GSA REPOSITORY ITEM

METHODS

Pb isotopic analyses, regardless of introduction method, were conducted on the VG Axiom magnetic sector, multicollector ICP-MS at the Geological Institute, University of Copenhagen. All analyses employed static measurement mode with all Pb isotopes measured by Faraday detectors. Samples were crushed and processed by standard mineral separation methods, including Wilfley table, sieving (200-500 µm) and heavy liquids of appropriate density. All regressions were calculated using Isoplot/Ex (Ludwig, 1999).

Laser ablation methods: Laser ablation of K-feldspar in grain mounts and rock slabs utilized a Cetac LSX-200 266 nm wavelength laser system. Mass spectrometer settings and Ar carrier gas flow rates were adjusted at the start of each session for maximum intensity of Pb 208 while analyzing NIST 610 by laser ablation. Data was acquired in 50 scans of 1 second duration. Mass fractionation during analyses of unknowns was determined by monitoring Pb and Tl in bracketing analyses of NIST 610 (with an average of 2 NIST 610 analyses for every 3 unknowns; Fig. DR1 and Table DR1).

A pre-ablation pass to remove surface contamination along the line to be analyzed used a ca. 300 µm spot size. Laser spot sizes of 100 µm and 200 µm were utilized for analyses of Kfs in grain mounts and rock slabs, respectively. Line lengths and laser tracking speed were dictated by grain size and were approximately matched with that of bracketing analyses of standard glass NIST 610. Results with 2SE errors are presented in Table DR2 and Figure DR2.

Laser ablation of epoxy mounted Kfs: Kfs grains free of obvious inclusions were selected using a binocular reflected-light microscope from mineral separates of appropriate density, placed on two-sided tape, collared, and covered with low-Pb epoxy. The grains in the resulting puck were ground and polished to approximately two thirds of their original thickness prior to analyses by LA-ICP-MS.

Laser ablation of Kfs in rock slabs: Rock slabs were cut using a standard water-cooled rock saw, polished and rinsed with de-ionized water. Polished surfaces of slabs were impregnated with a low-Pb epoxy and re-polished to re-expose grains through the epoxy. Reducing the intergranular permeability of the polished surface proved necessary for the subsequent staining procedure. The polished surfaces were etched at room temperature by HF vapor for 30-45 seconds and then treated for 2-5 minutes by a solution of sodium cobaltinitrate to stain Kfs yellow. With Kfs now readily identifiable, grains were selected and scribed using a binocular microscope. This method of sample preparation and grain selection proved far more rapid than preparing epoxy-mounted mineral separates but resulted in slightly less efficient analytical sessions. This is due to Kfs in some slabs containing optically undetectable apatite inclusions with different Pb isotopic compositions than that of Kfs, which caused severe inflation of errors on the $^{206}Pb/^{204}Pb$ ratios. P was monitored during the pre-ablation pass to detect apatite inclusions. Samples with unavoidable apatite inclusions in Kfs were abandoned.

***Solution methods*:** Solution analyses were conducted on a subset of five Kfs fractions to test for systematic differences between LA and total digestion solution methods (Fig. DR3). Fractions for solution analyses were optically selected from mineral separates of appropriate density, treated with warm 2N HCl for 1 hour, dissolved with HF:HNO_3 after which Pb was separated by standard HBr chemical methods. The natural isotopic composition of Pb was determined in static Faraday mode using 150 scans of 1 second duration. A ^{207}Pb-^{204}Pb double spike was subsequently added and the samples re-analyzed (100 scans of 1 second duration) to determine mass fractionation and obtain higher precision isotopic data (ca. +/-100 ppm; Baker et al., 2004). The SRM-981 standard was run by the double spike method at the beginning of the session. The procedural blank is estimated to be 80 pg.

REFERENCES FOR DATA REPOSITORY

Baker, J., Peate, D., Waight, T., and Meyzen, C., 2004, Pb isotopic analysis of standards and samples using a 207Pb/204Pb double spike and thallium to correct for mass bias with a double focusing MC-ICP-MS. Chemical Geology, v. 211, p. 275-303.

Ludwig, K.R., 1999. Isoplot/Ex version 2.00 – A geochronological toolkit for Microsoft Excel. Berkeley Geochronology Center, Special Publication No. 2.

FIGURES FOR GSA REPOSITORY

Figure DR1. Uranogenic Pb isotopic compositions of standard glass NIST 610 analyzed during this study. Thick error bars reflect 2SE of all standard data. Black box near center of diagram represent three analyses of NIST 610 by double spike solution ICP-MS at the Geological Institute, University of Copenhagen.

Figure DR2. Uranogenic Pb isotopic compositions of K-feldspar from Archean orthogneisses from the Nagssugtoqidian-Rinkian orogen. Dashed box in A defines extent of graph in B.

Figure DR3. Uranogenic Pb isotopic compositions of five K-feldspar unknowns from Archean orthogneisses as determined by both laser ablation (L) and solution (S) ICP-MS.

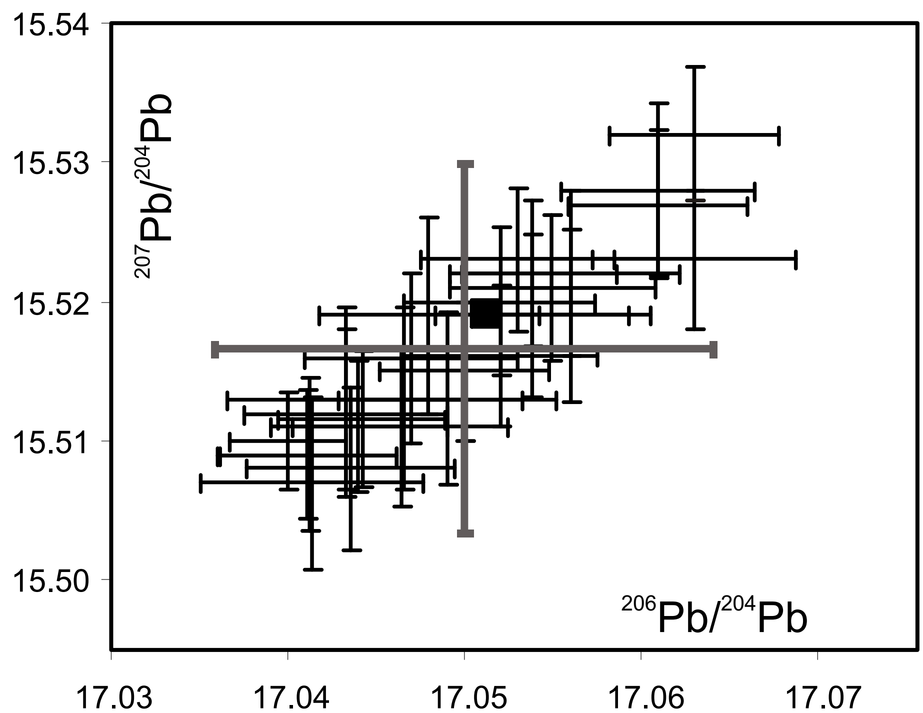

15.54
15.53
15.52
15.51
15.50
207Pb/204Pb
206Pb/204Pb
17.03
17.04
17.05
17.06
17.07

Figure DR1

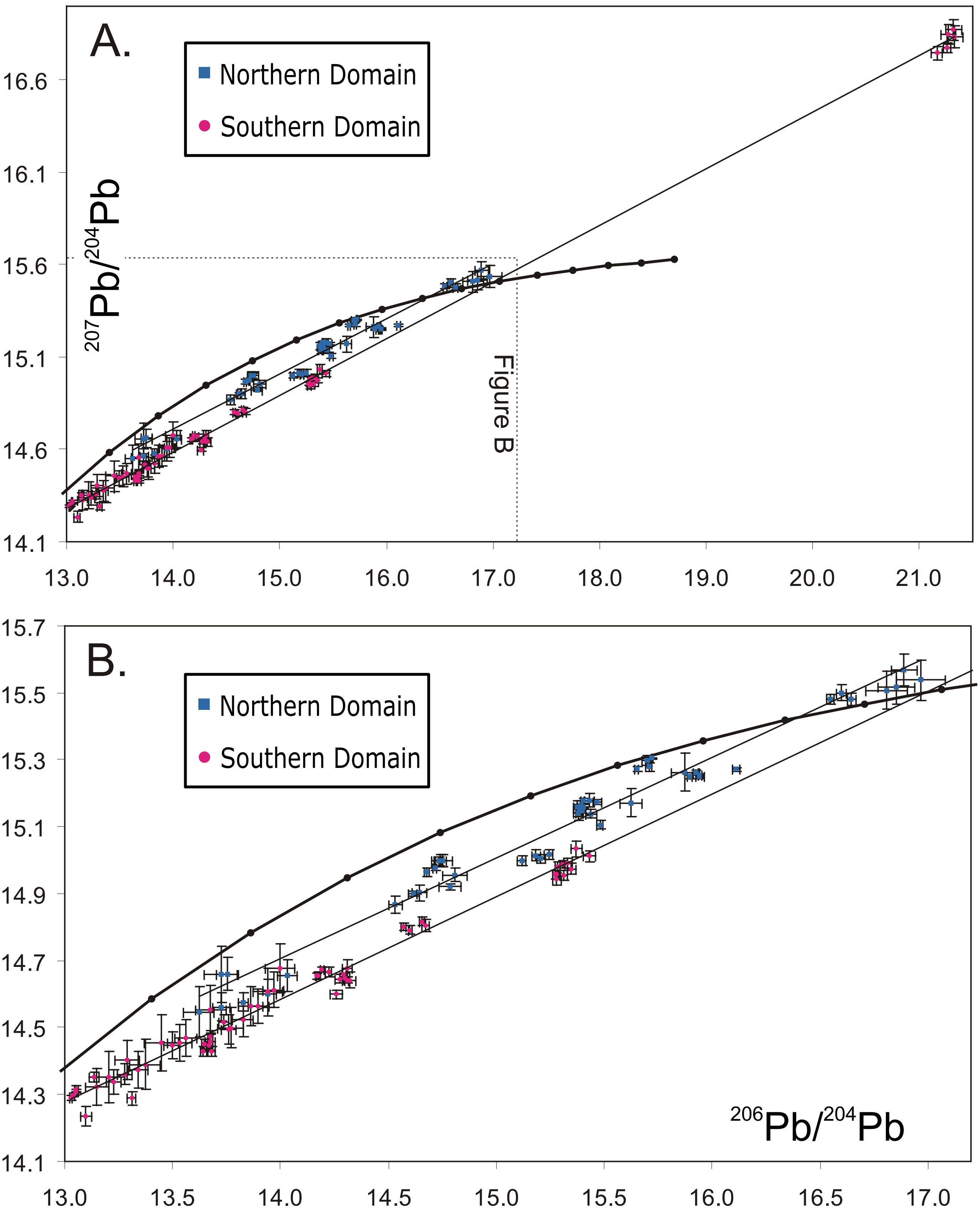
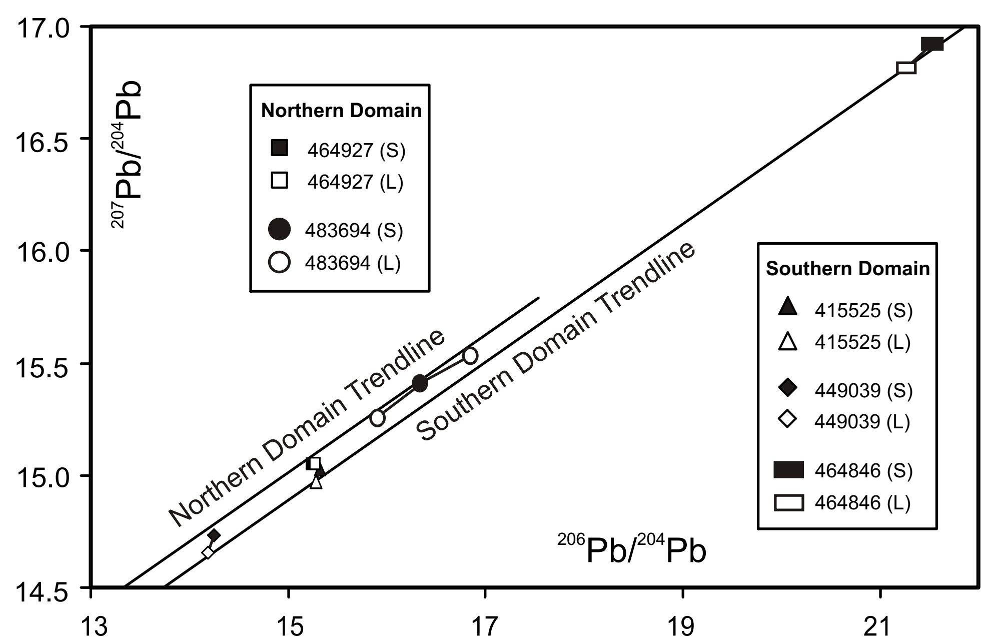


Figure DR2

NB: DATA POINTS ARE IN COLOR



17.0
16.5
16.0
15.5
15.0
14.5
13
15
17
19
21
$^{207}Pb/^{204}Pb$
$^{206}Pb/^{204}Pb$
Northern Domain
464927 (S)
464927 (L)
483694 (S)
483694 (L)
Southern Domain
415525 (S)
415525 (L)
449039 (S)
449039 (L)
464846 (S)
464846 (L)
Northern Domain Trendline
Southern Domain Trendline

Figure DR3

Table DR1. Isotopic composition of NIST 610 glass

$^{206}Pb/^{204}Pb$[1]	2SE%[2]	$^{207}Pb/^{204}Pb$[1]	2SE%[2]
17.040	0.019	15.505	0.022
17.041	0.037	15.502	0.040
17.041	0.030	15.504	0.030
17.047	0.039	15.508	0.042
17.043	0.039	15.508	0.042
17.046	0.036	15.506	0.037
17.044	0.028	15.507	0.031
17.041	0.029	15.504	0.035
17.043	0.034	15.507	0.039
17.053	0.032	15.518	0.033
17.047	0.036	15.511	0.039
17.052	0.032	15.511	0.033
17.044	0.034	15.503	0.037
17.044	0.029	15.506	0.031
17.048	0.036	15.514	0.045
17.054	0.028	15.517	0.034
17.061	0.032	15.523	0.040
17.054	0.032	15.514	0.038
17.049	0.036	15.508	0.040
17.056	0.027	15.514	0.040
17.050	0.028	15.510	0.032
17.063	0.034	15.518	0.032
17.055	0.034	15.516	0.034
17.052	0.032	15.515	0.034
17.056	0.036	15.517	0.038
17.061	0.030	15.522	0.034
17.063	0.028	15.527	0.031

Notes

1. Corrected for mass fractionation by simultaneous measurement of Tl.
2. 2SE% errors.

Table DR2. Isotopic composition of K-feldpar unknowns.

No.[1]	GEUS #[2]	$^{206}Pb/^{204}Pb$[3]	2SE%[4]	$^{207}Pb/^{204}Pb$[3]	2SE%[4]	$^{208}Pb/^{204}Pb$[3]	2SE%[4]	Method[5]
NORTHERN DOMAIN								
1	481669	15.382	0.089	15.143	0.075	34.751	0.033	slab
1	481669	15.376	0.111	15.158	0.120	34.812	0.055	slab
1	481669	15.391	0.094	15.164	0.097	34.819	0.046	slab
1	481669	15.432	0.145	15.179	0.132	34.892	0.070	slab
1	481669	15.381	0.137	15.141	0.148	34.806	0.066	slab
2	481636	15.707	0.094	15.278	0.093	37.888	0.043	slab
2	481636	15.650	0.047	15.273	0.042	37.661	0.023	slab
2	481636	15.696	0.118	15.297	0.096	37.736	0.054	slab
3	481733	14.679	0.077	14.965	0.083	34.521	0.040	slab
3	481733	14.715	0.050	14.976	0.043	34.557	0.022	slab
3	481733	14.732	0.087	14.997	0.079	34.640	0.043	slab
4	483641	15.723	0.015	15.304	0.015	35.393	0.021	soln
5	489405	15.401	0.042	15.177	0.050	35.071	0.022	slab
5	489405	15.387	0.046	15.152	0.050	35.018	0.022	slab
5	489405	15.382	0.050	15.158	0.050	35.001	0.024	slab
5	489405	15.467	0.132	15.174	0.048	35.047	0.024	slab
5	489405	15.396	0.036	15.148	0.036	34.997	0.017	slab
5	489405	15.404	0.028	15.161	0.036	35.021	0.014	slab
6	483656	13.725	0.580	14.659	0.577	34.846	0.294	mount
6	483656	13.727	0.298	14.561	0.286	34.716	0.143	mount
6	483656	13.751	0.340	14.661	0.342	34.951	0.175	mount
6	483656	13.621	0.523	14.547	0.521	34.610	0.254	mount
7	483665	14.533	0.225	14.869	0.170	33.518	0.087	mount
7	483665	14.643	0.227	14.902	0.165	33.615	0.079	mount
7	483665	14.808	0.394	14.957	0.136	33.820	0.076	mount
7	483665	14.614	0.140	14.900	0.046	33.580	0.024	slab
7	483665	14.786	0.336	14.921	0.060	33.673	0.048	slab
7	483665	14.739	0.200	14.999	0.120	33.877	0.065	slab
7	483665	14.750	0.320	15.000	0.120	33.874	0.070	slab
8	483686	13.826	0.173	14.575	0.187	34.371	0.088	mount
8	483686	13.939	0.307	14.601	0.289	34.516	0.140	mount
8	483686	14.032	0.316	14.656	0.321	34.733	0.155	mount
9	483694	15.623	0.331	15.172	0.283	35.046	0.155	mount
9	483694	16.966	0.671	15.539	0.388	35.066	0.271	mount
9	483694	16.854	0.520	15.516	0.320	34.789	0.210	mount
9	483694	16.891	0.360	15.569	0.300	34.965	0.150	mount
9	483694	16.809	0.580	15.508	0.360	35.208	0.187	mount
9	483694	15.874	0.388	15.263	0.366	34.944	0.187	mount
9	483694	16.111	0.118	15.272	0.034	34.908	0.026	slab

9	483694	15.944	0.047	15.253	0.030	34.708	0.017	slab
9	483694	15.927	0.096	15.262	0.039	34.811	0.032	slab
9	483694	15.896	0.072	15.250	0.034	34.730	0.020	slab
9	483694	15.943	0.128	15.250	0.033	34.746	0.024	slab
9	483694	16.357	0.031	15.413	0.032	34.724	0.014	soln
10	464927	15.208	0.120	15.005	0.085	34.249	0.048	slab
10	464927	15.438	0.169	15.139	0.091	34.756	0.058	slab
10	464927	15.480	0.098	15.106	0.079	34.651	0.048	slab
10	464927	15.117	0.121	14.998	0.090	34.254	0.053	slab
10	464927	15.244	0.131	15.017	0.106	34.270	0.058	slab
10	464927	15.183	0.127	15.014	0.112	34.233	0.051	slab
10	464927	15.253	0.033	15.048	0.033	34.248	0.015	soln
11	464932	16.601	0.137	15.501	0.144	33.628	0.073	slab
11	464932	16.647	0.123	15.480	0.121	33.564	0.062	slab
11	464932	16.549	0.093	15.481	0.090	33.585	0.046	slab
SOUTHERN DOMAIN								
12	464941	13.769	0.443	14.499	0.416	34.096	0.198	slab
12	464941	13.758	0.250	14.494	0.301	34.285	0.132	slab
12	464941	13.826	0.348	14.522	0.351	34.311	0.166	slab
12	464941	13.736	0.175	14.518	0.147	34.185	0.088	slab
13	464945	13.138	0.169	14.352	0.094	33.779	0.087	slab
13	464945	13.028	0.046	14.291	0.052	33.180	0.023	slab
13	464945	13.040	0.032	14.299	0.034	33.217	0.019	slab
13	464945	13.050	0.042	14.309	0.037	33.283	0.025	slab
13	464945	13.053	0.058	14.317	0.056	33.316	0.026	slab
14	484450	13.277	0.257	14.361	0.222	35.089	0.118	mount
14	484450	13.098	0.196	14.235	0.200	34.586	0.100	mount
14	484450	13.227	0.244	14.337	0.261	34.817	0.126	mount
15	449045	13.532	0.416	14.454	0.386	33.470	0.200	mount
15	449045	13.676	0.510	14.554	0.498	33.743	0.247	mount
15	449045	13.561	0.363	14.470	0.383	33.475	0.186	mount
15	449045	13.310	0.150	14.289	0.140	33.018	0.067	mount
16	449054	13.497	0.264	14.447	0.273	34.084	0.125	mount
16	449054	13.339	0.354	14.375	0.378	34.030	0.187	mount
16	449054	13.447	0.586	14.456	0.582	34.091	0.284	mount
16	449054	13.372	0.524	14.389	0.518	33.982	0.246	mount
17	415539	13.967	0.356	14.613	0.364	35.030	0.185	mount
17	415539	13.861	0.402	14.564	0.412	34.830	0.195	mount
17	415539	13.998	0.500	14.678	0.500	35.159	0.250	mount
17	415539	13.940	0.480	14.607	0.491	35.189	0.236	mount
17	415539	13.898	0.345	14.564	0.353	35.120	0.176	mount
18	415525	15.281	0.118	14.945	0.122	33.888	0.057	mount
18	415525	15.312	0.110	14.955	0.106	33.935	0.053	mount

18	415525	15.273	0.080	14.957	0.082	33.881	0.041	mount
18	415525	15.284	0.068	14.981	0.082	33.950	0.033	mount
18	415525	15.308	0.066	14.987	0.068	33.962	0.033	mount
18	415525	15.331	0.033	15.023	0.033	33.990	0.015	soln
19	464402	13.674	0.100	14.473	0.112	35.233	0.054	mount
19	464402	13.676	0.174	14.457	0.160	35.205	0.087	mount
19	464402	13.681	0.110	14.430	0.100	35.415	0.158	mount
19	464402	13.648	0.096	14.451	0.096	35.134	0.055	mount
19	464402	13.670	0.096	14.446	0.090	34.998	0.050	mount
19	464402	13.642	0.100	14.429	0.094	35.392	0.088	mount
20	449047	13.289	0.427	14.404	0.408	33.689	0.207	mount
20	449047	13.205	0.536	14.352	0.527	33.822	0.261	mount
20	449047	13.150	0.399	14.323	0.372	33.550	0.196	mount
21	464846	21.274	0.320	16.850	0.315	35.509	0.161	mount
21	464846	21.318	0.348	16.871	0.345	35.531	0.175	mount
21	464846	21.333	0.363	16.834	0.363	35.407	0.182	mount
21	464846	21.260	0.160	16.774	0.162	35.274	0.079	mount
21	464846	21.164	0.232	16.747	0.220	35.266	0.110	mount
21	464846	21.540	0.023	16.918	0.030	35.543	0.014	soln
22	449071	14.656	0.080	14.817	0.086	35.593	0.040	mount
22	449071	14.673	0.108	14.805	0.120	35.579	0.056	mount
22	449071	14.601	0.070	14.792	0.084	35.580	0.037	mount
22	449071	14.570	0.078	14.802	0.077	35.598	0.039	mount
23	449039	14.170	0.054	14.654	0.056	34.453	0.027	mount
23	449039	14.176	0.076	14.654	0.078	34.453	0.038	mount
23	449039	14.191	0.056	14.674	0.046	34.495	0.028	mount
23	449039	14.234	0.035	14.715	0.034	34.576	0.014	soln
24	415551	15.330	0.128	14.990	0.100	34.011	0.050	mount
24	415551	15.372	0.170	15.034	0.164	34.090	0.083	mount
24	415551	15.278	0.090	14.957	0.088	33.913	0.041	mount
24	415551	15.432	0.196	15.012	0.116	33.984	0.065	mount
24	415551	15.347	0.132	14.974	0.106	34.073	0.059	mount
25	484438	14.310	0.158	14.677	0.167	34.629	0.100	slab
25	484438	14.309	0.057	14.642	0.056	34.627	0.028	slab
25	484438	14.295	0.079	14.647	0.047	34.531	0.037	slab
25	484438	14.294	0.047	14.657	0.035	34.588	0.026	slab
25	484438	14.222	0.102	14.667	0.105	34.532	0.052	slab

Notes

1. Sample numbers used in text and Figure 1.
2. Geological Survey of Denmark and Greenland catalogue numbers.
3. Isotopic ratio corrected for blank and mass fractionation.
4. 2 standard error of the mean expressed as percent error.
5. Mount = analyses of hand picked K-feldspar grains in an epoxy mount;
   Slab = analyses of K-feldspar in cut rock slab;
   Soln = analyses of dissolved K-feldspar by solution.