

GSA Data Repository item 2003130, Table DR1, Ca^{2+} and SO_4^{2-} in ancient seawater (0-544 Ma)

used in Figure 1, Table DR2, Mineral mass balance calculations.

TABLE DR1. Ca^{2+} AND SO_4^{2-} IN ANCIENT SEAWATER (0-544 Ma) USED IN FIGURE 1

Sample	Age (Ma)	Ca^{2+} (mmol/kgH ₂ O)*	SO_4^{2-} (mmol/kgH ₂ O)*	Basin
Modern seawater	0	10.6	28.3	
Upper Miocene [†]	5	7-15	21-29	Red Sea
Middle Miocene [†]	14	9-18	17-26	Eastern Europe
Oligocene [†]	35	12-21	12-21	Mulhouse (France)
Eocene [†]	37	11-20	14-23	Navarra (Spain)
Lower-Upper Cretaceous	94-112	26-34	6-14	Sakhon Nakhon (Laos)
Lower Cretaceous	112-124	31-38	5-12	Congo, Sergipe (Brazil)
Upper Jurassic [†]	150	21-29	7-15	Predobrogea (Ukraine)
Upper Triassic [†]	230	12-21	13-22	Lorraine (France)
Middle Triassic [†]	240	11-20	14-23	Muschelkalk (Switzerland)
Upper Permian	251-258	9-17	18-26	Delaware (USA), Zechstein (Poland)
Lower Permian [†]	270	9-18	16-25	Kansas (USA)
Middle Devonian [†]	380	31-38	5-12	Saskatchewan (Canada)
Silurian	420	29-36	5-12	Michigan (USA) W.Australia
Lower Cambrian	515	34-40	5-11	Siberia (Russia)
Late Proterozoic	544	9-18.5	15.5-25	Oman

* Concentrations estimated from chemical composition of fluid inclusions in halite. Ranges shown assume seawater composition varied from $(m_{\text{Ca}^{2+}})(m_{\text{SO}_4^{2-}}) = 150$ to 450, where m is concentration in millimolality, and value in modern seawater is 300.

[†] Previously reported in (Horita et al., 2002).

TABLE DR2. MINERAL MASS BALANCE CALCULATIONS

Sample	Replacement Dolomite (X10 ⁻³ kg)	Dolomite Cement (X10 ⁻³ kg)	K-Feldspar (X10 ⁻³ kg)	Sample	Replacement Dolomite (X10 ⁻³ kg)	Dolomite Cement (X10 ⁻³ kg)	K-Feldspar (X10 ⁻³ kg)
11A*	14.0	4.4	9.5	58	7.0	2.6	6.7
15A*	4.3	2.9	5.0	58A	8.4	1.9	6.7
41*	32.3	1.7	2.5	66	7.2	3.0	5.8
61*	31.4	6.4	4.7	68	11.3	0.3	7.5
81*	11.9	1.2	8.9	69	10.9	1.8	8.6
29	13.5	4.8	11.1	70	12.1	2.7	9.5
213	10.0	4.3	7.2	72	15.4	1.9	10.6
31	13.2	1.9	10.9	75	11.8	3.7	8.4
153	7.9	4.8	6.7	256	13.9	0.3	8.1
176	19.0	11.8	12.0	257	13.7	0.6	8.1
177	23.4	1.7	6.7	258	13.3	0.9	8.9
187	14.9	2.0	9.2	259	14.1	1.0	8.1
187A	14.5	3.2	8.6	260	13.7	1.0	8.1
190	6.6	3.1	6.1	262	N.D. [†]	N.D. [†]	8.1
190A	4.6	2.8	4.2	21	11.4	6.4	8.6
34	6.5	4.5	3.9	76	9.1	4.5	6.7
2	35.3	8.8	9.7	78	14.8	6.0	10.9
7	8.1	6.5	6.4	79	15.0	6.4	11.1
10	10.3	3.3	8.9	110	5.4	4.1	4.7
35	2.4	3.7	3.3	110A	5.7	3.9	4.7
44	7.7	3.0	7.2	114	8.7	3.7	6.7
45	7.7	3.0	7.8	117	7.3	4.5	6.4
99	8.4	2.1	7.0	120	10.9	5.5	8.9
49	13.3	3.0	8.4	122	15.6	5.8	10.3
51	10.1	3.7	7.2	125	14.0	6.3	9.5
54	12.8	2.7	8.4				

Note: Calculations show mineral masses (X10⁻³ kg) of diagenetic dolomite (replacement and cement) and potassium feldspar cement required to transform evaporated Silurian seawater (Brennan and Lowenstein, 2002) into Silurian-Devonian Illinois basinal brines with the same Cl⁻ molality. Mass balances were calculated per kg H₂O because Silurian seawater and Illinois basinal brines are in concentration units of millimole/kg H₂O.

*Illinois basinal brines from Graf et al. (1966). All other samples from Stueber and Walter (1991).

[†]N.D.= not determined.