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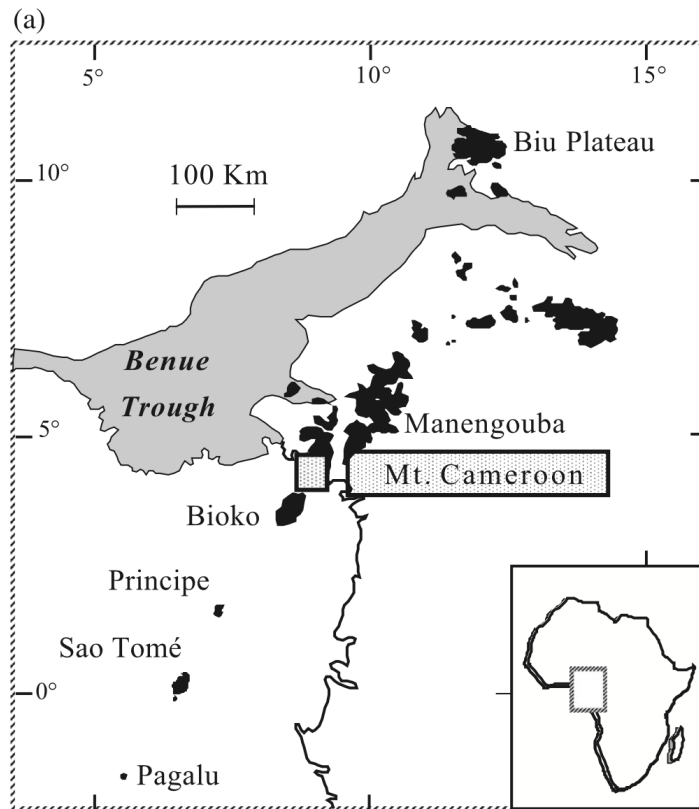
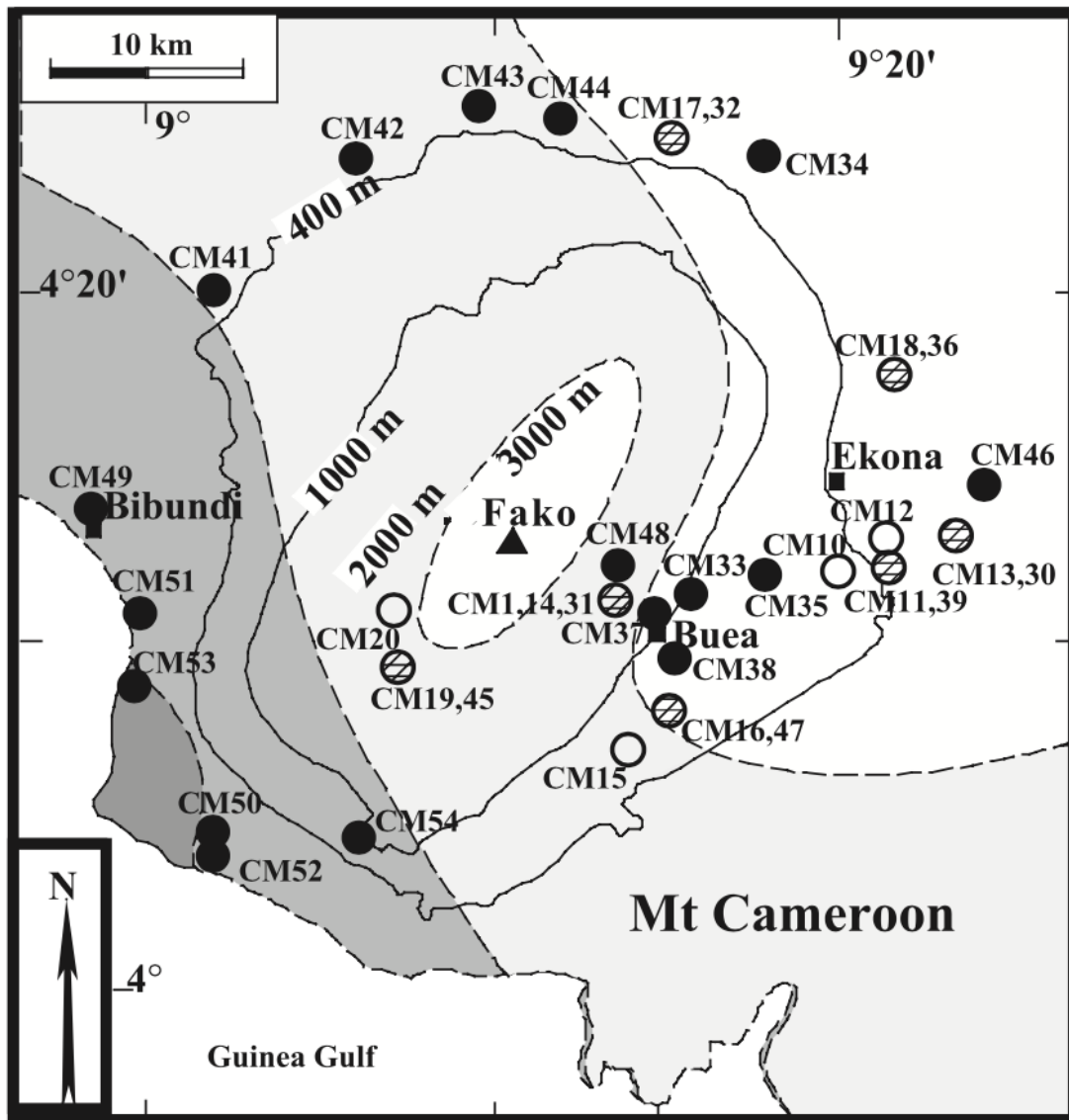


Fig. 1. (a) General location map showing the location of the Cameroon Line in West Africa (modified from Lee et al., 1994). (b) Mount Cameroon sampling location map showing elevations (m) and rainfalls expressed in mm per year (Sieffermann, 1973). The sample locations are reported as full circles for samples recovered during the wet season (March 1997), open circles dry season (December 1996) while samples recovered at both seasons are represented by patterned circles.

(b)



Mean Annual Rainfalls






-  Water samples (dry season)
-  Water samples (wet season)
-  Water samples (dry and wet seasons)

Fig. 1 (continued).

Table 1
Physico-chemical parameters of the water samples recovered all around the Mount Cameroon

Sample	Water type	Alt (m)	pH	Na (µM)	K (µM)	Mg (µM)	Ca (µM)	H ₄ SiO ₄ (µM)	Cl (µM)	F (µM)	SO ₄ (µM)	Alk. (µM)	NO ₃ (µM)	Fe (µM)	Al (µM)	
<i>December 1996 (dry season)</i>																
Low altitude																
CM13	Stream	50	7.81	809	152	488	370	792	111	4	94	2277	40	n.m.	n.m.	
CM18	Spring	100	7.67	1039	187	309	198	625	104	9	163	1715	40	n.m.	n.m.	
CM11	**	130	6.78	561	112	434	378	782	54	3	11	2165	74	n.m.	n.m.	
CM12	Spring	150	7.7	641	127	473	379	801	50	4	15	2367	43	n.m.	n.m.	
CM17	Spring	220	7.08	1091	205	586	331	815	101	7	112	2700	106	n.m.	n.m.	
CM10	Spring	350	6.8	628	123	426	411	792	59	3	9	2255	70	n.m.	n.m.	
CM15	Spring	600	7.58	435	86	353	272	670	37	3	5	1705	37	n.m.	n.m.	
CM16	Stream	700	8	358	83	244	240	568	29	4	6	1325	44	n.m.	n.m.	
CM1	Spring	1850	6.39	277	59	150	176	568	14	4	2	970	<q.l.	n.m.	n.m.	
CM14	Spring	1850	6.67	282	65	160	190	566	12	4	3	975	12	n.m.	n.m.	
CM19	Spring	2180	7.2	200	33	57	97	397	7	5	2	520	9	n.m.	n.m.	
CM20	Spring	2400	7.14	160	41	39	59	276	4	5	<q.l.	385	10	n.m.	n.m.	
<i>May 1997 (wet season)</i>																
Low altitude																
CM30	Stream	60	7.72	759	160	536	386	814	130	8	125	2400	<q.l.	109	97	
CM32	Spring	185	6.93	1029	207	563	350	860	123	9	121	2540	69	46	69	
CM34	Spring	97	7.7	1324	238	496	262	761	110	13	128	2590	<q.l.	70	75	
CM36	Spring	85	7.36	992	189	294	186	645	110	11	192	1602	<q.l.	37	172	
CM39	**	144	6.78	756	163	422	370	800	57	5	19	2238	<q.l.	83	71	
CM42	Spring	315	6.93	403	98	435	422	863	33	5	17	2138	<q.l.	224	95	
CM43	Stream	297	8.22	1208	201	775	420	1034	85	10	112	3677	<q.l.	130	103	
CM44	Spring	155	6.98	982	188	476	380	897	52	5	26	2596	<q.l.	64	71	
CM46	Stream	39	7.98	870	168	404	230	664.6	111	9	104	2017	<q.l.	1134	517	
CM49	Stream	0	6.73	1551	103	205	141	370	1485	3	71	610	<q.l.	221	187	
CM50	**	0	7.66	457	101	170	164	539	74	8	39	1068	<q.l.	51	358	
CM51	Spring	0	7.16	217	58	100	137	430	33.2	2	22	674	<q.l.	41	206	
CM52	Spring	0	7.07	632	120	178	144	541	97	11	32	1114	<q.l.	29	106	
CM33	Spring	987	6.5	56	14	353	271	539	29	1	14	1290	35	202	20	
CM35	**	645	6.96	478	92	301	288	667	56	4	15	1705	<q.l.	63	63	
CM37	**	1019	6.76	392	87	247	231	556	29	4	15	1343	<q.l.	79	200	
CM38	**	830	8.05	840	167	248	239	838	57	11	24	1867	<q.l.	52	63	
CM40	Spring	500	6.51	76	10	88	103	275	22	2	15	428	<q.l.	263	75	
CM41	Spring	448	7.78	574	114	271	291	621	59	5	20	1580	<q.l.	121	160	
CM47	Stream	674	7.96	397	95	233	228	589.6	32	5	14	1324	<q.l.	96	516	
CM54	Spring	887	7.2	71	32	128	160	357.6	34	3	19	631	<q.l.	321	0	
CM31	Spring	1850	6.58	101	355	184	216	471	28	5	14	1200	<q.l.	98	126	
CM45	Spring	2180	6.95	196	37	62	94	430	11	5	6	550	<q.l.	689	353	
CM48	Spring	2365	7.25	112	69	129	174	336	35	2	26	655	<q.l.	215	1625	

n.m. refers to not measured sample, < q.l. refers to below the quantification limit and ** refers to a spring catchment for water supply. All samples were filtered at 0.1 µm. Samples for cation content analysis were acidified.

Table 2

Sr and U concentrations expressed in μM and nM , respectively, as well as $^{87}\text{Sr}/^{86}\text{Sr}$ and $^{234}\text{U}/^{238}\text{U}$ isotopic ratios are reported

	Sample	Water type	Alt (m)	Sr (μM)	$^{87}\text{Sr}/^{86}\text{Sr}$	2σ	U (nM)	$^{234}\text{U}/^{238}\text{U}$	2σ	R	
<i>December 1996 (dry season)</i>											
Low altitude	CM13	Stream	50	1.403	0.703476	0.000007	0.87	1.200	0.0028	63,279	
	CM18	Spring	100	0.548	0.703437	0.000007	0.53	1.138	0.0027	46,369	
	CM11	**	130	1.654	0.703474	0.000006	0.59	1.277	0.0055	62,391	
	CM12	Spring	150	1.552	0.703439	0.000008	0.53	1.250	0.0022	47,237	
	CM17	Spring	220	1.198	0.703499	0.000007	0.92	1.142	0.0027	73,434	
	CM10	Spring	350	1.768	0.703456	0.000007	0.63	1.241	0.0037	54,555	
Medium altitude	CM15	Spring	600	1.415	0.703550	0.000008	0.40	1.184	0.0035	96,446	
	CM16	Stream	700	1.244	0.703541	0.000007	0.16	1.160	0.0050	92,329	
High altitude	CM1	Spring	1850	0.958	0.703453	0.000007	n.m.	n.m.	n.m.	53,265	
	CM14	Spring	1850	0.981	0.703465	0.000006	0.06	1.060	0.0050	58,462	
	CM19	Spring	2180	0.536	0.703397	0.000005	0.04	1.060	0.0200	29,452	
	CM20	Spring	2400	0.399	0.703514	0.000009	0.03	1.095	0.0170	80,115	
<i>May 1997 (wet season)</i>											
Low altitude	CM30	Stream	60	1.370	0.703496	0.000007	1.18	1.192	0.0036	72,084	
	CM32	Spring	185	1.346	0.703545	0.000007	1.18	1.123	0.0040	94,153	
	CM34	Spring	97	0.873	0.703477	0.000007	1.05	1.106	0.0033	63,723	
	CM36	Spring	85	0.563	0.703462	0.000007	0.49	1.140	0.0045	57,166	
	CM39	**	144	1.693	0.703457	0.000007	0.55	1.273	0.0033	54,993	
	CM42	Spring	315	1.649	0.703595	0.000008	0.34	1.127	0.0034	117,380	
	CM43	Stream	297	1.344	0.703500	0.000008	1.05	1.153	0.0035	73,858	
	CM44	Spring	155	1.601	0.703540	0.000007	1.34	1.230	0.0030	91,894	
	CM46	Stream	39	0.842	0.704049	0.000007	0.76	1.106	0.0035	367,450	
	CM49	Stream	0	0.854	0.704868	0.000007	n.m.	n.m.	n.m.	1,121,800	
	CM50	**	0	0.531	0.703716	0.000007	0.13	1.089	0.0040	176,740	
	CM51	Spring	0	0.607	0.703526	0.000007	0.06	n.m.	n.m.	85,536	
	CM52	Spring	0	0.517	0.703443	0.000007	0.55	1.133	0.0022	48,950	
	Medium altitude	CM33	Spring	987	0.878	0.703677	0.000007	0.11	1.075	0.0600	157,110
		CM35	**	645	1.500	0.703436	0.000007	0.29	1.169	0.0044	45,961
		CM37	**	1019	1.303	0.703470	0.000008	0.17	1.059	0.0036	60,645
CM38		**	830	0.951	0.703410	0.000006	0.42	1.053	0.0037	34,929	
CM40		Spring	500	0.650	0.703513	0.000007	0.03	1.070	0.0600	79,687	
CM41		Spring	448	1.383	0.703554	0.000008	0.71	1.397	0.0030	98,280	
CM47		Stream	674	1.259	0.703512	0.000007	0.17	1.150	0.0046	79,233	
CM54		Spring	887	1.194	0.703438	0.000007	n.m.	n.m.	n.m.	46,803	
High altitude		CM31	Spring	1850	1.207	0.703491	0.000007	0.09	1.059	0.0030	69,866
		CM45	Spring	2180	0.559	0.703415	0.000008	0.06	1.040	0.0115	37,016
	CM48	Spring	2365	0.724	0.703827	0.000007	0.07	1.038	0.0050	235,520	
	P0	Rain	919	0.027	0.707780	0.000010	n.m.	n.m.	n.m.	–	
	P1	Rain	919	0.015	0.706296	0.000008	n.m.	n.m.	n.m.	–	
	P2	Rain	919	0.036	0.706754	0.000010	n.m.	n.m.	n.m.	–	
	P3	Rain	919	0.018	0.706219	0.000010	n.m.	n.m.	n.m.	–	

Error bars at the 95% confidence limit (2σ) are also reported as well as R corresponding to water–rock ratios (see text for calculation). Uranium data are taken from Riotte et al. (in press).

n.m. refers to unmeasured sample and ** refers to a spring catchment for water supply.

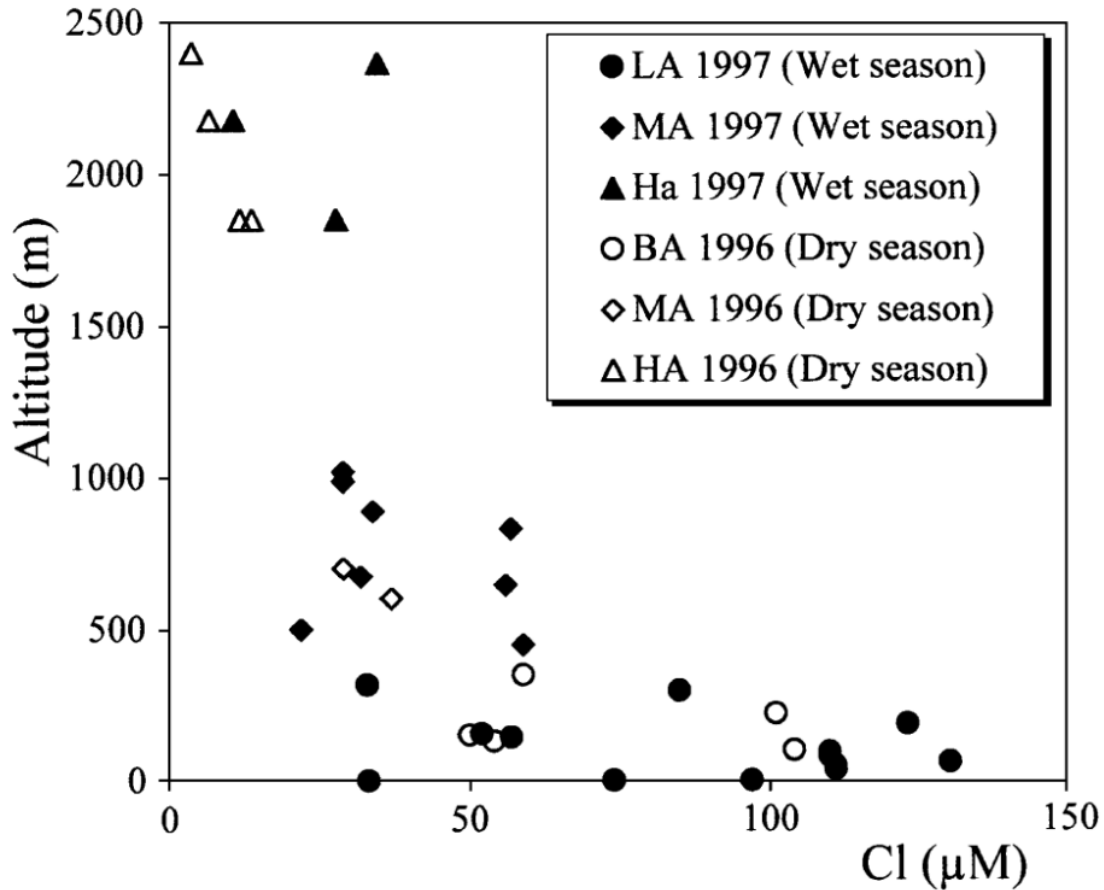


Fig. 2. Chloride concentrations expressed in μM as function of the elevation (m). LA corresponds to samples recovered at low elevation (below 400 m), while MA corresponds to samples whose elevation range in between 400 and 1850 m and HA characterizes samples higher than 1850 m. The open symbols correspond to dry season collected samples (December 1996) while the full symbols correspond to samples recovered during the short rainy season (March 1997). Circles are reported for low-elevation samples. Medium-elevation samples are plotted with diamonds while high-elevation samples are reported with triangles.

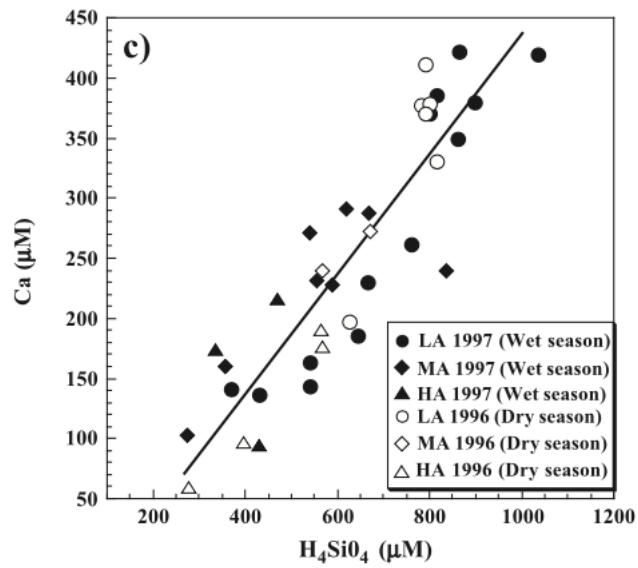
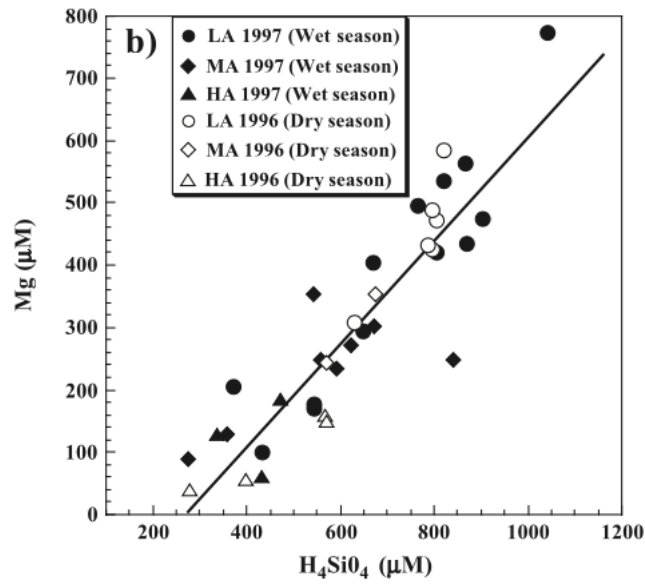
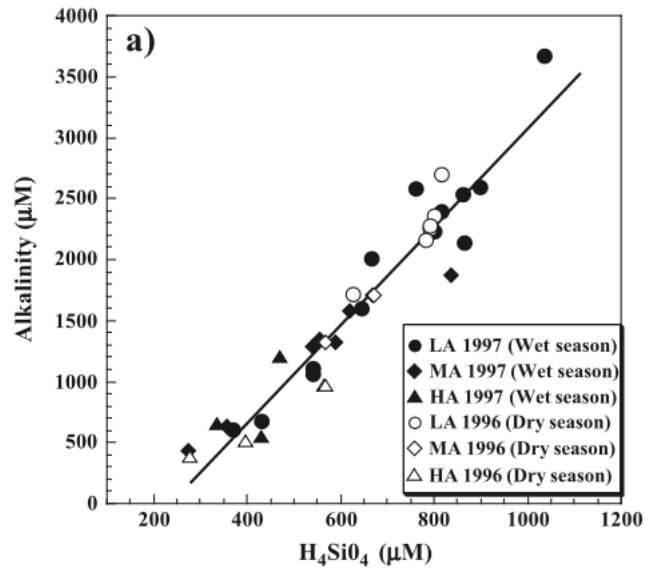


Fig. 3. (a) Alkalinity (μM) is reported versus dissolved silica (μM). (b) Mg (μM) versus dissolved silica (μM) and (c) Ca (μM) versus dissolved silica (μM). LA corresponds to samples recovered at low elevation (below 400 m), while MA corresponds to samples whose elevation range in between 400 and 1850 m and HA characterizes samples higher than 1850 m. The open symbols correspond to dry season collected samples (December 1996) while the full symbols correspond to samples recovered during the short rainy season (March 1997). Circles are reported for low-elevation samples. Medium-elevation samples are plotted with diamonds while high-elevation samples are reported with triangles.

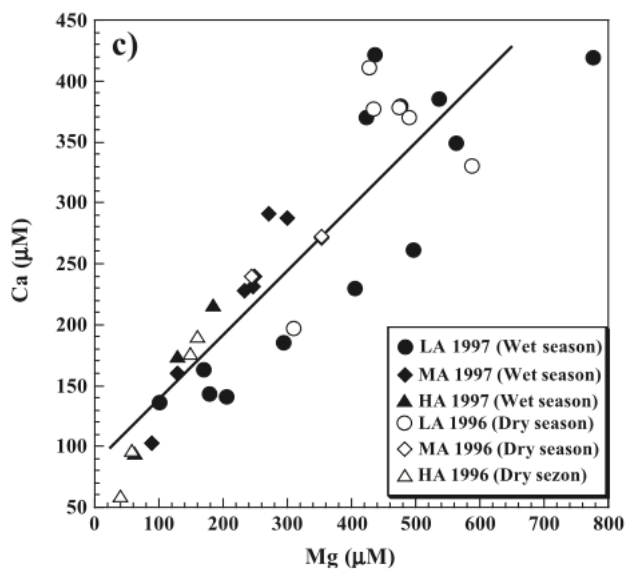
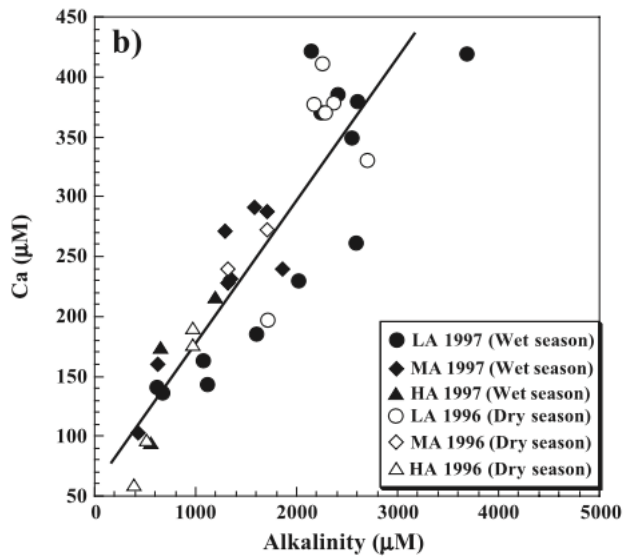
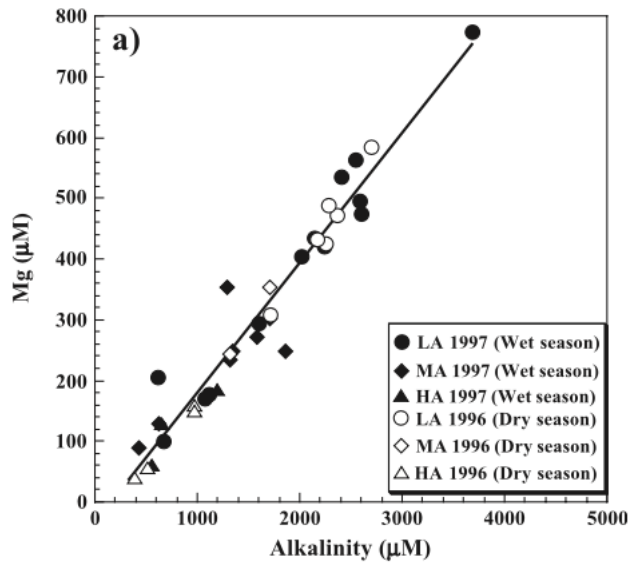
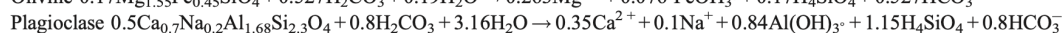
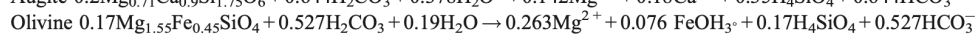
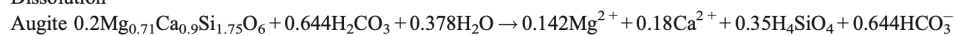


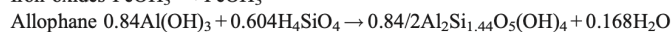
Fig. 4. (a) Mg (μM) is reported versus Alkalinity (μM). (b) Ca (μM) versus Alkalinity (μM) and (c) Ca (μM) versus Mg (μM). LA corresponds to samples recovered at low elevation (below 400 m), while MA corresponds to samples whose elevation range in between 400 and 1850 m and HA characterizes samples higher than 1850 m. The open symbols correspond to dry season collected samples (December 1996) while the full symbols correspond to samples recovered during the short rainy season (March 1997). Circles are reported for low-elevation samples. Medium-elevation samples are plotted with diamonds while high-elevation samples are reported with triangles.

Table 3
Reactions involving the major minerals used in the mass-balance calculations

Dissolution



Precipitation



$\text{Al}(\text{OH})_3$ and $\text{Fe}(\text{OH})_3$ stand for all dissolved species of Fe and Al.

Table 4

Comparison between calculated and measured element ratios

Element ratio	Measured		Calculated
	Ratio	r^2	
Mg/Si	0.83	0.90	0.35
Ca/Si	0.49	0.90	0.5
Alkalinity/Si	3.99	0.96	1.69
Ca/Alkalinity	0.12	0.89	0.25
Mg/Alkalinity	0.21	0.97	0.21
Ca/Mg	0.53	0.89	1.30

r^2 is the correlation coefficient corresponding to the regression lines in Figs. 3 and 4.

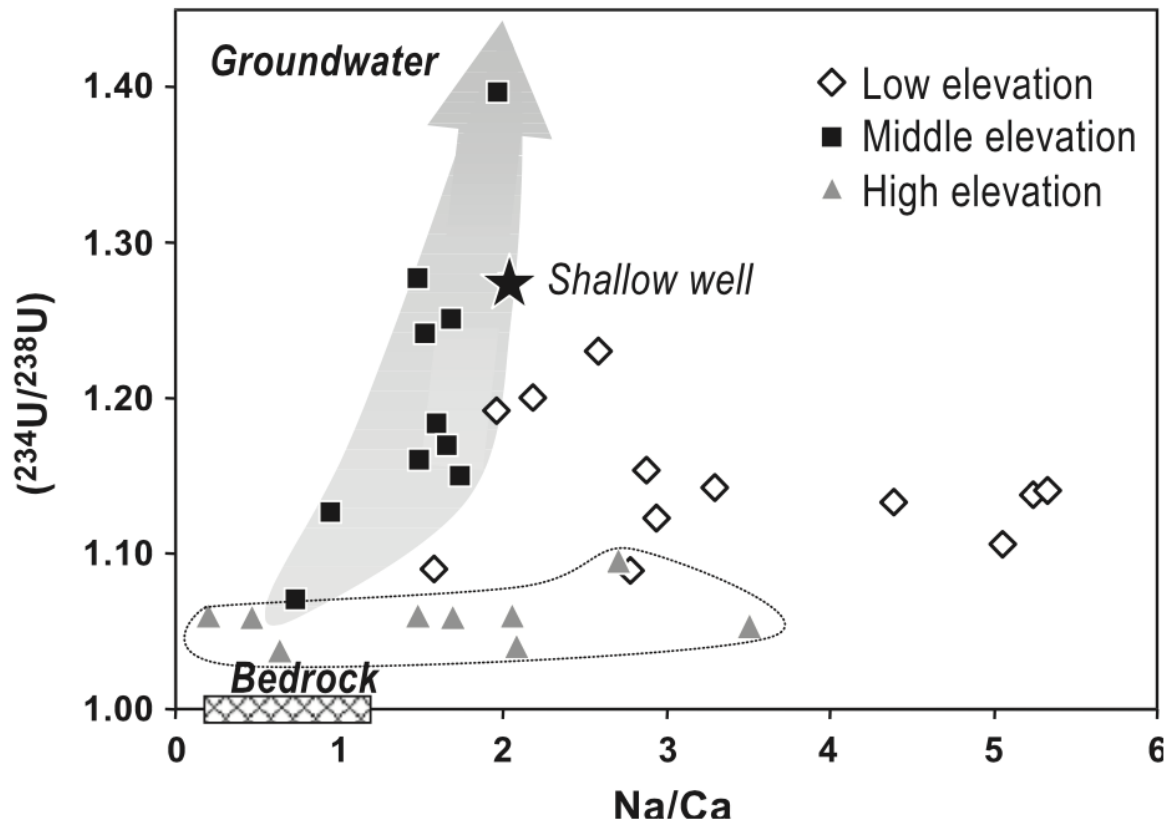


Fig. 5. Evolution of $(^{234}\text{U}/^{238}\text{U})$ a.r. with the Na/Ca ratio. The open diamonds correspond to the low-elevation water samples, the black squares in a greyed area to the mid-elevation ones. The gray triangles in a dotted outline characterise samples from high elevation. For comparison, the bedrock chemical composition (cross ruled field) from Bulourde (2001) and from Déruelle et al. (1987) is also reported, assuming that its $(^{234}\text{U}/^{238}\text{U})$ a.r. is about 1.

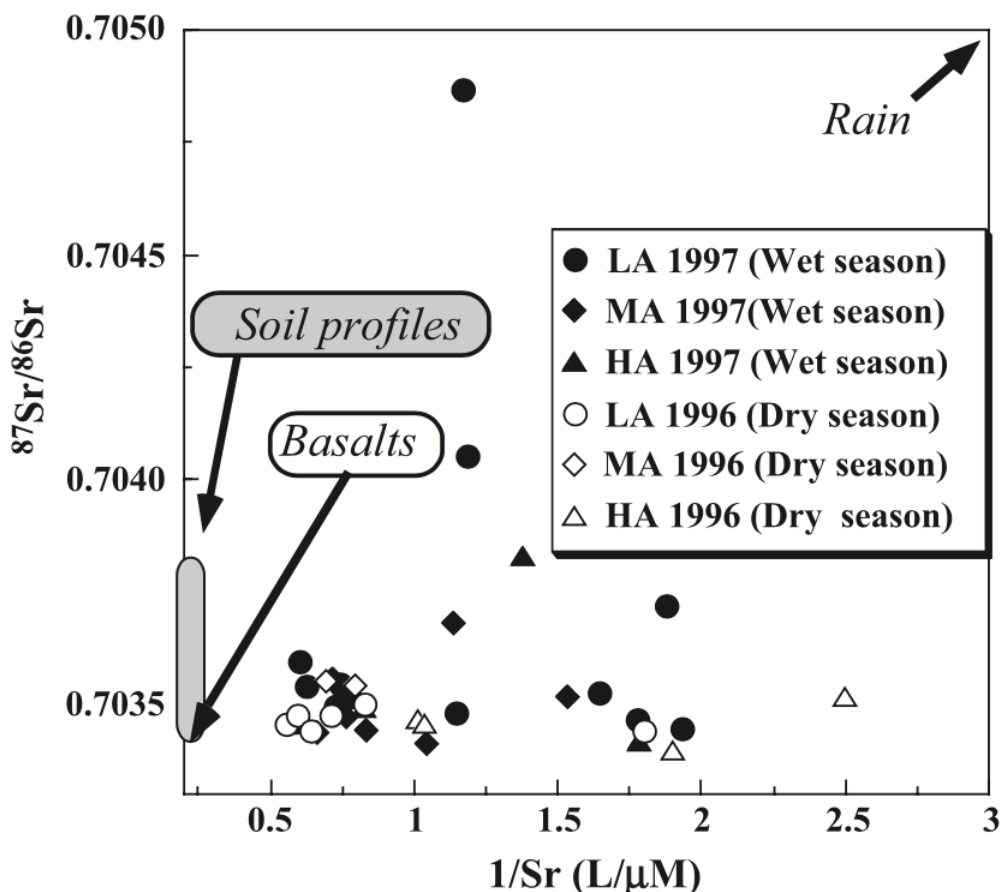


Fig. 6. $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios are reported versus $(1/\text{Sr})$ expressed in $(\mu\text{mol/l})^{-1}$. LA corresponds to samples recovered at low elevation (below 400 m), while MA corresponds to samples whose elevation range in between 400 and 1850 m and HA characterizes samples higher than 1850 m. The open symbols correspond to dry season collected samples (December 1996) while the full symbols correspond to samples recovered during the short rainy season (March 1997). Circles are reported for low-elevation samples. Medium-elevation samples are plotted with diamonds while high-elevation samples are reported with triangles. Basalt and associated soil profile developed onto sample $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios are also reported (Bulourde, 2001; Bulourde et al., submitted for publication). The arrow figures the rain data out of scale.

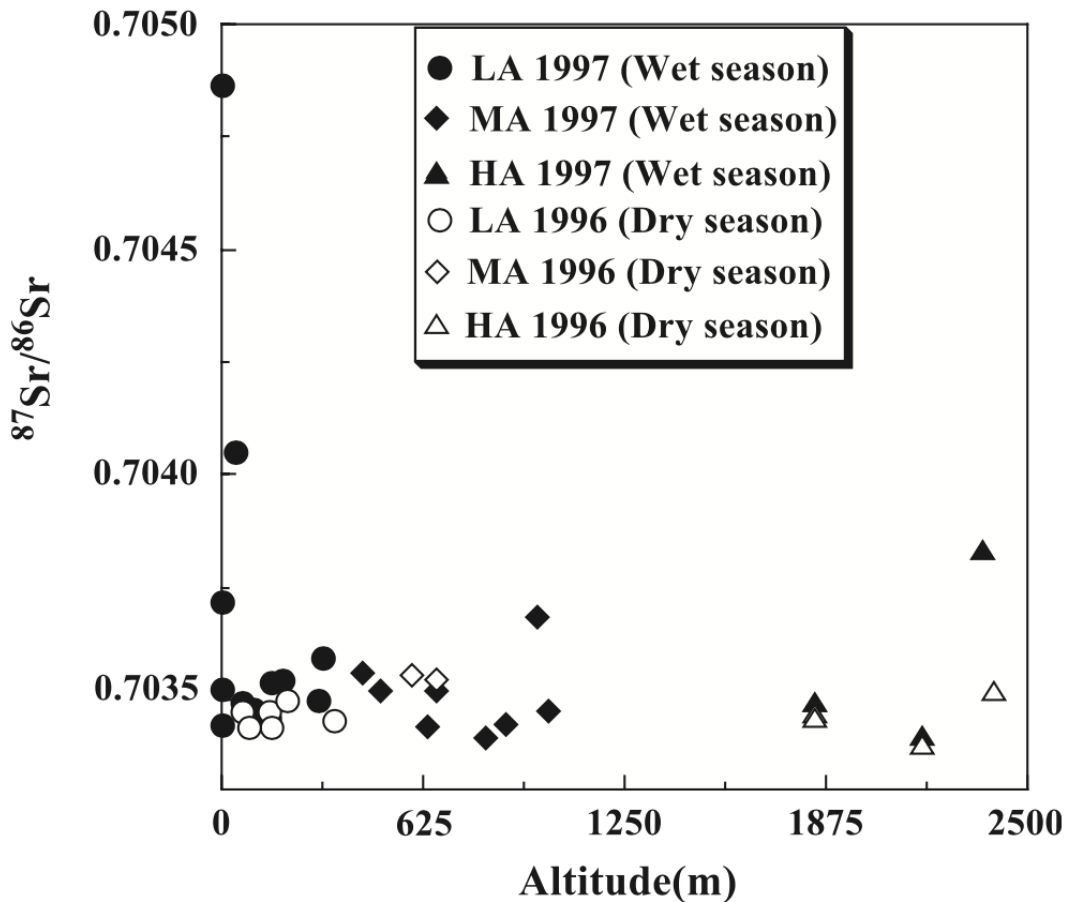


Fig. 7. $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic ratios are reported versus elevations (m). LA corresponds to samples recovered at low elevation (below 400 m), while MA corresponds to samples whose elevation range in between 400 and 1850 m and HA characterizes samples higher than 1850 m. The open symbols correspond to dry season collected samples (December 1996) while the full symbols correspond to samples recovered during the short rainy season (March 1997). Circles are reported for low-elevation samples. Medium-elevation samples are plotted with diamonds while high-elevation samples are reported with triangles.