Successive Modes of Carbonate Precipitation in Microbialites along the Hydrothermal Spring of La Salsa in Laguna Pastos Grandes (Bolivian Altiplano)

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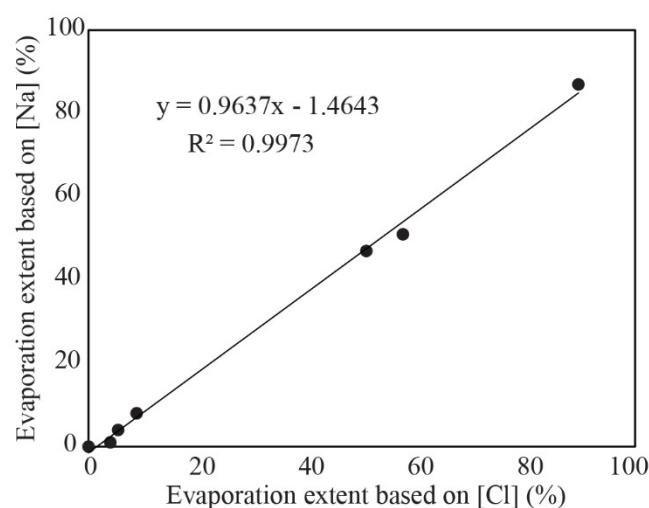
Figure S1. Evaporation extent (%) calculated with Na and Cl concentration along La Salsa transect.
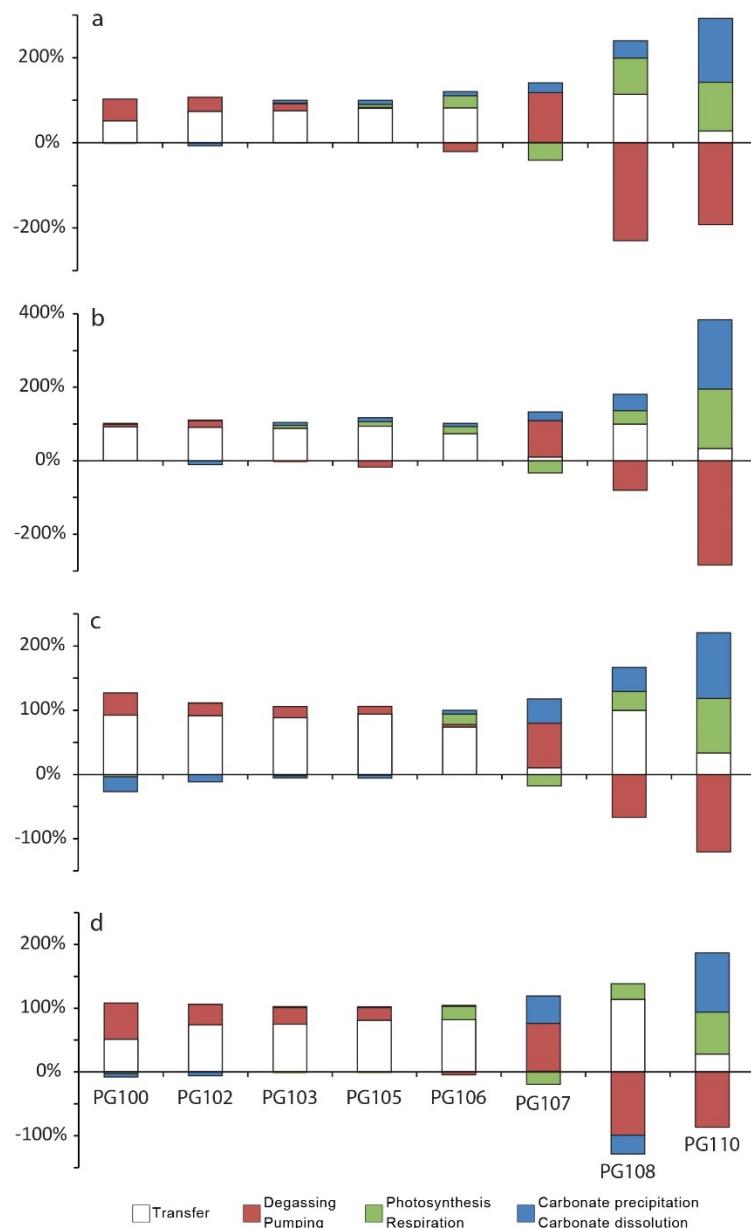
Figure S2. Results of the 4 modes of calculation of the DIC isotope mass balance modeling relying on a) Ca concentration to estimate carbonate precipitation and the measured alkalinity and pH to estimate the DIC (presented in the main text); b) Ca concentration to estimate carbonate precipitation and the measured DIC; c) the measured DIC to estimate the carbonate precipitation and the DIC; and d) the measured alkalinity and pH to estimate the carbonate precipitation and the DIC. In (a) and (d), the values of PG108 are divided by 10. Because the alkalinity measurement in PG107 was underestimated perhaps due to carbonate precipitation in the tube, the model relying on alkalinity measurement (d) gives different results for PG108 than the 3 other models.
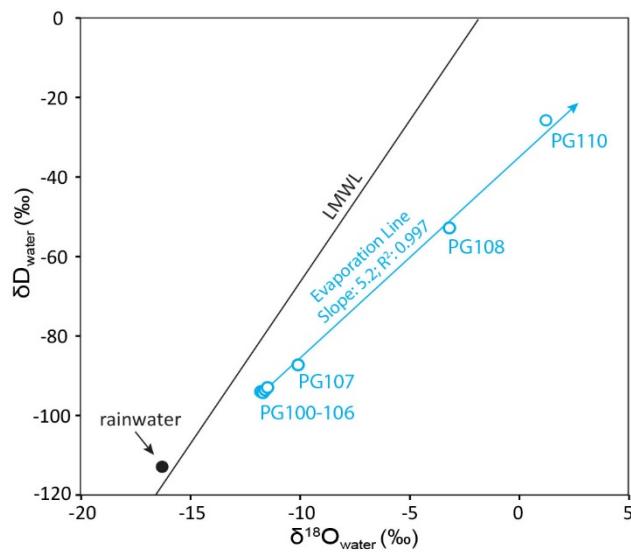
Figure S3. Downstream evolution of the δ^{18}O-δD composition of the water. The Local meteoric water line (LMWL [74]) and rainwater composition [38] are given for comparison.
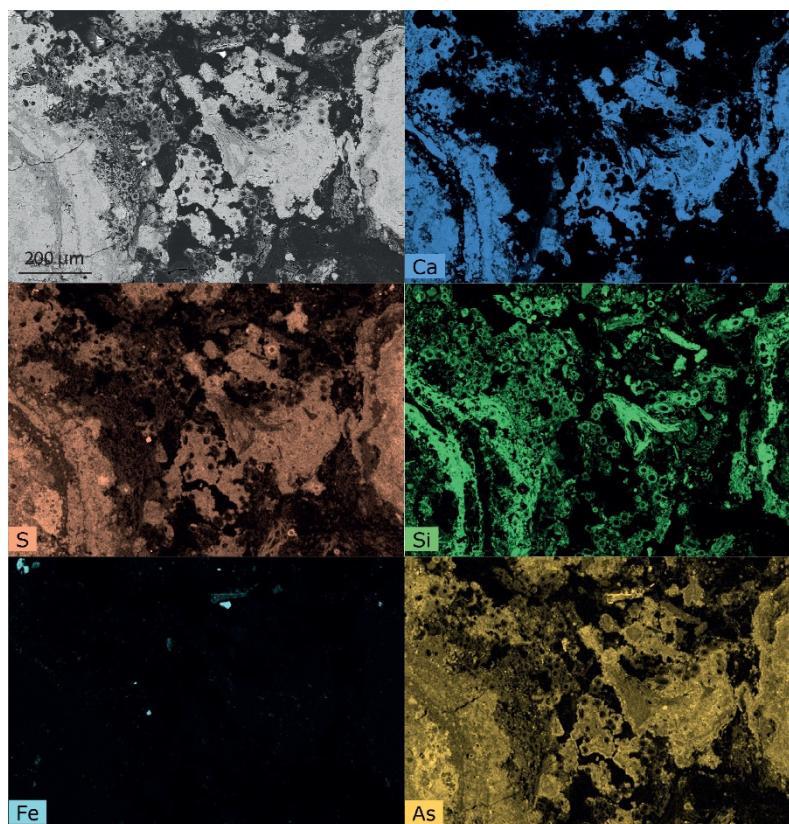

Figure S4. Backscattered electron (BSE) image and corresponding EDX maps of Ca (dark blue), S (orange), Si (green), Fe (light blue) and As (yellow) of the microbial mat associated with shrubs of PG108 embedded in LRwhite resin.

Table S1. Internal consistency of pH, alkalinity and DIC measurements calculated on PHREEQC.

		Option 1			Option 2			
	pH	DIC (mM ±10%)	Alkalinity PHREEQC	Bal%	Alkalinity (mM ±1%)	DIC PHREEQC	Bal%	ΔDIC %
PG100	6.9	9.7	8.5	3.9	7.38	8.4	4.2	13
PG101	5.8	10.5	3.6	-0.8	5.7	16.3	-1.2	-55
PG102	6.3	9.6	6.0	4.6	7.6	12.1	4.3	-26
PG103	6.65	8.8	7.0	2.8	7.48	9.4	2.7	-7
PG105	7.2	8.4	8.0	2.4	7.34	7.8	2.5	8
PG106	8.12	6.5	7.2	2.9	7.34	6.6	2.8	-2
PG107	8.8	1.2	4.4	0.2	*3.03**	0.1	0.3	89
PG108	8.64	1.4	4.0	-3.6	4.43	1.8	-3.7	-27
PG110	7.71	2	4.5	-1.2	4.56	2.0	-1.2	-2

Table S2. Alkalinity, DIC and major elements concentrations corrected from the evaporation effect and used for the isotopic mass balance calculations.

	PG100	PG101	PG102	PG103	PG105	PG106	PG107	PG108	PG110
Alkalinity (mM)	7.38	5.66	7.57	7.18	6.94	6.70	2.1	1.88	0.47
DIC	8.4	16.3	12.1	9.1	7.3	6.0	0.6	0.8	0.21
Na^+	173.2	207.7	205.3	199.2	201.4	203.0	189.6	175.0	182.1
K^+	12.5	12.3	12.2	11.7	12.0	12.1	11.3	10.3	12.1
Ca^{2+}	10.1	9.9	11.0	10.2	9.3	8.6	7.2	6.9	5.8
Mg^{2+}	5.2	5.2	5.4	5.1	5.1	5.1	4.8	4.5	5.0
SO_4^{2-}	2.3	3.0	2.7	2.4	3.2	2.8	2.4	2.4	2.1
Cl^-	196.6	254.6	226.4	226.4	226.4	226.4	226.4	226.4	226.4
Li^+	9.9	9.9	9.9	9.6	9.8	9.9	9.3	8.6	9.7
Sr^{2+}	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Fe	0	0	0.003	0.01	0.01	0	0	0	0
B	3.3	3.1	3.3	3.2	3.2	3.3	3.1	2.9	2.8
Br^-	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.05	0.04
SiO_2 (mg/l)	115.9	115.9	113.7	111.3	105.5	88.1	54.9	49.2	11.3

Table S3. Errors of the DIC isotope mass balance along the hydrological profile of La Salsa obtained using the Monte Carlo method (Anderson, 1976). Each parameter was calculated 1000 times by random drawing within ±1 sigma around the mean value.

	PG100	PG102	PG103	PG105	PG106	PG107	PG108	PG110
P_{transf}	1%	1%	1%	1%	1%	0.1%	2%	0.1%
$P_{deg-pump}$	1%	2%	3%	4%	5%	4%	34%	22%
$P_{fix-resp}$	1%	2%	2%	2%	4%	2%	17%	10%
P_{carb}	1%	1%	2%	2%	2%	2%	17%	12%

Table S4. Comparison of the results obtained with the 4 modes of calculation of the DIC isotope mass balance modeling.

	PG100	PG102	PG103	PG105	PG106	PG107	PG108	PG110
Alkalinity and Ca								
P_{transf}	52%	74%	75%	81%	82%	1%	1071%	28%
$P_{deg-pump}$	51%	33%	17%	3%	-20%	116%	-2174%	-192%
$P_{fix-resp}$	-2%	0%	2%	7%	28%	-41%	818%	114%
P_{carb}	-1%	-7%	6%	10%	10%	23%	384%	150%
DIC and Ca								
P_{transf}	92%	91%	89%	94%	74%	10%	100%	33%
$P_{deg-pump}$	7%	18%	-4%	-17%	-2%	99%	-81%	-284%
$P_{fix-resp}$	3%	1%	8%	12%	19%	-33%	36%	161%
P_{carb}	-2%	-10%	8%	10%	9%	24%	45%	189%
DIC								
P_{transf}	92%	91%	89%	94%	74%	10%	100%	33%
$P_{deg-pump}$	34%	19%	17%	12%	4%	70%	-67%	-121%
$P_{fix-resp}$	-4%	1%	-2%	-1%	16%	-18%	29%	85%
P_{carb}	-23%	-11%	-4%	-5%	6%	38%	38%	102%
Alkalinity								
P_{transf}	52%	74%	75%	81%	82%	1%	1140%	28%
$P_{deg-pump}$	57%	32%	26%	20%	-5%	75%	-993%	-87%
$P_{fix-resp}$	-3%	0%	-2%	-2%	21%	-19%	246%	66%
P_{carb}	-5%	-6%	2%	1%	2%	43%	-292%	93%