δ13C and δ18O values

depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Birba-2 (A3C)			
9631.5	2935.7	3.28	-3.35
9626.2	2934.1	3.41	-2.49
9622.7	2933.0	3.37	-2.02
9618.9	2931.8	3.40	-0.76
9610.0	2929.1	3.46	-0.87
9605.2	2927.7	3.36	-1.91
9600.9	2926.4	3.26	-2.23
9598.9	2925.7	3.09	-3.26
9595.6	2924.7	3.15	-1.93
9591.4	2923.5	3.44	-1.64
9582.0	2920.6	3.49	-2.11
9574.7	2918.4	3.54	-2.05
Birba-4 (A4C)			
9688.3	2953.0	1.78	-4.39
9680.8	2950.7	-1.16	-2.75
9679.1	2950.2	-4.11	-3.53
9674.5	2948.8	-4.41	-3.85
9672.3	2948.1	-4.04	-3.64
9666.9	2946.5	-3.93	-5.12
9663.2	2945.3	-4.03	-4.96
9653.9	2942.5	-3.36	-3.52
9650.6	2941.5	-3.20	-4.44
9647.8	2940.6	-3.08	-4.84
9643.9	2939.5	-3.00	-3.86
9639.5	2938.1	-3.02	-4.16
9633.9	2936.4	-2.78	-4.02
9625.2	2933.8	-3.04	-4.70
9619.7	2932.1	-2.78	-3.59
9614.8	2930.6	-2.62	-3.41
9610.4	2929.2	-2.20	-2.22
9602.9	2927.0	-2.53	-1.29
9593.2	2924.0	-2.65	-1.36
9581.6	2920.5	-2.61	-1.67
9580.8	2920.2	-2.11	-1.20
9579.9	2920.0	-2.38	-1.24
9572.5	2917.7	-2.42	-1.26
9564.1	2915.1	-2.46	-1.27
9560.6	2914.1	-2.45	-1.15
9543.6	2908.9	-2.48	-0.97
9540.8	2908.0	-2.52	-1.19
9536.0	2906.6	-2.47	-0.97
9531.0	2905.0	-2.51	-0.92

depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Birba-5 (A4C)			
10006.0	3049.8	2.54	-3.52
10000.0	3048.0	-1.01	-2.88
9998.1	3047.4	-3.84	-3.22
9996.9	3047.1	-4.36	-2.94
9995.0	3046.5	-4.78	-2.73
9987.2	3044.1	-3.98	-3.66
9981.2	3042.3	-3.62	-4.22
9971.5	3039.3	-3.04	-4.28
9963.0	3036.7	-3.23	-4.54
9962.2	3036.5	-3.26	-3.82
9958.7	3035.4	-3.16	-3.76
9957.5	3035.0	-3.36	-4.18
9951.0	3033.1	-3.08	-4.04
9946.2	3031.6	-3.12	-4.06
9940.9	3030.0	-2.78	-3.91
9938.0	3029.1	-2.58	-3.78
9932.7	3027.5	-2.58	-4.00
9927.8	3026.0	-2.60	-3.81
9921.1	3024.0	-2.57	-3.66
9915.5	3022.2	-2.35	-3.84
9912.0	3021.2	-2.51	-3.91
9899.9	3017.5	-2.25	-3.76
9887.2	3013.6	-2.35	-3.84
9872.5	3009.1	-1.96	-3.94
9862.1	3006.0	-2.37	-3.15
9856.2	3004.2	-2.18	-3.91
9853.0	3003.2	-2.16	-3.96
9850.8	3002.5	-1.60	-4.13
9848.0	3001.7	-1.58	-4.04
9845.2	3000.8	-2.47	-4.07
9843.5	3000.3	-2.54	-4.02
Birba North-1 (A3C and A5C)			
12467.7	3800.2	3.14	-0.50
12466.2	3799.7	3.23	-1.04
12459.6	3797.7	3.33	-2.04
12442.2	3792.4	3.21	-0.79
12435.2	3790.2	3.61	2.19
12430.3	3788.8	3.53	0.78
12425.3	3787.2	3.42	-0.45
12417.6	3784.9	3.51	0.46
12054.5	3674.2	2.66	4.04
12043.5	3670.9	2.69	4.16
12042.5	3670.6	3.20	1.93
12041.3	3670.2	2.86	-0.01
12039.0	3669.5	3.15	0.31
12024.7	3665.1	3.38	0.52
12016.4	3662.6	3.01	1.59
12015.0	3662.2	3.62	1.42

depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Dasimi-1 (A5C)			
3930.25	1197.94	2.03	-1.86
3930.25	1197.94	2.60	-3.09
3930.25	1197.94	2.86	-3.47
3930.00	1197.864	2.33	-2.94
3928.95	1197.544	2.83	-4.51
3928.77	1197.489	2.92	-4.24
3928.10	1197.285	2.76	-4.09
3927.10	1196.98	2.29	-2.97
3926.13	1196.684	2.70	-3.70
3925.20	1196.401	2.48	-2.99
3924.95	1196.325	2.36	-2.95
3923.90	1196.005	2.40	-2.90
3922.70	1195.639	2.51	-5.06
Dhahaban South-3 (A1C)			
9849.4	3002.1	2.48	-2.17
9846.2	3001.1	2.49	-1.83
9844.4	3000.6	2.85	-0.99
9842.2	2999.9	3.07	-0.82
9839.7	2999.1	2.43	-1.30
9835.0	2997.7	2.33	-1.50
9834.3	2997.5	2.92	0.34
9829.7	2996.1	2.33	-1.48
9738.6	2968.3	2.66	-0.93
9725.8	2964.4	2.49	-2.18
9719.0	2962.4	2.67	-1.90
9714.6	2961.0	2.96	-0.95
9709.0	2959.3	0.66	-2.44
9703.2	2957.5	2.81	0.30
Sabsab-1 (A1C-A2C)			
9971.2	3039.2	2.44	-5.08
9938.4	3029.2	2.28	-5.03
9905.6	3019.2	2.11	-4.86
9872.8	3009.2	2.52	-5.37
9774.4	2979.2	2.12	-4.62
9741.6	2969.2	1.7	-5.52
9676	2949.2	2.47	-4.72
9636.6	2937.2	1.91	-5.23
9587.4	2922.2	2.59	-5.06
9512	2899.3	3	-5.24
9479.2	2889.3	2.48	-4.51
9446.4	2879.3	3.28	-3.69
9380.8	2859.3	2.27	-5.66
9348	2849.3	2.32	-5.15
9315.2	2839.3	1.63	-4.64
9282.4	2829.3	3.23	-4.49
9249.6	2819.3	2.32	-5.25
9216.8	2809.3	-0.78	-3.89
9184	2799.3	2.29	-4.48
9151.2	2789.3	-0.62	-4.12
9118.4	2779.3	-0.17	-3.83
12005.9	3659.4	2.30	0.46
12003.4	3658.6	1.74	1.89
depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Sabsab-1 (ctnd.)			
9103	2774.6	1.17	-3.87
9100	2773.7	3.07	-0.58
9097	2772.8	3.11	0.56
9095	2772.2	2.92	-0.88
9093	2771.5	2.1	-3.49
9090	2770.6	3.26	-0.94
9086	2769.4	1.97	-2.54
9082	2768.2	2.76	-1.16
9078.4	2767.1	2.85	1.02
9074	2765.8	2.29	-2.9
9052.8	2759.3	0.15	-2.04
9020	2749.3	1.21	-4.27
8987.2	2739.3	3.28	-4.7
8954.4	2729.3	2.34	-5.16
8921.6	2719.3	3.87	-4.41
8856	2699.3	3.44	-4
8823.2	2689.3	3.61	-4.24
8757.6	2669.3	1.37	-3.16
8708.4	2654.3	1.48	-5.22
8636.2	2632.3	1.01	-4.82
8609.8	2624.3	1.89	-2.29
8608	2623.7	2.31	-1.57
8605.8	2623.0	2.32	-2.27
8602	2621.9	2.33	-1.52
8600	2621.3	2.54	-1.21
8597.8	2620.6	1.5	-4.01
8594	2619.5	1.91	-2.86
8592	2618.8	2.3	-1.92
8589.7	2618.1	2.61	-0.44
8588.3	2617.7	1.72	-4.32
8586	2617.0	2.7	-1.34
8583.7	2616.3	2.54	-1.5
8580	2615.2	2.79	-1.72
8104	2470.1	2.2	-1.81
8100	2468.9	1.1	-1.69
8098	2468.3	1.82	-0.53
8096	2467.7	2.02	-2.02
8092	2466.4	1.85	-1.89
8090.2	2465.9	1.97	-1.03
8089	2465.5	1.65	-1.45
8087	2464.9	1.94	-1.4
8085	2464.3	1.85	-1.32
8083	2463.7	2.18	-1.88
8081	2463.1	2.16	-2.35
8078	2462.2	1.81	-1.83
8076.5	2461.7	1.95	-0.9
8074	2461.0	1.54	-1.86
8072	2460.3	1.91	-1.79
8070	2459.7	2.1	-1.82
8066.8	2458.8	2.33	-2.1

depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Sabsab-1 (ctnd.)			
8064.2	2458.0	1.86	-2.25
8061	2457.0	1.81	-1.54
8058.1	2456.1	1.09	-2.41
8055.5	2455.3	1.1	-2.43
8053	2454.6	2.33	-2
8051	2453.9	2.27	-2.48
8049.1	2453.4	2.32	-1.36
8047	2452.7	2.2	-1.57
8045.8	2452.4	2.38	-1.04
8043	2451.5	1.82	-1.76
8039.5	2450.4	0.83	-2.79
8037.2	2449.7	1.32	-3.27
7884.5	2403.2	2.49	-1.28
7883	2402.7	2.7	-1.88
7880	2401.8	2.79	-1.7
7878	2401.2	3.04	-1.51
7876.3	2400.7	2.46	-1.52
7874	2400.0	3.03	0.54
7873	2399.7	2.58	-1.04
7872	2399.4	2.45	-1.56
7871	2399.1	1.89	-2.65
7870	2398.8	2.24	-1.34
7869	2398.5	2.24	-1.57
7868	2398.2	2.17	-1.19
7867	2397.9	2.21	-0.53
7866	2397.6	2.6	-0.24
7865	2397.3	2.18	-1.2
7864	2396.9	1.96	-1.85
7862	2396.3	1.64	-2.42
7861	2396.0	1.69	-1.66
7860	2395.7	0.73	-3.42
7858.8	2395.4	1.04	-2.22
7857.1	2394.8	0.89	-1.87
Thamoud-6			
2380	725.4	-5.02	-4.71
2370	722.4	-2.57	-3.65
2369	722.1	-0.73	-5.09
2365	720.9	-1.73	-4.31
2361	719.6	-6.03	-0.38
2360	719.3	-1.92	-3.99
2355	717.8	-5.21	-1.26
2350	716.3	-4.69	-1.37
2340	713.2	-0.92	-3.49
2330	710.2	-0.84	-3.5
2320	707.1	-1.3	-3.13
2310	704.1	-1.27	-2.87
2305	702.6	-3.83	0.38
2300	701.0	-0.89	-2.94
2290	698.0	-2.54	-3.49
2290	698.0	-1.01	-2.23
2280	694.9	0.03	-1.91
depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]

depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]
Thamoud-6 (ctnd.)			
2270	691.9	-0.39	-1.53
2265	690.4	0.59	-2.44
2260	688.8	0.87	-2.51
2260	688.8	1.01	-2.86
2255	687.3	1.27	-2.76
2250	685.8	0.19	-1.78
2240	682.8	0.17	-1.69
2230	679.7	1.61	-2.86
2220	676.7	1.84	-2.83
2210	673.6	1.71	-2.44
2200	670.6	1.59	-3.74
2190	667.5	-0.21	-6.56
2189	667.2	0.98	-3.15
2180	664.5	2.6	-3.27
2174	662.6	1.73	-3.62
2170	661.4	2.75	-2.86
2160	658.4	2.66	-2.53
2158	657.8	1.16	-1.94
2150	655.3	1.87	-3.3
2140	652.3	1.73	-3.08
2130	649.2	1.13	-3.98
2120	646.2	-2.95	-3.09
2110	643.1	-3.09	-2.84
2104	641.3	-3.73	-1.25
2100	640.1	-3.53	-2.21
2092	637.6	-2.75	-2.15
2090	637.0	-2.89	-2.82
2084	635.2	-2.68	-2.1
2080	634.0	-2.06	-2.72
2078	633.4	-2.9	-3.04
2074	632.2	2.23	-2.05
2070	630.9	2.02	-2.9
2060	627.9	2.54	-3.33
2050	624.8	2.7	-3.45
2050	624.8	2.49	-3.72
2040	621.8	2.78	-3.73
2030	618.7	2.48	-3.59
2020	615.7	2.78	-3.02
2010	612.6	2.69	-3.53
2000	609.6	2.55	-3.3
1995	608.1	1.56	-4.16
1990	606.6	2.28	-3.13
1980	603.5	2.15	-3.34
1977	602.6	2.41	-3.57
1970	600.5	1.79	-3.77
1960	597.4	0.93	-2.74
1958	596.8	1.95	-3.86
1950	594.4	-0.23	-1.13
1949	594.1	0.17	-3.71
1943	592.2	-0.69	-2.08
1940	591.3	-1.94	-1.91
depth [feet]	depth [m]	δ13C [‰ PDB]	δ18O [‰ PDB]

[feet]	[m]	[‰ PDB]	[‰ PDB]	[feet]	[m]	[‰ PDB]	[‰ PDB]
	Thamoud-6 (ctnd.)				**Thamoud-6 (ctnd.)**		
1930	588.3	2.08	-3.3	1810	551.7	-2.18	-6.23
1927	587.3	0.97	-3.73	1800	548.6	-0.64	-5.9
1920	585.2	2.36	-3.39	1790	545.6	-0.14	-5.74
1910	582.2	2.58	-3.02	1780	542.5	0.51	-5.28
1900	579.1	2.23	-3.16	1770	539.5	0.5	-5.38
1890	576.1	2.79	-2.97	1768	538.9	1.21	-3.41
1880	573.0	3.25	-3.15	1760	536.4	1.57	-5.74
1870	570.0	2.42	-3.29	1757	535.5	-1.78	-5.74
1863	567.8	-0.22	-5.52	1750	533.4	-0.01	-5.04
1860	566.9	0.4	-4.04	1740	530.4	0.32	-5.44
1850	563.9	-0.93	-4.86	1730	527.3	0.74	-5.14
1840	560.8	-2.91	-4.87	1720	524.3	0.76	-6.47
1830	557.8	-0.98	-6.17	1710	521.2	-0.28	-8.19
1820	554.7	-1.19	-5.28				

U-Pb data

Sample Fractions	Weight (µg) (a)	Concentrations U (ppm)	Concentrations Pb (ppm)	Pb_c (pg) (b)	206 Pb / 204 Pb (c)	208 Pb / 206 Pb (d)	Ratios 206 Pb / 238 U (e)	err (2σ%)	207 Pb / 235 U (e)	err (2σ%)	207 Pb / 206 Pb (e)	err (2σ%)	Age (Ma) 206 Pb / 238 U	Age (Ma) 207 Pb / 235 U	Age (Ma) 207 Pb / 206 Pb	err (2σ%)	corr. coef.	Pb* / Pb_c (f)
BB-5																		
z14	1.70	359	31.3	3.7	953.2	0.099	0.087744	(.22)	0.7062	(.43)	0.05837	(.35)	542.2	542.5	543.7	1.9	0.572	14.4
z6	3.50	376	33.0	4.0	1893.1	0.103	0.087659	(.26)	0.7058	(.32)	0.05840	(.19)	541.7	542.3	544.7	1.0	0.808	29.1
z17	1.80	420	41.5	7.0	617.0	0.193	0.087674	(.43)	0.7057	(.53)	0.05838	(.29)	541.8	542.2	543.9	1.6	0.836	10.2
z21	2.50	433	37.5	3.3	1886.4	0.089	0.087695	(.12)	0.7056	(.18)	0.05835	(.13)	541.9	542.1	543.1	0.7	0.681	28.6
z32	1.10	251	21.7	0.9	1785.4	0.087	0.087717	(.15)	0.7055	(.21)	0.05833	(.14)	542.0	542.1	542.3	0.8	0.747	27.0
z24	7.40	230	20.6	3.0	3229.5	0.130	0.087728	(.08)	0.7054	(.10)	0.05831	(.06)	542.1	542.0	541.6	0.3	0.819	51.0
z31	0.90	239	21.0	0.9	1395.1	0.105	0.087764	(.16)	0.7052	(.21)	0.05828	(.14)	542.3	541.9	540.2	0.7	0.773	21.4
z3	2.00	404	34.6	1.6	2917.7	0.080	0.087569	(.11)	0.7046	(.19)	0.05836	(.15)	541.1	541.5	543.3	0.8	0.618	44.1
z29	2.20	284	24.2	1.3	2683.7	0.071	0.087590	(.09)	0.7046	(.12)	0.05834	(.08)	541.3	541.5	542.5	0.4	0.755	40.2
z16	6.50	291	25.8	7.2	1468.2	0.096	0.087529	(.23)	0.7040	(.28)	0.05833	(.17)	540.9	541.2	542.2	0.9	0.808	22.7
z30	1.90	132	11.5	1.2	1219.2	0.101	0.087422	(.23)	0.7032	(.30)	0.05834	(.18)	540.3	540.7	542.5	1.0	0.803	18.6
z12	1.10	904	77.3	4.3	1309.0	0.076	0.087129	(.35)	0.7009	(.52)	0.05834	(.36)	538.5	539.3	542.6	2.0	0.721	19.6
z19	4.00	269	23.4	3.2	1888.2	0.105	0.087081	(.17)	0.7006	(.36)	0.05835	(.31)	538.2	539.2	543.0	1.7	0.498	29.0
z4	4.70	307	26.4	2.6	3128.2	0.092	0.086855	(.09)	0.6985	(.15)	0.05833	(.11)	536.9	537.9	542.2	0.6	0.644	47.8
z22	3.30	355	30.1	5.1	1288.1	0.064	0.086559	(.29)	0.6963	(.34)	0.05834	(.17)	535.2	536.6	542.6	0.9	0.869	19.2
z1	1.50	453	39.1	4.2	912.3	0.107	0.085556	(.50)	0.6883	(.57)	0.05834	(.25)	529.2	531.7	542.7	1.4	0.895	13.9
z23	3.50	356	29.6	3.0	2289.6	0.079	0.085025	(.10)	0.6842	(.19)	0.05836	(.16)	526.0	529.3	543.4	0.9	0.560	34.5
Mkz-11b																		
z9	2.00	156	14.4	1.2	1448.4	0.161	0.087785	(.17)	0.7061	(.23)	0.05834	(.15)	542.4	542.4	542.4	0.8	0.774	23.3
z11	2.10	261	23.8	0.9	3641.3	0.147	0.087708	(.08)	0.7056	(.13)	0.05835	(.10)	542.0	542.1	542.8	0.5	0.671	58.4
z12	1.50	109	9.8	0.8	1188.2	0.132	0.087676	(.20)	0.7056	(.36)	0.05837	(.29)	541.8	542.1	543.5	1.6	0.616	18.6
z13	1.50	236	22.3	0.7	2773.4	0.194	0.087714	(.10)	0.7056	(.14)	0.05834	(.09)	542.0	542.1	542.5	0.5	0.766	46.1
z10	2.00	173	16.1	2.5	813.9	0.178	0.087625	(.25)	0.7052	(.32)	0.05837	(.19)	541.5	541.9	543.6	1.1	0.799	13.1
z4	5.60	417	38.7	4.2	3099.0	0.169	0.087642	(.14)	0.7050	(.15)	0.05834	(.06)	541.6	541.8	542.5	0.3	0.913	50.8
z6	3.10	445	41.7	2.1	3714.9	0.186	0.087582	(.10)	0.7045	(.14)	0.05834	(.10)	541.2	541.5	542.5	0.6	0.688	61.5
z3	3.20	477	44.2	1.5	5707.0	0.178	0.087149	(.09)	0.7018	(.12)	0.05840	(.08)	538.7	539.8	544.9	0.4	0.771	94.0
z5	6.00	316	29.4	4.4	2389.7	0.176	0.086885	(.18)	0.6990	(.22)	0.05835	(.12)	537.1	538.2	543.0	0.6	0.840	39.4
z1	1.60	680	61.1	2.2	2790.0	0.151	0.086414	(.10)	0.6954	(.12)	0.05836	(.07)	534.3	536.0	543.4	0.4	0.800	44.8
z7	2.81	246	22.4	3.0	1279.1	0.167	0.086183	(.20)	0.6932	(.26)	0.05834	(.16)	532.9	534.7	542.5	0.9	0.786	20.6
z8	2.50	309	27.6	1.6	2618.4	0.156	0.085206	(.18)	0.6858	(.21)	0.05837	(.09)	527.1	530.3	543.9	0.5	0.900	42.2

(a) Sample weights are estimated by using a video monitor and are known to within 40%.

(b) Total common-Pb in analyses.

(c) Measured ratio corrected for spike and fractionation only.

(d) Radiogenic Pb.

(e) Corrected for fractionation, spike, blank, and initial common Pb.

Mass fractionation correction of 0.15%/amu ± 0.04%/amu (atomic mass unit) was applied to single-collector Daly analyses and 0.12%/amu ± 0.04% for dynamic Faraday-Daly analyses. Total procedural blank less than 0.6 pg for Pb and less than 0.1 pg for U.
Blank isotopic composition: 206Pb/204Pb = 19.10 ± 0.1, 207Pb/204Pb =15.71 ± 0.1, 208Pb/204Pb = 38.65 ± 0.1.
Age calculations are based on the decay constants of Jaffey et al. (1971).
Common-Pb corrections were calculated by using the model of Stacey and Kramers (1975) and the interpreted age of the sample.
Uncertainty associated with the assumed common-Pb isotopic composition is minor relative to the reported errors due to the high radiogenic/common-Pb ratio of all analyses.
Corr. coef. = correlation coefficient.
(f) Ratio of radiogenic Pb to common-Pb.
(g) Zircons were separated by standard crushing, heavy liquid, and magnetic separation techniques. Zircons with the lowest magnetic susceptibilities were chosen for further study. All zircons were air-abraded, washed in 3M HNO3 at 50°C for 2 hours, and ultrasonicated for an additional 30 minutes. After photographing to estimate sample weights, zircons were loaded into 300 µl Teflon FEP microcapsules, washed again in 150 µl 3M HNO3 at 50°C for 12 hours, and finally rinsed with four capsule volumes of high-purity H2O. Zircons were dissolved in 120 µl 29M HF with a trace of HNO3 at 220°C for 48 hours with a mixed 205Pb-233U-235U tracer, dried to salts, and redissolved in 120 µl 6M HCl at 180°C overnight. Pb and U were separated using HCl-based anion-exchange procedures modified after Krogh (1973). Separated Pb and U were analyzed by conventional thermal-ionization mass spectrometry on the MIT VG Sector 54 multicollector mass spectrometer. Lead and uranium were loaded with a silica gel-phosphoric acid mixture on previously degassed single Re filaments, and its isotopes measured by peak-jumping all ion beams into the axial Daly detector in ion-counting mode. Uranium was measured in static mode on three Faraday cups with an average 235U ion beam of 3 x 10-13 A. Pb isotopic fractionation was monitored throughout the course of the study by daily analysis of the NBS-981 common Pb standard; uranium fractionation was monitored and corrected using the double spike. Total common Pb in all analyses ranged from 0.7 to 7 pg a mean and 2s s.d. of 3.5 pg ± 40% was used to reduce all zircon data. For total common Pb less than 3.5 pg, it is assumed to be all blank. U blanks were negligible relative to sample contents, with a nominal value of 0.1 pg ± 50% used in error propagation for each analysis.

References:

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