

Electronic supplementary information (ESI) Data Table 1: Analytical results of AgCl chemical reagents.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE% ₀
Run1	AgCl (Kanto)-1	FsLA/266/90µm/60µmRR/10Hz	1.24710	1.37447	0.44838	1.37405	0.00697	2.35163	2.78126	0.00587	0.338457	0.000028	0.08
Run2	AgCl (Kanto)-2	FsLA/266/90µm/60µmRR/10Hz	1.26567	1.26985	0.45384	1.26730	0.00648	4.05255	2.78868	0.00526	0.338441	0.000028	0.08
Run3	AgCl (Kanto)-3	FsLA/266/90µm/60µmRR/10Hz	1.26381	1.25177	0.45146	1.25002	0.00722	2.01327	2.79924	0.00554	0.338404	0.000028	0.08
Run4	AgCl (Kanto)-4	FsLA/266/90µm/60µmRR/10Hz	1.23059	1.16671	0.43908	1.16565	0.00567	1.43368	2.80256	0.00463	0.338409	0.000041	0.12
Run5	AgCl (Kanto)-5	FsLA/266/90µm/60µmRR/10Hz	1.22319	1.09309	0.43599	1.09074	0.00551	1.49246	2.80542	0.00491	0.338415	0.000039	0.11
Run6	AgCl (Kanto)-6	FsLA/266/90µm/60µmRR/10Hz	1.21169	1.09001	0.43158	1.08730	0.00535	1.40365	2.80744	0.00538	0.338414	0.000035	0.10
Run7	AgCl (Kanto)-7	FsLA/266/90µm/60µmRR/10Hz	1.21768	1.15146	0.43334	1.14991	0.00513	1.32773	2.80984	0.00447	0.338419	0.000030	0.09
Run8	AgCl (Kanto)-8	FsLA/266/90µm/60µmRR/10Hz	1.24096	1.22894	0.44114	1.22798	0.00504	1.43219	2.81291	0.00485	0.338432	0.000030	0.09
Run9	AgCl (Kanto)-9	FsLA/266/90µm/60µmRR/10Hz	1.24538	1.06363	0.44246	1.06461	0.00498	3.24254	2.81450	0.00651	0.338424	0.000030	0.09
Run10	AgCl (Kanto)-10	FsLA/266/90µm/60µmRR/10Hz	1.20311	1.09667	0.42773	1.09518	0.00482	1.35935	2.81264	0.00468	0.338432	0.000032	0.09
Run11	AgCl(ARD)-1	FsLA/266/90µm/60µmRR/10Hz	1.18659	1.10210	0.42174	1.10263	0.00441	1.40093	2.81345	0.00562	0.338477	0.000023	0.07
Run12	AgCl(ARD)-2	FsLA/266/90µm/60µmRR/10Hz	1.16315	1.08845	0.41349	1.08929	0.00452	1.41065	2.81286	0.00540	0.338508	0.000046	0.14
										2SD	0.338419	0.000042	0.12
Run19	AgCl (Kanto)-13	FsLA/266/90µm/60µmRR/10Hz	1.18867	1.07806	0.42151	1.07849	0.00410	1.66750	2.81995	0.00421	0.338782	0.000045	0.13
Run20	AgCl (Kanto)-14	FsLA/266/90µm/60µmRR/10Hz	1.18240	1.04422	0.41916	1.04436	0.00404	1.31332	2.82081	0.00503	0.338796	0.000041	0.12
Run21	AgCl (Kanto)-15	FsLA/266/90µm/60µmRR/10Hz	1.20148	1.06497	0.42575	1.06581	0.00394	1.44155	2.82184	0.00562	0.338792	0.000047	0.14
Run22	AgCl (Kanto)-16	FsLA/266/90µm/60µmRR/10Hz	1.21500	1.16895	0.43071	1.16791	0.00458	1.55259	2.82076	0.00442	0.338767	0.000047	0.14
Run24	AgCl (Kanto)-18	FsLA/266/90µm/60µmRR/10Hz	1.18137	1.18246	0.41866	1.18424	0.00396	1.36615	2.82170	0.00621	0.338813	0.000039	0.12
Run25	AgCl (Kanto)-19	FsLA/266/90µm/60µmRR/10Hz	1.21482	1.04673	0.43029	1.04803	0.00391	3.58446	2.82307	0.00538	0.338859	0.000032	0.09
Run26	AgCl (Kanto)-20	FsLA/266/90µm/60µmRR/10Hz	1.23623	1.19046	0.43781	1.19269	0.00391	1.41441	2.82355	0.00569	0.338832	0.000040	0.12
Run27	AgCl (Kanto)-21	FsLA/266/90µm/60µmRR/10Hz	1.25039	1.02189	0.44274	1.02202	0.00390	2.89370	2.82409	0.00547	0.338807	0.000039	0.11
Run28	AgCl (Kanto)-22	FsLA/266/90µm/60µmRR/10Hz	1.23010	1.11882	0.43561	1.12173	0.00382	1.33038	2.82375	0.00685	0.338810	0.000036	0.11
Run29	AgCl (Kanto)-23	FsLA/266/90µm/60µmRR/10Hz	1.22814	1.04690	0.43495	1.04731	0.00375	3.21497	2.82350	0.00441	0.338815	0.000030	0.09
										2SD	0.338809	0.000047	0.14
Run23	AgCl (Kanto)-17	FsLA/266/90µm/60µmRR/15Hz	1.86534	1.56108	0.65828	1.56038	0.00418	4.06443	2.83359	0.00633	0.338926	0.000050	0.15
Run13	AgCl(ARD)-3	FsLA/266/90µm/60µmRR/10Hz	1.15975	1.07913	0.41226	1.07817	0.00462	1.52055	2.81300	0.00491	0.338496	0.000046	0.14
Run14	AgCl(ARD)-4	FsLA/266/90µm/60µmRR/10Hz	1.04261	0.91705	0.37104	0.91844	0.00436	1.25558	2.80829	0.00665	0.338397	0.000042	0.12
Run15	AgCl(SC)-1	FsLA/266/90µm/60µmRR/10Hz	1.18105	0.97017	0.41915	0.97156	0.00415	1.36399	2.81746	0.00627	0.338183	0.000055	0.16
Run16	AgCl(SC)-2	FsLA/266/90µm/60µmRR/10Hz	1.13887	0.99102	0.40448	0.99151	0.00407	1.41826	2.81532	0.00594	0.338314	0.000054	0.16
										2SD	0.338470	0.000100	0.30
Run17	AgCl (Kanto)-11	FsLA/266/90µm/60µmRR/10Hz	1.23072	1.11892	0.43670	1.11874	0.00429	1.73994	2.81802	0.00610	0.338407	0.000030	0.09
Run18	AgCl (Kanto)-12	FsLA/266/90µm/60µmRR/10Hz	1.22283	1.13343	0.43387	1.13324	0.00431	1.59203	2.81826	0.00499	0.338373	0.000036	0.11
										2SD	0.338249	0.000186	0.55

Note: 2SD: 2-standard deviation; SE: standard error (n = 20 for all measurement); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 2: Analytical results of halite samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar/ ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	Halite (MSP)-1	FsLA/266/90µm/60µmRR/10Hz	3.16433	29.11325	1.12947	5.62194	0.88609	6.38801	2.79779	5.17851	0.338945	0.000050	0.15
Run2	Halite (MSP)-2	FsLA/266/90µm/60µmRR/10Hz	3.01383	29.50562	1.07323	5.69715	0.43865	5.41548	2.80432	5.17902	0.338913	0.000046	0.13
Run3	Halite (MSP)-3	FsLA/266/90µm/60µmRR/10Hz	2.98144	29.96153	1.05861	5.78450	0.34557	4.53020	2.81185	5.17964	0.338860	0.000044	0.13
Run4	Halite (MSP)-4	FsLA/266/90µm/60µmRR/10Hz	2.55746	30.49697	0.90838	5.88755	0.47083	4.03771	2.80714	5.17992	0.338856	0.000045	0.13
Run5	Halite (MSP)-5	FsLA/266/90µm/60µmRR/10Hz	2.77787	30.57994	0.98428	5.90290	0.45628	3.68124	2.81886	5.18050	0.338892	0.000041	0.12
Run6	Halite (MSP)-6	FsLA/266/90µm/60µmRR/10Hz	2.79157	30.61126	0.98828	5.90870	0.29402	3.53001	2.82124	5.18072	0.338888	0.000048	0.14
Run7	Halite (MSP)-7	FsLA/266/90µm/60µmRR/10Hz	2.83161	30.72472	1.00176	5.93020	0.46395	3.27959	2.82344	5.18107	0.338892	0.000044	0.13
Run8	Halite (MSP)-8	FsLA/266/90µm/60µmRR/10Hz	2.83764	30.74320	1.00327	5.93384	0.25885	3.13235	2.82528	5.18101	0.338894	0.000040	0.12
Run9	Halite (MSP)-9	FsLA/266/90µm/60µmRR/10Hz	2.60839	30.84238	0.92253	5.95302	0.41134	3.00788	2.81989	5.18097	0.338842	0.000061	0.18
Run10	Halite (MSP)-10	FsLA/266/90µm/60µmRR/10Hz	2.75905	30.91692	0.97495	5.96743	0.66057	2.89249	2.82515	5.18095	0.338855	0.000044	0.13
Run11	Halite (MSP)-11	FsLA/266/90µm/60µmRR/10Hz	2.80213	30.98467	0.98973	5.98055	0.45198	2.77456	2.82864	5.18091	0.338900	0.000044	0.13
Run12	Halite (MSP)-12	FsLA/266/90µm/60µmRR/10Hz	2.81918	30.95933	0.99551	5.97568	0.32190	2.70811	2.82975	5.18089	0.338913	0.000031	0.09
Run13	Halite (MSP)-13	FsLA/266/90µm/60µmRR/10Hz	2.75061	30.95927	0.97128	5.97573	0.31434	2.67036	2.82960	5.18084	0.338889	0.000032	0.09
Run14	Halite (MSP)-14	FsLA/266/90µm/60µmRR/10Hz	2.64747	30.93518	0.93559	5.97126	1.05314	2.73560	2.82535	5.18068	0.338900	0.000046	0.14
Run15	Halite (MSP)-15	FsLA/266/90µm/60µmRR/10Hz	2.77917	30.91214	0.98124	5.96677	0.42234	2.60908	2.82927	5.18072	0.338904	0.000040	0.12
									2SD		0.338891	0.000037	0.11
Run16	Halite (DS)-1	FsLA/266/90µm/60µmRR/10Hz	3.00466	30.83440	1.05985	5.95180	0.05063	2.52586	2.83323	5.18069	0.338865	0.000038	0.11
Run17	Halite (DS)-2	FsLA/266/90µm/60µmRR/10Hz	2.96276	30.91053	1.04504	5.96645	0.04095	2.49826	2.83360	5.18073	0.338858	0.000029	0.09
Run18	Halite (DS)-3	FsLA/266/90µm/60µmRR/10Hz	3.05405	30.88674	1.07702	5.96210	0.03633	2.48154	2.83406	5.18052	0.338874	0.000031	0.09
Run19	Halite (DS)-4	FsLA/266/90µm/60µmRR/10Hz	3.03628	31.00599	1.07059	5.98490	0.04787	2.43812	2.83440	5.18071	0.338840	0.000042	0.12
Run20	Halite (DS)-5	FsLA/266/90µm/60µmRR/10Hz	3.05438	30.89918	1.07675	5.96431	0.05441	2.39294	2.83501	5.18069	0.338832	0.000049	0.15
Run21	Halite (DS)-6	FsLA/266/90µm/60µmRR/10Hz	2.98827	30.98823	1.05351	5.98143	0.05239	2.34780	2.83490	5.18075	0.338831	0.000052	0.15
Run22	Halite (DS)-7	FsLA/266/90µm/60µmRR/10Hz	2.90521	30.88295	1.02455	5.96179	0.04193	2.54452	2.83388	5.18015	0.338819	0.000051	0.15
Run23	Halite (DS)-8	FsLA/266/90µm/60µmRR/10Hz	3.04475	30.93809	1.07422	5.97306	0.05863	2.71829	2.83254	5.17962	0.338784	0.000044	0.13
Run24	Halite (DS)-9	FsLA/266/90µm/60µmRR/10Hz	3.13719	30.90657	1.10690	5.96742	0.05109	2.73010	2.83272	5.17923	0.338764	0.000049	0.15
Run25	Halite (DS)-10	FsLA/266/90µm/60µmRR/10Hz	3.18609	30.94981	1.12400	5.97601	0.05238	2.72807	2.83266	5.17902	0.338749	0.000039	0.11
Run27	Halite (MSP)-16	FsLA/266/90µm/60µmRR/10Hz	3.17609	30.91302	1.12070	5.96946	0.34578	2.73363	2.83167	5.17853	0.338780	0.000028	0.08
Run28	Halite (MSP)-17	FsLA/266/90µm/60µmRR/10Hz	3.17691	30.93035	1.12097	5.97301	0.46721	2.72812	2.83139	5.17836	0.338771	0.000030	0.09

Note: MSP: Modern saltpan; DS: Dead Sea halite; 2SD: 2-standard deviation; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Samples with italics are co-ablation of fluid inclusions and excluded from 2SD calculation.

Electronic supplementary information (ESI) Data Table 3: Analytical results of the Dead Sea and the Salt pan halite samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar/ ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	Halite (MSP)-1	FsLA/266/90µm/60µmRR/10Hz	2.17396	29.01279	0.77510	5.59658	0.45443	4.18295	2.79080	5.18402	0.339196	0.000048	0.14
Run2	Halite (DS)-1	FsLA/266/90µm/60µmRR/10Hz	3.05768	29.18392	1.08240	5.62941	0.06932	3.62440	2.82312	5.18420	0.339180	0.000022	0.07
Run3	Halite (MSP)-2	FsLA/266/90µm/60µmRR/10Hz	2.40631	29.37636	0.85318	5.66657	0.35153	3.32675	2.81034	5.18416	0.339137	0.000049	0.15
Run4	Halite (DS)-2	FsLA/266/90µm/60µmRR/10Hz	3.13046	29.46393	1.10602	5.68338	0.06391	3.10576	2.82877	5.18423	0.339158	0.000021	0.06
Run5	Halite (MSP)-3	FsLA/266/90µm/60µmRR/10Hz	2.39161	29.58195	0.84672	5.70628	0.43277	2.96020	2.81656	5.18411	0.339119	0.000039	0.12
Run6	Halite (DS)-3	FsLA/266/90µm/60µmRR/10Hz	2.89117	29.59736	1.02126	5.70929	0.06616	2.85983	2.82684	5.18407	0.339105	0.000040	0.12
Run7	Halite (DS)-4	FsLA/266/90µm/60µmRR/10Hz	3.09041	29.58530	1.09085	5.70722	0.04552	2.78353	2.83146	5.18384	0.339123	0.000022	0.07
Run8	Halite (MSP)-4	FsLA/266/90µm/60µmRR/10Hz	1.95052	29.66073	0.69141	5.72201	0.57049	2.76150	2.81062	5.18362	0.339030	0.000039	0.12
Run9	Halite (DS)-5	FsLA/266/90µm/60µmRR/10Hz	3.04390	29.66917	1.07437	5.72401	0.07344	2.73323	2.83143	5.18329	0.339081	0.000026	0.08
Run10	Halite (MSP)-6	FsLA/266/90µm/60µmRR/10Hz	2.62943	29.80229	0.92906	5.74968	0.77683	2.69843	2.82338	5.18330	0.339061	0.000046	0.14
Run11	Halite (DS)-6	FsLA/266/90µm/60µmRR/10Hz	3.20327	29.85574	1.12978	5.75993	0.07599	2.63279	2.83382	5.18335	0.339031	0.000029	0.08
Run12	Halite (MSP)-7	FsLA/266/90µm/60µmRR/10Hz	3.11576	29.94030	1.09914	5.77652	0.69788	2.60652	2.83224	5.18311	0.339068	0.000028	0.08
Run13	Halite (DS)-7	FsLA/266/90µm/60µmRR/10Hz	3.08561	29.90995	1.08842	5.77088	0.06426	2.58555	2.83312	5.18291	0.339017	0.000022	0.06
Run14	Halite (MSP)-8	FsLA/266/90µm/60µmRR/10Hz	3.11576	29.94030	1.09914	5.77652	0.69788	2.60652	2.83224	5.18311	0.339068	0.000028	0.08
Run15	Halite (DS)-8	FsLA/266/90µm/60µmRR/10Hz	3.24120	30.09945	1.14284	5.80758	0.21537	2.56764	2.83367	5.18279	0.339003	0.000028	0.08
Run16	Halite (MSP)-9	FsLA/266/90µm/60µmRR/10Hz	2.82642	30.22288	0.99761	5.83154	0.58017	2.55879	2.82875	5.18266	0.339008	0.000038	0.11
Run17	Halite (DS)-9	FsLA/266/90µm/60µmRR/10Hz	3.23183	30.15413	1.13945	5.81849	0.05082	2.53461	2.83464	5.18247	0.338990	0.000031	0.09
Run18	Halite (MSP)-10	FsLA/266/90µm/60µmRR/10Hz	2.84685	30.21642	1.00473	5.83061	0.36500	2.54331	2.82849	5.18238	0.339009	0.000042	0.12
Run19	Halite (DS)-10	FsLA/266/90µm/60µmRR/10Hz	3.17212	30.17985	1.11859	5.82368	0.04362	2.53567	2.83407	5.18227	0.338997	0.000021	0.06
Run20	Halite (MSP)-11	FsLA/266/90µm/60µmRR/10Hz	2.59544	30.24700	0.91661	5.83667	0.71126	2.53792	2.82493	5.18224	0.338992	0.000048	0.14
Run21	Halite (DS)-11	FsLA/266/90µm/60µmRR/10Hz	3.31083	30.14309	1.16706	5.81672	0.06700	2.51969	2.83557	5.18215	0.338981	0.000023	0.07
Run22	Halite (MSP)-12	FsLA/266/90µm/60µmRR/10Hz	2.82152	30.31572	0.99586	5.85026	0.78609	2.56123	2.82913	5.18195	0.338999	0.000032	0.09
Run23	Halite (DS)-12	FsLA/266/90µm/60µmRR/10Hz	3.25925	30.13974	1.14910	5.81610	0.05550	2.54307	2.83483	5.18213	0.338998	0.000023	0.07
Run24	Halite (MSP)-13	FsLA/266/90µm/60µmRR/10Hz	2.75451	30.18394	0.97243	5.82478	0.36654	2.55944	2.82915	5.18200	0.339008	0.000032	0.10
Run25	Halite (DS)-13	FsLA/266/90µm/60µmRR/10Hz	3.27127	30.05115	1.15334	5.79927	0.06720	2.56090	2.83470	5.18189	0.338980	0.000020	0.06
Run26	Halite (MSP)-14	FsLA/266/90µm/60µmRR/10Hz	2.70525	30.04689	0.95527	5.79856	0.67313	2.59445	2.82721	5.18179	0.338995	0.000046	0.14
Run27	Halite (DS)-14	FsLA/266/90µm/60µmRR/10Hz	3.31879	30.02012	1.17010	5.79343	0.06435	2.59599	2.83506	5.18176	0.338969	0.000020	0.06
Run28	Halite (MSP)-15	FsLA/266/90µm/60µmRR/10Hz	2.70525	30.04689	0.95527	5.79856	0.67313	2.59445	2.82721	5.18179	0.338995	0.000046	0.14

Note: MSP: Modern saltpan; DS: Dead Sea halite; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 4: Analytical results of the Mediterranean halites the IAPSO AgCl samples by the Dead Sea halite

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	DeadSea-1	FsLA/266/90um/60umRR/10Hz	2.73207	28.44381	0.97082	5.49664	0.04400	4.44510	2.81189	5.17477	0.338595	0.000035	0.10
Run2	MH1-1	FsLA/266/90um/60umRR/10Hz	2.58745	28.54140	0.91975	5.51572	1.66902	4.31985	2.80942	5.17456	0.338599	0.000041	0.12
Run3	DeadSea-2	FsLA/266/90um/60umRR/10Hz	2.63101	28.71087	0.93446	5.54859	0.04749	4.19072	2.81261	5.17444	0.338554	0.000031	0.09
Run4	MH1-2	FsLA/266/90um/60umRR/10Hz	2.65164	28.78608	0.94164	5.56330	0.01975	4.09115	2.81310	5.17429	0.338651	0.000026	0.08
Run5	DeadSea-3	FsLA/266/90um/60umRR/10Hz	2.71164	28.87364	0.96217	5.58033	0.03111	4.00441	2.81535	5.17419	0.338567	0.000032	0.09
Run6	MH1-3	FsLA/266/90um/60umRR/10Hz	2.75975	28.98451	0.97903	5.60170	0.03181	3.92809	2.81573	5.17424	0.338639	0.000028	0.08
Run7	DeadSea-4	FsLA/266/90um/60umRR/10Hz	2.70541	29.04093	0.95962	5.61265	0.03733	3.87158	2.81634	5.17419	0.338570	0.000029	0.09
Run8	MH1-4	FsLA/266/90um/60umRR/10Hz	2.65407	29.05540	0.94161	5.61543	0.04565	3.81363	2.81516	5.17421	0.338634	0.000031	0.09
Run9	DeadSea-5	FsLA/266/90um/60umRR/10Hz	2.19913	28.98449	0.78184	5.60179	0.02790	3.76469	2.80654	5.17415	0.338503	0.000062	0.18
Run10	MH1-5	FsLA/266/90um/60umRR/10Hz	2.61847	28.90127	0.92882	5.58580	0.04796	3.70236	2.81570	5.17406	0.338621	0.000040	0.12
Run11	DeadSea-6	FsLA/266/90um/60umRR/10Hz	2.90102	28.90145	1.02753	5.58600	0.04023	3.64683	2.82128	5.17391	0.338597	0.000026	0.08
Run12	MH2-1	FsLA/266/90um/60umRR/10Hz	2.69925	28.90585	0.95651	5.58667	0.20824	3.60873	2.81908	5.17407	0.338522	0.000031	0.09
Run13	DeadSea-7	FsLA/266/90um/60umRR/10Hz	2.68154	28.99312	0.95059	5.60342	0.03837	3.61681	2.81808	5.17418	0.338606	0.000031	0.09
Run14	MH2-2	FsLA/266/90um/60umRR/10Hz	2.82194	29.03153	0.99948	5.61087	0.07380	3.59602	2.82109	5.17416	0.338544	0.000036	0.11
Run15	DeadSea-8	FsLA/266/90um/60umRR/10Hz	2.70033	29.03360	0.95705	5.61138	0.03936	3.60163	2.81906	5.17406	0.338603	0.000036	0.11
Run16	MH2-3	FsLA/266/90um/60umRR/10Hz	2.78349	29.00082	0.98606	5.60505	0.14450	3.59440	2.82003	5.17405	0.338535	0.000028	0.08
Run17	DeadSea-9	FsLA/266/90um/60umRR/10Hz	2.63440	29.06036	0.93382	5.61633	0.06582	3.56325	2.81758	5.17427	0.338580	0.000033	0.10
Run18	MH2-4	FsLA/266/90um/60umRR/10Hz	2.73717	29.06827	0.96948	5.61791	0.38532	3.52329	2.82053	5.17422	0.338515	0.000028	0.08
Run19	DeadSea-10	FsLA/266/90um/60umRR/10Hz	2.59270	28.85514	0.91924	5.57736	0.04516	3.54000	2.81786	5.17363	0.338594	0.000036	0.11
Run20	MH2-5	FsLA/266/90um/60umRR/10Hz	2.63498	28.84343	0.93383	5.57548	0.55168	3.53596	2.81695	5.17327	0.338491	0.000039	0.12
Run21	DeadSea-11	FsLA/266/90um/60umRR/10Hz	2.76063	28.84432	0.97811	5.57574	0.03357	3.52556	2.82006	5.17319	0.338592	0.000028	0.08
Run22	IAPSO-1	FsLA/266/90um/60umRR/10Hz	1.06834	28.96953	0.38539	5.60069	0.03255	3.61263	2.77049	5.17250	0.338559	0.000046	0.14
Run23	DeadSea-12	FsLA/266/90um/60umRR/10Hz	2.75929	28.93286	0.97767	5.59332	0.04327	3.53758	2.81991	5.17275	0.338561	0.000027	0.08
Run24	IAPSO-2	FsLA/266/90um/60umRR/10Hz	1.04725	28.99603	0.37796	5.60586	0.03174	3.59922	2.76883	5.17245	0.338545	0.000050	0.15
Run25	DeadSea-13	FsLA/266/90um/60umRR/10Hz	2.64549	28.83788	0.93776	5.57489	0.05882	3.54773	2.81756	5.17282	0.338572	0.000034	0.10
Run26	IAPSO-3	FsLA/266/90um/60umRR/10Hz	1.04990	28.83665	0.37890	5.57507	0.03312	3.63882	2.76804	5.17243	0.338528	0.000062	0.18
Run27	DeadSea-14	FsLA/266/90um/60umRR/10Hz	2.65394	28.84983	0.94103	5.57761	0.04427	3.61448	2.81742	5.17244	0.338583	0.000030	0.09
Run28	IAPSO-4	FsLA/266/90um/60umRR/10Hz	1.08510	28.92366	0.39148	5.59251	0.03373	3.69339	2.76971	5.17186	0.338538	0.000048	0.14
Run29	DeadSea-15	FsLA/266/90um/60umRR/10Hz	2.76149	28.87349	0.97888	5.58242	0.06090	3.65649	2.81854	5.17222	0.338570	0.000031	0.09
Run30	IAPSO-5	FsLA/266/90um/60umRR/10Hz	1.06607	29.00466	0.38492	5.60820	0.03400	3.73406	2.76684	5.17183	0.338520	0.000055	0.16
Run31	DeadSea-16	FsLA/266/90um/60umRR/10Hz	2.66652	28.77822	0.94566	5.56388	0.04983	3.70108	2.81629	5.17233	0.338575	0.000039	0.11

Note: IAPSO: Standard ocean water AgCl; MH1 and MH2: Mediterranean halite samples; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 5: Analytical results of the Cica chemical reagent and the IAPSO AgCl samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	Cica-0	FsLA/266/90µm/60µmRR/10Hz	1.14789	30.88488	0.40982	5.95542	0.00263	2.56481	2.80082	5.18601	0.339251	0.000036	0.11
Run2	IAPSO-1	FsLA/266/90µm/60µmRR/10Hz	1.05530	31.07796	0.37694	5.99318	0.03352	2.40139	2.79863	5.18556	0.339137	0.000036	0.11
Run3	Cica-1	FsLA/266/90µm/60µmRR/10Hz	1.11947	31.22415	0.39956	6.02176	0.00254	2.39531	2.80165	5.18522	0.339205	0.000025	0.07
Run4	IAPSO-2	FsLA/266/90µm/60µmRR/10Hz	1.06918	31.33371	0.38120	6.04327	0.03217	2.24307	2.80341	5.18489	0.339106	0.000040	0.12
Run5	Cica-2	FsLA/266/90µm/60µmRR/10Hz	1.06008	31.42657	0.37814	6.06135	0.00236	2.21867	2.80323	5.18475	0.339165	0.000031	0.09
Run6	IAPSO-3	FsLA/266/90µm/60µmRR/10Hz	1.05865	31.59782	0.37720	6.09488	0.03402	2.15159	2.80566	5.18432	0.339073	0.000039	0.12
Run7	Cica-3	FsLA/266/90µm/60µmRR/10Hz	1.06948	31.66039	0.38139	6.10735	0.00237	2.17542	2.80393	5.18398	0.339146	0.000026	0.08
Run8	IAPSO-4	FsLA/266/90µm/60µmRR/10Hz	1.02634	31.62457	0.36574	6.10130	0.03132	2.66218	2.80501	5.18326	0.339039	0.000043	0.13
Run9	Cica-4	FsLA/266/90µm/60µmRR/10Hz	1.06014	31.83590	0.37874	6.14200	0.00317	2.40627	2.79889	5.18332	0.339053	0.000032	0.09
Run10	IAPSO-5	FsLA/266/90µm/60µmRR/10Hz	1.01379	31.86004	0.36236	6.14695	0.03045	2.35429	2.79655	5.18306	0.339003	0.000036	0.11
Run11	Cica-5	FsLA/266/90µm/60µmRR/10Hz	1.05464	31.92503	0.37618	6.15979	0.00239	2.21253	2.80335	5.18282	0.339075	0.000025	0.07
Run12	IAPSO-6	FsLA/266/90µm/60µmRR/10Hz	1.06423	31.98173	0.37922	6.17095	0.03173	2.16020	2.80527	5.18263	0.338995	0.000042	0.12
Run13	Cica-6	FsLA/266/90µm/60µmRR/10Hz	1.04700	31.97585	0.37346	6.17004	0.00243	2.15611	2.80332	5.18244	0.339073	0.000025	0.07
Run14	IAPSO-7	FsLA/266/90µm/60µmRR/10Hz	1.03191	32.07786	0.36769	6.18972	0.03176	2.05561	2.80554	5.18245	0.339001	0.000033	0.10
Run15	Cica-7	FsLA/266/90µm/60µmRR/10Hz	1.06579	32.08969	0.37942	6.19223	0.00220	2.06158	2.80878	5.18225	0.339070	0.000035	0.10
Run16	IAPSO-8	FsLA/266/90µm/60µmRR/10Hz	1.07806	32.09492	0.38369	6.19333	0.03273	2.00588	2.80892	5.18218	0.339000	0.000040	0.12
Run17	Cica-8	FsLA/266/90µm/60µmRR/10Hz	1.10084	32.20447	0.39157	6.21476	0.00220	1.95515	2.81112	5.18193	0.339054	0.000032	0.10
Run18	IAPSO-9	FsLA/266/90µm/60µmRR/10Hz	1.05098	32.18149	0.37419	6.21044	0.03103	1.99570	2.80795	5.18184	0.338973	0.000033	0.10
Run19	Cica-9	FsLA/266/90µm/60µmRR/10Hz	1.13202	32.27775	0.40242	6.22928	0.00217	1.92247	2.81285	5.18162	0.339047	0.000029	0.08
Run20	IAPSO-10	FsLA/266/90µm/60µmRR/10Hz	1.03273	32.35589	0.36744	6.24434	0.03117	1.89118	2.80992	5.18164	0.338987	0.000034	0.10
Run21	Cica-10	FsLA/266/90µm/60µmRR/10Hz	1.12694	32.36850	0.40073	6.24674	0.00223	1.91497	2.81210	5.18167	0.339056	0.000024	0.07
Run22	IAPSO-11	FsLA/266/90µm/60µmRR/10Hz	1.04560	32.41244	0.37183	6.25539	0.03075	1.84879	2.81117	5.18152	0.338976	0.000029	0.09
Run23	Cica-11	FsLA/266/90µm/60µmRR/10Hz	1.15325	32.40006	0.40975	6.25325	0.00219	1.89936	2.81436	5.18132	0.339062	0.000021	0.06
Run24	IAPSO-12	FsLA/266/90µm/60µmRR/10Hz	1.07520	32.45062	0.38219	6.26298	0.03162	1.82707	2.81263	5.18134	0.338977	0.000034	0.10
Run25	Cica-12	FsLA/266/90µm/60µmRR/10Hz	1.15982	32.43090	0.41191	6.25946	0.00216	1.86718	2.81558	5.18110	0.339069	0.000032	0.10
Run26	IAPSO-13	FsLA/266/90µm/60µmRR/10Hz	1.10786	32.47020	0.39350	6.26704	0.03306	1.79743	2.81488	5.18111	0.338976	0.000039	0.12

Note: IAPSO: Standard ocean water AgCl; Cica: Cica Chemical reagent AgCl; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 6: Analytical results of the JB-1a and the IAPSO AgCl samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	IAPSO-1	FsLA/266/90um/60umRR/10Hz	1.01558	42.97213	0.36164	8.24534	0.02671	2.50021	2.80738	5.21171	0.339557	0.000040	0.12
Run2	JB-1a-3-1	FsLA/266/90um/60umRR/10Hz	0.89162	43.03909	0.31789	8.25977	0.00272	2.37286	2.79071	5.21071	0.339059	0.000053	0.16
Run3	IAPSO-2	FsLA/266/90um/60umRR/10Hz	1.04730	44.22800	0.37321	8.49098	0.02751	2.61520	2.80500	5.20886	0.339460	0.000035	0.10
Run4	JB-1a-3-2	FsLA/266/90um/60umRR/10Hz	0.88536	45.04916	0.31660	8.65137	0.00293	2.67975	2.78227	5.20719	0.338936	0.000049	0.15
Run5	IAPSO-3	FsLA/266/90um/60umRR/10Hz	1.21555	45.82823	0.43223	8.80318	0.03429	2.72225	2.81146	5.20590	0.339308	0.000030	0.09
Run6	JB-1a-3-3	FsLA/266/90um/60umRR/10Hz	1.04898	46.47223	0.37398	8.92918	0.00298	2.77523	2.79232	5.20456	0.338872	0.000042	0.13
Run7	IAPSO-4	FsLA/266/90um/60umRR/10Hz	1.26221	47.32822	0.44883	9.09608	0.03446	2.83024	2.81126	5.20318	0.339202	0.000027	0.08
Run8	JB-1a-4-1	FsLA/266/90um/60umRR/10Hz	1.40935	47.85149	0.50008	9.19941	0.00385	2.87789	2.81505	5.20161	0.338869	0.000031	0.09
Run9	IAPSO-5	FsLA/266/90um/60umRR/10Hz	1.38022	48.74553	0.49043	9.37383	0.03541	2.93174	2.81355	5.20021	0.339094	0.000040	0.12
Run14	IAPSO-8	FsLA/266/90um/60umRR/10Hz	1.17380	46.55539	0.41721	8.94669	0.03027	2.55782	2.81205	5.20367	0.339206	0.000028	0.08
Run15	JB-1a-4-4	FsLA/266/90um/60umRR/10Hz	1.11084	46.81984	0.39504	8.99965	0.00385	2.58208	2.80672	5.20243	0.338879	0.000047	0.14
Run16	IAPSO-9	FsLA/266/90um/60umRR/10Hz	1.23650	47.30603	0.43932	9.09464	0.03258	2.60172	2.81385	5.20156	0.339163	0.000025	0.07
Run17	JB-1a-4-5	FsLA/266/90um/60umRR/10Hz	0.86729	49.56033	0.31046	9.53775	0.96591	2.74931	2.78740	5.19634	0.338838	0.000058	0.17
Run18	IAPSO-10	FsLA/266/90um/60umRR/10Hz	1.28221	49.13315	0.45597	9.45114	0.03280	2.77729	2.81085	5.19868	0.339092	0.000033	0.10
Run5	IAPSO-3	FsLA/266/90um/60umRR/10Hz	1.76983	37.97759	0.65154	7.41319	0.05954	10.00154	2.71537	5.12297	0.336511	0.000042	0.13
Run6	JB-1-21-1	FsLA/266/90um/60umRR/10Hz	2.40993	37.85505	0.87484	7.38922	0.01805	9.77833	2.75389	5.12301	0.336242	0.000061	0.18
Run7	IAPSO-4	FsLA/266/90um/60umRR/10Hz	1.76639	37.98919	0.64935	7.41587	0.05914	9.64216	2.71838	5.12268	0.336472	0.000038	0.11
Run11	JB-1-21-3	FsLA/266/90um/60umRR/10Hz	1.56640	36.91103	0.57614	7.20741	0.01678	9.00215	2.71618	5.12126	0.336170	0.000142	0.42
Run12	IAPSO-6	FsLA/266/90um/60umRR/10Hz	1.76507	37.20469	0.64689	7.26387	0.05958	9.00608	2.72682	5.12189	0.336460	0.000042	0.13
Run13	JB-1-21-4	FsLA/266/90um/60umRR/10Hz	2.09981	37.32320	0.76340	7.28639	0.01468	8.89752	2.74964	5.12232	0.336192	0.000064	0.19
Run14	IAPSO-7	FsLA/266/90um/60umRR/10Hz	1.86345	37.65852	0.68102	7.35127	0.06479	8.86990	2.73468	5.12273	0.336505	0.000045	0.13

Note: IAPSO: Standard ocean water AgCl; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 7: Analytical results of the JB-3 and the IAPSO AgCl samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	IAPSSO-1	FsLA/266/90um/60umRR/10Hz	1.48695	40.21512	0.54722	7.75887	0.04744	9.62503	2.71499	5.18312	0.337611	0.000053	0.16
Run2	JB-3-1-1	FsLA/266/90um/60umRR/10Hz	2.52681	40.34863	0.90920	7.78336	0.01131	9.33211	2.77776	5.18394	0.337902	0.000103	0.30
Run3	IAPSSO-2	FsLA/266/90um/60umRR/10Hz	1.58576	40.85484	0.58105	7.88116	0.05131	9.25345	2.72802	5.18386	0.337907	0.000032	0.09
Run4	JB-3-1-2	FsLA/266/90um/60umRR/10Hz	2.34577	40.74637	0.84512	7.85989	0.01097	8.94691	2.77444	5.18409	0.338048	0.000092	0.27
Run5	IAPSSO-3	FsLA/266/90um/60umRR/10Hz	1.48186	41.18008	0.54400	7.94360	0.04281	8.90561	2.72143	5.18406	0.337972	0.000050	0.15
Run6	JB-3-1-3	FsLA/266/90um/60umRR/10Hz	2.37190	41.14813	0.85365	7.93735	0.01042	8.66790	2.77651	5.18411	0.338132	0.000107	0.32
Run7	IAPSSO-4	FsLA/266/90um/60umRR/10Hz	1.51182	41.52494	0.55360	8.01000	0.04390	8.62043	2.72912	5.18414	0.338007	0.000054	0.16
Run8	JB-3-2-1	FsLA/266/90um/60umRR/10Hz	2.19306	41.52073	0.78988	8.00954	0.01689	8.46294	2.77610	5.18391	0.337806	0.000064	0.19
Run9	IAPSSO-5	FsLA/266/90um/60umRR/10Hz	1.52809	41.90444	0.55864	8.08370	0.04493	8.39345	2.73309	5.18382	0.337997	0.000047	0.14
Run10	JB-3-2-2	FsLA/266/90um/60umRR/10Hz	2.10487	41.83226	0.75870	8.07016	0.01081	8.22602	2.77315	5.18358	0.337807	0.000064	0.19
Run11	IAPSSO-6	FsLA/266/90um/60umRR/10Hz	1.49739	42.11669	0.54731	8.12520	0.04444	8.18966	2.73359	5.18347	0.338002	0.000041	0.12
Run12	JB-3-2-3	FsLA/266/90um/60umRR/10Hz	2.15895	41.98671	0.77707	8.10048	0.01016	8.05183	2.77773	5.18324	0.337810	0.000066	0.20
Run13	IAPSSO-7	FsLA/266/90um/60umRR/10Hz	1.61436	42.33670	0.58769	8.16823	0.04938	8.01100	2.74528	5.18310	0.338038	0.000053	0.16
Run14	JB-3-3-1	FsLA/266/90um/60umRR/10Hz	1.72832	42.30695	0.62699	8.16260	0.00960	7.91880	2.75626	5.18303	0.337980	0.000050	0.15
Run15	IAPSSO-8	FsLA/266/90um/60umRR/10Hz	1.47239	42.56158	0.53776	8.21214	0.04355	7.86026	2.73703	5.18276	0.337952	0.000025	0.08
Run16	JB-3-3-2	FsLA/266/90um/60umRR/10Hz	2.11507	42.55993	0.76136	8.21213	0.00975	7.73134	2.77599	5.18257	0.338013	0.000107	0.32
Run17	IAPSSO-9	FsLA/266/90um/60umRR/10Hz	1.58588	42.89469	0.57695	8.27746	0.04961	7.72711	2.74693	5.18211	0.337969	0.000047	0.14
Run18	JB-3-3-3	FsLA/266/90um/60umRR/10Hz	2.28116	42.64244	0.81896	8.22865	0.00941	7.58444	2.78424	5.18219	0.338000	0.000086	0.25
Run19	IAPSSO-10	FsLA/266/90um/60umRR/10Hz	1.45531	42.87121	0.53092	8.27260	0.04239	7.55299	2.73970	5.18231	0.337992	0.000039	0.12
Run20	JB-3-1-4	FsLA/266/90um/60umRR/10Hz	2.47928	42.79205	0.88777	8.25767	0.00925	7.38918	2.79134	5.18210	0.338185	0.000118	0.35
Run21	IAPSSO-11	FsLA/266/90um/60umRR/10Hz	1.65484	43.00193	0.60000	8.29696	0.05160	7.35776	2.75646	5.18286	0.338133	0.000042	0.13
Run22	JB-3-1-5	FsLA/266/90um/60umRR/10Hz	2.45900	42.83464	0.88034	8.26468	0.00929	7.22060	2.79187	5.18285	0.338248	0.000104	0.31
Run23	IAPSSO-12	FsLA/266/90um/60umRR/10Hz	1.53466	43.13149	0.55769	8.32137	0.04553	7.21836	2.74982	5.18322	0.338188	0.000055	0.16
Run24	JB-3-1-6	FsLA/266/90um/60umRR/10Hz	2.64357	42.79206	0.94449	8.25591	0.01053	7.07419	2.79773	5.18320	0.338328	0.000097	0.29
Run25	IAPSSO-13	FsLA/266/90um/60umRR/10Hz	1.52091	43.13499	0.55248	8.32167	0.04420	7.10014	2.75072	5.18346	0.338252	0.000033	0.10

IAPSO: Standard ocean water AgCl; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.

Electronic supplementary information (ESI) Data Table 8: Outlier analytical results of the JB-1a and JB-3 and the IAPSO AgCl samples.

Run	Sample ID	Remarks	³⁵ Cl*	³⁶ Ar	³⁷ Cl*	³⁸ Ar	³⁹ K*	⁴⁰ Ar ¹ H	³⁵ Cl/ ³⁷ Cl*	³⁶ Ar/ ³⁸ Ar	³⁷ Cl/ ³⁵ Cl	2SE	2SE‰
Run1	IAPSO-1	FsLA/266/90um/60umRR/10Hz	1.67421	37.58972	0.62047	7.33987	0.06119	10.78771	2.69588	5.12131	0.336339	0.000042	0.13
Run2	JB-1-20-1	FsLA/266/90um/60umRR/10Hz	2.85376	37.36291	1.03301	7.29471	0.02073	10.47075	2.76016	5.12192	0.336321	0.000113	0.34
Run3	IAPSO-2	FsLA/266/90um/60umRR/10Hz	1.77872	37.76856	0.65574	7.37389	0.05944	10.35022	2.71030	5.12193	0.336406	0.000039	0.12
Run4	JB-1-20-2	FsLA/266/90um/60umRR/10Hz	2.75999	37.58037	0.99873	7.33609	0.01778	10.05291	2.76174	5.12266	0.336363	0.000125	0.37
Run5	IAPSO-3	FsLA/266/90um/60umRR/10Hz	1.76983	37.97759	0.65154	7.41319	0.05954	10.00154	2.71537	5.12297	0.336511	0.000042	0.13
Run14	IAPSO-7	FsLA/266/90um/60umRR/10Hz	1.86345	37.65852	0.68102	7.35127	0.06479	8.86990	2.73468	5.12273	0.336505	0.000045	0.13
Run15	JB-3-4-1	FsLA/266/90um/60umRR/10Hz	2.91354	37.36214	1.04854	7.29341	0.01317	8.66919	2.77701	5.12274	0.336336	0.000111	0.33
Run16	IAPSO-8	FsLA/266/90um/60umRR/10Hz	1.71864	37.63426	0.62958	7.34668	0.05279	8.66274	2.72796	5.12263	0.336487	0.000046	0.14
Run17	JB-3-4-2	FsLA/266/90um/60umRR/10Hz	2.47563	37.37545	0.89403	7.29568	0.02723	8.41632	2.76794	5.12296	0.336386	0.000128	0.38
Run18	IAPSO-9	FsLA/266/90um/60umRR/10Hz	1.62477	37.56525	0.59611	7.33250	0.04689	8.47005	2.72408	5.12312	0.336601	0.000050	0.15
Run19	JB-3-5-1	FsLA/266/90um/60umRR/10Hz	1.84973	37.43496	0.67456	7.30715	0.01661	8.39756	2.74170	5.12307	0.336359	0.000061	0.18
Run20	IAPSO-10	FsLA/266/90um/60umRR/10Hz	1.73654	37.40401	0.63493	7.30121	0.05079	8.33508	2.73326	5.12299	0.336508	0.000040	0.12

Note: IAPSO: Standard ocean water AgCl; SE: standard error (n = 20); *: signal intensity and isotope ratios from samples.