

Table S3: Results of carbon and oxygen isotope analyses

Shanggan					Qiakong					Laren			
Sample	Depth (m)	Substage	$\delta^{13}\text{C}$ (VPDB)	$\delta^{18}\text{O}$ (VPDB)	Sample	Depth (m)	Substage	$\delta^{13}\text{C}$ (VPDB)	$\delta^{18}\text{O}$ (VPDB)	Sample	Depth (m)	$\delta^{13}\text{C}$ (VPDB)	$\delta^{18}\text{O}$ (VPDB)
SHA 323	60.9	Spathian	1.38	-7.40	QIA 64	32.0	Spathian	0.58	-6.52	W 81 FB	0.0	1.41	-6.91
SHA 321	59.2	Spathian	1.93	-7.39	QIA 63	31.0	Spathian	0.76	-6.58	W80	0.4	1.15	-6.93
SHA 320	58.8	Spathian	1.93	-7.30	QIA 62	30.4	Spathian	0.81	-6.38	W76	1.3	-1.69	-7.09
SHA 319	57.7	Spathian	1.83	-7.36	QIA 17 C	30.0	Spathian	1.05	-6.39	W74	1.6	-0.52	-7.05
SHA 318	57.2	Spathian	2.01	-6.79	QIA 61	29.7	Spathian	0.95	-6.44	W71	1.8	-0.93	-7.04
SHA 317	56.8	Spathian	1.85	-7.34	QIA 65	29.2	Spathian	0.99	-6.91	W70	2.1	-1.74	-7.51
SHA 316	56.3	Spathian	2.00	-7.47	QIA 66	28.1	Spathian	2.09	-5.81	W69	2.6	-1.66	-7.31
SHA 315	55.8	Spathian	1.51	-7.61	QIA 67	27.5	Spathian	2.31	-5.88	W64	3.6	-1.11	-6.76
SHA 313	55.3	Spathian	1.57	-7.41	QIA 155 C	27.2	Spathian	1.93	-6.49	W62	3.9	-1.49	-6.91
SHA 312	54.6	Spathian	1.90	-7.34	QIA 68	27.0	Spathian	2.49	-5.90	W59	4.7	-1.56	-7.00
SHA 311	54.1	Spathian	2.35	-7.31	QIA 69	26.8	Spathian	2.72	-5.94	W57	5.0	-1.70	-6.92
SHA 540	52.0	Smithian	-2.19	-8.12	QIA 70	26.2	Spathian	2.54	-6.41	W55	5.4	-1.87	-8.25
SHA 345	51.8	Smithian	-1.86	-8.00	QIA 71	25.9	Spathian	2.77	-5.76	W54	5.7	-1.79	-7.24
SHA 538	51.4	Smithian	-0.76	-7.46	QIA 72	25.5	Spathian	2.63	-5.67	W53	6.2	-1.09	-7.63
SHA 536	50.7	Smithian	-0.92	-7.39	QIA 73	25.0	Spathian	2.25	-6.15	W51	7.0	-0.42	-7.24
SHA 544	50.4	Smithian	-2.84	-7.80	QIA 74	24.4	Spathian	2.14	-6.40	W50	7.1	-1.59	-7.21
SHA 343	49.8	Smithian	-2.09	-7.51	QIA 75	24.0	Spathian	2.45	-5.85	W1	7.7	-1.55	-7.06
SHA 535	49.6	Smithian	-1.85	-7.60	QIA 76	23.6	Spathian	2.35	-6.44	W3	8.0	-1.59	-8.01
SHA 534	49.4	Smithian	-1.90	-7.37	QIA 151 C	23.4	Spathian	2.30	-5.89	W4	8.2	-1.71	-7.02
SHA 529	49.2	Smithian	-1.99	-7.39	QIA 77	23.0	Spathian	2.20	-6.16	W5	8.5	-1.67	-7.15
SHA 533	48.9	Smithian	-1.89	-8.64	QIA 150 C	22.6	Spathian	2.33	-6.10	W6	8.9	-0.51	-5.45
SHA 336	48.7	Smithian	-2.09	-7.29	QIA 78	22.5	Spathian	1.77	-6.40	W7	9.2	-1.62	-7.28
SHA 532	48.6	Smithian	-2.20	-7.43	QIA 79	22.1	Spathian	2.39	-5.99	W8	9.5	-1.31	-7.22
SHA 528	48.4	Smithian	-2.11	-7.31	QIA 149 C	21.9	Spathian	2.15	-6.28	W9	9.8	-1.65	-7.10
SHA 335	47.7	Smithian	-1.82	-7.49	QIA 16 C	21.8	Spathian	2.28	-6.10	W10	10.0	-1.76	-6.23
SHA 530	47.7	Smithian	-2.04	-8.73	QIA 83	21.5	Spathian	2.13	-6.37	W11	10.5	-0.58	-8.18
SHA 527	47.5	Smithian	-1.82	-7.42	QIA 80	21.4	Spathian	1.94	-6.36	W12	10.8	-0.12	-7.06
SHA 341	47.4	Smithian	-2.05	-7.52	QIA 84	21.3	Spathian	2.50	-6.49	W 13A	11.3	1.03	-7.23
SHA 526	47.1	Smithian	-2.21	-7.71	QIA 85	21.1	Spathian	1.67	-6.67	W 13B	11.5	1.08	-7.72
SHA 334	46.8	Smithian	-4.08	-7.79	QIA 81	21.0	Spathian	2.34	-6.60	W14	11.8	2.14	-7.38
SHA 525	46.5	Smithian	-1.89	-7.31	QIA 86	20.8	Spathian	2.36	-6.19	W15	12.3	3.12	-7.65
SHA 337	46.0	Smithian	-1.99	-8.32	QIA 82	20.7	Spathian	1.69	-6.60	W15B	12.5	2.34	-7.16
SHA 523	45.4	Smithian	-1.83	-5.90	QIA 87	20.5	Spathian	2.33	-6.36	W16	12.9	2.24	-5.98
SHA 522	45.2	Smithian	-7.20	-8.28	QIA 88	20.2	Spathian	2.28	-6.51	W17	13.1	2.43	-7.46
SHA 305	45.0	Smithian	-1.64	-9.30	QIA 89	19.9	Spathian	2.32	-6.34	W18	13.3	2.72	-7.22
SHA 521	44.8	Smithian	-4.79	-9.24	QIA 147 C	19.7	Spathian	1.04	-6.74	W19	13.6	2.70	-7.13
SHA 521	44.8	Smithian	-4.79	-9.14	QIA 90	19.6	Spathian	2.51	-6.04	W20	13.8	2.36	-7.00
SHA 520	44.6	Smithian	-2.41	-8.94	QIA 91	19.5	Spathian	2.74	-6.35	W21	14.0	2.25	-7.23
SHA 304	44.2	Smithian	-1.40	-7.62	QIA 92	19.2	Spathian	3.06	-5.66	W 21A	14.2	2.13	-7.52
SHA 519	43.6	Smithian	-1.74	-7.37	QIA 93	18.8	Spathian	2.87	-5.72	W22	14.4	2.39	-6.62
SHA 333	43.1	Smithian	-1.73	-7.38	QIA 145 C	18.4	Spathian	2.51	-6.32	W 23A	14.8	2.19	-7.32
SHA 518	42.8	Smithian	-2.04	-8.85	QIA 94	18.3	Spathian	2.58	-6.36	W23B	15.2	2.07	-7.09
SHA 332	41.7	Smithian	-2.17	-7.86	QIA 95	17.9	Spathian	3.41	-5.97	W24	15.4	2.11	-7.26
SHA 516	41.3	Smithian	-1.47	-7.39	QIA 96	17.6	Spathian	4.29	-5.62	W25	15.8	2.24	-6.90
SHA 515	40.9	Smithian	-1.40	-7.67	QIA 97	17.4	Spathian	3.27	-5.75	W26	16.0	2.04	-7.03
SKA 514	40.5	Smithian	-0.75	-7.51	QIA 98	17.2	Spathian	3.00	-5.81	W27	16.3	2.17	-7.14
SHA 512	40.2	Smithian	-1.08	-7.41	QIA 99	16.9	Spathian	3.11	-5.72	W28	17.0	2.21	-7.20
SHA 513	40.2	Smithian	-0.60	-8.56	QIA 100	16.7	Spathian	3.12	-5.88	W30A	17.5	2.18	-7.42
SHA 513	40.1	Smithian	-0.91	-8.92	QIA 101	16.5	Spathian	3.13	-6.10	W 30B	18.0	1.90	-6.94
SHA 511	40.0	Smithian	-0.69	-7.44	QIA 60	16.2	Spathian	3.28	-5.84	W31	18.2	2.29	-6.76
SHA 510	39.9	Smithian	-0.32	-7.26	QIA 59	15.9	Spathian	3.20	-5.79	W34	18.9	2.15	-7.11
SHA 509	39.7	Smithian	0.43	-6.37	QIA 58	15.5	Spathian	3.43	-5.76	W35	19.2	2.02	-7.19
SHA 508	39.3	Smithian	0.85	-7.23	QIA 57	15.0	Smithian	3.06	-6.42	W37	19.6	1.75	-7.25
SHA 507	39.1	Smithian	1.61	-7.00	QIA 138 C	14.8	Smithian	3.81	-5.05	W38	19.9	1.74	-7.25
SHA 506	38.8	Smithian	1.34	-7.04	QIA 56	14.6	Smithian	4.43	-5.32	W39	20.1	1.51	-7.44
SHA 505	38.5	Smithian	2.60	-6.98	QIA 55	14.0	Smithian	1.94	-5.38	W40	20.3	1.42	-7.31
SHA 325	38.4	Smithian	1.68	-7.32	QIA 54	13.6	Smithian	2.65	-5.25	W41	20.5	0.37	-7.26
SHA 504	38.2	Smithian	2.64	-4.54	QIA 53	13.4	Smithian	2.62	-5.23	W42	21.0	0.40	-7.25
SHA 324	38.0	Smithian	0.77	-7.35	QIA 52	13.1	Smithian	0.89	-4.48	W43	21.4	2.16	-6.55
					QIA 51	12.9	Smithian	1.48	-6.44	W44A	21.9	1.02	-5.71
					QIA 50	12.6	Smithian	0.27	-5.96	W44B	22.3	1.40	-7.31
					QIA 49	11.8	Smithian	-1.40	-4.26				
					QIA 48	11.4	Smithian	-0.80	-5.37				
					QIA 47	11.1	Smithian	-1.68	-5.81				
					QIA 46	10.7	Smithian	-2.20	-4.22				
					QIA 45	9.8	Smithian	-1.41	-5.17				
					QIA 44	9.4	Smithian	-2.87	-5.65				
					QIA 43	9.3	Smithian	-2.12	-4.86				
					QIA 42	8.8	Smithian	-1.53	-6.14				
					QIA 131 C	8.7	Smithian	-1.96	-5.30				
					QIA 41	8.5	Smithian	-1.87	-5.27				
					QIA 130 C	8.3	Smithian	-2.04	-6.92				
					QIA 40	8.1	Smithian	-1.86	-6.82				
					QIA 39	7.9	Smithian	-1.92	-5.80				
					QIA 38	7.7	Smithian	-1.77	-7.27				
					QIA 37	7.2	Smithian	-2.19	-6.01				
					QIA 36	7.1	Smithian	-2.52	-6.40				
					QIA 127 C	7.0	Smithian	-2.44	-5.68				
					QIA 126 C	6.7	Smithian	-2.31	-5.94				
					QIA 35	6.5	Smithian	-2.52	-5.77				
					QIA 125 C	6.3	Smithian	-2.12	-7.20				
					QIA 34	6.2	Smithian	-2.20	-7.08				
					QIA 33	5.8	Smithian	-2.39	-5.59				
					QIA 32	5.6	Smithian	-2.41	-5.63				
					QIA 31	5.2	Smithian	-2.35	-6.98				
					QIA 30	5.0	Smithian	-2.44	-6.21				
					QIA 29	4.6	Smithian	-2.08	-7.14				
					QIA 120 C	4.4	Smithian	-2.27	-6.90				
					QIA 28	4.1	Smithian	-2.47	-6.15				
					QIA 27	3.6	Smithian	-2.52	-6.52				
					QIA 26	3.1	Smithian	-2.65	-6.19				
					QIA 25	2.8	Smithian	-2.39	-6.30				
					QIA 24	2.4	Smithian	-2.40	-5.76				
					QIA 23	2.0	Smithian	-2.35	-6.23				
					QIA 22	1.4	Smithian	-2.28	-5.81				
					QIA 21	0.7	Smithian	-2.24	-5.75				
					QIA 20	0.1	Smithian	-2.14	-6.72				