

Supporting Information

Elephant bones for the Middle Pleistocene toolmaker

Paola Villa*, Giovanni Boschian, Luca Pollarolo, Daniela Saccà, Fabrizio Marra, Sebastien Nomade, Alison Pereira.

Correspondence to: villap@colorado.edu

S3 File. $^{40}\text{Ar}/^{39}\text{Ar}$ dataset

⁴⁰Ar/³⁹Ar dataset

Sebastien Nomade, Alison Pereira

InstrumentLSCE Micromass 5400				Interferences Corrections			
Standard:Alder Creek rhyolite sanidine				39/37(Ca)	±(%1σ)	6.5560E-04	1.36
Standard age ± Ma:1.1891 ± 0.0008 Niespolo et al., 2017				38/37(Ca)	±(%1σ)	7.1800E-05	12.81
				36/37(Ca)	±(%1σ)	2.6630E-04	1.5
Atmospheric argon ratios							
⁴⁰ Ar/ ³⁶ Ar298.56 ± 0,31 Lee et al. (2006)				40/39(K)	±(%1σ)	3.8230E-03	2.67
³⁸ Ar/ ³⁶ Ar0.1885 ± 0,0003 Lee et al. (2006)				38/39(K)	±(%1σ)	1.2031E-02	0.16
				36/38(Cl)	±(%1σ)	262.8	1.71
Decay constant (Renne et al., 2011)							
λ _{40Ar} (0.5757 ± 0.016) x 10 ⁻¹⁰ a ⁻¹				K/Ca	±(%1σ)	0.43	0
λ _{B⁻} (4.9548 ± 0.0134) x 10 ⁻¹⁰ a ⁻¹				K/Cl	±(%1σ)	1.17	0
λ _{Tot} (5.531 ± 0.0135) x 10 ⁻¹⁰ a ⁻¹							

Sample ID: Sanidines	CDG-1	Lab#N1572-01/N1572-15	J = 0.00052990 ± 0.00000106																			
Flux standard monitor	ACs-2	1.1891 Ma	Irradiation # CO-001 (120 min)	Single crystal total fusion	reactor: CICLIT, Oregon University, Triga reactor																	
N	⁴⁰ Ar (moles)	³⁶ Ar V	±σ ₃₆ V	³⁷ Ar V	±σ ₃₇ V	³⁸ Ar V	±σ ₃₈ V	³⁹ Ar V	±σ ₃₉ V	⁴⁰ Ar V	±σ ₄₀ V	D ⁽¹⁾	±%σ _D	% ⁴⁰ Ar*	Age (ka)	±σ	K/Ca	±σ				
N1572-01	2.96E-15	6.97E-08	19.67	7.65E-05	1.27	6.32E-05	0.35	5.16E-03	0.13	2.16E-03	0.09	1.01	0.10	98.41	394.97	0.99	29.03	0.37				
N1572-02	6.12E-15	2.03E-06	0.95	1.20E-04	0.96	9.95E-05	0.28	8.04E-03	0.11	4.47E-03	0.07	1.01	0.10	85.95	457.47	0.97	28.78	0.28				
N1572-03	1.08E-14	1.20E-06	1.78	2.26E-04	0.59	1.92E-04	0.26	1.55E-02	0.10	7.87E-03	0.07	1.01	0.10	94.93	461.71	0.92	29.50	0.18				
N1572-04	4.26E-15	2.34E-07	7.35	9.29E-05	0.99	7.51E-05	0.31	6.29E-03	0.12	3.11E-03	0.09	1.01	0.10	97.22	460.55	1.06	29.12	0.29				
N1572-07	5.38E-15	2.63E-07	7.93	1.21E-04	0.83	9.81E-05	0.32	7.98E-03	0.11	3.93E-03	0.08	1.01	0.10	97.47	459.39	0.98	28.32	0.24				
N1572-08	4.17E-15	1.02E-06	2.07	1.51E-04	0.87	8.01E-05	0.43	6.59E-03	0.11	3.04E-03	0.10	1.01	0.10	89.57	396.44	1.12	18.73	0.16				
N1572-09	7.26E-15	1.50E-06	2.15	1.43E-04	0.70	1.24E-04	0.23	1.00E-02	0.11	5.30E-03	0.07	1.01	0.10	91.05	462.23	1.12	30.06	0.21				
N1572-10	5.51E-15	2.16E-07	9.18	1.17E-04	0.84	9.68E-05	0.36	8.07E-03	0.11	4.02E-03	0.05	1.01	0.10	97.86	466.64	0.92	29.55	0.25				
N1572-11	3.41E-15	9.52E-07	1.93	7.28E-05	1.02	6.52E-05	0.36	5.34E-03	0.11	2.49E-03	0.05	1.01	0.10	87.99	392.93	1.12	31.51	0.32				
N1572-12	4.00E-15	6.72E-07	1.79	8.30E-05	1.02	6.87E-05	0.32	5.65E-03	0.12	2.92E-03	0.09	1.01	0.10	92.62	459.17	0.94	29.23	0.30				
N1572-13	3.73E-15	9.96E-07	2.04	8.65E-05	1.60	6.99E-05	0.41	5.76E-03	0.12	2.72E-03	0.12	1.01	0.10	88.53	401.48	1.26	28.63	0.46				
N1572-14	4.44E-15	1.12E-06	1.58	9.03E-05	1.39	7.46E-05	0.46	6.07E-03	0.12	3.24E-03	0.11	1.01	0.10	89.14	455.54	1.16	28.91	0.40				
N1572-15	2.60E-15	2.33E-07	6.58	6.58E-05	1.70	4.68E-05	0.59	3.86E-03	0.12	1.90E-03	0.09	1.01	0.10	95.83	451.82	1.34	25.19	0.43				
Results	⁴⁰ Ar*/ ³⁹ Ark ± 1σ		Age ± 1σ (ka)		MSWD	³⁹ Ar(k) (%, n)	K/Ca ± 1σ		Background corrections CDG-1													
Weighted mean	0.4121 ± 0.0010		394.8 ± 1.3		2.46	15.79	22.4 ± 3.9		N	³⁶ Ar V	±s36 V	³⁷ Ar V	±s37 V	³⁸ Ar V	±s38 V	³⁹ Ar V	±s39 V	⁴⁰ Ar V	±s40 V			
	± 0.25%		± 0.32%			3			N1572-01	2.27E-07	8.64E-09	2.49E-07	1.72E-08	5.86E-08	1.25E-08	6.57E-07	1.14E-07	1.68E-05	2.86E-07			
	Full External Error		± 1.5		1.21				N1572-02	2.27E-07	8.64E-09	2.49E-07	1.72E-08	5.86E-08	1.25E-08	6.57E-07	1.14E-07	1.68E-05	2.86E-07			
	Analytical Error		± 1.0		1.5698				N1572-03	2.20E-07	1.50E-08	2.40E-07	2.11E-08	8.34E-08	1.06E-08	1.37E-06	2.16E-07	1.87E-05	6.74E-07			
Results	40(a)/36(a) ± 1σ		40(r)/39(k) ± 1σ		Age ± 1σ (ka)		MSWD		N1572-04	2.20E-07	1.50E-08	2.40E-07	2.11E-08	8.34E-08	1.06E-08	1.37E-06	2.16E-07	1.87E-05	6.74E-07			
Inverse Isochron	294.60 ± 18.8		0.4125 ± 0.0024		395.2 ± 2.4		4.83		N1572-05	2.03E-07	9.72E-09	2.57E-07	1.85E-08	1.08E-07	2.25E-08	5.56E-06	8.90E-08	1.87E-05	6.74E-07			
	± 6.36%		± 0.58%		± 0.61%				N1572-06	2.03E-07	9.72E-09	2.57E-07	1.85E-08	1.08E-07	2.25E-08	5.56E-06	8.90E-08	2.05E-05	2.66E-07			
									N1572-07	2.03E-07	9.72E-09	2.57E-07	1.85E-08	1.08E-07	2.25E-08	5.56E-06	8.90E-08	2.05E-05	2.66E-07			
									N1572-08	2.03E-07	9.72E-09	2.57E-07	1.85E-08	1.08E-07	2.25E-08	5.56E-06	8.90E-08	2.05E-05	2.66E-07			
									N1572-09	2.13E-07	1.66E-08	2.65E-07	1.06E-08	5.65E-08	1.92E-08	4.57E-07	1.10E-07	1.81E-05	5.24E-07			
									N1572-10	2.13E-07	1.66E-08	2.65E-07	1.06E-08	5.65E-08	1.92E-08	4.57E-07	1.10E-07	1.81E-05	5.24E-07			
									N1572-11	1.76E-07	6.34E-09	2.02E-07	1.98E-08	6.88E-08	6.26E-09	9.90E-07	1.73E-07	1.95E-05	5.06E-07			
									N1572-12	1.76E-07	6.34E-09	2.02E-07	1.98E-08	6.88E-08	6.26E-09	9.90E-07	1.73E-07	1.95E-05	5.06E-07			
									N1572-13	1.55E-07	1.49E-08	2.37E-07	1.21E-08	1.05E-07	2.16E-08	9.75E-07	1.68E-07	1.81E-05	5.26E-07			
									N1572-14	1.55E-07	1.49E-08	2.37E-07	1.21E-08	1.05E-07	2.16E-08	9.75E-07	1.68E-07	1.81E-05	5.26E-07			
Full External Error									N1572-15	1.38E-07	1.05E-08	1.50E-07	1.12E-08	4.79E-08	1.40E-08	2.44E-07	2.02E-07	1.62E-05	4.05E-07			
Anal. Error																				Table S4		
Statistics	Statistical F ratio		0.87		Convergence		0.0000509398															
	Error Magnification		2.1979		Number of Iterations		3															
	Number of Data Points		3		Calculated Line		Weighted York-2															

Sample ID:	CDG-2	Lab#N1578-01/N1578-09				J = 0.00052907 ± 0.00000265													
Sanidines						reactor:				CICLIT, Oregon									
Flux standard monitor	ACs-2	1.1891 Ma	Irradiation # CO-001 (120 min)	Single crystal total fusion		University, Triga reactor													
N	⁴⁰ Ar (moles)	³⁶ Ar V	±σ ₃₆ V	³⁷ Ar V	±σ ₃₇ V	³⁸ Ar V	±σ ₃₈ V	³⁹ Ar V	±σ ₃₉ V	⁴⁰ Ar V	±σ ₄₀ V	D ⁽¹⁾	±σ _{D0}	% ⁴⁰ Ar*	Age (ka)	±σ	K/Ca	±σ	
N1578-01	3.34E-15	2.30E-06	1.23	6.82E-05	1.53	4.38E-05	0.36	3.58E-03	0.13	2.44E-03	0.08	1.01	0.10	71.50	466.13	2.47	22.55	0.35	
N1578-02	4.63E-15	2.47E-06	1.07	1.00E-04	1.11	6.59E-05	0.47	5.40E-03	0.12	3.38E-03	0.08	1.01	0.10	77.83	465.80	1.63	23.21	0.26	
N1578-03	3.87E-15	3.65E-07	5.50	1.04E-04	1.45	6.66E-05	0.41	5.45E-03	0.12	2.82E-03	0.15	1.01	0.10	95.70	474.19	1.41	22.45	0.33	
N1578-04	1.72E-15	8.58E-08	22.97	4.73E-05	2.37	2.98E-05	0.61	2.52E-03	0.14	1.26E-03	0.14	1.01	0.10	97.50	465.94	2.42	22.91	0.54	
N1578-05	4.01E-15	6.51E-07	2.92	1.03E-04	0.78	6.62E-05	0.42	5.49E-03	0.11	2.92E-03	0.06	1.01	0.10	92.92	473.20	1.17	22.85	0.18	
N1578-06	4.72E-15	1.04E-06	2.43	1.31E-04	1.29	7.88E-05	0.42	6.42E-03	0.12	3.45E-03	0.07	1.01	0.10	90.55	464.90	1.31	21.03	0.27	
N1578-07	2.24E-15	1.42E-07	13.24	5.44E-05	1.59	3.90E-05	0.40	3.25E-03	0.12	1.63E-03	0.07	1.01	0.10	96.91	465.63	1.78	25.74	0.41	
N1578-08	1.82E-15	1.65E-07	12.42	5.23E-05	1.49	3.22E-05	0.86	2.63E-03	0.13	1.33E-03	0.13	1.01	0.10	95.86	464.93	2.41	21.61	0.32	
N1578-09	1.72E-15	2.17E-07	9.60	4.75E-05	1.10	3.01E-05	0.52	2.46E-03	0.13	1.25E-03	0.19	1.01	0.10	94.39	459.75	2.65	22.27	0.25	
Results	⁴⁰ Ar*/ ³⁹ ArK ± 1σ		Age ± 1σ		MSWD		³⁹ Ar(k) (%, n)		K/Ca ± 1σ		Background corrections CDG-2								
			(ka)								N ³⁶ Ar ±σ ₃₆ ³⁷ Ar ±σ ₃₇ ³⁸ Ar ±σ ₃₈ ³⁹ Ar ±σ ₃₉ ⁴⁰ Ar ±σ ₄₀								
											V V V V V V V V V								
	Weighted mean		0.4862 ± 0.0008		465.0 ± 2.4		0.77		0.44		22.5 ± 0.5		N1578-01 1.43E-07 1.62E-08 8.86E-08 2.48E-08 7.82E-08 2.18E-08 3.63E-07 1.45E-07 2.45E-05 2.45E-07						
			± 0.16%		± 0.52%				7				N1578-02 1.43E-07 1.62E-08 8.86E-08 2.48E-08 7.82E-08 2.18E-08 3.63E-07 1.45E-07 2.45E-05 2.45E-07						
Full External Error				± 2.6		1.01						N1578-03 1.77E-07 1.71E-08 1.18E-07 2.04E-08 8.99E-08 3.11E-08 2.90E-06 1.45E-07 2.44E-05 5.19E-07							
Analytical Error				± 0.7		1.000						N1578-04 1.77E-07 1.71E-08 1.18E-07 2.04E-08 8.99E-08 3.11E-08 2.90E-06 1.45E-07 2.44E-05 5.19E-07							
Results	40(a)/36(a) ± 1σ		40(r)/39(k) ± 1σ		Age ± 1σ (ka)		MSWD		N1578-05 1.77E-07 1.71E-08 1.18E-07 2.04E-08 8.99E-08 3.11E-08 2.90E-06 1.45E-07 2.44E-05 5.19E-07										
									N1578-06 1.67E-07 1.62E-08 1.12E-07 2.95E-08 4.55E-08 1.92E-08 3.97E-07 2.41E-07 2.14E-05 2.78E-07										
	Inverse Isochron		301.38 ± 3.8		0.4856 ± 0.0011		464.5 ± 2.6		0.82		N1578-07 1.67E-07 1.62E-08 1.12E-07 2.95E-08 4.55E-08 1.92E-08 3.97E-07 2.41E-07 2.14E-05 2.78E-07								
			± 1.25%		± 0.23%		± 0.55%				N1578-08 1.68E-07 1.92E-08 2.18E-07 2.53E-08 7.93E-08 1.87E-08 3.00E-07 2.59E-07 2.03E-05 3.65E-07								
	Full External Error				± 2.7						N1578-09 1.68E-07 1.92E-08 2.18E-07 2.53E-08 7.93E-08 1.87E-08 3.00E-07 2.59E-07 2.03E-05 3.65E-07								
Analytical Error				± 1.1															
Statistics	Statistical F ratio		2.07		Convergence		0.0056717462												
	Error Magnification		1.2084		Number of Iterations		2												
	Number of Data Points		9		Calculated Line		Weighted York-2												
Table S5																			

Sample ID:	MG-1	Lab#N1577-01/N1577-14	J = 0.00052803 ± 0.00000264																	
Sandindes			Irradiation #	reactor:		CICLIT, Oregon														
Flux standard monitor	ACS-2	1.1891 Ma	CO-001 (120 min)	Single crystal total fusion		University, Triga reactor														
N	⁴⁰ Ar (moles)	³⁶ Ar V	±σ ₃₆ V	³⁷ Ar V	±σ ₃₇ V	³⁸ Ar V	±σ ₃₈ V	³⁹ Ar V	±σ ₃₉ V	⁴⁰ Ar V	±σ ₄₀ V	D ⁽¹⁾	±%σ _D	% ⁴⁰ Ar*	Age (ka)	±σ	K/Ca	±σ		
N1577-01	3.29E-15	1.00E-06	1.54	7.00E-05	1.72	5.19E-05	0.42	4.20E-03	0.17	2.40E-03	0.17	1.01	0.10	87.11	475.78	1.64	25.80	0.45		
N1577-02	2.40E-15	4.87E-07	3.41	5.19E-05	1.21	4.12E-05	0.47	3.37E-03	0.13	1.75E-03	0.14	1.01	0.10	91.22	453.97	1.70	27.87	0.34		
N1577-03	2.15E-15	3.85E-07	4.86	6.01E-05	1.58	4.19E-05	0.51	3.43E-03	0.13	1.57E-03	0.13	1.01	0.10	92.16	403.69	1.75	24.53	0.39		
N1577-04	2.12E-15	1.06E-06	2.15	3.93E-05	2.06	3.48E-05	0.50	2.83E-03	0.13	1.55E-03	0.08	1.01	0.10	79.18	413.77	2.42	31.01	0.64		
N1577-05	2.47E-15	7.01E-07	2.72	4.67E-05	4.45	4.01E-05	0.49	3.32E-03	0.14	1.81E-03	0.15	1.01	0.10	87.92	457.04	1.92	30.58	1.36		
N1577-06	1.53E-15	7.21E-07	2.69	2.93E-05	2.36	2.57E-05	0.52	2.13E-03	0.14	1.12E-03	0.14	1.01	0.10	80.21	402.35	2.77	31.23	0.74		
N1577-07	5.97E-15	5.14E-06	0.66	7.81E-05	1.66	6.65E-05	0.27	5.50E-03	0.12	4.35E-03	0.10	1.01	0.10	64.43	487.02	2.18	30.28	0.50		
N1577-08	1.61E-15	3.22E-07	5.88	3.12E-05	1.06	3.12E-05	0.60	2.54E-03	0.13	1.18E-03	0.14	1.01	0.10	91.23	403.54	2.27	34.97	0.38		
N1577-09	2.50E-15	6.37E-07	3.17	5.40E-05	1.78	4.14E-05	0.45	3.41E-03	0.13	1.83E-03	0.10	1.01	0.10	89.11	455.34	1.87	27.18	0.49		
N1577-10	8.65E-16	3.03E-07	4.36	2.38E-05	2.31	1.65E-05	0.84	1.36E-03	0.16	6.32E-04	0.17	1.01	0.10	85.15	376.89	2.93	24.58	0.57		
N1577-11	1.33E-15	6.31E-07	2.72	1.97E-05	3.91	1.99E-05	0.65	1.66E-03	0.17	9.68E-04	0.16	1.01	0.10	80.03	445.95	3.19	36.16	1.42		
N1577-12	9.34E-16	8.97E-08	18.67	4.05E-05	2.84	1.99E-05	0.63	1.64E-03	0.13	6.82E-04	0.16	1.01	0.10	95.63	379.61	3.02	17.42	0.49		
N1577-13	4.51E-15	2.07E-06	1.17	7.59E-05	1.54	6.32E-05	0.35	5.18E-03	0.12	3.30E-03	0.07	1.01	0.10	80.82	491.03	1.56	29.32	0.45		
N1577-14	1.98E-15	5.31E-08	27.56	4.30E-05	2.50	3.65E-05	0.46	3.03E-03	0.13	1.44E-03	0.12	1.01	0.10	98.34	447.26	1.61	30.31	0.76		
Results	⁴⁰ Ar*/ ³⁹ ArK ± 1σ			Age ± 1σ (ka)		MSWD	³⁸ Ar(k) (% , n)	K/Ca ± 1σ		Background corrections MG-1										
										N	³⁶ Ar	±s36	³⁷ Ar	±s37	³⁸ Ar	±s38	³⁹ Ar	±s39	⁴⁰ Ar	±s40
										V	V	V	V	V	V	V	V	V	V	
	Weighted mean			0.3962 ± 0.0022 ± 0.56%		378.2 ± 2.8 ± 0.75%	0.42	0.29 2		N1577-01	2.48E-07	1.14E-08	2.18E-07	2.53E-08	7.11E-08	2.58E-08	5.52E-07	1.85E-07	2.55E-05	2.80E-07
										N1577-02	2.48E-07	1.14E-08	2.18E-07	2.53E-08	7.11E-08	2.58E-08	5.52E-07	1.85E-07	2.55E-05	2.80E-07
	Full External Error					± 2.9	1.63			N1577-03	2.48E-07	1.14E-08	2.18E-07	2.53E-08	7.11E-08	2.58E-08	5.52E-07	1.85E-07	2.55E-05	2.80E-07
	Analytical Error					± 2.1	1.0000			N1577-04	2.38E-07	1.45E-08	2.07E-07	2.19E-08	7.94E-08	1.88E-08	3.96E-07	1.55E-07	2.65E-05	5.56E-07
										N1577-05	2.38E-07	1.45E-08	2.07E-07	2.19E-08	7.94E-08	1.88E-08	3.96E-07	1.55E-07	2.65E-05	5.56E-07
										N1577-06	2.25E-07	1.46E-08	2.59E-07	9.57E-09	4.76E-08	1.65E-08	3.80E-07	6.39E-08	2.34E-05	2.80E-07
										N1577-07	2.25E-07	1.46E-08	2.59E-07	9.57E-09	4.76E-08	1.65E-08	3.80E-07	6.39E-08	2.34E-05	2.80E-07
										N1577-08	2.15E-07	1.36E-08	1.43E-07	1.54E-08	1.57E-07	1.50E-08	5.86E-07	2.72E-07	2.71E-05	3.26E-07
										N1577-09	2.15E-07	1.36E-08	1.43E-07	1.54E-08	1.57E-07	1.50E-08	5.86E-07	2.72E-07	2.71E-05	3.26E-07
										N1577-10	2.00E-07	8.00E-09	2.50E-07	1.25E-08	8.00E-08	1.60E-08	4.00E-07	1.60E-07	1.81E-05	3.89E-07
										N1577-11	2.00E-07	8.00E-09	2.50E-07	1.25E-08	8.00E-08	1.60E-08	4.00E-07	1.60E-07	1.81E-05	3.89E-07
									N1577-12	2.02E-07	1.27E-08	1.73E-07	3.22E-08	5.62E-08	1.69E-08	3.77E-07	1.67E-07	1.77E-05	3.83E-07	
									N1577-13	2.02E-07	1.27E-08	1.73E-07	3.22E-08	5.62E-08	1.69E-08	3.77E-07	1.67E-07	1.77E-05	3.83E-07	
									N1577-14	2.02E-07	1.27E-08	1.73E-07	3.22E-08	5.62E-08	1.69E-08	3.77E-07	1.67E-07	1.77E-05	3.83E-07	

