Anexo D

Cálculos de Isótopos Estables

Tabla 1. Resultados isotópicos de $\delta^{13}C$ ‰(PDB) y $\delta^{18}O$ ‰(PDB) y variables calculadas para el modelamiento isotópico

	Resultados de Laboratorio		Variables calculadas para lo modelos de isotopos estables y las relaciones del fraccionamiento con la temperatura											
Muestra	$\delta^{13}C$ ‰(PDB)	$\delta^{18}O$ ‰(PDB)	$\delta^{18}O$ ‰(SMOW)	$\delta^{18}O$ ‰(VPDB)	$\delta^{13}C$ ‰(VPDB)	f de ^{13}C	d pool ^{13}C	f de ^{18}O	d pool de ^{18}O	ln	alfa	T C	$10^{\wedge 6}T^2$	Oxigen isotope fractionation
1	-27,145	-7,187	23,501	-7,184	-27,675	0,152	16,351	1,719	-60,467	0,542	1,012	71,320	11,540	12,201
11	-23,997	-1,883	28,968	-1,880	-24,465	0,250	18,977	1,188	-38,722	0,173	1,007	44,631	6,213	6,873
20	-21,633	-5,574	25,164	-5,570	-22,055	0,324	20,950	1,557	-53,851	0,443	1,011	63,022	9,917	10,577
40	-19,785	-2,789	28,034	-2,786	-20,171	0,382	22,492	1,279	-42,436	0,246	1,008	49,071	7,121	7,781
11b	-18,843	-5,478	25,262	-5,475	-19,211	0,411	23,278	1,548	-53,461	0,437	1,011	62,537	9,821	10,481
9a	-18,498	-4,018	26,767	-4,015	-18,858	0,422	23,566	1,402	-47,476	0,338	1,009	55,172	8,354	9,014
11a	-18,003	-4,101	26,683	-4,097	-18,354	0,437	23,979	1,410	-47,812	0,344	1,009	55,583	8,436	9,097
5	-17,924	-4,299	26,478	-4,295	-18,273	0,440	24,045	1,430	-48,625	0,358	1,009	56,576	8,635	9,296
53	-17,430	-5,325	25,421	-5,321	-17,770	0,455	24,457	1,532	-52,831	0,427	1,010	61,756	9,666	10,326
2	-17,152	-10,236	20,358	-10,233	-17,486	0,464	24,689	2,024	-72,967	0,705	1,015	87,426	14,616	15,276
35	-17,097	-8,425	22,224	-8,422	-17,431	0,466	24,734	1,843	-65,543	0,611	1,014	77,793	12,788	13,448
9	-16,904	-2,605	28,225	-2,602	-17,234	0,472	24,896	1,260	-41,680	0,232	1,008	48,163	6,936	7,596
47	-16,090	-4,266	26,512	-4,263	-16,404	0,497	25,575	1,427	-48,490	0,355	1,009	56,412	8,602	9,263
22	-14,398	-4,526	26,244	-4,522	-14,678	0,550	26,987	1,453	-49,555	0,373	1,010	57,716	8,863	9,523
21	-14,366	-4,960	25,797	-4,957	-14,646	0,551	27,014	1,496	-51,336	0,403	1,010	59,908	9,300	9,960
21b	-13,934	-8,074	22,586	-8,071	-14,205	0,565	27,374	1,807	-64,103	0,592	1,013	75,948	12,434	13,094
32c	-13,310	-4,102	26,681	-4,098	-13,570	0,584	27,894	1,410	-47,817	0,344	1,009	55,589	8,438	9,098
25	-13,293	-9,403	21,217	-9,400	-13,552	0,585	27,909	1,940	-69,552	0,663	1,015	82,970	13,775	14,435
23	-12,780	-8,780	21,858	-8,777	-13,029	0,601	28,337	1,878	-66,999	0,630	1,014	79,667	13,146	13,807
33	-12,123	-5,503	25,237	-5,500	-12,359	0,621	28,885	1,550	-53,564	0,438	1,011	62,664	9,846	10,506
13	-12,114	-11,006	19,564	-11,002	-12,350	0,621	28,892	2,101	-76,123	0,742	1,016	91,580	15,394	16,054
50	-11,707	-4,605	26,163	-4,602	-11,935	0,634	29,232	1,461	-49,881	0,379	1,010	58,116	8,943	9,603

	Resultados de Laboratorio		Variables calculadas para lo modelos de isotopos estables y las relaciones del fraccionamiento con la temperatura											
Muestra	$\delta^{13}C$ ‰(PDB)	$\delta^{18}O$ ‰(PDB)	$\delta^{18}O$ ‰(SMOW)	$\delta^{18}O$ ‰(VPDB)	$\delta^{13}C$ ‰(VPDB)	f de ^{13}C	d pool ^{13}C	f de ^{18}O	d pool de ^{18}O	ln	alfa	T C	$10^{\wedge 6}T^2$	Oxigen isotope fractionation
31	-11,605	-4,311	26,466	-4,307	-11,831	0,637	29,317	1,431	-48,673	0,358	1,009	56,636	8,647	9,307
43	-11,546	-4,381	26,393	-4,378	-11,771	0,639	29,366	1,438	-48,962	0,363	1,009	56,990	8,718	9,378
10	-11,249	-4,047	26,738	-4,043	-11,468	0,648	29,614	1,405	-47,591	0,340	1,009	55,313	8,382	9,042
49	-11,231	-6,403	24,309	-6,400	-11,450	0,649	29,629	1,640	-57,254	0,495	1,011	67,270	10,751	11,412
24	-10,601	-7,793	22,876	-7,790	-10,808	0,669	30,155	1,779	-62,951	0,576	1,013	74,476	12,151	12,811
13	-10,542	-12,524	17,998	-12,521	-10,748	0,671	30,204	2,252	-82,350	0,812	1,018	99,882	16,931	17,591
32	-10,173	-2,744	28,081	-2,741	-10,372	0,682	30,512	1,274	-42,250	0,242	1,008	48,847	7,075	7,735
46 ocre	-10,090	-14,629	15,829	-14,626	-10,287	0,685	30,581	2,463	-90,978	0,901	1,020	111,613	19,064	19,724
26	-9,895	-2,444	28,391	-2,440	-10,088	0,691	30,744	1,244	-41,020	0,219	1,007	47,372	6,774	7,434
11c	-9,885	-6,438	24,273	-6,434	-10,078	0,691	30,752	1,644	-57,395	0,497	1,012	67,447	10,786	11,446
42a	-9,426	-5,592	25,145	-5,589	-9,610	0,705	31,135	1,559	-53,928	0,444	1,011	63,118	9,935	10,596
19	-9,394	-1,072	29,804	-1,069	-9,578	0,706	31,162	1,107	-35,397	0,102	1,006	40,699	5,400	6,060
48	-8,697	-4,711	26,053	-4,708	-8,867	0,728	31,743	1,471	-50,316	0,386	1,010	58,651	9,050	9,710
46	-8,543	-5,798	24,933	-5,795	-8,710	0,733	31,872	1,580	-54,773	0,457	1,011	64,168	10,143	10,803
52	-8,169	-2,848	27,974	-2,845	-8,328	0,745	32,184	1,285	-42,678	0,251	1,008	49,362	7,180	7,840
42e	-6,755	-4,112	26,671	-4,109	-6,887	0,789	33,364	1,411	-47,859	0,344	1,009	55,640	8,448	9,108
51	-6,235	-5,155	25,596	-5,152	-6,357	0,805	33,798	1,515	-52,135	0,416	1,010	60,895	9,496	10,156
41	-5,566	-2,783	28,041	-2,780	-5,675	0,826	34,356	1,278	-42,411	0,246	1,008	49,041	7,115	7,775
45	-5,358	-5,403	25,340	-5,400	-5,462	0,833	34,529	1,540	-53,152	0,432	1,010	62,154	9,745	10,405
44	-1,119	-5,820	24,910	-5,817	-1,141	0,965	38,067	1,582	-54,862	0,459	1,011	64,279	10,164	10,825

Las formulas para el cálculo de las variables del fraccionamiento isotópico presentado en los modelos y que se encuentran en la tabla son:

1) Δ de pool = $\Delta 2+f + \Delta 1- \Delta 2 *f$.

2) $f\ ^{13}C = 1- (\delta^{13}C$ ‰(PDB) / KIE), KIE = -32.

3) $f\ ^{18}O = 1- (\delta^{18}O$‰(PDB) / KIE), KIE = 10.

4) ln = LN (f)

5) alfa = (1000+KIE)/(1000 + $\delta^{18}O$‰(PDB)

6) 10^6T^2= 103 LN(a) – 1.69/2.56

7) $\delta^{18}O$‰(SMOW) = 1.03090 * $\delta^{18}O$‰(PDB) + 30,91

8) $\delta^{18}O$‰(VPDB) = $\delta^{18}O$‰(SMOW) * 0.97002 -29,98

9) $\delta^{13}C$ ‰(VPDB) = $\delta^{13}C$ ‰(PDB) + ($\delta^{13}C$ ‰(PDB)*1,95/100)

10) Oxygen Isotope fractionation = 10^3 LN (alfa)