2001066 Data Repository Figure Captions

Figure DR-1. Tera-Wasserburg (1972) concordia plot showing the inheritance characteristics of samples GTT-2 and GTT-12. Error bars indicate 2σ uncertainties. Linear regression based on the method of York (1969). Letters identifying individual fractions correspond to fraction designations in Table 2. The chord for sample GTT-2 does not include the single near concordant fraction (fraction c). Mid-Proterozic upper intercept ages are consistent with high level assimilation of continentally derived zircons as seen elsewhere in California (e.g., Saleeby et al., 1987,1990; James, 1992).

Figure DR-2. Stacked Tera-Wasserburg (1972) concordia plots for GTT clasts. Error bars indicate 2σ uncertainties.

Figure DR-3. Stacked Tera-Wasserburg (1972) concordia plots for HBT and miscellaneous clasts. Error bars indicate 2σ uncertainties.

Figure DR-4. Tera-Wasserburg (1972) concordia plot for the two samples yielding pre-Cretaceous U/Pb crystallization ages. Error bars indicate 2σ uncertainties. Letters identifying individual fractions correspond to fraction designations in Table DR-2.

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TABLE DR-1. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST SAMPLE LOCALITIES, INTERPRETED AGES, AND PETROGRAPHY

Sample Number	Field Sample Identification	Latitude N	Longitude W	Interpreted U/Pb Zircon Crystallization Age (Ma)	Rock Classification and Texture
			Garnet-bearing Tonalite and Trondhjemite Clasts (GTT)		
GTT-1	RS92PL9	38°32’50”	123°17’49”	135 +2/ -1	foliated gnt hbd biot tonalite
GTT-2	RS92PL10	38°32’51”	123°18’02”	140 ± 2 or 126 ± 1*	gnt biot trondhjemite
GTT-3	RS92PL12	38°32’51”	123°18’02”	132 ± 2	musc gnt biot trondhjemite
GTT-4	RS95PL1	38°32’51”	123°18’02”	120 †	gnt musc biot trondhjemite
GTT-5	RS95PL2	38°32’51”	123°18’02”	120 †	biot gnt trondhjemite
GTT-6	RS95PL5	38°33’34”	123°19’02”	117.5 ± 2	musc biot gnt trondhjemite
GTT-7	RS95PL7	38°33’34”	123°19’02”	123 ± 4	musc biot gnt trondhjemite
GTT-8	RS95PL13	38°32’50”	123°17’58”	124 ± 2	epid biot gnt trondhjemite
GTT-9	RS95PL24	38°32’50”	123°17’58”	117 ± 2	biot musc gnt trondhjemite
GTT-10	RS95PL25	38°32’50”	123°17’58”	119 ± 4	gnt biot trondhjemite
GTT-11	RS95PL27	38°32’50”	123°17’58”	109 ± 1	musc gnt trondhjemite
GTT-12	RS95PL34A	38°32’50”	123°17’59”	118 ± 2	biot gnt trondhjemite
			Hornblende- and Biotite-bearing Tonalite and Granodiorite Clasts (HBT)		
HBT-1	CJ-831A	38°32’50”	123°17’55”	100 †	hbd biot tonalite
HBT-2	RS92PL1	38°32’50”	123°17’49”	99 ± 1	hbd biot tonalite
HBT-3	RS92PL5	38°32’50”	123°17’49”	97 ± 1	biot hbd tonalite
HBT-4	RS92PL8	38°32’50”	123°17’49”	100 †	hbd biot granodiorite
HBT-5	RS92PL13	38°32’51”	123°18’02”	99 ± 2	hbd biot tonalite
HBT-6	RS95PL4	38°33’34”	123°19’02”	100 ± 3	hbd biot tonalite
HBT-7	RS95PL6	38°33’34”	123°19’02”	98 +2/ -1	hbd biot tonalite
HBT-8	RS95PL16	38°32’50”	123°17’58”	99 ± 1	biot hbd granodiorite
HBT-9	RS95PL31	38°32’50”	123°17’59”	102 ± 1	hbd biot tonalite
			Miscellaneous Clasts		
QRT	RS95PL10	38°33’34”	123°19’02”	105 +4/ -2	biot tonalite (quartz-rich)
DFG-1	RS95PL8	38°33’34”	123°19’02”	103 +4/ -1	foliated biot granite
DFG-2	RS95PL23	38°32’50”	123°17’59”	112 ± 2	gneissic biot granite
MXG	RS92PL12	38°32’50”	123°17’58”	118 ± 4	hbd biot granite (megacrystic K-feldspar)
GAB	RS95PL28	38°32’50”	123°17’59”	144 +18/ -3	biot cpx hbd gabbro
EHT	RS95PL30	38°32’50”	123°17’59”	258 +2/ -18	epid hbd trondhjemite

Note: Texture is medium-grained equigranular unless otherwise noted. Varietal minerals listed in order of increasing abundance. Abbreviations: biot = biotite, cpx = augite, epid = epidote, gnt = garnet, hbd = hornblende, musc = muscovite.

* 140 ± 2 Ma is our preferred crystallization age based on single, near-concordant zircon fraction; 126 ± 1 is the lower intercept of three zircon fractions that have significant Proterozoic inherited Pb components.

† Assumed age based on dated clasts of similar composition and texture; insufficient zircon yield for U/Pb age determination.

TABLE DR-2. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST U/Pb ZIRCON ISOTOPIC AGE DATA

Sample Number	Field ID, Fractions, and Properties†	Amount Analyzed (mg)	Concentrations U (ppm)	Pb* (ppm)	Common Pb (ppm)	Atomic Ratios § $^{206}Pb/^{204}Pb$	$^{206}Pb^*/^{238}U$	%err	$^{207}Pb^*/^{235}U$	%err	$^{207}Pb^*/^{206}Pb$	%err	Ages (Ma) $^{206}Pb^*/^{238}U$	$^{207}Pb^*/^{235}U$	$^{207}Pb^*/^{206}Pb$	6/8-7/5 Correlation Coefficient
	Garnet-bearing Tonalite and Trondhjemite (GTT) Clasts															
GTT-1	RS92PL9 - foliated garnet hornblende biotite tonalite															
a	D 64-100	3.17	198.5	4.146	0.001	3135	0.021398	0.38	0.14533	0.93	0.049257	0.84	136.5	137.8	160.1	0.4204
b	N 100-150	4.54	183.2	3.850	0.023	7693	0.021576	0.20	0.14584	0.24	0.049024	0.12	137.6	138.2	149.0	0.8519
c	N <64	2.62	259.3	5.384	0.050	5368	0.021193	0.20	0.14232	0.26	0.048705	0.16	135.2	135.1	133.7	0.7950
GTT-2	RS92PL10 - garnet biotite trondhjemite															
a	N <64	2.00	100.8	2.558	0.056	2288	0.025194	0.24	0.21230	0.35	0.061115	0.24	160.4	195.5	643.3	0.7408
b	N <64	0.10	796.3#	17.27#	0.774	1027	0.021516	0.59	0.15784	0.63	0.053204	0.24	137.2	148.8	337.5	0.9247
c	N 100-150	1.25	84.50	1.888	0.051	1578	0.022008	0.46	0.14893	0.48	0.049079	0.16	140.3	141.0	151.6	0.9468
d	N <64	4.41	102.3	2.265	0.042	2989	0.021959	0.24	0.16502	0.72	0.054503	0.64	140.0	155.1	391.9	0.4946
GTT-3	RS92PL12 - muscovite garnet biotite trondhjemite															
a	N >100	0.28	267.9	5.419	0.251	1425	0.020733	0.21	0.13864	0.28	0.048501	0.18	132.3	131.8	123.8	0.7730
GTT-6	RS95PL5 - muscovite biotite garnet trondhjemite															
a	D <64	0.77	119.8	2.112	0.013	1829	0.018393	0.91	0.12276	1.03	0.048405	0.48	117.5	117.6	119.1	0.8854
GTT-7	RS95PL7 - muscovite biotite garnet trondhjemite															
a	D <64	2.23	261.2	4.770	0.060	4570	0.019455	0.24	0.13182	0.39	0.049141	0.29	124.2	125.7	154.5	0.6645
GTT-8	RS95PL13 - epidote biotite garnet trondhjemite															
a	D <64	1.09	130.1	2.414	0.757	218.9	0.019487	0.53	0.13095	0.76	0.048737	0.52	124.4	125.0	135.2	0.7272
GTT-9	RS95PL24 - biotite muscovite garnet trondhjemite															
a	D <64	1.71	79.13	1.355	0.016	2068	0.018228	0.63	0.12248	0.66	0.048734	0.21	116.4	117.3	135.1	0.9487
b	N <64	0.69	89.10	1.571	0.053	848.9	0.018277	1.33	0.12249	1.72	0.048606	1.04	116.8	117.3	128.9	0.7946
GTT-10	RS95PL25 - garnet biotite trondhjemite															
a	D <64	5.48	189.4	3.348	0.019	9588	0.018931	0.25	0.12910	0.39	0.049460	0.29	120.9	123.3	169.7	0.6705
GTT-11	RS95PL27 - muscovite garnet trondhjemite															
a	N <64	0.75	122.1	2.023	0.297	383.9	0.017119	0.95	0.11444	1.00	0.048484	0.34	109.4	110.0	123.0	0.9397
b	N >64	2.88	146.3	2.382	0.036	3000	0.017121	0.48	0.11326	0.56	0.047978	0.28	109.4	108.9	98.2	0.8707
GTT-12	RS95PL34A - biotite garnet trondhjemite															
a	D <64	2.70	31.36	0.580	0.003	1736	0.018645	0.95	0.12525	1.05	0.048723	0.45	119.1	119.8	134.5	0.9027
b	N <64	1.83	36.55	0.710	0.010	1251	0.019476	1.17	0.13604	1.26	0.050658	0.50	124.3	129.5	225.3	0.9169

TABLE DR-2. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST U/Pb ZIRCON ISOTOPIC AGE DATA (continued)

Sample Number	Field ID, Fractions, and Properties†	Amount Analyzed (mg)	Concentrations U (ppm)	Pb* (ppm)	Common Pb (ppm)	Atomic Ratios § $^{206}Pb/^{204}Pb$	$^{206}Pb^*/^{238}U$	%err	$^{207}Pb^*/^{235}U$	%err	$^{207}Pb^*/^{206}Pb$	%err	Ages (Ma) $^{206}Pb^*/^{238}U$	$^{207}Pb^*/^{235}U$	$^{207}Pb^*/^{206}Pb$	6/8-7/5 Correlation Coefficient
	Garnet-free Biotite- and Hornblende-bearing Tonalite and Granodiorite (HBT) Clasts															
HBT-2	RS92PL1 - hornblende biotite tonalite															
a	M1 64-100	2.13	650.6	9.828	0.182	2135	0.015397	0.21	0.10286	0.58	0.048453	0.54	98.5	99.4	121.4	0.3950
b	D 64-100	5.54	594.5	8.999	0.160	2967	0.015477	0.23	0.10306	0.32	0.048297	0.22	99.0	99.6	113.8	0.7213
c	M5 64-100	3.59	628.8	9.447	0.359	1440	0.015245	0.25	0.10222	0.44	0.048634	0.35	97.5	98.8	130.2	0.5873
d	M5 100-150	1.33	601.7	9.070	0.956	509.7	0.015225	0.22	0.10475	1.19	0.049898	1.15	97.4	101.1	190.3	0.2695
e	N 64-100	2.42	499.3	7.553	0.101	2466	0.015429	0.20	0.10314	0.61	0.048484	0.57	98.7	99.7	123.0	0.3679
f	N 64-100	4.82	603.7	9.189	0.067	4441	0.015532	0.26	0.10541	0.42	0.049222	0.32	99.4	101.8	158.4	0.6336
g	N <64	2.56	683.1	10.36	0.066	4132	0.015483	0.22	0.10408	0.48	0.048752	0.42	99.0	100.5	135.9	0.4851
h	N 100-150	4.17	588.8	8.901	0.228	2051	0.015460	0.22	0.10230	0.44	0.047992	0.37	98.9	98.9	98.9	0.5518
HBT-3	RS92PL5 - biotite hornblende tonalite															
a	D <64	5.96	695.9	10.49	0.088	6287	0.015179	0.35	0.10090	0.37	0.048215	0.11	97.1	97.6	109.8	0.9540
b	N 100-150	2.88	524.8	7.865	0.488	979.2	0.015162	0.24	0.10090	0.34	0.048263	0.24	97.0	97.6	112.2	0.6976
HBT-5	RS92PL13 - hornblende biotite tonalite															
a	N 64-100	5.19	568.0	8.718	0.109	4937	0.015497	0.23	0.10307	0.24	0.048236	0.08	99.1	99.6	110.9	0.9452
b	N >100	2.17	490.6	7.427	1.870	272.3	0.015321	0.26	0.10066	0.46	0.047650	0.36	98.0	97.4	81.9	0.6268
HBT-6	RS95PL4 - hornblende biotite tonalite															
a	N 100-150	0.93	430.3	6.636	0.116	3108	0.015419	0.29	0.10031	0.52	0.047182	0.42	98.6	97.1	58.4	0.6117
b	N <64	7.70	549.8	8.599	0.059	9016	0.015653	2.77	0.10334	2.81	0.047879	0.49	100.1	99.9	93.3	0.9848
HBT-7	RS95PL6 - hornblende biotite tonalite															
a	D <64	9.43	668.2	10.46	0.042	15341	0.015647	0.68	0.10418	0.68	0.048288	0.08	100.1	100.6	113.4	0.9938
b	D 100-150	4.84	370.9	5.622	0.046	7318	0.015353	0.31	0.10184	0.32	0.048111	0.08	98.2	98.5	104.7	0.9701
HBT-8	RS95PL16 - biotite hornblende granodiorite															
a	N 64-100	7.64	617.7	9.411	0.124	4897	0.015521	0.59	0.10313	0.59	0.048192	0.07	99.3	99.7	108.7	0.9927
b	D 64-100	6.14	611.2	9.320	0.169	3566	0.015542	0.64	0.10330	0.65	0.048208	0.09	99.4	99.8	109.5	0.9909
HBT-9	RS95PL31 - hornblende biotite tonalite															
a	D <64	3.85	1035	16.44	0.056	17243	0.015978	0.65	0.10617	0.66	0.048190	0.07	102.2	102.5	108.6	0.9951
b	N 100-150	1.10	851.8	13.43	0.096	7525	0.015882	0.49	0.10554	0.51	0.048197	0.14	101.6	101.9	108.9	0.9606

TABLE DR-2. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST U/Pb ZIRCON ISOTOPIC AGE DATA (continued)

Sample Number	Field ID, Fractions, and Properties†	Amount Analyzed (mg)	Concentrations U (ppm)	Pb* (ppm)	Common Pb (ppm)	Atomic Ratios § $^{206}Pb/^{204}Pb$	$^{206}Pb^*/^{238}U$	%err	$^{207}Pb^*/^{235}U$	%err	$^{207}Pb^*/^{206}Pb$	%err	Ages (Ma) $^{206}Pb^*/^{238}U$	$^{207}Pb^*/^{235}U$	$^{207}Pb^*/^{206}Pb$	6/8-7/5 Correlation Coefficient
	Miscellaneous Clasts															
QRT	RS95PL10 - biotite tonalite (quartz-rich)															
a	D <64	1.12	451.1	7.17	0.067	4308	0.016477	0.30	0.10989	0.34	0.048370	0.17	105.4	105.9	117.4	0.8746
b	D >64	5.2	313.7	5.19	0.210	1619	0.017264	1.70	0.11724	1.70	0.049255	0.07	110.3	112.6	160.0	0.9991
DFG-1	RS95PL8 - foliated biotite granite															
a	N <64	4.31	1319	21.244	0.084	14711	0.016669	0.44	0.11135	0.45	0.048450	0.13	106.6	107.2	121.3	0.9583
b	N >100	4.23	1308	20.299	0.196	6500	0.016104	0.48	0.10685	0.48	0.048122	0.09	103.0	103.1	105.3	0.9840
DFG-2	RS95PL23 - gneissic biotite granite															
a	N <64	7.68	1702	27.400	0.157	11515	0.016943	1.12	0.11324	1.13	0.048477	0.05	108.3	108.9	122.6	0.9988
b	N 64-100	5.78	1373	23.114	0.620	2482	0.017560	0.61	0.11712	0.61	0.048374	0.06	112.2	112.5	117.6	0.9951
MXG	RS95PL12 - hornblende biotite granite (megacrystic K-feldspar)															
a	N <64	4.76	1040	19.324	0.244	4963	0.018895	0.20	0.12899	0.21	0.049511	0.06	120.7	123.2	172.1	0.9588
b	N 64-100	3.95	856.1	15.818	0.509	2000	0.018855	0.20	0.12918	0.22	0.049690	0.09	120.4	123.4	180.5	0.9068
GAB	RS95PL28 - biotite augite hornblende gabbro															
a	D <64	4.23	86.59	1.882	0.038	2841	0.022138	0.68	0.14848	0.77	0.048644	0.33	141.2	140.6	130.7	0.9011
b	D >150	2.63	115.7	2.624	0.033	4115	0.023057	0.22	0.15646	0.32	0.049214	0.23	146.9	147.6	158.1	0.7074
EHT	RS95PL30 - epidote hornblende trondhjemite															
a	D 64-100	9.76	447.9	19.627	0.062	18285	0.042653	0.40	0.30253	0.40	0.051442	0.06	269.3	268.4	260.7	0.9884
b	D 100-150	1.42	337.1	13.227	0.036	11530	0.038402	0.19	0.27193	0.22	0.051357	0.12	242.9	244.2	256.9	0.8444

* Radiogenic; nonradiogenic correction based on measured Pb blanks of 20 to 380 picograms (30 pg average) (1:19.00:15.35:37.62) and initial Pb from feldspar or from Stacey-Kramers (1975) model.

† Zircon fractions separated by size and magnetic properties. All magnetic separations performed on a Frantz Magnetic Barrier Separator, model LB-1, with current of 1.7 amps and a forward slope of 17.5°. Magnetic fractions as follows: D = diamagnetic; N = non-magnetic at 2° side slope (weakly paramagnetic); M# = paramagnetic at #° side slope. Size fraction cuts at 64, 100, and 150 µm. Dissolution and chemical separation techniques modified from Krogh (1973). Data reduction and error analysis based on Ludwig (1989). Decay constants used for age calculation are: $\lambda^{238}U = 1.55125 \times 10^{-10}\ yr^{-1}$ and $\lambda^{235}U = 9.8485 \times 10^{-10}\ yr^{-1}$ (Steiger and Jäger, 1977).

§ Corrected for mass fractionation of 0.1 % per amu for Pb analyses and 0.12 % per amu for U analyses based on replicate analyses of NBS-981, NBS-982, NBS-983, and U500 standards.

Uncertainties in weighing < 0.5 mg samples may lead to erroneously high concentrations of U and Pb. This does not affect the accuracy ot the age calculations.

TABLE DR-3. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST MAJOR AND TRACE ELEMENT CHEMISTRY

Sample Number	Field ID	SiO_2	Al_2O_3	$Fe_2O_3^*$	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO	LOI	Total
Garnet-bearing Tonalite and Trondhjemite (GTT) Clasts													
GTT-1	RS92PL9	60.11	19.05	3.73	2.30	6.35	4.19	0.87	0.35	0.13	0.06	1.48	98.62
GTT-2	RS92PL10	72.71	15.02	1.19	0.43	3.00	4.50	0.59	0.13	0.02	0.06	1.34	98.99
GTT-3	RS92PL12	73.87	14.30	1.24	0.41	2.74	5.01	0.43	0.06	0.00	0.08	1.33	99.47
GTT-4	RS95PL1	72.31	16.07	1.12	0.27	3.50	4.97	0.38	0.12	0.02	0.03	0.55	99.34
GTT-5	RS95PL2	73.47	15.95	1.69	0.38	3.44	4.83	0.36	0.12	0.06	0.08	0.46	100.84
GTT-6	RS95PL5	73.28	15.23	0.95	0.24	3.15	5.03	0.39	0.09	0.01	0.06	1.22	99.65
GTT-7	RS95PL7	72.84	15.21	1.34	0.43	3.21	4.76	0.45	0.13	0.03	0.03	0.62	99.05
GTT-8	RS95PL13	69.05	18.10	1.16	0.38	4.51	5.19	0.40	0.13	0.02	0.04	0.46	99.44
GTT-9	RS95PL24	72.68	15.77	1.19	0.20	3.02	5.22	0.32	0.08	0.01	0.09	0.68	99.26
GTT-10	RS95PL25	67.36	18.02	1.41	0.59	4.12	4.91	0.77	0.12	0.02	0.04	2.03	99.39
GTT-11	RS95PL27	71.46	16.27	1.83	0.37	3.20	5.10	0.28	0.07	0.02	0.11	0.31	99.02
GTT-12	RS95PL34A	70.23	15.07	1.99	0.45	3.74	4.45	0.44	0.17	0.04	0.03	2.30	98.91
Biotite- and Hornblende-bearing Tonalite and Granodiorite (HBT) Clasts													
HBT-1	CJ-831A	62.70	16.65	6.18	2.40	3.98	3.36	1.51	0.68	0.09	0.08	1.72	99.35
HBT-2	RS92PL1	63.07	15.00	4.14	1.77	4.87	3.40	2.87	0.53	0.09	0.06	3.55	99.26
HBT-3	RS92PL5	61.10	16.49	5.69	2.35	5.59	2.91	1.40	0.79	0.13	0.06	3.08	99.59
HBT-4	RS92PL8	64.78	15.32	5.01	2.13	3.96	2.95	2.17	0.59	0.09	0.09	3.24	100.33
HBT-5	RS92PL13	62.10	16.04	6.31	3.03	2.92	3.23	2.25	0.71	0.12	0.07	3.34	100.12
HBT-6	RS95PL4	59.94	16.62	5.99	2.46	5.47	3.25	1.38	0.75	0.12	0.07	2.89	98.94
HBT-7	RS95PL6	65.18	15.82	4.90	1.96	4.88	3.42	1.12	0.71	0.16	0.09	0.79	99.03
HBT-8	RS95PL16	65.44	15.13	4.46	1.88	3.41	3.40	2.87	0.53	0.09	0.06	1.66	98.93
HBT-9	RS95PL31	64.36	16.20	4.98	2.07	3.94	3.66	1.80	0.65	0.12	0.06	2.03	99.87
Miscellaneous Clasts													
QRT	RS95PL10	82.97	9.40	1.84	0.24	1.67	2.34	0.91	0.27	0.01	0.03	0.47	100.15
DFG-1	RS95PL8	75.44	12.78	1.63	0.29	1.34	3.80	3.21	0.18	0.03	0.02	0.43	99.15
DFG-2	RS95PL23	76.54	12.34	1.14	0.03	0.74	3.77	4.46	0.06	0.01	0.00	0.34	99.43
MXG	RS92PL12	70.56	14.03	2.77	0.77	1.78	3.95	3.30	0.32	0.09	0.05	1.38	99.00
GAB	RS95PL28	54.65	15.93	8.68	3.49	7.28	3.11	1.04	0.91	0.18	0.09	4.52	99.88
EHT	RS95PL30	67.82	16.17	1.89	0.83	6.06	4.27	0.34	0.27	0.11	0.03	1.63	99.42

TABLE DR-3. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST MAJOR AND TRACE ELEMENT CHEMISTRY (continued)

Sample Number	Field ID	Rb	Sr	Y	Zr	Nb	Ba	Sc	V	Cr	Ni	Cu	Zn
Garnet-bearing Tonalite and Trondhjemite (GTT) Clasts													
GTT-1	RS92PL9	28.19	708.1	13	152	7	277	11	67	26	25	n.d.	38
GTT-2	RS92PL10	14.78	401.8	8	54	1	212	3	12	10	4	1	23
GTT-3	RS92PL12	10.38	388.0	5	37	<1	168	2	1	9	4	<1	29
GTT-4	RS95PL1	9.69	447.1	6	138	5	156	2	3	<2	4	<1	10
GTT-5	RS95PL2	7.73	456.7	9	150	8	193	3	3	3	<2	<1	15
GTT-6	RS95PL5	8.14	428.4	9	102	5	151	4	<1	2	4	<1	<1
GTT-7	RS95PL7	10.15	443.9	6	101	5	140	2	8	<2	5	<1	21
GTT-8	RS95PL13	9.36	544.0	7	131	6	223	3	9	<2	6	<1	<1
GTT-9	RS95PL24	5.48	442.4	10	100	6	213	4	2	<2	2	<1	<1
GTT-10	RS95PL25	22.73	550.2	6	147	5	197	2	8	2	5	<1	9
GTT-11	RS95PL27	5.24	440.8	12	141	6	190	3	1	<2	<2	<1	8
GTT-12	RS95PL34A	12.26	416.6	7	169	6	148	3	11	2	6	<1	13
Biotite- and Hornblende-bearing Tonalite and Granodiorite (HBT) Clasts													
HBT-1	CJ-831A	60.22	314.8	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
HBT-2	RS92PL1	102.21	282.6	19	131	11	875	16	93	21	8	n.d.	51
HBT-3	RS92PL5	57.69	373.5	20	112	6	708	21	115	25	6	7	84
HBT-4	RS92PL8	76.94	280.1	22	109	6	775	16	106	12	2	6	66
HBT-5	RS92PL13	84.85	236.9	18	137	6	685	17	126	20	12	n.d.	78
HBT-6	RS95PL4	52.20	363.2	24	161	9	737	22	145	25	12	1	79
HBT-7	RS95PL6	34.02	477.1	15	143	11	851	10	86	24	10	<1	92
HBT-8	RS95PL16	107.93	304.7	20	140	6	934	13	91	23	11	<1	57
HBT-9	RS95PL31	65.36	332.4	22	156	9	829	19	114	15	10	<1	69
Miscellaneous Clasts													
QRT	RS95PL10	35.71	242.1	11	426	13	585	8	4	4	7	<1	28
DFG-1	RS95PL8	81.80	183.7	12	144	7	1650	5	10	4	9	<1	29
DFG-2	RS95PL23	102.78	68.0	5	90	6	822	3	<1	4	12	<1	4
MXG	RS92PL12	84.04	166.6	28	149	9	831	7	31	4	8	<1	50
GAB	RS95PL28	39.33	326.8	28	112	9	273	42	319	54	28	31	80
EHT	RS95PL30	12	863	14	183	13	181	6	67	4	7	<1	3

TABLE DR-3. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST MAJOR AND TRACE ELEMENT CHEMISTRY (continued)

Sample Number	Field ID	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb
Garnet-bearing Tonalite and Trondhjemite (GTT) Clasts									
GTT-1	RS92PL9	14.78	8.1	1.68	0.63	1.53	1.28	0.74	0.73
GTT-2	RS92PL10	4.05	2.3	0.56	0.22	0.78	1.07	0.97	1.06
GTT-3	RS92PL12	4.19	2.1	0.44	0.27	0.58	0.75	0.52	0.56
GTT-4	RS95PL1	1.99	n.d.	0.29	0.14	0.29	0.30	0.21	0.27
GTT-5	RS95PL2	2.24	1.8	0.54	0.16	0.62	0.67	0.48	0.56
GTT-6	RS95PL5	2.34	n.d.	0.26	0.18	0.38	0.80	0.72	0.90
GTT-7	RS95PL7	2.77	1.6	0.37	0.17	0.35	0.25	0.14	0.15
GTT-8	RS95PL13	3.16	1.7	0.37	0.21	0.37	0.41	0.30	0.37
GTT-9	RS95PL24	2.50	1.9	0.46	0.20	0.55	0.86	0.57	0.75
GTT-10	RS95PL25	2.23	1.2	0.27	0.14	0.30	0.32	0.23	0.32
GTT-11	RS95PL27	6.48	2.8	0.52	0.44	0.78	1.20	0.79	0.91
GTT-12	RS95PL34A	2.15	n.d.	0.29	0.12	0.35	0.40	0.30	0.39
Biotite- and Hornblende-bearing Tonalite and Granodiorite (HBT) Clasts									
HBT-1	CJ-831A	35.46	17.9	3.89	0.99	2.96	3.80	2.34	2.03
HBT-2	RS92PL1	19.47	11.7	2.80	0.65	2.73	2.93	1.82	1.84
HBT-3	RS92PL5	28.53	15.8	3.54	0.95	3.36	3.15	1.79	1.69
HBT-4	RS92PL8	35.06	17.0	3.51	0.78	3.26	3.31	2.14	2.30
HBT-5	RS92PL13	40.68	n.d.	3.40	0.77	2.93	2.71	1.57	1.64
HBT-6	RS95PL4	32.80	18.7	4.04	0.98	3.64	3.71	2.22	2.21
HBT-7	RS95PL6	21.34	12.4	2.80	1.00	2.59	2.16	1.14	1.03
HBT-8	RS95PL16	38.97	15.4	3.16	0.74	3.11	3.05	1.84	1.88
HBT-9	RS95PL31	34.39	16.9	3.59	0.88	3.28	3.21	1.91	1.95
Miscellaneous Clasts									
QRT	RS95PL10	10.99	4.6	0.89	1.31	1.12	1.23	0.82	1.03
DFG-1	RS95PL8	27.33	11.4	2.11	0.76	2.03	1.70	0.91	0.78
DFG-2	RS95PL23	19.84	7.6	1.33	0.38	1.11	0.85	0.49	0.58
MXG	RS92PL12	56.02	23.1	4.46	0.65	4.00	3.97	2.43	2.53
GAB	RS95PL28	20.53	14.2	3.78	1.04	4.24	4.49	2.78	2.78
EHT	RS95PL30	35.80	14.63	2.63	0.73	2.13	1.76	1.05	1.17

Note: Major element oxides in weight percent. Trace element abundances in parts per million. LOI = loss on ignition. n.d. = not determined. All abundances determined by XRF, except Rb, Sr, and REE by isotope dilution mass spectrometry.

* All Fe as Fe_2O_3.

TABLE DR-4. EOCENE GERMAN RANCHO FORMATION CONGLOMERATE CLAST ISOTOPE DATA

Sample Number	Field Sample Identification	Age (Ma)	ppm Rb	ppm Sr	$^{87}Rb/^{86}Sr$	Meas. $^{87}Sr/^{86}Sr$	Init. $^{87}Sr/^{86}Sr$	ppm Sm	ppm Nd	$^{147}Sm/^{144}Nd$	Meas. $^{143}Nd/^{144}Nd$	$\varepsilon_{Nd}(t)$	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$\delta^{18}O$ (qtz)	$\delta^{18}O$ (magma)
Garnet-bearing Tonalite and Trondhjemite (GTT) Clasts																	
GTT-1	RS92PL9	135	28.19	708.1	0.1152	0.703660	0.70344	1.680	8.07	0.1256	0.512870	5.8	18.721	15.644	38.425	7.7	6.2
GTT-2	RS92PL10	140	14.78	401.8	0.1064	0.704390	0.70418	0.561	2.28	0.1488	0.512639	0.9	18.632	15.625	38.311	8.8	7.3
GTT-3	RS92PL12	132	10.38	388.0	0.0774	0.704586	0.70444	0.436	2.06	0.1273	0.512731	3.0	18.687	15.660	38.451	8.7	7.2
GTT-4	RS95PL1	120	9.69	447.1	0.0627	0.703478	0.70337	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
GTT-5	RS95PL2	120	7.73	456.7	0.0489	0.703573	0.70349	0.540	1.79	0.1823	0.512994	7.2	n.d.	n.d.	n.d.	n.d.	n.d.
GTT-6	RS95PL5	117.5	8.14	428.4	0.0550	0.703731	0.70364	n.d.	n.d.	n.d.	n.d.	n.d.	18.598	15.589	38.279	7.9	6.4
GTT-7	RS95PL7	123	10.15	443.9	0.0662	0.703588	0.70347	0.370	1.63	0.1371	0.512743	3.0	18.583	15.555	38.158	8.7	7.2
GTT-8	RS95PL13	124	9.36	544.0	0.0498	0.703591	0.70350	0.370	1.72	0.1298	0.512869	5.6	n.d.	n.d.	n.d.	8.2	6.7
GTT-9	RS95PL24	117	5.48	442.4	0.0358	0.703451	0.70339	0.461	1.93	0.1443	0.512790	3.7	18.646	15.602	38.332	8.1	6.6
GTT-10	RS95PL25	119	22.73	550.2	0.1195	0.704280	0.70408	0.269	1.15	0.1413	0.512884	5.6	18.584	15.548	38.145	8.9	7.4
GTT-11	RS95PL27	109	5.24	440.8	0.0344	0.704062	0.70401	0.514	2.79	0.1111	0.512729	3.0	18.640	15.571	38.283	8.4	6.9
GTT-12	RS95PL34A	118	12.26	416.6	0.0852	0.704220	0.70408	n.d.	n.d.	n.d.	n.d.	n.d.	18.708	15.709	38.592	8.0	6.5
Hornblende- and Biotite-bearing Tonalite and Granodiorite (HBT) Clasts																	
HBT-1	CJ-831A	100	60.22	314.8	0.5536	0.706653	0.70587	3.889	17.95	0.1308	0.512433	-3.2	n.d.	n.d.	n.d.	n.d.	n.d.
HBT-2	RS92PL1	99	102.21	282.6	1.0470	0.707896	0.70642	2.801	11.70	0.1445	0.512489	-2.3	19.174	15.701	38.835	10.9	9.4
HBT-3	RS92PL5	97	57.69	373.5	0.4470	0.706573	0.70596	3.532	15.71	0.1357	0.512504	-1.9	19.061	15.685	38.730	11.7	10.2
HBT-4	RS92PL8	100	76.94	280.1	0.7949	0.707461	0.70633	3.495	16.87	0.1251	0.512541	-1.0	19.082	15.683	38.752	10.8	9.3
HBT-5	RS92PL13	99	84.85	236.9	1.0367	0.707659	0.70620	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	11.7	10.2
HBT-6	RS95PL4	100	52.20	363.2	0.4160	0.706639	0.70605	4.030	18.61	0.1307	0.512501	-1.8	19.104	15.660	38.723	10.8	9.3
HBT-7	RS95PL6	98	34.02	477.1	0.2063	0.706056	0.70577	2.795	12.34	0.1367	0.512503	-1.9	19.005	15.633	38.629	11.2	9.7
HBT-8	RS95PL16	99	107.93	304.7	1.0253	0.707882	0.70644	3.154	15.33	0.1242	0.512469	-2.4	19.134	15.665	38.746	11.0	9.5
HBT-9	RS95PL31	102	65.36	332.3	0.5691	0.706993	0.70617	3.580	16.82	0.1285	0.512500	-1.8	n.d.	n.d.	n.d.	10.6	9.1
Miscellaneous Clasts																	
QRT	RS95PL10	105	35.71	242.1	0.4270	0.709250	0.70861	0.886	4.54	0.1179	0.512275	-6.0	19.538	15.749	39.056	14.8	13.3
DFG-1	RS95PL8	103	81.80	183.7	1.2892	0.708198	0.70631	2.108	11.36	0.1120	0.512491	-1.8	18.924	15.643	38.659	12.4	10.9
DFG-2	RS95PL23	112	102.78	68.0	4.3795	0.712570	0.70560	1.327	7.51	0.1067	0.512588	0.3	18.772	15.602	38.486	11.6	10.1
MXG	RS92PL12	118	84.04	166.6	1.4604	0.707978	0.70553	4.452	22.97	0.1170	0.512630	1.0	18.958	15.644	38.626	10.9	9.4
GAB	RS95PL28	144	39.33	326.8	0.3482	0.703914	0.70320	3.774	14.10	0.1616	0.512993	7.6	18.262	15.477	37.734	9.6	8.1
EHT	RS95PL30	258	12	863	n.d.	n.d.	n.d.	2.620	14.55	0.1087	0.512591	2.0	19.166	15.622	38.577	9.4	7.9

Note: n.d. = not determined. Rb, Sr, Sm, and Nd concentrations determined by isotope dilution mass spectrometry at UW-Madison. Initial $^{87}Sr/^{86}Sr$ and $\varepsilon_{Nd}(t)$ are calculated from measured whole rock values using the U/Pb zircon crystallization age determined for each sample. Pb corrected for mass fractionation of 0.1% per amu. Sr mass fractionation corrected to $^{86}Sr/^{88}Sr = 0.1194$ and Nd mass fractionation corrected to $^{146}Nd/^{144}Nd = 0.7219$. $\delta^{18}O_{magma}$ (per mil relative to SMOW) is calculated as $\delta^{18}O_{qtz}$ - 1.5‰ (Taylor, 1968).

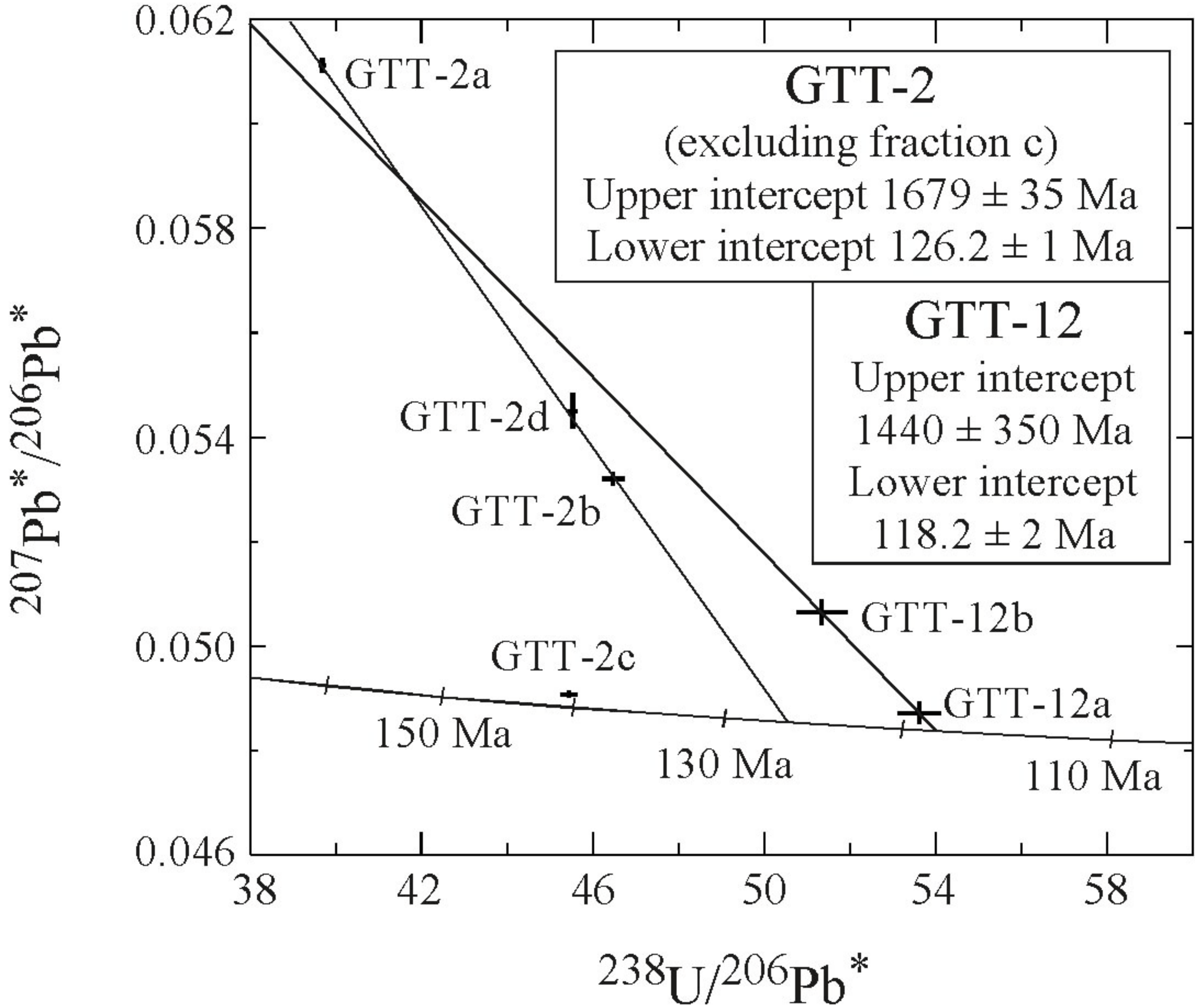
GTT-2
(excluding fraction c)
Upper intercept 1679 ± 35 Ma
Lower intercept 126.2 ± 1 Ma
GTT-12
Upper intercept
1440 ± 350 Ma
Lower intercept
118.2 ± 2 Ma
GTT-2a
GTT-2d
GTT-2b
GTT-2c
GTT-12b
GTT-12a
150 Ma
130 Ma
110 Ma
0.062
0.058
0.054
0.050
0.046
38
42
46
50
54
58
207Pb*/206Pb*
238U/206Pb*

Figure DR-1

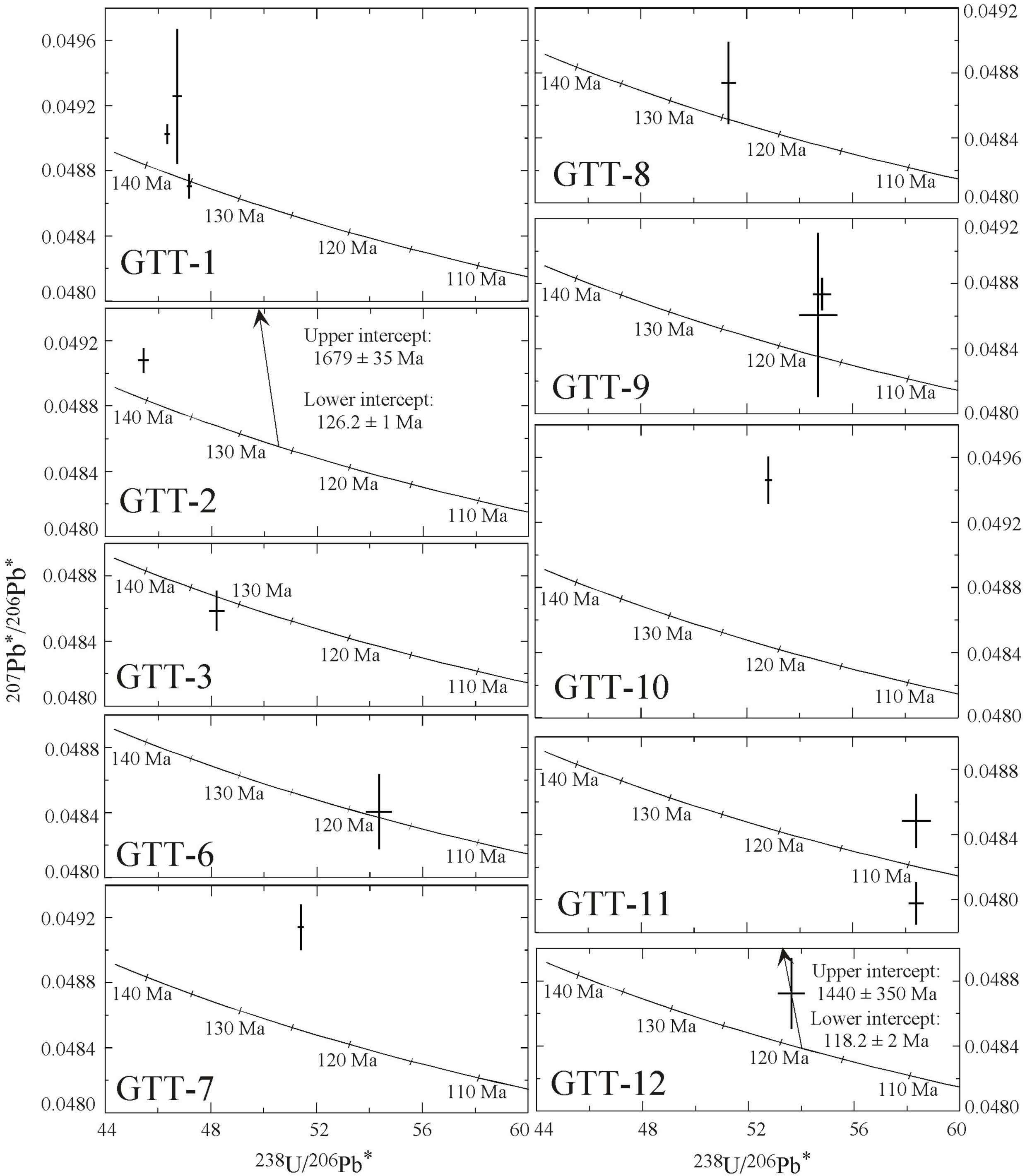
GTT-1
GTT-2
GTT-3
GTT-6
GTT-7
GTT-8
GTT-9
GTT-10
GTT-11
GTT-12
140 Ma
130 Ma
120 Ma
110 Ma
Upper intercept:
1679 ± 35 Ma
Lower intercept:
126.2 ± 1 Ma
Upper intercept:
1440 ± 350 Ma
Lower intercept:
118.2 ± 2 Ma
207Pb*/206Pb*
238U/206Pb*
0.0496
0.0492
0.0488
0.0484
0.0480
44
48
52
56
60

Figure DR-2

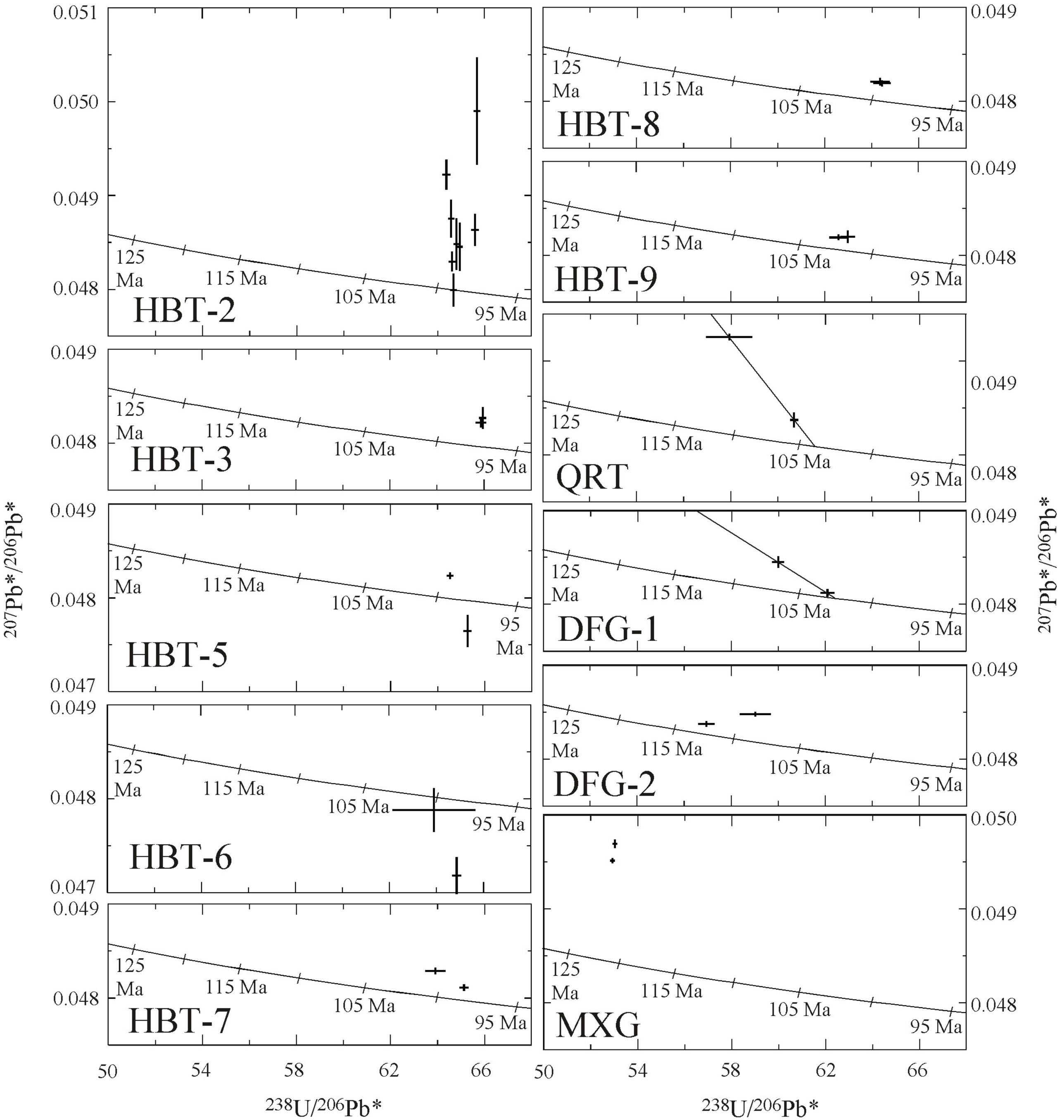
HBT-2
HBT-3
HBT-5
HBT-6
HBT-7
HBT-8
HBT-9
QRT
DFG-1
DFG-2
MXG
125 Ma
115 Ma
105 Ma
95 Ma
207Pb*/206Pb*
238U/206Pb*
0.051
0.050
0.049
0.048
0.047
50
54
58
62
66

Figure DR-3

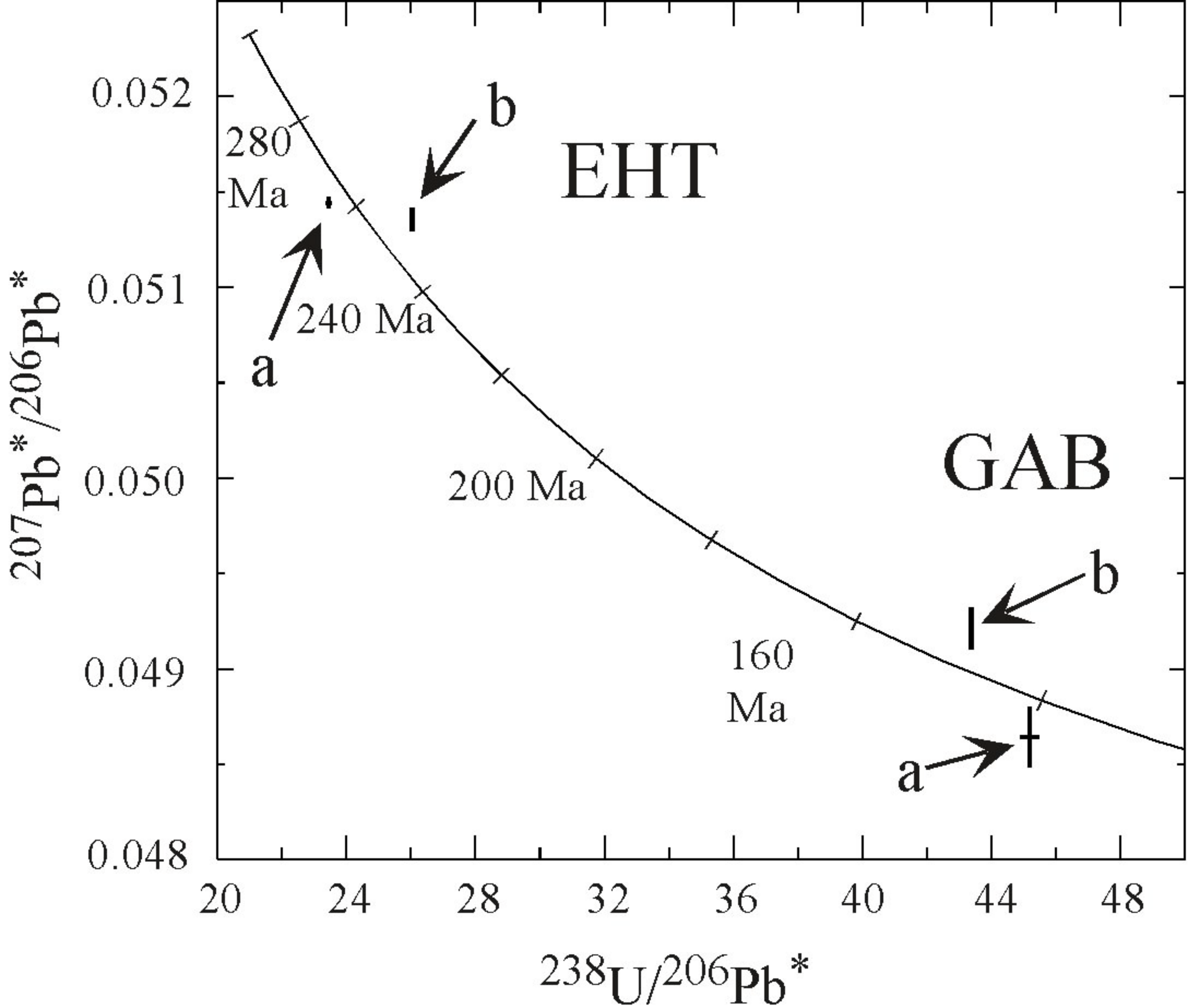
0.052
0.051
0.050
0.049
0.048
20
24
28
32
36
40
44
48
$^{207}Pb^*/^{206}Pb^*$
$^{238}U/^{206}Pb^*$
280 Ma
240 Ma
200 Ma
160 Ma
a
b
EHT
GAB

Figure DR-4