SUPPLEMENTARY MATERIAL

1. METHODOLOGY

1.1. $^{40}AR/^{39}AR$ METHODOLOGY

Samples ZULU-1-2150 and ZULU-1-133 were irradiated in the 8C facility of the Mac Master Nuclear Reactor (Hamilton, Ontario, Canada). Irradiation lasted 80 h with a global efficiency (J/h) of 6.755 x 10^{-5} h^{-1}. The irradiation standard was sanidine TCRs (28.608 ± 0.033 Ma according to Renne *et al.* (1998, 2010 and 2011). Four whole rock fragments were analyzed by the $^{40}Ar/^{39}Ar$ method by step-heating with a CO_2 laser probe coupled with a MAP 215 mass spectrometer. The procedure was described by Ruffet *et al.* (1991, 1995, 1997).

Blanks were performed routinely each first or third/fourth run, and are subtracted from the subsequent sample gas fractions. Apparent age errors are plotted at the 1σ level and do not include the errors on the $^{40}Ar^{*}/^{39}Ar_K$ ratio and age of the monitor and decay constant. Plateau ages were calculated if 70% or more of the $^{39}Ar_K$ was released in at least three or more contiguous steps which define apparent ages agreeing, to within 2σ, with the integrated age of the plateau segment. Pseudo-plateau ages (PPA) can be defined with less than 70% of the $^{39}Ar_K$ released. The errors on the $^{40}Ar^{*}/^{39}Ar_K$ ratio and age of the monitor and decay constant are included in the final calculation of the error margins on the plateau ages.

$^{40}Ar/^{39}Ar$ ages are provided with 1σ errors. Analytical data and parameters used for calculations (*e.g.* isotopic ratios measured on pure K, Ca and Cl salts; mass discrimination; atmospheric argon ratios; J parameter; decay constants) and reference sources are available in the supplementary data repository.

2. $^{40}AR/^{39}AR$ RESULT

			J parameter	error J			Mass Discrimination (1+e)	Err Discrimination							
	ZULU-1-2150 Whole Rock		5,44E-03	1,84E-05			1,009405	1,32E-03							
step	40Ar	Error 40Ar	39Ar	Error 39Ar	38Ar	Error 38Ar	37Ar	Error 37Ar	36Ar	Error 36Ar	40Ar*/39ArK	Error 40Ar*/39ArK	Apparent age (My)	Error Age (My)	Delay to irradiation (day)
1	13947,5442	6,101017	5,805897	0,058312	0,011518	0,017301	2,185487	0,032123	47,756713	0,101082	37,824346	13,659832	338,064387	111,361226	141,970833
2	1516,6245	2,183166	3,705993	0,056703	0,009085	0,017382	1,577357	0,023369	5,177782	0,029653	8,208764	3,229104	78,927253	30,381654	141,990972
3	3966,62511	2,50083	11,620303	0,039437	0,000001	0,018984	3,111588	0,067258	13,162724	0,05714	16,197553	2,271985	152,566809	20,531451	142,000694
4	2533,40396	2,148812	11,672432	0,056312	0,000001	0,020373	2,324495	0,037907	8,182282	0,058727	15,926477	1,835283	150,116615	16,611205	142,020833
5	10726,7705	5,425272	45,034183	0,100496	0,000001	0,016589	11,596106	0,10611	34,349124	0,123829	19,464004	1,439181	181,833839	12,812045	142,040972
6	4042,35347	1,225101	21,81337	0,107732	0,009496	0,016169	6,480975	0,045846	12,606767	0,071085	19,814972	1,317918	184,949978	11,716889	142,661111
7	8661,53589	2,287759	65,72652	0,056072	0,000001	0,013918	17,978897	0,035988	25,665943	0,053087	20,147843	0,665707	187,900898	5,945464	142,680556
8	996,985145	1,344305	19,443741	0,036301	0,000001	0,015522	5,051226	0,04479	2,249197	0,038468	18,633238	0,614385	174,434741	5,528191	142,690972
9	5830,13327	3,853757	165,914232	0,281295	0,002087	0,026139	38,362583	0,212771	9,426753	0,043323	19,381758	0,140422	181,102274	1,447817	142,730556
10	2333,88641	0,992268	67,240036	0,117056	0,000001	0,020727	19,83929	0,136588	3,839133	0,028337	18,983644	0,169156	177,559083	1,669755	142,750694
11	3539,10117	3,130017	109,682083	0,286831	0,004554	0,021237	46,991406	0,110725	5,25941	0,024926	19,419636	0,131028	181,439021	1,376959	142,770833
12	5215,69188	1,737048	113,50424	0,146319	0,025964	0,018365	64,466744	0,199587	11,590196	0,026223	17,757277	0,19129	166,600661	1,842968	142,790972
Fusion	4582,39111	3,004539	115,019976	0,132201	0,000001	0,022401	231,410691	0,288736	9,498324	0,04458	19,945682	0,189115	186,109307	1,837988	142,811111

Table 1: $^{40}Ar/^{39}Ar$ step heating result of sample ZULU-1-2150.

			J parameter	error J			Mass Discrimination (1+e)	Err Discrimination							
	ZULU-1-133 Whole Rock		5,28E-03	1,79E-05			1,011354	1,33E-03							
step	40Ar	Error 40Ar	39Ar	Error 39Ar	38Ar	Error 38Ar	37Ar	Error 37Ar	36Ar	Error 36Ar	40Ar*/39ArK	Error 40Ar*/39ArK	Apparent age (My)	Error Age (My)	Delay to irradiation (day)
1	1963,36063	1,636334	2,022549	0,039862	0,001287	0,013671	0,234699	0,02445	3,401642	0,028479	501,800252	11,314236	2341,08906	30,472054	238,650694
2	349,159269	1,074622	2,313371	0,037986	0,008052	0,015602	0,225727	0,031931	0,779057	0,013782	56,866368	2,120985	474,858372	15,683412	238,670833
3	1062,05041	0,884609	8,4518	0,080292	0,012057	0,013868	1,025965	0,022528	2,087852	0,022274	57,581847	1,054476	480,105125	7,93987	238,690972
4	171,883795	0,101663	3,162083	0,023161	0,000001	0,014739	0,433844	0,037101	0,377655	0,016791	22,180174	1,57834	200,29724	13,516168	238,720833
5	775,231488	1,080121	8,389772	0,080014	0,000001	0,011951	1,116611	0,029505	2,086972	0,016121	23,293821	0,741967	209,791969	6,36561	238,770833
6	579,999285	0,663776	9,99358	0,043602	0,007354	0,01028	1,416577	0,034571	1,330645	0,010569	21,999952	0,404489	198,756011	3,552338	238,800694
7	735,242418	0,556326	19,201017	0,045353	0,009299	0,011683	2,408204	0,024113	1,198927	0,014021	22,23715	0,252704	200,784217	2,30648	238,820833
8	405,435094	0,640757	17,063665	0,147096	0,000001	0,013505	2,167651	0,053093	0,354207	0,010291	19,566409	0,256349	177,81501	2,332692	238,840972
9	332,180574	0,552594	15,157971	0,041215	0,000001	0,016834	1,548994	0,028913	0,19068	0,012051	19,757376	0,245089	179,467109	2,240453	238,880556
10	322,085465	0,656611	13,990808	0,021915	0,00153	0,014043	1,40204	0,04313	0,229413	0,012542	19,750759	0,273717	179,409889	2,475934	238,900694
11	433,344501	0,770105	14,463961	0,046363	0,004405	0,013781	2,178349	0,035096	0,406314	0,01273	24,064756	0,284707	216,335709	2,564456	238,920833
12	642,24305	0,577883	10,101341	0,039862	0,000001	0,012827	3,161661	0,031046	0,594957	0,009755	51,953304	0,397594	438,412691	3,430263	238,940972
Fusion	2834,77725	1,190611	41,519315	0,060404	0,000001	0,012517	36,494625	0,107135	2,814525	0,013466	63,577181	0,31014	523,481836	2,987855	238,961111

Table 2: $^{40}Ar/^{39}Ar$ step heating result of sample ZULU-1-133.

Parameters	(36Ar/37Ar)Ca	0,000322	3	%
	(39Ar/37Ar)Ca	0,000788	4	%
	(38Ar/37Ar)Ca	0,000026	100	%
	(40Ar/37Ar)Ca	0,0006	100	%
	(40Ar/39Ar)K	0,00085	4	%
	(38A/39Ar)K	0,011	91	%
[3]	(36Cli/38Cl)	316	5	%
[1] and [1']	(40Ar/36Ar)Atm	298,56	0,104	%
[1] and [1']	(38Ar/36Ar)Atm	0,1885	0,159	%
[2]	Lambda 40	5,53E-10	1,35E-12	y-1
	Lambda 39	2,58E-03		y-1
	Lambda 37	1,98E-02		d-1
	Lambda 36Cl	2,26E-06		y-1

Table 3: $^{40}Ar/^{39}Ar$ parameters.

2.1. ISOTOPIC ANALYSES

		Rb	Sr	Th	U	Pb	$^{87}Sr/^{86}Sr$	2σ	$^{206}Pb/^{204}Pb$	2σ	$^{207}Pb/^{204}Pb$	2σ	$^{208}Pb/^{204}Pb$	2σ	$^{87}Sr/^{86}Sr_i$	$^{206}Pb/^{204}Pb_i$	$^{207}Pb/^{204}Pb_i$	$^{208}Pb/^{204}Pb_i$
Funhaluro	N°14	0,18	72,42	1,37	0,38	4,28	0,705597	6E-06	17,9395	0,0007	15,5076	0,0007	38,167	0,003	0,70558	17,784	15,500	37,984
Funhaluro	N°19	0,14	101,45	1,76	0,44	3,94	0,705566	4E-06	17,8204	0,0012	15,4781	0,0008	38,062	0,003	0,70556	17,626	15,468	37,806
Funhaluro	N°27	0,21	114,41	1,76	0,43	2,41	0,705398	4E-06	17,9651	0,0008	15,4998	0,0010	38,186	0,004	0,70539	17,654	15,484	37,767
Nhachengue	N°47	5,77	734,09	1,63	0,37	1,25	0,704163	8E-06	18,5277	0,0010	15,5418	0,0009	38,636	0,003	0,70412	18,116	15,522	38,044
Nhachengue	N°49	7,56	476,76	1,46	0,36	1,20	0,704008	4E-06	18,5146	0,0009	15,5382	0,0008	38,609	0,003	0,70392	18,097	15,518	38,054
Nhachengue	N°52	26,89	524,40	1,80	0,43	3,18	0,704389	6E-06	18,3245	0,0008	15,5505	0,0006	38,488	0,002	0,70409	18,138	15,541	38,231
Nhachengue	N°55	17,97	288,13	1,15	0,46	3,39	0,704616	4E-06	18,3282	0,0010	15,5552	0,0011	38,447	0,003	0,70426	18,141	15,546	38,294
Nhachengue	N°59	29,23	565,94	1,36	0,36	6,63	0,704327	6E-06	18,2360	0,0007	15,5569	0,0006	38,460	0,002	0,70403	18,162	15,553	38,367

Nhamura	N°115	6,17	147,74	3,00	0,51	4,80	0,717174	6E-06	17,9215	0,0008	15,6694	0,0008	39,143	0,003	0,71687	17,734	15,660	38,778
Nhamura	N°118	40,68	351,49	2,12	0,56	2,81	0,710485	4E-06	18,0654	0,0009	15,5970	0,0007	38,766	0,002	0,70963	17,709	15,579	38,326
Nhamura	N°122	29,10	297,41	2,27	0,57	3,11	0,708690	4E-06	18,0112	0,0007	15,5947	0,0007	38,702	0,002	0,70797	17,690	15,579	38,278
Nhamura	N°126	27,77	276,20	2,17	0,60	2,79	0,708271	6E-06	18,0568	0,0006	15,5944	0,0007	38,751	0,002	0,70753	17,677	15,575	38,299
Zululand	N°128	3,92	295,73	0,69	0,16	1,50	0,703925	6E-06	17,9004	0,0010	15,5130	0,0007	38,173	0,002	0,70383	17,717	15,504	37,906
Zululand	N°133	5,60	269,50	0,73	0,15	1,45	0,704015	6E-06	17,8071	0,0013	15,4966	0,0010	38,180	0,003	0,70386	17,623	15,487	37,892
Zululand	N°141	2,00	232,00	0,66	0,14	2,31	0,703841	6E-06	17,6736	0,0009	15,4775	0,0007	38,050	0,002	0,70404	17,568	15,472	37,886
Zululand duplicate	N°141						0,703850	6E-06	17,5835	0,0020	15,4649	0,0015	38,023	0,004	0,70379	17,478	15,460	37,859

Table 4: Rb, Sr, Th, U and Pb concentrations in ppm. Initial values were calculated at 180 Ma.

3. REFERENCES

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