

Supplement Table 1.

Data on cave air CO₂ concentrations and dripwater amount. Magnesium, strontium and calcium concentrations, Mg/Ca and Sr/Ca molar ratios for dripwater and host rock samples. Pearson coefficient *r* for Mg/Ca and Sr/Ca; *p*<0.001 for every dripwater sampling location except for the site NG-9. Samples marked with * are treated as outliers. For explanation, please refer to the main text.

Sample name	Date of sample collection	Cave air CO ₂	Dripwater amount	Mg	Sr	Ca	Sr/Ca	Mg/Ca	Pearson coefficient <i>r</i>
NG-2	05/10/2022	3613	1.98	949	89	73979	0.5	21	0.98
NG-2	03/11/2022	3190	1.01	929	91	62704	0.7	24	
NG-2	01/12/2022	933	0.98	925	85	61445	0.6	25	
NG-2	29/12/2022	882	13.15	913	86	65639	0.6	23	
NG-2	02/02/2023	940	49.29	995	90	72045	0.6	23	
NG-2	01/03/2023	658	30.75	912	96	74451	0.6	20	
NG-2	04/04/2023	928	35.63	1019	99	69394	0.7	24	
NG-2	09/05/2023	2488	38.06	949	94	67760	0.6	23	
NG-2	01/06/2023	4379	21.63	937	83	70949	0.5	22	
NG-2	05/07/2023	6802	11.48	981	90	76897	0.5	21	
NG-2*	25/07/2023	6706	0.23	1270	137	68394	0.9	31	
NG-2	30/08/2023	7600	0.12	997	83	87056	0.4	19	
NG-2	27/09/2023	5427	0.16	977	85	75134	0.5	21	
NG-2	26/10/2023	5450	0.76	958	82	73862	0.5	21	
NG-2	30/11/2023	1114	1.31	876	86	52887	0.7	27	
NG-2	28/12/2023	887	0.40	893	82	34885	1.1	42	
NG-2	31/01/2024	775	2.96	926	86	43308	0.9	35	
NG-2	29/02/2024	1211	3.53	910	84	45408	0.9	33	
NG-3	05/10/2022	3613	0.49	719	81	72297	0.5	16	0.97
NG-3	03/11/2022	3190	0.49	794	84	73028	0.5	18	
NG-3	01/12/2022	933	0.40	760	79	50084	0.7	25	
NG-3	29/12/2022	882	0.54	750	80	38798	0.9	32	
NG-3	02/02/2023	940	0.88	813	84	40754	0.9	33	
NG-3	01/03/2023	658	0.64	779	91	44293	0.9	29	
NG-3	04/04/2023	928	0.85	818	87	40955	1.0	33	
NG-3	09/05/2023	2488	0.52	805	87	48841	0.8	27	
NG-3	01/06/2023	4379	0.62	832	82	58071	0.6	24	
NG-3	05/07/2023	6802	0.85	887	87	72019	0.6	20	
NG-3*	25/07/2023	6706	0.50	1280	145	71615	0.9	29	
NG-3	30/08/2023	7600	0.95	867	77	84309	0.4	17	
NG-3	27/09/2023	5427	0.75	900	89	86331	0.5	17	
NG-3	26/10/2023	5450	0.75	990	84	81761	0.5	20	
NG-3	30/11/2023	1114	0.78	873	87	54322	0.7	27	
NG-3	28/12/2023	887	0.72	807	80	37389	1.0	36	
NG-3	31/01/2024	775	1.10	924	89	39372	1.0	39	
NG-3	29/02/2024	1211	0.96	879	85	53073	0.7	27	
NG-8	05/10/2022	3613	0.31	1308	92	54492	0.8	40	0.97
NG-8	03/11/2022	3190	0.19	1317	93	53427	0.8	41	
NG-8	01/12/2022	933	0.14	1384	88	42105	1.0	54	
NG-8	29/12/2022	882	1.06	1267	88	36668	1.1	57	
NG-8	02/02/2023	940	1.90	1362	93	36381	1.2	62	
NG-8	01/03/2023	658	0.93	1243	98	34664	1.3	59	
NG-8	04/04/2023	928	0.62	1354	98	33518	1.3	67	

Supplement Table 1. Continued.

Sample name	Date of sample collection	Cave air CO ₂	Dripwater amount	Mg	Sr	Ca	Sr/Ca	Mg/Ca	Pearson coefficient r
		Dripwater							
		ppm	L	ppb	ppb	ppb	mmol/mol	mmol/mol	
NG-8	09/05/2023	2488	0.50	1392	98	36478	1.2	63	
NG-8	01/06/2023	4379	0.28	1388	92	47489	0.9	48	
NG-8	05/07/2023	6802	0.38	1494	98	60591	0.7	41	
NG-8*	25/07/2023	6706	0.23	1610	135	58696	1.1	45	
NG-8	30/08/2023	7600	0.38	1466	91	74619	0.6	32	
NG-8	27/09/2023	5427	0.24	1346	101	63467	0.7	35	
NG-8	26/10/2023	5450	0.25	1435	92	61212	0.7	39	
NG-8	30/11/2023	1114	0.29	1254	93	44208	1.0	47	
NG-8	28/12/2023	887	0.29	1294	87	31547	1.3	68	
NG-8	31/01/2024	775	0.40	1440	95	30239	1.4	79	
NG-8	29/02/2024	1211	0.34	1346	95	34030	1.3	65	
NG-9	05/10/2022	3613	0.09	2157	109	81519	0.6	44	0.47
NG-9	03/11/2022	3190	0.02	1195	84	66935	0.6	29	
NG-9	01/12/2022	933	0.12	2008	85	64410	0.6	51	
NG-9	29/12/2022	882	0.15	1191	79	50400	0.7	39	
NG-9	02/02/2023	940	0.53	795	91	66669	0.6	20	
NG-9	01/03/2023	658	0.19	689	89	44904	0.9	25	
NG-9	04/04/2023	928	0.09	1010	77	45059	0.8	37	
NG-9	09/05/2023	2488	0.11	1055	82	50642	0.7	34	
NG-9	01/06/2023	4379	0.14	1296	88	67428	0.6	32	
NG-9	05/07/2023	6802	0.08	811	89	75315	0.5	18	
NG-9*	25/07/2023	6706	0.07	986	125	72866	0.8	22	
NG-9	30/08/2023	7600	0.11	998	86	93659	0.4	18	
NG-9	27/09/2023	5427	0.05	835	88	81395	0.5	17	
NG-9	26/10/2023	5450	0.09	905	80	86085	0.4	17	
NG-9	30/11/2023	1114	0.09	1577	97	56341	0.8	46	
NG-9	28/12/2023	887	0.17	1622	82	52942	0.7	51	
NG-9	31/01/2024	775	0.16	1047	78	50561	0.7	34	
NG-9	29/02/2024	1211	0.17	776	79	48950	0.7	26	
NG-10	05/10/2022	3613	0.30	1189	94	80293	0.5	24	0.97
NG-10	03/11/2022	3190	0.27	1186	94	67362	0.6	29	
NG-10	01/12/2022	933		1275	91	54115	0.8	39	
NG-10	29/12/2022	882		1158	92	42448	1.0	45	
NG-10	02/02/2023	940	0.34	1165	91	42801	1.0	45	
NG-10	01/03/2023	658	0.28	1091	101	51148	0.9	35	
NG-10	04/04/2023	928	0.33	1138	95	39589	1.1	47	
NG-10	09/05/2023	2488		1128	96	42790	1.0	43	
NG-10	01/06/2023	4379	0.14	1106	85	55534	0.7	33	
NG-10	05/07/2023	6802		1213	94	74593	0.6	27	
NG-10*	25/07/2023	6706		1695	165	78601	1.0	36	
NG-10	30/08/2023	7600	0.34	1272	90	87810	0.5	24	
NG-10	27/09/2023	5427	0.26	1135	97	74846	0.6	25	
NG-10	26/10/2023	5450	0.27	1282	89	74398	0.5	28	
NG-10	30/11/2023	1114	0.27	1128	93	50409	0.8	37	
NG-10	28/12/2023	887	0.21	1112	93	37378	1.1	49	
NG-10	31/01/2024	775	0.26	1214	94	35750	1.2	56	
NG-10	29/02/2024	1211	0.28	1128	94	45227	1.0	41	

Supplement Table 1. Continued.

Sample name	Date of sample collection	Cave air CO ₂	Dripwater amount	Mg	Sr	Ca	Sr/Ca	Mg/Ca	Pearson coefficient r
		Dripwater							
		ppm	L	ppb	ppb	ppb	mmol/mol	mmol/mol	
NG-11	05/10/2022	3613	24.06	671	79	72971	0.5	15	0.94
NG-11	03/11/2022	3190	19.70	684	80	70363	0.5	16	
NG-11	01/12/2022	933	19.04	722	79	68587	0.5	17	
NG-11	29/12/2022	882	25.01	705	80	60819	0.6	19	
NG-11	02/02/2023	940	32.13	723	81	56358	0.7	21	
NG-11	01/03/2023	658	22.82	674	87	59236	0.7	19	
NG-11	04/04/2023	928	27.99	712	83	55986	0.7	21	
NG-11	09/05/2023	2488	26.98	684	82	57881	0.6	19	
NG-11	01/06/2023	4379	16.38	666	74	62387	0.5	18	
NG-11	05/07/2023	6802	24.50	714	79	73866	0.5	16	
NG-11*	25/07/2023	6706	14.81	950	126	69460	0.8	23	
NG-11	30/08/2023	7600	24.60	688	73	82857	0.4	14	
NG-11	27/09/2023	5427	19.66	687	81	73400	0.5	15	
NG-11	26/10/2023	5450	23.69	753	74	79376	0.4	16	
NG-11	30/11/2023	1114	26.48	664	81	64932	0.6	17	
NG-11	28/12/2023	887	23.00	672	80	50496	0.7	22	
NG-11	31/01/2024	775	30.05	695	80	56015	0.7	20	
NG-11	29/02/2024	1211	25.44	715	80	57099	0.6	21	
NG-12	05/10/2022	3613	0.31	999	85	55841	0.7	30	0.96
NG-12	03/11/2022	3190	0.21	950	84	51690	0.7	30	
NG-12	01/12/2022	933	0.20	1080	81	42646	0.9	42	
NG-12	29/12/2022	882	0.61	935	82	38151	1.0	40	
NG-12	02/02/2023	940	1.08	957	83	40389	0.9	39	
NG-12	01/03/2023	658	0.91	889	88	40920	1.0	36	
NG-12	04/04/2023	928	0.54	946	86	49060	0.8	32	
NG-12	09/05/2023	2488	0.43	911	85	40752	1.0	37	
NG-12	01/06/2023	4379	0.30	1011	85	53609	0.7	31	
NG-12	05/07/2023	6802	0.43	944	83	71569	0.5	22	
NG-12*	25/07/2023	6706	0.49	1349	144	73298	0.9	30	
NG-12	30/08/2023	7600	0.89	999	83	75246	0.5	22	
NG-12	27/09/2023	5427	0.86	1051	97	83350	0.5	21	
NG-12	26/10/2023	5450	0.61	1054	79	66373	0.5	26	
NG-12	30/11/2023	1114	0.52	980	87	46058	0.9	35	
NG-12	28/12/2023	887	0.74	996	87	36398	1.1	45	
NG-12	31/01/2024	775	1.00	1052	90	37830	1.1	46	
NG-12	29/02/2024	1211	0.88	1049	92	42873	1.0	40	
NG-13	05/10/2022	3613	0.59	605	97	95630	0.5	10	0.97
NG-13	03/11/2022	3190	0.27	664	98	84038	0.5	13	
NG-13	01/12/2022	933	0.19	673	94	60354	0.7	18	
NG-13	29/12/2022	882	0.46	654	95	58848	0.7	18	
NG-13	02/02/2023	940	2.85	667	102	73901	0.6	15	
NG-13	01/03/2023	658	1.76	634	111	69850	0.7	15	
NG-13	04/04/2023	928	1.28	645	103	50639	0.9	21	
NG-13	09/05/2023	2488	1.15	628	104	59870	0.8	17	
NG-13	01/06/2023	4379	1.18	628	96	69805	0.6	15	
NG-13	05/07/2023	6802	1.05	637	98	79506	0.6	13	
NG-13*	25/07/2023	6706	0.62	832	156	83567	0.9	16	

Supplement Table 1. Continued.

Sample name	Date of sample collection	Cave air CO ₂	Dripwater amount	Mg	Sr	Ca	Sr/Ca	Mg/Ca	Pearson coefficient r
		Dripwater							
		ppm	L	ppb	ppb	ppb	mmol/mol	mmol/mol	
NG-13	30/08/2023	7600	1.10						
NG-13	27/09/2023	5427	0.87	615	102	89845	0.5	11	
NG-13	26/10/2023	5450	0.79	667	92	88361	0.5	12	
NG-13	30/11/2023	1114	0.71	618	102	58147	0.8	18	
NG-13	28/12/2023	887	0.72	666	105	45006	1.1	24	
NG-13	31/01/2024	775	1.32	638	102	47252	1.0	22	
NG-13	29/02/2024	1211	1.20	682	109	52908	0.9	21	
NG-14	05/10/2022	3613	0.34	582	87	74328	0.5	13	0.95
NG-14	03/11/2022	3190	0.23	656	86	56423	0.7	19	
NG-14	01/12/2022	933	0.22	620	79	50851	0.7	20	
NG-14	29/12/2022	882	9.81	623	77	61212	0.6	17	
NG-14	02/02/2023	940	18.70	712	85	61975	0.6	19	
NG-14	01/03/2023	658	6.24	596	87	49356	0.8	20	
NG-14	04/04/2023	928	11.49	639	84	52839	0.7	20	
NG-14	09/05/2023	2488	20.06	675	88	64118	0.6	17	
NG-14	01/06/2023	4379	22.08	684	81	75121	0.5	15	
NG-14	05/07/2023	6802	7.44	702	86	79724	0.5	15	
NG-14*	25/07/2023	6706	2.49	879	137	74091	0.8	20	
NG-14	30/08/2023	7600	2.99	653	82	89366	0.4	12	
NG-14	27/09/2023	5427	0.86	618	90	78408	0.5	13	
NG-14	26/10/2023	5450	0.58						
NG-14	30/11/2023	1114	0.52	601	88	44968	0.9	22	
NG-14	28/12/2023	887	3.99	599	79	48537	0.7	20	
NG-14	31/01/2024	775	8.42	630	83	44267	0.9	23	
NG-14	29/02/2024	1211	8.11	635	83	50730	0.7	21	
NG-15	05/10/2022	3613		1214	97	82825	0.5	24	0.89
NG-15	03/11/2022	3190	0.56	1176	94	64709	0.7	30	
NG-15	01/12/2022	933		1288	89	64660	0.6	33	
NG-15	29/12/2022	882	1.93	1119	90	58381	0.7	32	
NG-15	02/02/2023	940	2.78	1159	91	51180	0.8	37	
NG-15	01/03/2023	658	1.68	1069	99	51113	0.9	35	
NG-15	04/04/2023	928	1.90	1093	94	54927	0.8	33	
NG-15	09/05/2023	2488	2.95	1097	95	56309	0.8	32	
NG-15	01/06/2023	4379	0.35	1104	84	62876	0.6	29	
NG-15	05/07/2023	6802	0.52	1212	91	70169	0.6	28	
NG-15*	25/07/2023	6706	0.88	1398	136	67917	0.9	34	
NG-15	30/08/2023	7600	0.44	1231	87	85998	0.5	24	
NG-15	27/09/2023	5427	0.81	1109	95	73935	0.6	25	
NG-15	26/10/2023	5450	0.55	662	80	76816	0.5	14	
NG-15	30/11/2023	1114	0.64	1128	94	53774	0.8	35	
NG-15	28/12/2023	887		1152	94	46174	0.9	41	
Host rock									
				ppm	ppm	ppm	mmol/mol	mmol/mol	
NG-WR-1				1351	242	288275	0.4	8	
NG rock 1				1121	237	272236	0.4	7	

Supplement Table 2.

Monthly average data on cave air temperature and relative humidity.

Month and year	Temperature	Relative humidity
	°C	%
Jan-23	11.43	100
Feb-23	11.43	100
Mar-23	11.42	100
Apr-23	11.41	100
May-23	11.42	100
Jun-23	11.42	100
Jul-23	11.42	100
Aug-23	11.42	100
Sep-23	11.42	100
Oct-23	11.42	100
Nov-23	11.42	100
Dec-23	11.42	100
Jan-24	11.42	100
Feb-24	11.43	100