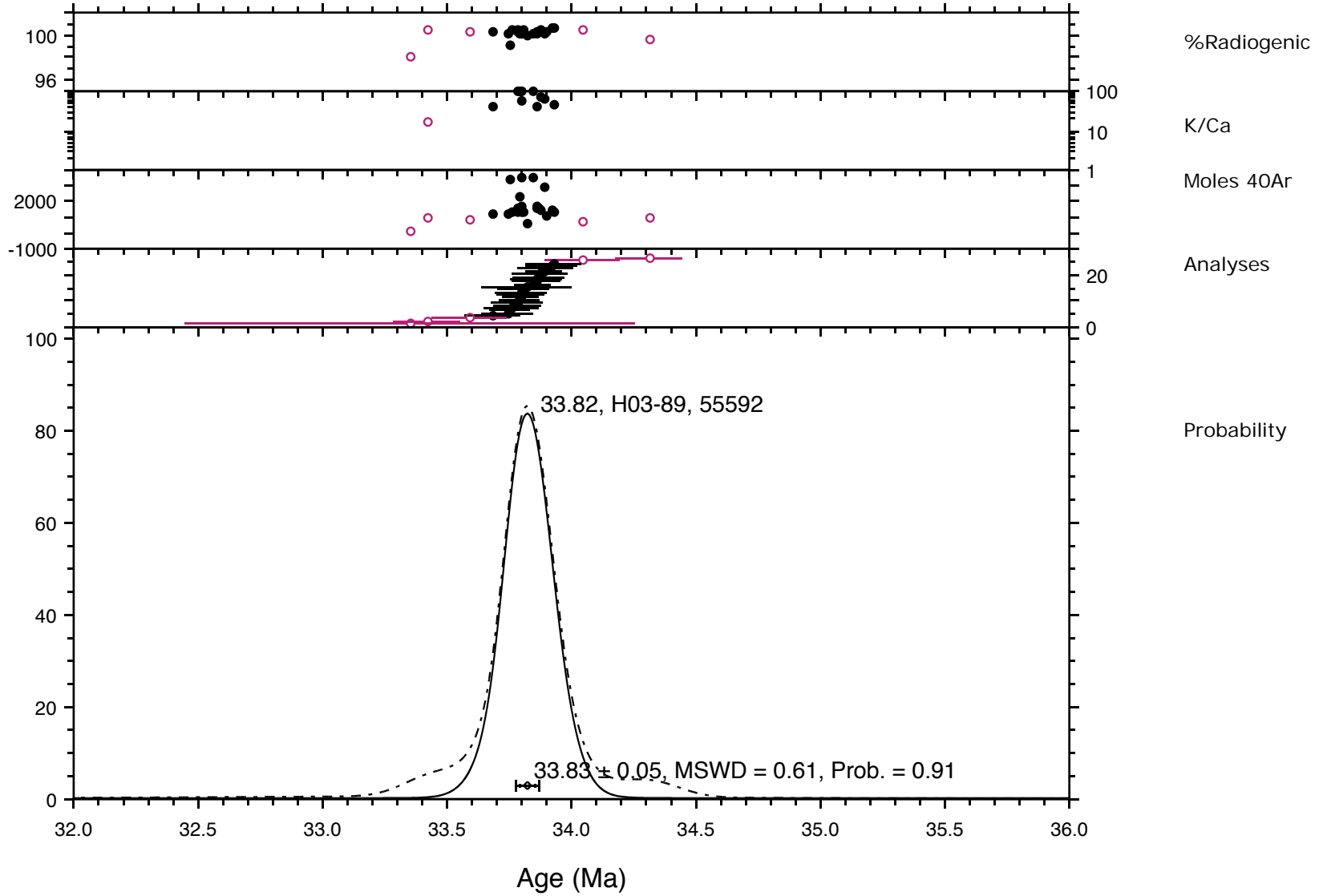
Age-Probability Spectrum for Run 55590 (H03-96)



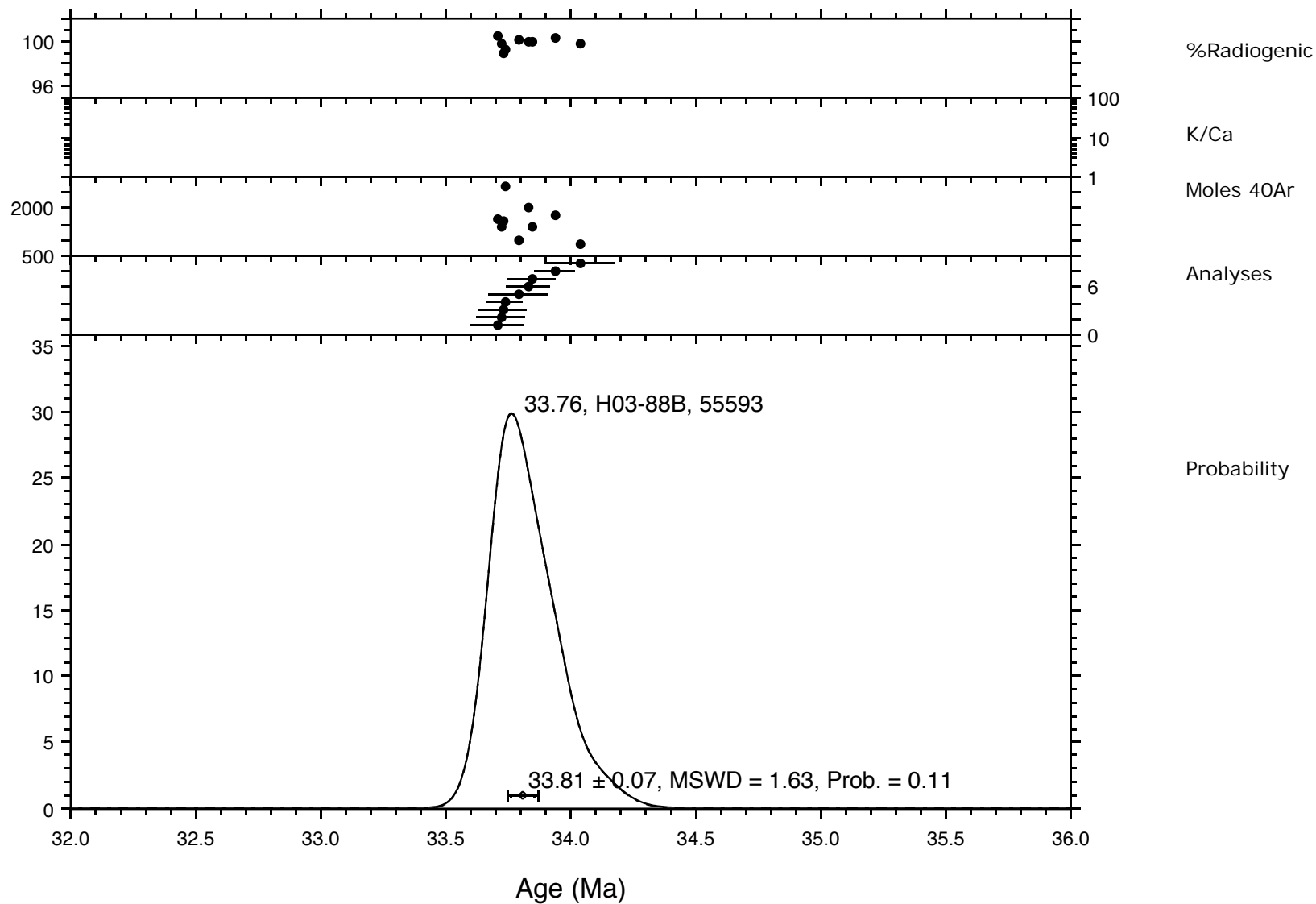
Age-Probability Spectrum for Run 55591 (H03-94)



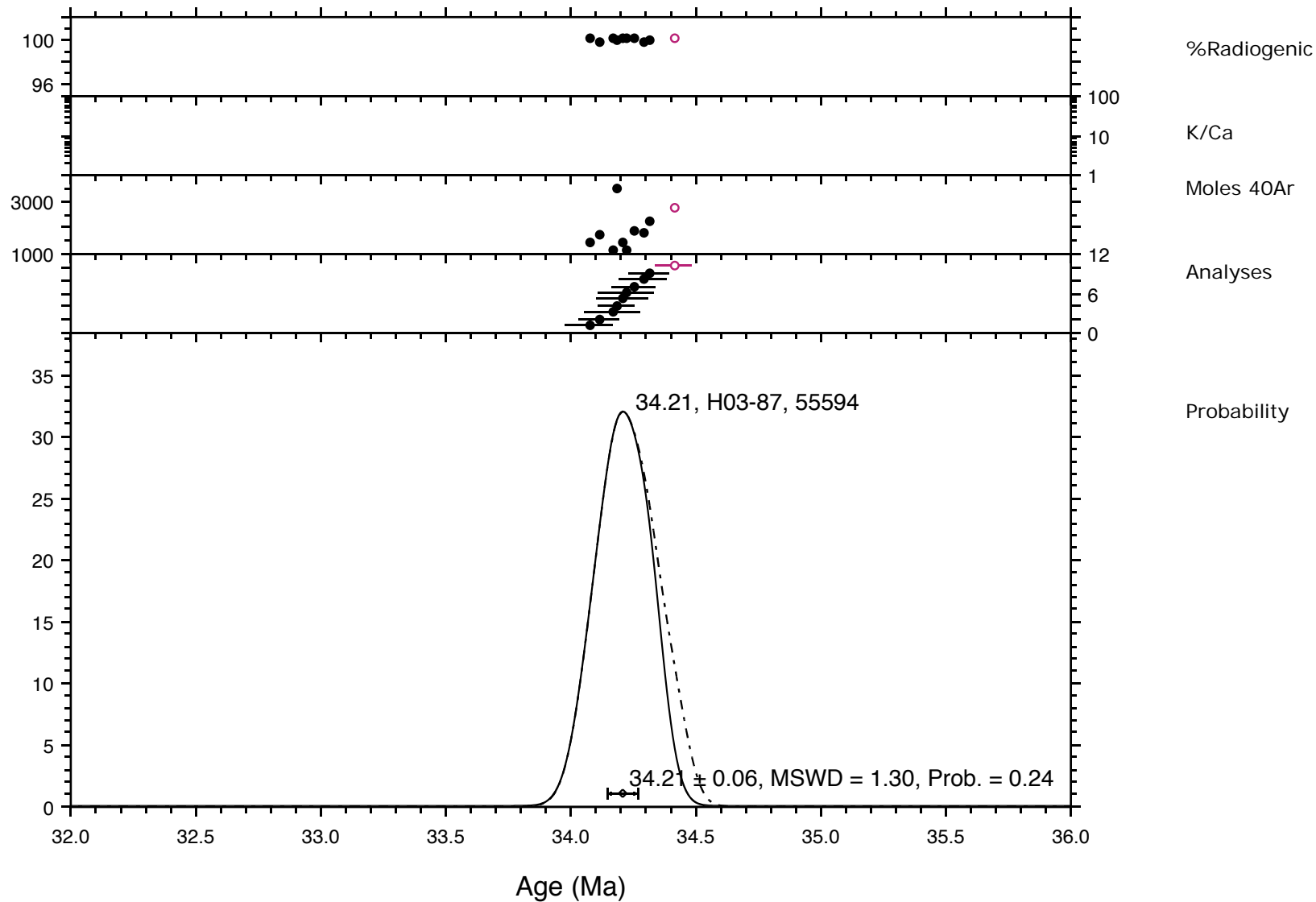
Age-Probability Spectrum for Run 55592 (H03-89)



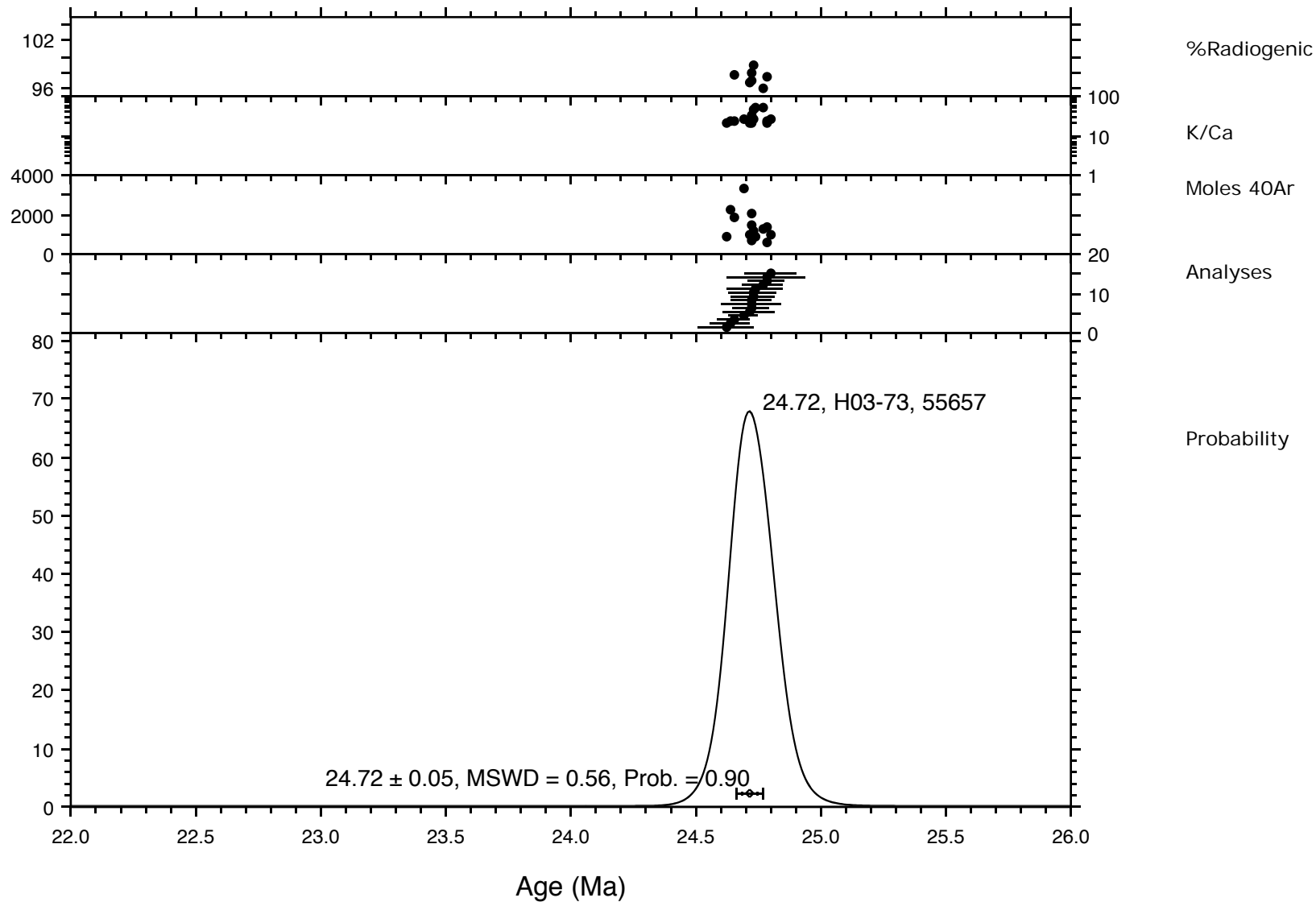
Age-Probability Spectrum for Run 55593 (H03-88B)



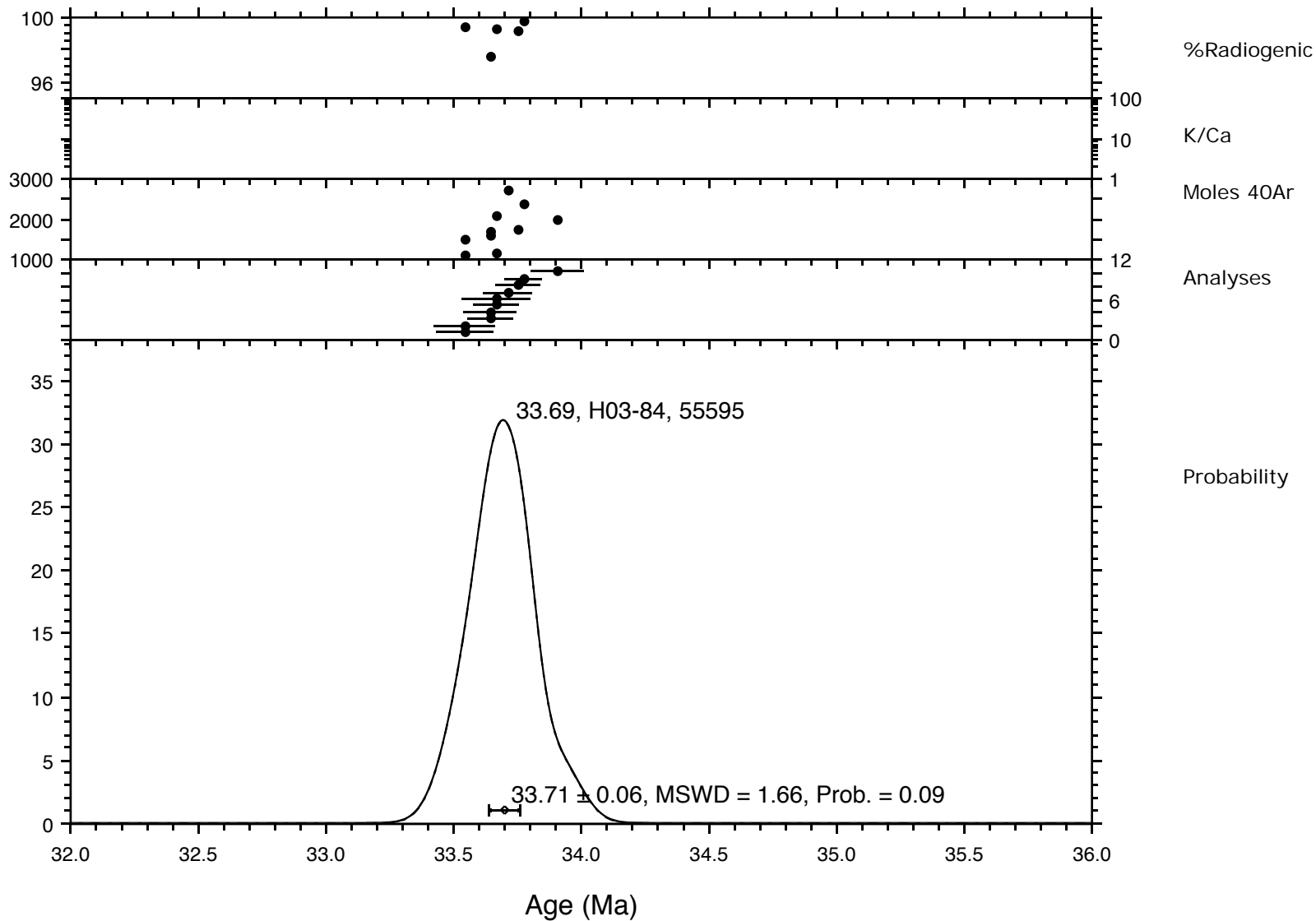
Age-Probability Spectrum for Run 55594 (H03-87)



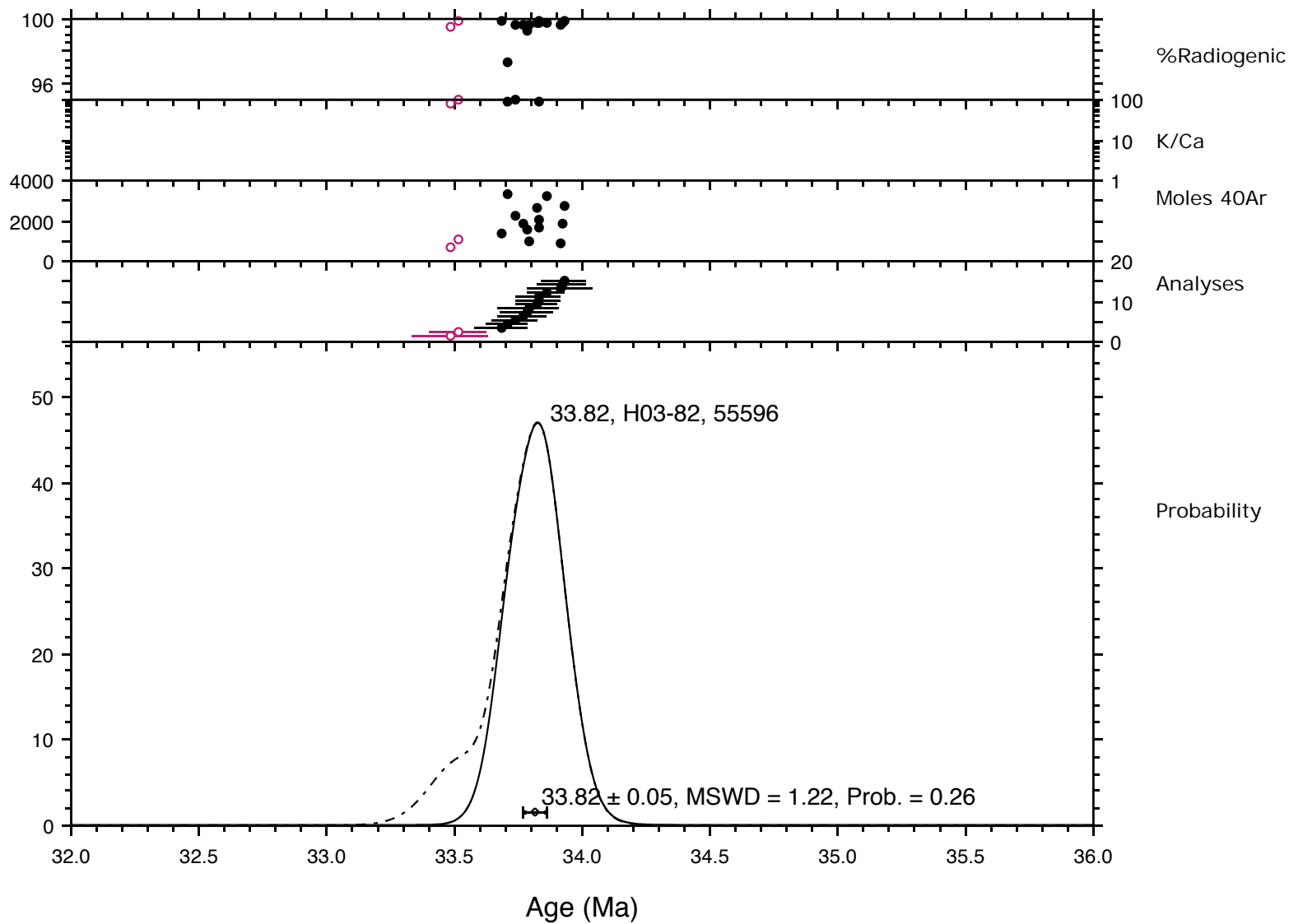
Age-Probability Spectrum for Run 55657 (H03-73)



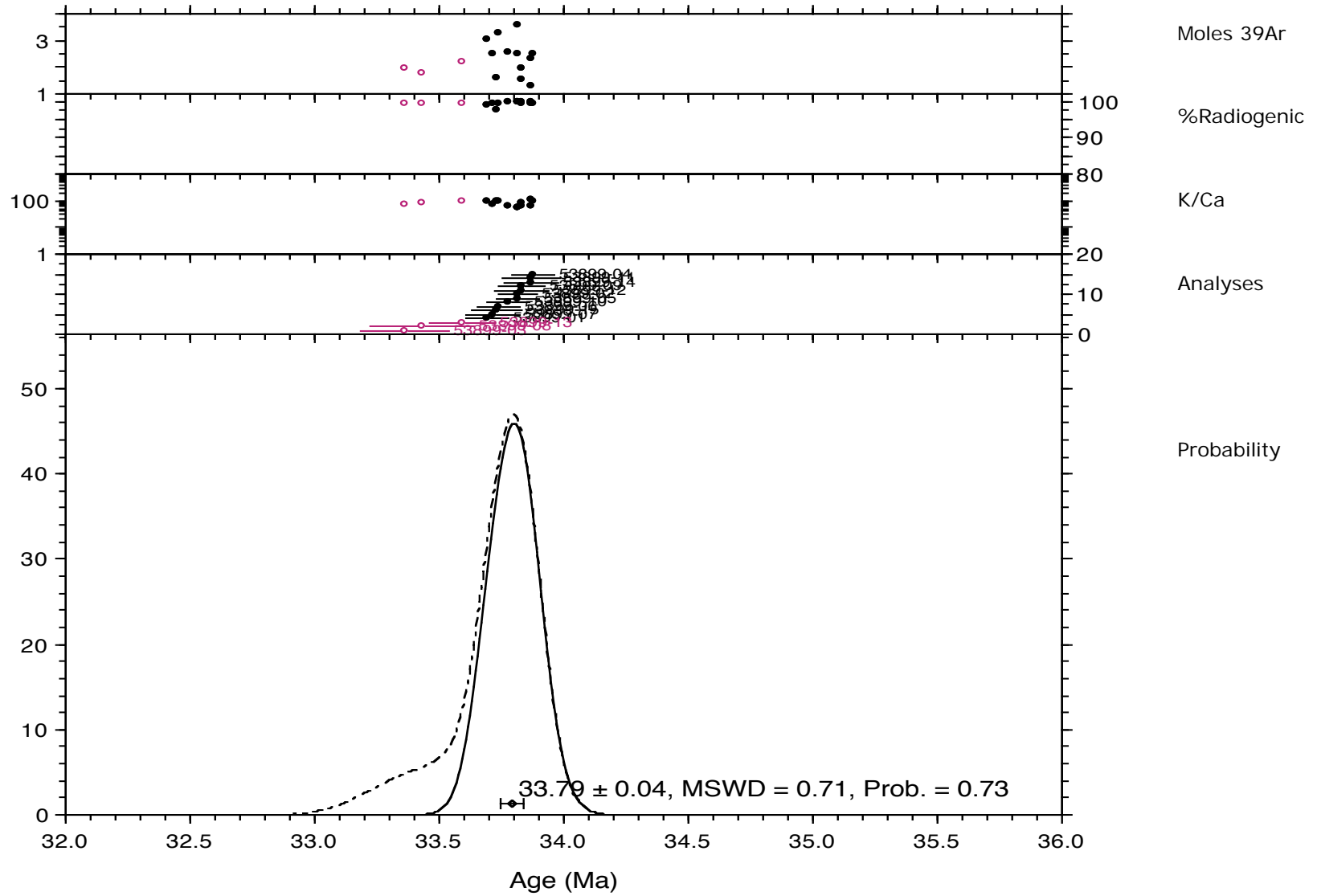
Age-Probability Spectrum for Run 55595 (H03-84)



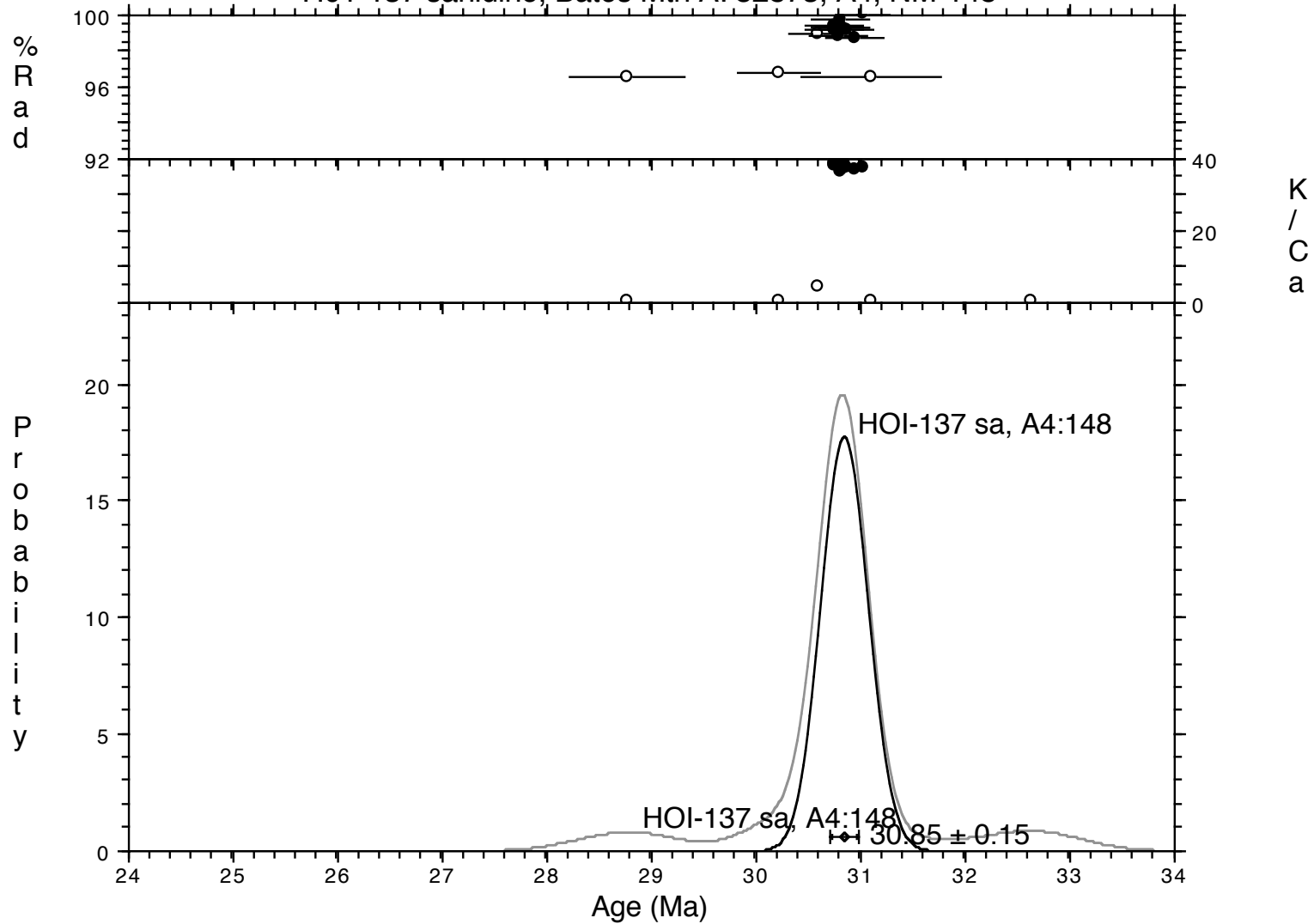
Age-Probability Spectrum for Run 55596 (H03-82)



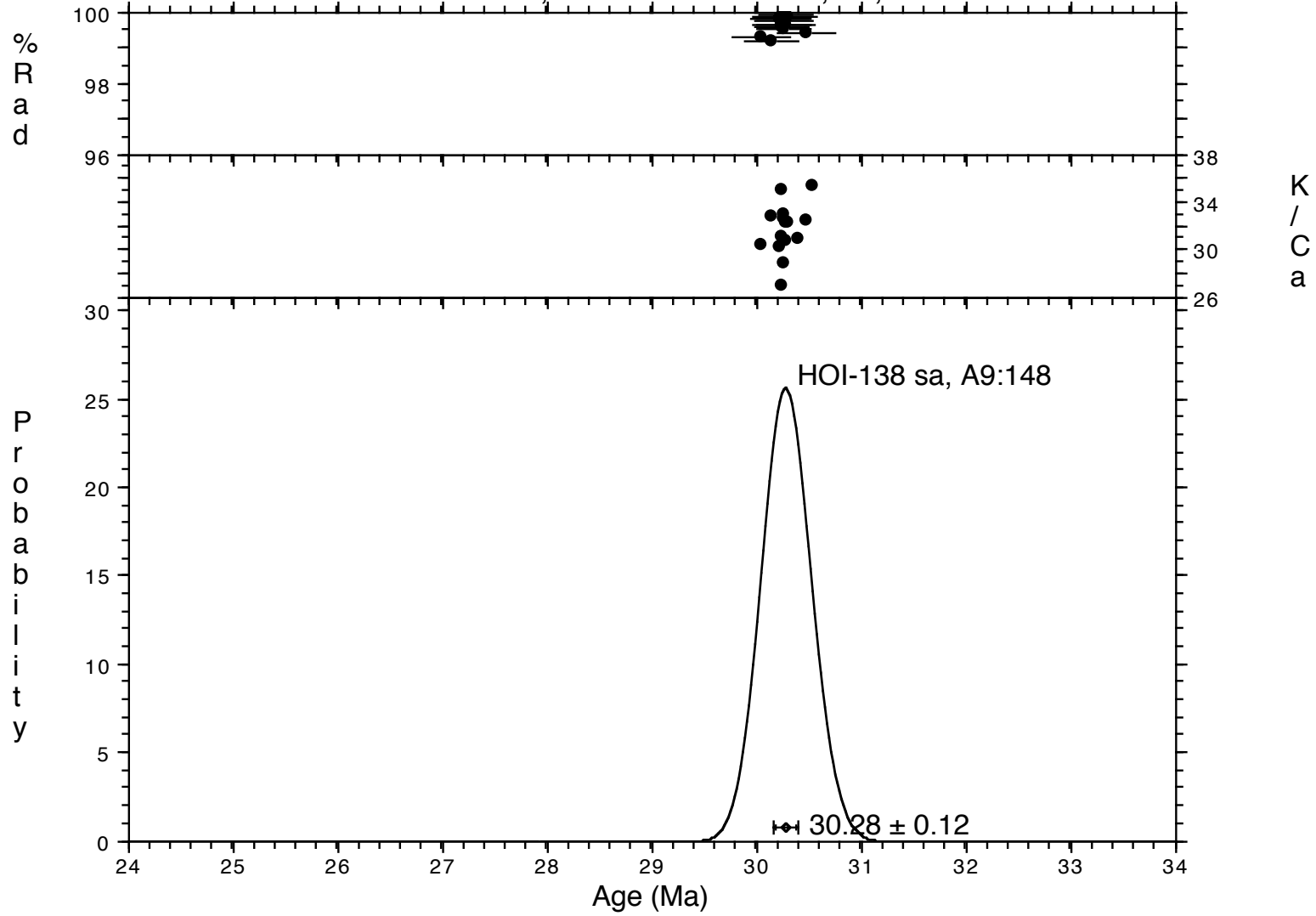
Age-Probability Spectrum for Run 53899, 00DJ 34 sa, C2:162



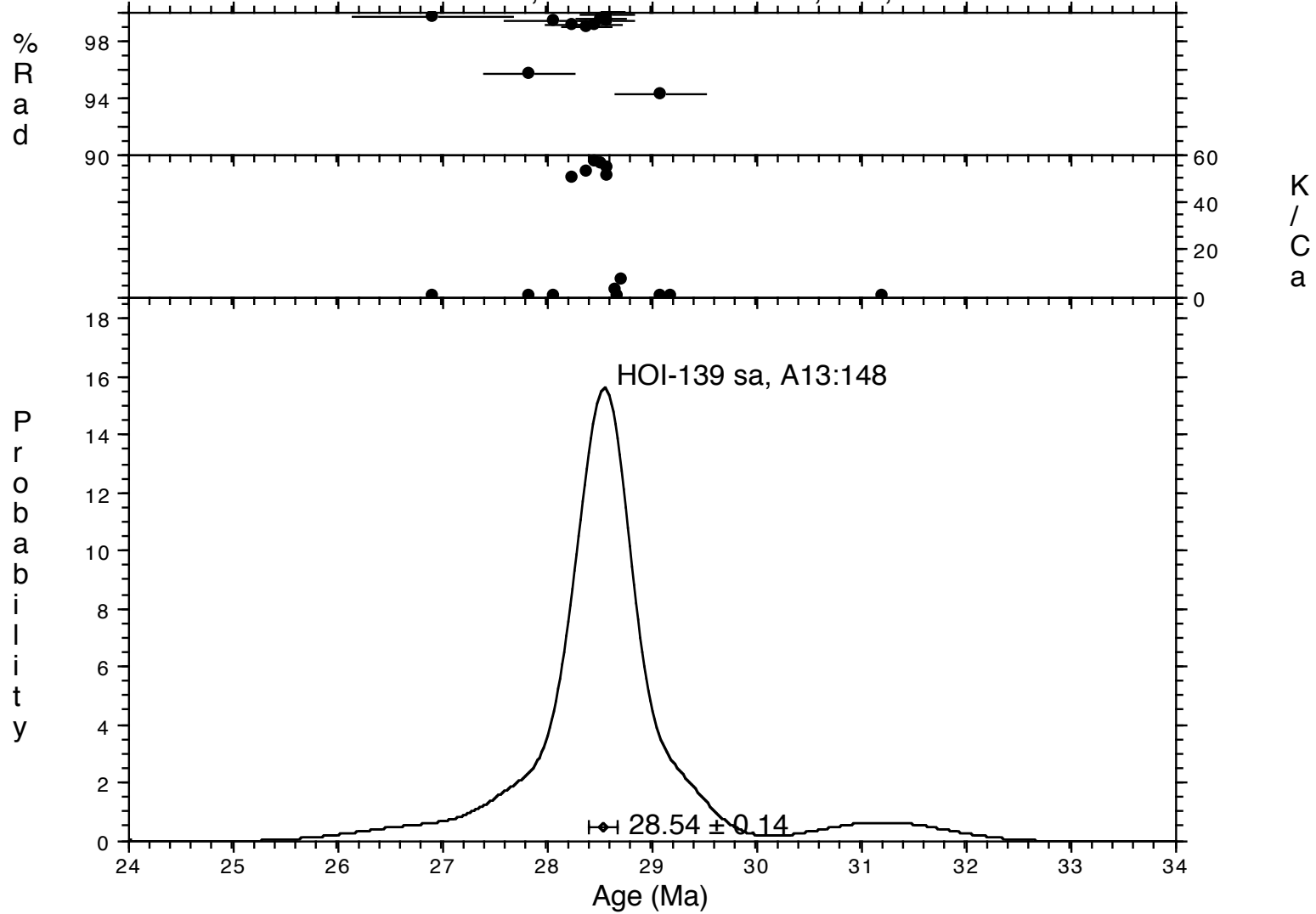
H01-137 sanidine, Bates Mtn A: 52873, A4, NM-148



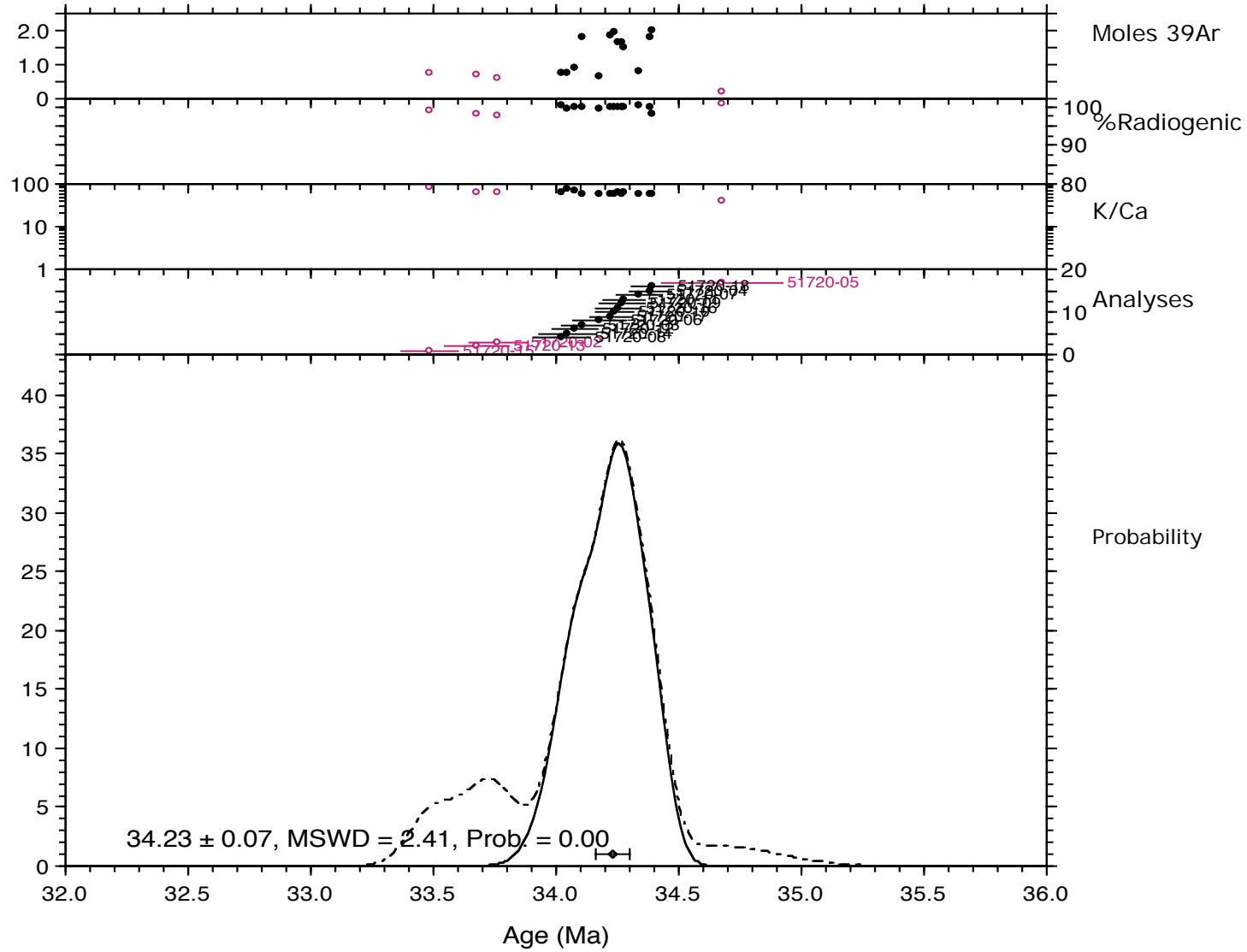
H01-138 sanidine, Bates Mtn B: 52878, A9, NM-148



H01-139 sanidine, Bates Mtn C: 52882, A13, NM-148



Age-Probability Spectrum for Run 51720, H00-53



H00-78, Bates Mtn D; 51701, A2, NM130

