MT. SIMON DIAGENESIS

The distribution and composition of diagenetic material has been described both modally (e.g., Templeton, 1951; Hoholick et al., 1984; Duffin et al., 1989) and chemically (e.g., Duffin et al., 1989; Chen et al., 2001). Hoholick et al. (1984) mapped the distribution of dominant cement and porosity types in the Mt. Simon in Illinois based on descriptions of core samples from the basin. The cements are dominantly quartz and K-feldspar and minor amounts of hematite, kaolinite, chlorite, microquartz and carbonate (Hoholick et al., 1984).

METHODS

Sample preparation

Each rock was cut into blocks of ~1 cm^3 and cast in 2.5 cm epoxy rounds with 4 pieces of the quartz standard UWQ-1 ($\delta^{18}O$=12.33‰ VSMOW; Kelly et al., 2007) and one other rock (Fig. DR1). Epoxy rounds were prepared with two samples per mount in order to minimize the time required for sample change and re-standardization. Epoxy mounts have sequential numbering based on when they were prepared (i.e., MSim-1, MSim-2, etc.). Prior to imaging and isotope analysis all samples were cleaned in deionized water and ethyl alcohol and stored in a vacuum desiccator. All analyses are within 5 mm of the center of the mount in order to prevent instrument bias related to position (Kita et al., 2009; Valley and Kita, 2009).

Analytical conditions

Data were collected from spots ~15 μm in diameter during seven sessions between July and December 2009 and from spots ~5 μm in diameter during three sessions between November 2009 and February 2010. A total of 1179 spot analyses (727 sample, 452 standard) were analyzed during the ten sessions.

Two different analytical settings were used: (I) a ~15 μm diameter $^{133}Cs^{+}$ primary beam with an intensity of 2.1 nA, (II) a ~30 pA $^{133}Cs^{+}$ primary beam with a beam spot size of ~5 μm. "Normal" spot size varied from 10 μm to 20 μm and small spot size varied from 5 μm to 6 μm due to slight variability in the primary beam. For clarity in the text, we call these spots 15 μm and 5 μm respectively.

In both settings, the mass resolving power (MRP, M/ΔM), measured at 10% peak height, was set at 2200. The magnetic field strength was held at a constant stable value using a nuclear magnetic resonance (NMR) probe, which is readjusted every 12 hours. For 15 μm spot analyses, two Faraday cup detectors were used to simultaneously collect sputtered $^{16}O^{-}$ and $^{18}O^{-}$ ions with an average $^{16}O^{-}$ intensity of $2.6x10^{9}$ cps. Each spot analysis took about ~4 minutes, which includes 10s of presputtering to penetrate the carbon coat, ~60s to automatically center the secondary ions in the field aperture using high voltage deflectors and 80s (20 cycles of 4s each) of integrating secondary ions.

For small spot analysis, the typical secondary $^{16}O^{-}$ ion intensity was $2.3x10^{7}$ cps. The $^{16}O^{-}$ ions were collected with a Faraday cup while $^{18}O^{-}$ ions were collected with an electron multiplier in pulse counting mode. A single small spot analysis took ~6 minutes which includes ~60s presputtering, ~60s centering of the secondary ions in the field aperture, and ~200s (25 cycles of 8s each) integration of secondary ions. Detailed

descriptions of these analytical conditions and the instrument setup have been published previously (Kelly et al., 2007; Page et al., 2007; Kita et al., 2009; Valley and Kita, 2009).

For quartz analyzed during this study the bias varied, session-to-session, depending on instrument conditions from -4.5‰ to -6.6‰ (average=-5.8‰, *n*=614) for 15 μm spots and from -11.3‰ to -13.6‰ (average=-12.2‰, *n*=113) for 5 μm spots. The precision of each bracket is taken as the reproducibility of a set of individual standard analyses (Valley and Kita, 2009).

Factors influencing $\delta^{18}O(OQ)$

In detail the $\delta^{18}O$(fluid) can vary with temperature, composition, and water/rock (W/R) ratio or flux (e.g., Dickinson, 1987), and the composition of the fluid is influenced by pH, other gas species, and dissolved solids (Horita et al., 1995; Marchand et al., 2002; Hu and Clayton, 2003; Beck et al., 2005). The fractionation of $\delta^{18}O$ between quartz and water in equilibrium is experimentally calibrated at temperatures down to 200°C [$\Delta^{18}O(\text{quartz-fluid}) = \delta^{18}O(\text{quartz})-\delta^{18}O(\text{fluid}) \approx 3.38(10^6/T^2)-2.90$; Clayton et al. (1972) (Friedman and O'Neil, 1977)] where T is the temperature in Kelvin; These experiments were performed at temperatures closest to basin temperatures, and are in good agreement with results of Hu and Clayton (2003) at higher temperatures.

ADDITIONAL REFERENCES NOT CITED IN TEXT

Beck, W.C., Grossman, E.L., and Morse, J.W., 2005, Experimental studies of oxygen isotope fractionation in the carbonic acid system at 15º, 25º, and 40ºC: Geochimica Et Cosmochimica Acta, v. 69, p. 3493-3503.

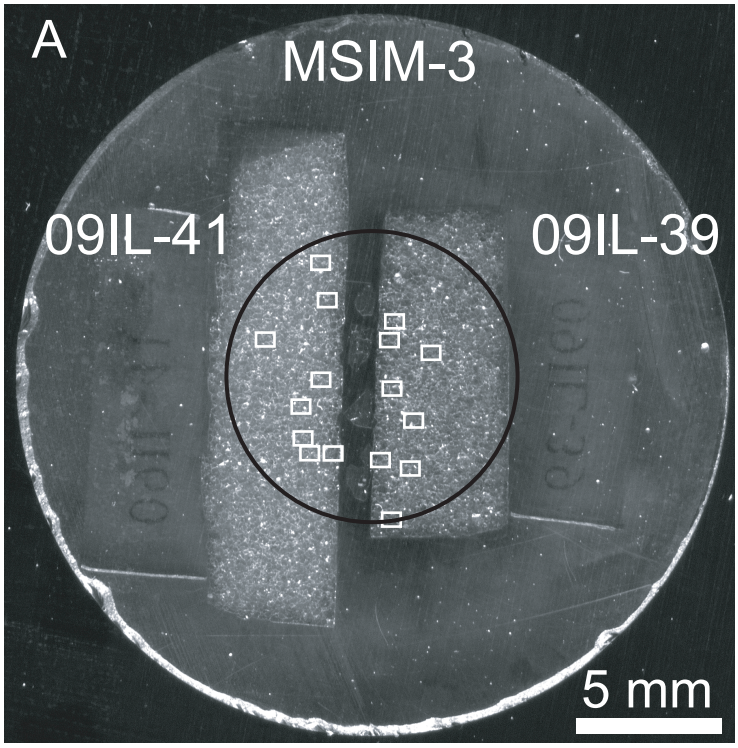
Dickinson, W.W., 1987, An Oxygen Isotope Model for Interpreting Carbonate Diagenesis in Nonmarine Rocks (Green River Basin, Wyoming, USA): Chemical Geology, v. 65, p. 103-116.

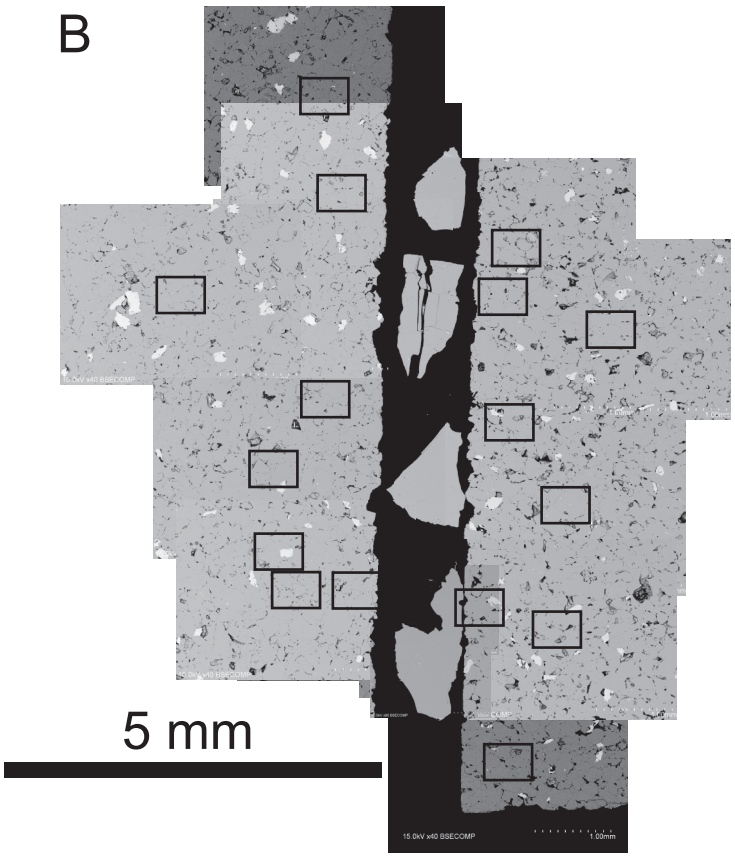
Friedman, I., and O'Neil, J.R., 1977, Compilation of stable isotope fractionation factors of geochemical interest: Washington, D.C., U.S. G.P.O., 67 p.
Hu, G.X., and Clayton, R.N., 2003, Oxygen isotope salt effects at high pressure and high temperature and the calibration of oxygen isotope geothermometers: Geochimica Et Cosmochimica Acta, v. 67, p. 3227-3246.

FIGURES

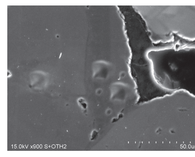
Figure DR1. Samples cast in epoxy. a) Photograph of two rock chips (09IL-39, 09IL-41) cast in 25 mm diameter epoxy mount MSim-3. White rectangles represent areas selected for detailed imaging preparatory to ion microprobe analysis. Black circle represents the inner 10 mm, where analyses can be made without machine-induced position bias. Area 15, which is outside the 10 mm circle was not analyzed. b) BSE map of MSim-3. Grayscale in BSE images is proportional to the mean atomic weight of the material; in this image black is epoxy, white is K-feldspar and light gray is quartz. Four grains of the standard UWQ-1 are mounted between the rock chips. Black rectangles represent areas selected for ion microprobe analysis.

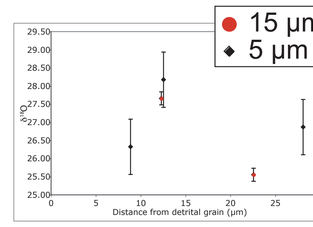
Figure DR2. SEM images and $\delta^{18}O$ vs. distance plots for every overgrowth analyzed with 5 μm spots. The first two overgrowths show no clear trend, whereas the other 9 all have overall decreasing trends. Overgrowths are plotted in depth order with the shallowest at the top.


A
MSIM-3
09IL-41
09IL-39
5 mm

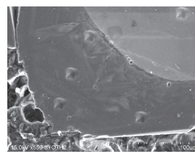

B
5 mm

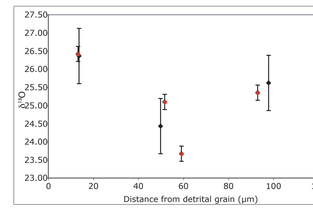
09IL-11
469.5 m



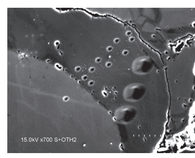


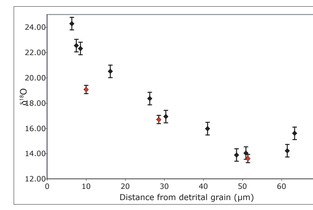
09IL-16
519.9 m



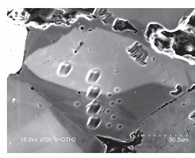


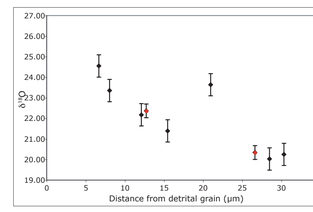
09IL-29
663.4 m



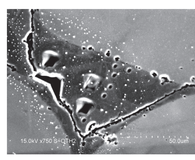


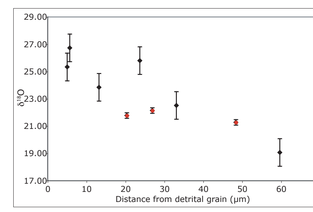
09IL-31
1648.4 m



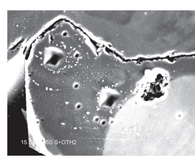


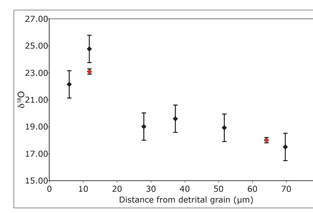
09IL-35
1875.9 m



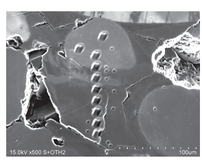


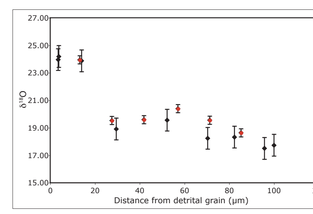
09IL-35
1875.9 m



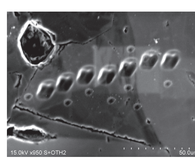


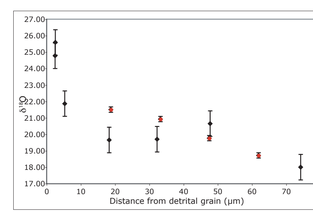
09IL-39
1980.9 m



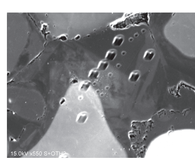


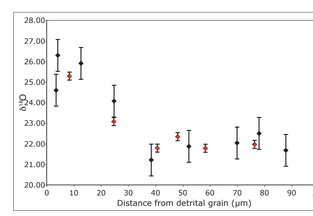
09IL-39
1980.9 m



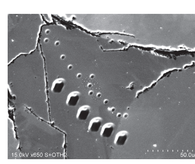


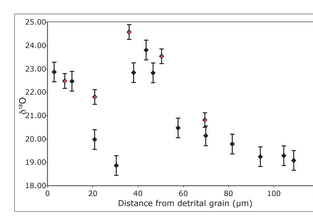
09IL-41
1982.1 m



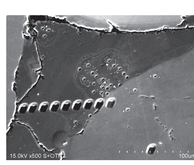


09IL-50
2581.3 m





09IL-50
2581.3 m



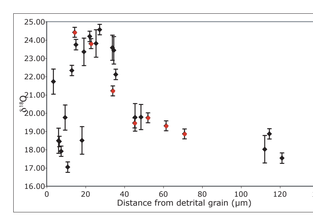


TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	pit## removing
July 30-August 2, 2009																	
								MSim-1									
5	MSim-1_UWQ1	Std							6.62	0.18	2.866	1.286	-500	1439	-12	25	
6	MSim-1_UWQ1	Std							6.46	0.20	2.828	1.282	990	1194	-3	24	
7	MSim-1_UWQ1	Std							6.58	0.19	2.841	1.296	-1217	1313	-14	27	
8	MSim-1_UWQ1	Std							6.18	0.19	2.775	1.277	-2125	1152	-19	25	
9	MSim-1_UWQ1	Std							6.35	0.17	2.789	1.291	-2332	1105	-19	26	
10	MSim-1_UWQ1	Std							6.54	0.19	2.710	1.272	-284	1550	-11	27	
11	MSim-1_UWQ1	Std							6.37	0.20	2.722	1.284	-284	1530	-11	29	
12	MSim-1_UWQ1	Std							6.42	0.15	2.720	1.287	-284	1510	-11	28	
13	MSim-1_UWQ1	Std							6.32	0.24	2.712	1.287	-284	1490	-11	28	
14	MSim-1_1ADQ	DQ	09IL-6	1425.6	434.5	10.51	0.27		4.66	0.16	2.868	1.296	623	2971	-4	39	
~~15~~	~~MSim-1_1BOQ~~	~~OQ~~	~~09IL-6~~	~~1425.6~~	~~434.5~~	~~25.61~~	~~0.27~~		~~19.68~~	~~0.21~~	~~2.951~~	~~1.324~~	~~684~~	~~2943~~	~~-3~~	~~40~~	Mixed analysis
16	MSim-1_1COQ	OQ	09IL-6	1425.6	434.5	26.22	0.27		20.28	0.19	2.870	1.290	362	2993	-5	41	
~~17~~	~~MSim-1_1DOQ~~	~~OQ~~	~~09IL-6~~	~~1425.6~~	~~434.5~~	~~23.07~~	~~0.27~~		~~17.15~~	~~0.17~~	~~2.850~~	~~1.287~~	~~371~~	~~2715~~	~~-6~~	~~37~~	Mixed analysis
18	MSim-1_1EDQ	DQ	09IL-6	1425.6	434.5	9.81	0.27		3.97	0.23	2.831	1.284	389	2757	-5	38	
19	MSim-1_2ADQ	DQ	09IL-6	1425.6	434.5	10.69	0.27		4.84	0.23	2.830	1.284	-974	3007	-11	43	
20	MSim-1_2BOQ	OQ	09IL-6	1425.6	434.5	27.22	0.27		21.27	0.23	2.804	1.281	-1019	3068	-13	42	
21	MSim-1_2COQ	OQ	09IL-6	1425.6	434.5	26.06	0.27		20.12	0.21	2.798	1.286	-821	3037	-10	44	
22	MSim-1_2DOQ	OQ	09IL-6	1425.6	434.5	25.56	0.27		19.62	0.23	2.793	1.287	-912	3106	-11	44	
23	MSim-1_2EDQ	DQ	09IL-6	1425.6	434.5	10.67	0.27		4.82	0.16	2.769	1.285	-874	2987	-13	44	
24	MSim-1_UWQ1	Std							6.31	0.20	2.745	1.286	-259	1543	-8	28	
25	MSim-1_UWQ1	Std							6.60	0.17	2.721	1.279	-259	1523	-8	28	
26	MSim-1_UWQ1	Std							6.64	0.19	2.718	1.282	-259	1503	-7	28	
27	MSim-1_UWQ1	Std							6.59	0.20	2.706	1.285	-259	1483	-8	28	
	*****bracket; 10-13, 24-27**						**0.27**	**0.9942**	**6.47**								
28	MSim-1_3ADQ	DQ	09IL-6	1425.6	434.5	9.80	0.28		4.00	0.21	2.674	1.277	-2629	3175	-14	42	
~~29~~	~~MSim-1_3BOQ~~	~~OQ~~	~~09IL-6~~	~~1425.6~~	~~434.5~~				~~19.53~~	~~0.19~~	~~2.670~~	~~1.279~~	~~-2697~~	~~3262~~	~~-14~~	~~43~~	Bad pit
30	MSim-1_3COQ	OQ	09IL-6	1425.6	434.5	25.34	0.28		19.45	0.24	2.641	1.270	-2480	3268	-10	44	
31	MSim-1_3DOQ	OQ	09IL-6	1425.6	434.5	24.46	0.28		18.58	0.15	2.626	1.268	-2457	3258	-12	43	
32	MSim-1_3EDQ	DQ	09IL-6	1425.6	434.5	11.41	0.28		5.59	0.15	2.613	1.269	-2415	3255	-14	43	
33	MSim-1_3FDQ	DQ	09IL-6	1425.6	434.5	12.27	0.28		6.45	0.21	2.609	1.273	-2375	3200	-12	41	
~~34~~	~~MSim-1_4ADQ~~	~~DQ~~	~~09IL-6~~	~~1425.6~~	~~434.5~~	~~10.27~~	~~0.28~~		~~4.47~~	~~0.19~~	~~2.750~~	~~1.281~~	~~-157~~	~~4283~~	~~-9~~	~~69~~	Mixed analysis
35	MSim-1_4BOQ	OQ	09IL-6	1425.6	434.5	24.55	0.28		18.66	0.22	2.774	1.278	-189	4300	-10	71	
36	MSim-1_4COQ	OQ	09IL-6	1425.6	434.5	24.48	0.28		18.60	0.14	2.799	1.288	-359	4363	-10	74	
37	MSim-1_4DDQ	DQ	09IL-6	1425.6	434.5	8.86	0.28		3.06	0.20	2.766	1.274	-403	4352	-10	74	
~~38~~	~~MSim-1_4EOQ~~	~~OQ~~	~~09IL-6~~	~~1425.6~~	~~434.5~~	~~24.00~~	~~0.28~~		~~18.12~~	~~0.23~~	~~2.766~~	~~1.278~~	~~-172~~	~~4030~~	~~-9~~	~~64~~	Mixed analysis
39	MSim-1_UWQ1	Std							6.26	0.18	2.789	1.292	-245	1545	-13	30	
40	MSim-1_UWQ1	Std							6.60	0.17	2.754	1.280	-245	1525	-13	29	
41	MSim-1_UWQ1	Std							6.55	0.15	2.719	1.266	-245	1505	-13	29	
42	MSim-1_UWQ1	Std							6.55	0.20	2.717	1.266	-245	1485	-13	28	
	*****bracket; 24-27, 39-42**						**0.28**	**0.9943**	**6.51**								
								MSim-2									
79	MSim-2_UWQ1	Std							6.42	0.19	2.802	1.267	-1428	924	2	8	
80	MSim-2_UWQ1	Std							6.34	0.24	2.782	1.264	-1428	904	2	7	
81	MSim-2_UWQ1	Std							6.47	0.19	2.773	1.263	-1428	884	2	7	
82	MSim-2_UWQ1	Std							6.22	0.21	2.770	1.264	-1428	864	2	8	
83	MSim-2_5ADQ	DQ	09IL-21	1883.3	574	7.94	0.19		2.01	0.18	2.767	1.270	-287	3473	1	19	
84	MSim-2_5BOQ	OQ	09IL-21	1883.3	574	25.52	0.19		19.49	0.17	2.776	1.278	-276	3384	-1	17	
85	MSim-2_5COQ	OQ	09IL-21	1883.3	574	23.49	0.19		17.47	0.22	2.701	1.244	-199	3468	-1	15	
86	MSim-2_5DOQ	OQ	09IL-21	1883.3	574	26.15	0.19		20.11	0.21	2.714	1.259	-339	3248	-1	15	
87	MSim-2_5EDQ	DQ	09IL-21	1883.3	574	9.24	0.19		3.30	0.26	2.723	1.271	-441	3248	-2	15	
88	MSim-2_6ADQ	DQ	09IL-21	1883.3	574	8.34	0.19		2.40	0.22	2.706	1.268	-103	1561	1	8	
89	MSim-2_6BOQ	OQ	09IL-21	1883.3	574	26.64	0.19		20.59	0.15	2.657	1.245	-58	1373	2	9	
90	MSim-2_6COQ	OQ	09IL-21	1883.3	574	25.06	0.19		19.02	0.19	2.673	1.253	15	1441	1	8	
91	MSim-2_6DOQ	OQ	09IL-21	1883.3	574	23.99	0.19		17.96	0.24	2.688	1.265	-141	1318	1	9	
92	MSim-2_6EOQ	OQ	09IL-21	1883.3	574	26.07	0.19		20.03	0.23	2.691	1.272	236	1558	0	9	
93	MSim-2_UWQ1	Std							6.45	0.23	2.639	1.262	-1393	930	-3	11	
94	MSim-2_UWQ1	Std							6.32	0.20	2.612	1.268	-1393	910	-4	9	
95	MSim-2_UWQ1	Std							6.26	0.16	2.600	1.266	-1393	890	-4	9	
96	MSim-2_UWQ1	Std							6.47	0.26	2.601	1.269	-1393	870	-4	8	
	*****bracket; 79-82, 93-96**						**0.19**	**0.9941**	**6.37**								
97	MSim-2_7ADQ	DQ	09IL-21	1883.3	574	9.39	0.23		3.52	0.17	2.721	1.283	-64	-224	-1	4	
98	MSim-2_7BOQ	OQ	09IL-21	1883.3	574	26.90	0.23		20.93	0.21	2.736	1.270	-99	-332	-1	3	
99	MSim-2_7COQ	OQ	09IL-21	1883.3	574	25.04	0.23		19.08	0.23	2.725	1.261	-68	-388	0	3	
100	MSim-2_7DOQ	OQ	09IL-21	1883.3	574	25.45	0.23		19.49	0.18	2.732	1.262	-236	-334	0	4	
101	MSim-2_7EOQ	OQ	09IL-21	1883.3	574	26.07	0.23		20.11	0.21	2.727	1.262	-12	-362	0	3	
102	MSim-2_7FDQ	DQ	09IL-21	1883.3	574	9.35	0.23		3.48	0.19	2.728	1.263	-341	-310	0	4	
103	MSim-2_8ADQ	DQ	09IL-21	1883.3	574	11.50	0.23		5.62	0.23	2.718	1.265	1357	3602	-8	14	
104	MSim-2_8BOQ	OQ	09IL-21	1883.3	574	25.37	0.23		19.41	0.26	2.625	1.226	1227	3585	-10	13	
105	MSim-2_8COQ	OQ	09IL-21	1883.3	574	25.35	0.23		19.39	0.16	2.701	1.267	1433	3508	-7	15	
106	MSim-2_8DOQ	OQ	09IL-21	1883.3	574	24.94	0.23		18.99	0.21	2.540	1.194	1578	3536	-7	12	
107	MSim-2_8EOQ	OQ	09IL-21	1883.3	574	25.30	0.23		19.34	0.19	2.663	1.254	1511	3771	-8	16	
108	MSim-2_8FDQ	DQ	09IL-21	1883.3	574	9.66	0.23		3.79	0.23	2.674	1.263	1603	3650	-8	15	
109	MSim-2_UWQ1	Std							6.55	0.16	2.659	1.262	-1411	850	-17	7	
110	MSim-2_UWQ1	Std							6.39	0.21	2.641	1.259	-1391	850	-17	8	

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
111	MSim-2_UWQ1	Std							6.53	0.21	2.630	1.258	-1391	830	-17	7		
112	MSim-2_UWQ1	Std							6.60	0.18	2.625	1.258	-1411	830	-17	8		
	***bracket; 93-96, 109-112						0.23	0.9942	6.45									
								MSim-3										
169	MSim-3_UWQ1	Std							6.73	0.15	2.774	1.268	-1640	2976	1	20		
170	MSim-3_UWQ1	Std							6.50	0.23	2.767	1.267	-1986	1770	0	16		
171	MSim-3_UWQ1	Std							6.43	0.23	2.747	1.260	-1610	-708	4	10		
172	MSim-3_UWQ1	Std							6.54	0.23	2.722	1.250	-1226	-3135	5	-2		
173	MSim-3_UWQ1	Std							6.45	0.25	2.742	1.255	-1226	-3155	5	-3		
174	MSim-3_UWQ1	Std							6.58	0.17	2.756	1.265	-1226	-3175	5	-3		
175	MSim-3_UWQ1	Std							6.37	0.23	2.730	1.259	-1226	-3195	4	-3		
176	MSim-3_UWQ1	Std							6.43	0.22	2.736	1.263	-1226	-3215	4	-4		
177	MSim-3_1ADQ	DQ	09IL-41	6503	1982.1	8.36	0.17		2.49	0.18	2.749	1.271	-3555	-832	-7	10		
178	MSim-3_1BOQ	OQ	09IL-41	6503	1982.1	22.10	0.17		16.15	0.12	2.748	1.273	-3595	-768	-7	12		
179	MSim-3_1COQ	OQ	09IL-41	6503	1982.1	18.28	0.17		12.36	0.18	2.735	1.273	-3628	-738	-7	12		
180	MSim-3_1DOQ	OQ	09IL-41	6503	1982.1	19.91	0.17		13.98	0.18	2.721	1.271	-3612	-752	-7	11		
181	MSim-3_1EOQ	OQ	09IL-41	6503	1982.1	24.71	0.17		18.75	0.20	2.713	1.264	-3675	-851	-8	11		
182	MSim-3_1FDQ	DQ	09IL-41	6503	1982.1	14.57	0.17		8.67	0.14	2.704	1.267	-3738	-875	-8	11		
183	MSim-3_2AOQ	OQ	09IL-41	6503	1982.1	18.88	0.17		12.96	0.19	2.695	1.275	-5158	1489	-14	12		
184	MSim-3_2BOQ	OQ	09IL-41	6503	1982.1	23.63	0.17		17.68	0.23	2.689	1.276	-5122	1543	-14	12		
185	MSim-3_2CDQ	DQ	09IL-41	6503	1982.1	10.18	0.17		4.30	0.20	2.661	1.270	-5072	1562	-14	12		
186	MSim-3_2DOQ	OQ	09IL-41	6503	1982.1	21.63	0.17		15.69	0.16	2.663	1.274	-4929	1521	-13	12		
187	MSim-3_2EOQ	OQ	09IL-41	6503	1982.1	22.47	0.17		16.53	0.19	2.656	1.273	-4879	1393	-12	13		
188	MSim-3_2FDQ	DQ	09IL-41	6503	1982.1	8.67	0.17		2.81	0.19	2.631	1.267	-4912	1624	-13	12		
189	MSim-3_UWQ1	Std							6.29	0.23	2.705	1.259	-1255	-3159	2	-3		
190	MSim-3_UWQ1	Std							6.46	0.19	2.771	1.270	-1255	-3179	2	-2		
191	MSim-3_UWQ1	Std							6.44	0.16	2.741	1.254	-1255	-3199	2	-4		
192	MSim-3_UWQ1	Std							6.52	0.21	2.754	1.255	-1255	-3219	2	-4		
	***bracket; 173-176, 189-192						0.17	0.9942	6.44									
193	MSim-3_3ADQ	DQ	09IL-41	6503	1982.1	9.76	0.20		3.82	0.20	2.805	1.279	-3000	2886	-12	18		
194	MSim-3_3BOQ	OQ	09IL-41	6503	1982.1	20.03	0.20		14.03	0.25	2.807	1.274	-2955	3050	-12	18		
195	MSim-3_3COQ	OQ	09IL-41	6503	1982.1	23.99	0.20		17.97	0.14	2.826	1.279	-2899	3067	-12	18		
196	MSim-3_3DOQ	OQ	09IL-41	6503	1982.1	19.08	0.20		13.08	0.20	2.748	1.258	-3150	3022	-13	18		
197	MSim-3_3EOQ	OQ	09IL-41	6503	1982.1	21.02	0.20		15.02	0.23	2.734	1.268	-3090	2917	-12	18		
198	MSim-3_4AOQ	OQ	09IL-41	6503	1982.1	20.22	0.20		14.22	0.13	2.709	1.264	-3203	-2405	-8	5		
199	MSim-3_4BOQ	OQ	09IL-41	6503	1982.1	21.04	0.20		15.03	0.20	2.709	1.268	-3185	-2369	-7	6		
200	MSim-3_4CDQ	DQ	09IL-41	6503	1982.1	12.10	0.20		6.15	0.21	2.686	1.262	-3175	-2313	-8	7		
201	MSim-3_4DOQ	OQ	09IL-41	6503	1982.1	19.51	0.20		13.52	0.20	2.659	1.249	-3241	-2395	-8	7		
202	MSim-3_4EDQ	DQ	09IL-41	6503	1982.1	9.31	0.20		3.37	0.24	2.704	1.268	-2926	-2389	-8	6		
203	MSim-3_4FOQ	OQ	09IL-41	6503	1982.1	23.52	0.20		17.49	0.19	2.715	1.276	-3147	-2467	-9	6		
204	MSim-3_4GOQ	OQ	09IL-41	6503	1982.1	17.52	0.20		11.54	0.19	2.684	1.266	-3177	-2449	-9	6		
205	MSim-3_UWQ1	Std							6.28	0.27	2.669	1.265	-1206	-3216	1	-4		
206	MSim-3_UWQ1	Std							6.40	0.20	2.663	1.264	-1206	-3196	1	-4		
207	MSim-3_UWQ1	Std							6.38	0.20	2.668	1.269	-1206	-3176	2	-2		
208	MSim-3_UWQ1	Std							6.23	0.12	2.645	1.262	-1206	-3156	2	-2		
	***bracket; 189-192, 205-208						0.20	0.9941	6.37									
209	MSim-3_5ADQ	DQ	09IL-39	6499	1980.9	9.40	0.40		3.58	0.27	2.768	1.280	282	-2501	-5	2		
210	MSim-3_5BOQ	OQ	09IL-39	6499	1980.9	19.48	0.40		13.61	0.26	2.805	1.268	365	-2563	-5	1		
211	MSim-3_5COQ	OQ	09IL-39	6499	1980.9	21.36	0.40		15.47	0.22	2.826	1.273	317	-2440	-5	2		
212	MSim-3_5DOQ	OQ	09IL-39	6499	1980.9	19.06	0.40		13.18	0.18	2.785	1.254	333	-2390	-6	1		
213	MSim-3_5EOQ	OQ	09IL-39	6499	1980.9	18.84	0.40		12.97	0.23	2.802	1.265	387	-2622	-5	1		
214	MSim-3_5FOQ	OQ	09IL-39	6499	1980.9	17.47	0.40		11.61	0.22	2.810	1.270	264	-2778	-6	1		
215	MSim-3_5GDQ	DQ	09IL-39	6499	1980.9	8.52	0.40		2.71	0.21	2.793	1.268	172	-2664	-5	0		
216	MSim-3_6ADQ	DQ	09IL-39	6499	1980.9	11.86	0.40		6.03	0.17	2.811	1.276	417	-961	-5	9		
217	MSim-3_6BOQ	OQ	09IL-39	6499	1980.9	25.12	0.40		19.22	0.18	2.795	1.268	372	-1102	-6	10		
218	MSim-3_6COQ	OQ	09IL-39	6499	1980.9	21.12	0.40		15.24	0.21	2.791	1.271	336	-1091	-6	8		
219	MSim-3_6DOQ	OQ	09IL-39	6499	1980.9	18.73	0.40		12.86	0.20	2.776	1.267	229	-1085	-5	10		
220	MSim-3_6EOQ	OQ	09IL-39	6499	1980.9	19.72	0.40		13.84	0.19	2.799	1.276	517	-896	-6	8		
221	MSim-3_6FOQ	OQ	09IL-39	6499	1980.9	23.76	0.40		17.86	0.19	2.760	1.263	494	-891	-7	8		
222	MSim-3_6GDQ	DQ	09IL-39	6499	1980.9	8.03	0.40		2.22	0.21	2.785	1.279	106	-814	-6	9		
223	MSim-3_UWQ1	Std							6.70	0.21	2.748	1.269	-1188	-3215	-10	-3		
224	MSim-3_UWQ1	Std							6.75	0.15	2.749	1.274	-1188	-3195	-10	-1		
225	MSim-3_UWQ1	Std							6.55	0.20	2.740	1.274	-1188	-3175	-10	-1		
226	MSim-3_UWQ1	Std							6.70	0.23	2.752	1.279	-1188	-3155	-10	-1		
	***bracket; 205-208, 223-226						0.40	0.9942	6.50									
227	MSim-3_7ADQ	DQ	09IL-39	6499	1980.9	9.47	0.24		3.75	0.21	2.710	1.264	693	1401	-3	12		
~~228~~	~~MSim-3_7BOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~23.16~~	~~0.24~~		~~17.36~~	~~0.26~~	~~2.729~~	~~1.271~~	~~627~~	~~1302~~	~~-2~~	~~13~~	Mixed analysis	
229	MSim-3_7COQ	OQ	09IL-39	6499	1980.9	19.81	0.24		14.03	0.27	2.710	1.263	618	1284	-3	14		
230	MSim-3_7DOQ	OQ	09IL-39	6499	1980.9	22.88	0.24		17.09	0.21	2.716	1.269	543	1370	-2	13		
231	MSim-3_7EOQ	OQ	09IL-39	6499	1980.9	19.04	0.24		13.27	0.25	2.693	1.264	524	1437	-2	14		
232	MSim-3_7FDQ	DQ	09IL-39	6499	1980.9	9.04	0.24		3.32	0.19	2.697	1.269	509	1521	-2	16		
233	MSim-3_8AOQ	OQ	09IL-39	6499	1980.9	19.76	0.24		13.98	0.24	2.705	1.274	-684	2285	-6	16		
~~234~~	~~MSim-3_8BOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~22.64~~	~~0.24~~		~~16.85~~	~~0.22~~	~~2.707~~	~~1.276~~	~~-749~~	~~2368~~	~~-5~~	~~16~~	Mixed analysis	
235	MSim-3_8COQ	OQ	09IL-39	6499	1980.9	25.57	0.24		19.75	0.21	2.716	1.279	-765	2406	-5	16		
236	MSim-3_8DOQ	OQ	09IL-39	6499	1980.9	19.31	0.24		13.53	0.20	2.699	1.274	-715	2391	-5	16		
~~237~~	~~MSim-3_8EDQ~~	~~DQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~8.77~~	~~0.24~~		~~3.05~~	~~0.20~~	~~2.684~~	~~1.270~~	~~-859~~	~~2435~~	~~-5~~	~~15~~	Mixed analysis	
238	MSim-3_8FDQ	DQ	09IL-39	6499	1980.9	11.57	0.24		5.84	0.23	2.673	1.266	-786	2296	-5	16		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
239	MSim-3_UWQ1	Std							6.38	0.20	2.679	1.274	-1161	-3152	-5	-1		
240	MSim-3_UWQ1	Std							6.63	0.18	2.661	1.269	-1161	-3172	-5	-2		
241	MSim-3_UWQ1	Std							6.53	0.22	2.653	1.267	-1161	-3192	-5	-2		
242	MSim-3_UWQ1	Std							6.52	0.27	2.650	1.269	-1161	-3212	-6	-4		
	*****bracket; 223-226, 239-242**						**0.24**	**0.9943**	**6.59**									
								MSim-4										
292	MSim-4_UWQ1	Std							6.34	0.20	2.693	1.253	313	2797	-5	13		
293	MSim-4_UWQ1	Std							6.44	0.20	2.686	1.251	243	1542	-4	10		
294	MSim-4_UWQ1	Std							6.14	0.18	2.684	1.248	214	394	-3	7		
295	MSim-4_UWQ1	Std							6.27	0.16	2.695	1.249	316	-727	1	4		
296	MSim-4_UWQ1	Std							6.30	0.19	2.656	1.236	316	-747	0	3		
297	MSim-4_UWQ1	Std							6.39	0.22	2.707	1.259	316	-767	1	3		
298	MSim-4_UWQ1	Std							6.19	0.21	2.614	1.236	316	-787	1	2		
299	MSim-4_1ADQ	DQ	09IL-11	1540.5	469.5	8.27	0.19		2.21	0.24	2.614	1.242	-2611	1852	-13	10		
300	MSim-4_1BOQ	OQ	09IL-11	1540.5	469.5	25.07	0.19		18.91	0.25	2.544	1.211	-2591	1764	-13	8		
301	MSim-4_1COQ	OQ	09IL-11	1540.5	469.5	24.34	0.19		18.18	0.18	2.581	1.234	-2370	1586	-12	10		
~~302~~	~~MSim-4_1DOQ~~	~~OQ~~	~~09IL-11~~	~~1540.5~~	~~469.5~~	~~26.11~~	~~0.19~~		~~19.94~~	~~0.18~~	~~2.593~~	~~1.241~~	~~-2380~~	~~1605~~	~~-11~~	~~10~~	Mixed analysis	
303	MSim-4_1EOQ	OQ	09IL-11	1540.5	469.5	24.87	0.19		18.71	0.16	2.626	1.262	-2310	1718	-13	9		
304	MSim-4_2ADQ	DQ	09IL-11	1540.5	469.5	9.75	0.19		3.67	0.20	2.686	1.255	-471	40	-4	6		
305	MSim-4_2BOQ	OQ	09IL-11	1540.5	469.5	26.89	0.19		20.71	0.20	2.710	1.236	-417	91	-2	6		
306	MSim-4_2COQ	OQ	09IL-11	1540.5	469.5	26.74	0.19		20.57	0.20	2.751	1.245	-305	-91	-2	6		
307	MSim-4_2DOQ	OQ	09IL-11	1540.5	469.5	25.29	0.19		19.13	0.19	2.771	1.250	-357	-74	-4	5		
308	MSim-4_2EOQ	OQ	09IL-11	1540.5	469.5	27.83	0.19		21.65	0.23	2.752	1.246	-332	-86	-3	5		
309	MSim-4_3ADQ	DQ	09IL-11	1540.5	469.5	9.35	0.19		3.28	0.13	2.782	1.261	-3011	3758	-20	16		
310	MSim-4_3BOQ	OQ	09IL-11	1540.5	469.5	25.93	0.19		19.76	0.19	2.775	1.256	-2981	3814	-19	16		
~~311~~	~~MSim-4_3COQ~~	~~OQ~~	~~09IL-11~~	~~1540.5~~	~~469.5~~	~~27.30~~	~~0.19~~		~~21.12~~	~~0.22~~	~~2.765~~	~~1.250~~	~~-2984~~	~~3774~~	~~-20~~	~~16~~	Mixed analysis	
312	MSim-4_3DOQ	OQ	09IL-11	1540.5	469.5	28.14	0.19		21.96	0.20	2.784	1.260	-2891	3568	-19	15		
313	MSim-4_UWQ1	Std							6.25	0.23	2.758	1.249	336	-727	-3	4		
314	MSim-4_UWQ1	Std							6.25	0.16	2.730	1.240	336	-747	-3	4		
315	MSim-4_UWQ1	Std							6.07	0.21	2.727	1.242	336	-767	-3	3		
316	MSim-4_UWQ1	Std							6.22	0.17	2.693	1.230	336	-787	-3	3		
	*****bracket; 295-298, 313-316**						**0.19**	**0.9940**	**6.24**									
317	MSim-4_4ADQ	DQ	09IL-11	1540.5	469.5	9.90	0.18		3.78	0.22	2.694	1.231	-3058	-1998	-16	6		
~~318~~	~~MSim-4_4BOQ~~	~~OQ~~	~~09IL-11~~	~~1540.5~~	~~469.5~~	~~26.31~~	~~0.18~~		~~20.09~~	~~0.25~~	~~2.694~~	~~1.229~~	~~-3195~~	~~-2102~~	~~-17~~	~~3~~	Mixed analysis	
319	MSim-4_4COQ	OQ	09IL-11	1540.5	469.5	25.55	0.18		19.34	0.21	2.703	1.238	-3334	-1970	-18	5		
320	MSim-4_4DOQ	OQ	09IL-11	1540.5	469.5	27.66	0.18		21.43	0.18	2.741	1.260	-3345	-1953	-18	4		
321	MSim-4_4EDQ	DQ	09IL-11	1540.5	469.5	11.11	0.18		4.98	0.24	2.763	1.272	-3390	-1958	-18	5		
322	MSim-4_5ADQ	DQ	09IL-16	1705.8	519.9	4.18	0.18		-1.91	0.18	2.737	1.263	2876	1343	-4	9		
323	MSim-4_5BOQ	OQ	09IL-16	1705.8	519.9	26.16	0.18		19.94	0.22	2.745	1.269	2819	1335	-6	9		
324	MSim-4_5COQ	OQ	09IL-16	1705.8	519.9	27.87	0.18		21.64	0.22	2.719	1.259	2772	1316	-6	9		
325	MSim-4_5DOQ	OQ	09IL-16	1705.8	519.9	26.26	0.18		20.04	0.16	2.703	1.259	2380	1377	-9	9		
326	MSim-4_5EOQ	OQ	09IL-16	1705.8	519.9	25.99	0.18		19.77	0.24	2.676	1.250	2414	1602	-12	11		
327	MSim-4_5FOQ	OQ	09IL-16	1705.8	519.9	26.61	0.18		20.38	0.22	2.663	1.247	2427	1588	-10	10		
328	MSim-4_UWQ1	Std							6.05	0.22	2.713	1.274	356	-727	-12	6		
329	MSim-4_UWQ1	Std							6.28	0.19	2.637	1.242	356	-747	-13	4		
330	MSim-4_UWQ1	Std							6.15	0.25	2.642	1.248	356	-767	-13	4		
331	MSim-4_UWQ1	Std							6.25	0.15	2.611	1.235	356	-787	-12	3		
	*****bracket; 313-316, 328-331**						**0.18**	**0.9939**	**6.19**									
332	MSim-4_1FOQ	OQ	09IL-11	1540.5	469.5	26.75	0.24		20.48	0.22	2.648	1.252	-2200	1696	-8	9		
333	MSim-4_1GOQ	OQ	09IL-11	1540.5	469.5	24.57	0.24		18.32	0.24	2.641	1.252	-2484	1944	-9	9		
~~334~~	~~MSim-4_1HDQ~~	~~DQ~~	~~09IL-11~~	~~1540.5~~	~~469.5~~	~~11.96~~	~~0.24~~		~~5.79~~	~~0.26~~	~~2.636~~	~~1.252~~	~~-2277~~	~~1922~~	~~-8~~	~~8~~	Mixed analysis	
~~335~~	~~MSim-4_2FDQ~~	~~DQ~~	~~09IL-11~~	~~1540.5~~	~~469.5~~	~~10.32~~	~~0.24~~		~~4.16~~	~~0.21~~	~~2.658~~	~~1.266~~	~~-154~~	~~-79~~	~~5~~	~~4~~	Mixed analysis	
336	MSim-4_2GOQ	OQ	09IL-11	1540.5	469.5	24.76	0.24		18.50	0.19	2.610	1.244	-219	-242	4	3		
337	MSim-4_UWQ1	Std							5.92	0.14	2.632	1.258	378	-724	-14	4		
338	MSim-4_UWQ1	Std							6.17	0.25	2.596	1.240	378	-744	-14	4		
339	MSim-4_UWQ1	Std							6.15	0.25	2.632	1.255	378	-764	-15	4		
340	MSim-4_UWQ1	Std							6.26	0.24	2.637	1.258	378	-784	-14	3		
	*****bracket; 328-331, 337-340**						**0.24**	**0.9939**	**6.15**									
								MSim-4										
526	MSim-4_UWQ1	Std							6.30	0.12	2.756	1.239	406	-722	15	3		
527	MSim-4_UWQ1	Std							6.20	0.17	2.747	1.222	406	-747	16	2		
528	MSim-4_UWQ1	Std							6.29	0.21	2.782	1.233	406	-772	17	3		
529	MSim-4_UWQ1	Std							6.16	0.19	2.774	1.224	406	-797	18	3		
530	MSim-4_UWQ1	Std							6.48	0.26	2.798	1.236	224	1500	12	10		
531	MSim-4_UWQ1	Std							6.28	0.19	2.812	1.245	224	1475	12	10		
532	MSim-4_UWQ1	Std							6.39	0.17	2.786	1.239	224	1450	12	9		
533	MSim-4_UWQ1	Std							6.36	0.17	2.790	1.239	224	1425	12	8		
534	MSim-4_6ADQ	DQ	09IL-16	1705.8	519.9	9.26	0.12		3.30	0.24	2.786	1.239	2468	2969	22	10		
535	MSim-4_6BOQ†††	OQ	09IL-16	1705.8	519.9	18.50	0.12		12.49	0.14	2.810	1.250	2334	3045	21	11		
536	MSim-4_6COQ†††	OQ	09IL-16	1705.8	519.9	26.20	0.12		20.14	0.19	2.777	1.238	2293	3080	21	11		
537	MSim-4_6DOQ†††	OQ	09IL-16	1705.8	519.9	16.69	0.12		10.69	0.15	2.797	1.248	2311	3059	21	11		
538	MSim-4_6EDQ	DQ	09IL-16	1705.8	519.9	12.09	0.12		6.11	0.18	2.762	1.235	2237	2916	21	10		
539	MSim-4_6FOQ	OQ	09IL-16	1705.8	519.9	27.22	0.12		21.16	0.23	2.775	1.239	2119	2928	20	11		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##
~~540~~	~~MSim-4_6CDQ~~	~~DQ~~	~~09IL-16~~	~~1705.8~~	~~519.9~~				~~5.32~~	~~0.19~~	~~2.773~~	~~1.241~~	~~2048~~	~~3003~~	~~20~~	~~11~~	Bad pit
541	MSim-4_7ADQ	DQ	09IL-16	1705.8	519.9	9.97	0.12		4.01	0.19	2.773	1.251	2299	1181	-19	11	
542	MSim-4_7BOQ	OQ	09IL-16	1705.8	519.9	26.91	0.12		20.85	0.22	2.651	1.193	2336	1111	-19	8	
543	MSim-4_7COQ	OQ	09IL-16	1705.8	519.9	25.53	0.12		19.48	0.27	2.821	1.271	2422	1082	-21	8	
544	MSim-4_7DOQ	OQ	09IL-16	1705.8	519.9	25.42	0.12		19.36	0.27	2.817	1.269	2415	1100	-23	8	
545	MSim-4_7EOQ	OQ	09IL-16	1705.8	519.9	24.95	0.12		18.90	0.21	2.705	1.222	2301	1092	-20	9	
546	MSim-4_UWQ1	Std							6.34	0.18	2.757	1.247	261	1429	-6	9	
547	MSim-4_UWQ1	Std							6.35	0.15	2.766	1.253	261	1454	-5	10	
548	MSim-4_UWQ1	Std							6.34	0.19	2.766	1.253	261	1479	-6	11	
549	MSim-4_UWQ1	Std							6.29	0.22	2.734	1.251	261	1504	-7	11	
	*****bracket; 530-533, 546-549**						**0.12**	**0.9941**	**6.35**								
550	MSim-4_8ADQ	DQ	09IL-16	1705.8	519.9	8.74	0.21		2.79	0.20	2.713	1.244	3128	-1137	4	3	
551	MSim-4_8BOQ	OQ	09IL-16	1705.80	519.9	24.54	0.21		18.50	0.21	2.589	1.187	3411	-1162	4	3	
552	MSim-4_8COQ	OQ	09IL-16	1705.8	519.9	25.14	0.21		19.10	0.16	2.636	1.212	3383	-1142	4	3	
553	MSim-4_8DOQ	OQ	09IL-16	1705.8	519.9	27.61	0.21		21.55	0.23	2.666	1.232	2998	-1258	0	1	
554	MSim-4_8EOQ	OQ	09IL-16	1705.8	519.9	27.48	0.21		21.42	0.20	2.704	1.252	2987	-1356	2	2	
555	MSim-4_8aAOQ	OQ	09IL-16	1705.8	519.9	25.10	0.21		19.05	0.19	2.627	1.218	3013	-1770	5	1	
556	MSim-4_8aBOQ	OQ	09IL-16	1705.8	519.9	25.35	0.21		19.31	0.16	2.677	1.243	2916	-1747	5	2	
557	MSim-4_8aCOQ	OQ	09IL-16	1705.8	519.9	23.67	0.21		17.63	0.19	2.673	1.246	2933	-1712	4	2	
558	MSim-4_8aDOQ	OQ	09IL-16	1705.8	519.9	26.42	0.21		20.37	0.12	2.672	1.250	2959	-1669	5	3	
559	MSim-4_8aEDQ	DQ	09IL-16	1705.8	519.9	12.61	0.21		6.64	0.15	2.643	1.243	3072	-1649	5	2	
560	MSim-4_UWQ1	Std							6.52	0.20	2.655	1.249	276	1426	-11	9	
561	MSim-4_UWQ1	Std							6.44	0.22	2.651	1.246	279	1453	-11	10	
562	MSim-4_UWQ1	Std							6.17	0.19	2.669	1.253	279	1478	-11	11	
563	MSim-4_UWQ1	Std							6.43	0.18	2.662	1.253	279	1503	-11	12	
	*****bracket; 546-549, 560-563**						**0.21**	**0.9941**	**6.36**								
								MSim-5									
~~564~~	~~MSim-5_UWQ1~~	~~Std~~															Electron gun off, stopped ar
~~565~~	~~MSim-5_UWQ1~~	~~Std~~															NMR probe not set
~~566~~	~~MSim-5_UWQ1~~	~~Std~~															NMR probe not set
567	MSim-5_UWQ1	Std							6.69	0.19	2.628	1.252	-2003	1298	3	16	
568	MSim-5_UWQ1	Std							6.86	0.17	2.648	1.264	-1734	2575	5	23	
569	MSim-5_UWQ1	Std							6.53	0.22	2.596	1.245	-2176	-884	1	7	
570	MSim-5_UWQ1	Std							6.61	0.20	2.615	1.254	-2253	-1946	2	3	
571	MSim-5_UWQ1	Std							6.53	0.21	2.578	1.239	-2180	-910	1	7	
572	MSim-5_UWQ1	Std							6.54	0.21	2.680	1.255	-2180	-935	1	7	
573	MSim-5_UWQ1	Std							6.44	0.21	2.730	1.248	-2180	-960	1	7	
574	MSim-5_UWQ1	Std							6.47	0.26	2.752	1.250	-2180	-985	1	7	
575	MSim-5_1ADQ	DQ	09IL-33	5422	1652.6	1.38	0.24		-4.48	0.12	2.798	1.266	-4289	1363	-6	16	
576	MSim-5_1BOQ	OQ	09IL-33	5422	1652.6	20.52	0.24		14.55	0.23	2.776	1.255	-4317	1469	-6	16	
577	MSim-5_1COQ	OQ	09IL-33	5422	1652.6	19.07	0.24		13.11	0.19	2.805	1.266	-4470	1662	-7	17	
578	MSim-5_1DOQ	OQ	09IL-33	5422	1652.6	20.44	0.24		14.47	0.21	2.799	1.261	-4445	1658	-8	18	
~~579~~	~~MSim-5_1EOQ~~	~~OQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~				~~16.27~~	~~0.20~~	~~2.813~~	~~1.269~~	~~-4348~~	~~1419~~	~~-6~~	~~17~~	Bad pit
580	MSim-5_1FDQ	DQ	09IL-33	**5422**	1652.6	0.84	0.24		-5.02	0.23	2.813	1.268	-4297	1331	-6	16	
581	MSim-5_1GDQ	DQ	09IL-33	5422	1652.6	11.67	0.24		5.75	0.22	2.807	1.268	-4360	1574	-6	17	
582	MSim-5_1HDQ	DQ	09IL-33	5422	1652.6	9.69	0.24		3.78	0.18	2.811	1.270	-4202	1559	-6	16	
583	MSim-5_2AOQ	OQ	09IL-33	5422	1652.6	19.97	0.24		14.01	0.17	2.812	1.273	-4339	46	-7	12	
584	MSim-5_2BOQ	OQ	09IL-33	5422	1652.6	20.41	0.24		14.44	0.19	2.836	1.279	-4362	51	-7	12	
585	MSim-5_2COQ	OQ	09IL-33	5422	1652.6	19.59	0.24		13.63	0.23	2.807	1.272	-4292	26	-7	13	
586	MSim-5_2DOQ	OQ	09IL-33	5422	1652.6	20.21	0.24		14.24	0.24	2.788	1.272	-4676	-107	-7	12	
~~587~~	~~MSim-5_2EDQ~~	~~DQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~				~~4.06~~	~~0.22~~	~~2.811~~	~~1.282~~	~~-4562~~	~~-180~~	~~-6~~	~~12~~	Bad pit
588	MSim-5_2FDQ	DQ	09IL-33	5422	1652.6	10.17	0.24		4.26	0.21	2.810	1.279	-4344	-56	-7	13	
589	MSim-5_UWQ1	Std							6.41	0.24	2.791	1.271	-2155	-985	0	6	
590	MSim-5_UWQ1	Std							6.40	0.24	2.792	1.271	-2155	-960	0	7	
591	MSim-5_UWQ1	Std							6.24	0.19	2.783	1.269	-2155	-935	0	7	
592	MSim-5_UWQ1	Std							6.23	0.20	2.792	1.273	-2155	-910	1	7	
	*****bracket; 571-574, 589-592**						**0.24**	**0.9941**	**6.41**								
593	MSim-5_3ADQ	DQ	09IL-33	5422	1652.6	10.12	0.17		4.14	0.15	2.796	1.272	-4038	3434	-4	20	
594	MSim-5_3BOQ	OQ	09IL-33	5422	1652.6	20.88	0.17		14.84	0.13	2.819	1.281	-4195	3548	-4	20	
595	MSim-5_3COQ	OQ	09IL-33	5422	1652.6	24.81	0.17		18.75	0.18	2.814	1.277	-4207	3494	-5	19	
596	MSim-5_3DOQ	OQ	09IL-33	5422	1652.6	19.16	0.17		13.12	0.20	2.762	1.257	-4308	3429	-5	18	
~~597~~	~~MSim-5_3EOQ~~	~~OQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~	~~12.63~~	~~0.17~~		~~6.64~~	~~0.24~~	~~2.810~~	~~1.272~~	~~-4307~~	~~3477~~	~~-5~~	~~20~~	Mixed analysis
598	MSim-5_3FOQ	OQ	09IL-33	5422	1652.6	20.11	0.17		14.07	0.20	2.826	1.275	-4307	3454	-5	19	
599	MSim-5_3GOQ	OQ	09IL-33	5422	1652.6	18.58	0.17		12.55	0.16	2.804	1.265	-4009	3630	-3	22	
~~600~~	~~MSim-5_3HOQ~~	~~OQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~	~~24.90~~	~~0.17~~		~~18.84~~	~~0.17~~	~~2.803~~	~~1.264~~	~~-4066~~	~~3619~~	~~-6~~	~~20~~	Mixed analysis
~~601~~	~~MSim-5_4ADQ~~	~~DQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~	~~9.56~~	~~0.17~~		~~3.59~~	~~0.22~~	~~2.828~~	~~1.271~~	~~-4661~~	~~-2668~~	~~0~~	~~4~~	Mixed analysis
602	MSim-5_4BOQ	OQ	09IL-33	5422	1652.6	19.26	0.17		13.23	0.21	2.763	1.243	-4767	-2767	-3	5	
~~603~~	~~MSim-5_4COQ~~	~~OQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~	~~24.61~~	~~0.17~~		~~18.54~~	~~0.19~~	~~2.765~~	~~1.249~~	~~-4811~~	~~-2770~~	~~1~~	~~8~~	Mixed analysis
604	MSim-5_4DOQ	OQ	09IL-33	5422	1652.6	19.13	0.17		13.10	0.29	2.798	1.266	-4786	-2770	-1	8	
~~605~~	~~MSim-5_4EOQ~~	~~OQ~~	~~09IL-33~~	~~5422~~	~~1652.6~~	~~16.36~~	~~0.17~~		~~10.34~~	~~0.23~~	~~2.777~~	~~1.257~~	~~-4759~~	~~-2838~~	~~-3~~	~~2~~	Mixed analysis
606	MSim-5_4FDQ	DQ	09IL-33	5422	1652.6	9.49	0.17		3.52	0.18	2.794	1.268	-4723	-2553	0	5	
607	MSim-5_UWQ1	Std							6.43	0.15	2.757	1.257	-2132	-986	8	5	
608	MSim-5_UWQ1	Std							6.37	0.20	2.750	1.258	-2132	-961	8	6	
609	MSim-5_UWQ1	Std							6.24	0.24	2.702	1.241	-2132	-936	9	6	
610	MSim-5_UWQ1	Std							6.37	0.21	2.702	1.242	-2132	-911	9	6	
	*****bracket; 589-592, 607-610**						**0.17**	**0.9941**	**6.34**								

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
611	MSim-5_5ADQ	DQ	09IL-31	5408	1648.4	10.25	0.22		4.21	0.16	2.729	1.257	-656	1443	15	14		
612	MSim-5_5BOQ	OQ	09IL-31	5408	1648.4	19.58	0.22		13.49	0.18	2.719	1.254	-634	1383	16	15		
613	MSim-5_5COQ	OQ	09IL-31	5408	1648.4	20.40	0.22		14.30	0.26	2.717	1.253	-663	1381	15	15		
614	MSim-5_5DOQ	OQ	09IL-31	5408	1648.4	21.48	0.22		15.37	0.15	2.716	1.248	-539	1504	16	15		
615	MSim-5_5EOQ	OQ	09IL-31	5408	1648.4	20.88	0.22		14.78	0.21	2.753	1.256	-568	1469	16	15		
616	MSim-5_5FDQ	DQ	09IL-31	5408	1648.4	9.60	0.22		3.56	0.13	2.769	1.264	-504	1368	16	15		
617	MSim-5_6ADQ	DQ	09IL-31	5408	1648.4	10.73	0.22		4.69	0.19	2.708	1.251	-573	101	15	10		
618	MSim-5_6BOQ	OQ	09IL-31	5408	1648.4	20.37	0.22		14.27	0.24	2.690	1.251	-852	142	15	11		
~~619~~	~~MSim-5_6COQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~19.50~~	~~0.22~~		~~13.41~~	~~0.15~~	~~2.644~~	~~1.234~~	~~-641~~	~~364~~	~~15~~	~~11~~		Mixed analysis
620	MSim-5_6DOQ	OQ	09IL-31	5408	1648.4	20.17	0.22		14.07	0.23	2.701	1.260	-685	350	15	11		
~~621~~	~~MSim-5_6EOQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~				~~13.81~~	~~0.15~~	~~2.673~~	~~1.254~~	~~-895~~	~~261~~	~~15~~	~~11~~		Bad pit
622	MSim-5_6FDQ	DQ	09IL-31	5408	1648.4	9.71	0.22		3.67	0.22	2.674	1.255	-835	222	15	11		
623	MSim-5_6GOQ	OQ	09IL-31	5408	1648.4	19.18	0.22		13.09	0.27	2.659	1.249	-868	148	15	11		
624	MSim-5_UWQ1	Std							6.10	0.16	2.638	1.237	-2104	-914	9	6		
625	MSim-5_UWQ1	Std							6.28	0.24	2.602	1.225	-2104	-939	9	6		
626	MSim-5_UWQ1	Std							6.19	0.18	2.748	1.246	-2104	-964	9	6		
627	MSim-5_UWQ1	Std							6.25	0.16	2.783	1.243	-2104	-989	9	6		
	***bracket; 607-610, 624-627						0.22	0.9940	6.28									
628	MSim-5_7ADQ	DQ	09IL-31	5408	1648.4	10.35	0.21		4.31	0.15	2.820	1.255	-188	3544	17	23		
629	MSim-5_7BOQ	OQ	09IL-31	5408	1648.4	24.97	0.21		18.85	0.18	2.841	1.258	-282	3594	16	23		
630	MSim-5_7COQ	OQ	09IL-31	5408	1648.4	20.18	0.21		14.09	0.17	2.861	1.263	-298	3589	17	23		
631	MSim-5_7DOQ	OQ	09IL-31	5408	1648.4	22.98	0.21		16.87	0.26	2.866	1.266	-466	3550	16	23		
632	MSim-5_7EOQ	OQ	09IL-31	5408	1648.4	20.27	0.21		14.18	0.16	2.871	1.270	-444	3563	16	23		
633	MSim-5_7FOQ	OQ	09IL-31	5408	1648.4	20.48	0.21		14.38	0.18	2.818	1.247	-354	3636	16	22		
634	MSim-5_8ADQ	DQ	09IL-31	5408	1648.4	9.96	0.21		3.94	0.15	2.849	1.261	-1034	-1093	15	6		
635	MSim-5_8BOQ	OQ	09IL-31	5408	1648.4	20.39	0.21		14.30	0.13	2.867	1.266	-1079	-1057	16	6		
636	MSim-5_8COQ	OQ	09IL-31	5408	1648.4	20.07	0.21		13.98	0.20	2.838	1.254	-946	-914	15	7		
~~637~~	~~MSim-5_8DOQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~23.01~~	~~0.21~~		~~16.90~~	~~0.22~~	~~2.821~~	~~1.250~~	~~-975~~	~~-911~~	~~16~~	~~7~~		Mixed analysis
638	MSim-5_8EOQ	OQ	09IL-31	5408	1648.4	23.50	0.21		17.39	0.14	2.784	1.242	-754	-936	18	9		
639	MSim-5_8FOQ	OQ	09IL-31	5408	1648.4	25.42	0.21		19.29	0.10	2.736	1.224	-736	-952	18	9		
640	MSim-5_UWQ1	Std							6.35	0.16	2.780	1.252	-2076	-914	10	8		
641	MSim-5_UWQ1	Std							6.42	0.20	2.771	1.251	-2076	-939	9	8		
642	MSim-5_UWQ1	Std							6.38	0.20	2.796	1.255	-2076	-964	9	7		
643	MSim-5_UWQ1	Std							6.34	0.19	2.800	1.257	-2076	-989	9	7		
	***bracket; 624-627, 640-643						0.21	0.9940	6.29									
								MSim-10										
644	MSim-10_UWQ1	Std							6.56	0.18	2.707	1.239	-792	1984	0	4		
645	MSim-10_UWQ1	Std							6.69	0.21	2.730	1.255	-1157	175	3	2		
646	MSim-10_UWQ1	Std							6.34	0.14	2.692	1.239	-1205	-1496	4	1		
647	MSim-10_UWQ1	Std							6.40	0.22	2.698	1.241	-1016	-2585	8	-4		
648	MSim-10_UWQ1	Std							6.51	0.18	2.661	1.229	-1202	-1525	4	0		
649	MSim-10_UWQ1	Std							6.53	0.22	2.650	1.231	-1202	-1550	4	0		
650	MSim-10_UWQ1	Std							6.56	0.16	2.634	1.226	-1202	-1575	4	-1		
651	MSim-10_UWQ1	Std							6.66	0.19	2.648	1.231	-1202	-1600	5	0		
652	MSim-10_1ADQ	DQ	09IL-50	8468.8	2581.3	6.33	0.20		0.53	0.20	2.660	1.239	-2571	-2024	-3	-2		
653	MSim-10_1BDQ	DQ	09IL-50	8468.8	2581.3	11.21	0.20		5.38	0.21	2.654	1.241	-2252	-2314	-1	-3		
654	MSim-10_1COQ	OQ	09IL-50	8468.8	2581.3	20.70	0.20		14.82	0.20	2.653	1.241	-2444	-2220	-2	-2		
655	MSim-10_1DOQ	OQ	09IL-50	8468.8	2581.3	24.35	0.20		18.44	0.22	2.642	1.235	-2510	-2226	-2	-2		
~~656~~	~~MSim-10_1EOQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~18.00~~	~~0.20~~		~~12.13~~	~~0.54~~	~~2.667~~	~~1.248~~	~~-2533~~	~~-2276~~	~~-2~~	~~-3~~		Mixed analysis
657	MSim-10_1FOQ	OQ	09IL-50	8468.8	2581.3	18.72	0.20		12.85	0.23	2.645	1.237	-2302	-2038	-2	-2		
658	MSim-10_1GOQ	OQ	09IL-50	8468.8	2581.3	19.28	0.20		13.41	0.28	2.625	1.234	-2550	-1889	-3	-1		
659	MSim-10_1HOQ	OQ	09IL-50	8468.8	2581.3	23.53	0.20		17.64	0.24	2.630	1.236	-2500	-1900	-3	-2		
660	MSim-10_1IOQ	OQ	09IL-50	8468.8	2581.3	18.54	0.20		12.67	0.18	2.616	1.232	-2471	-1888	-3	-1		
661	MSim-10_1JDQ	DQ	09IL-50	8468.8	2581.3	9.99	0.20		4.17	0.24	2.608	1.237	-2413	-1949	-2	-1		
~~662~~	~~MSim-10_1KDQ~~	~~DQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~10.07~~	~~0.20~~		~~4.25~~	~~0.19~~	~~2.595~~	~~1.238~~	~~-2385~~	~~-1914~~	~~-2~~	~~-1~~		Mixed analysis
663	MSim-10_UWQ1	Std							6.50	0.19	2.688	1.248	-1222	-1602	4	-1		
664	MSim-10_UWQ1	Std							6.40	0.22	2.753	1.246	-1222	-1577	4	0		
665	MSim-10_UWQ1	Std							6.34	0.22	2.769	1.246	-1222	-1552	4	1		
666	MSim-10_UWQ1	Std							6.47	0.22	2.804	1.252	-1222	-1527	4	0		
	***bracket; 648-651, 663-666						0.20	0.9942	6.50									
667	MSim-10_2ADQ	DQ	09IL-50	8468.8	2581.3	9.32	0.32		3.57	0.21	2.783	1.243	-3012	154	-8	3		
668	MSim-10_2BOQ	OQ	09IL-50	8468.8	2581.3	19.53	0.32		13.73	0.22	2.812	1.257	-2982	72	-8	2		
669	MSim-10_2COQ	OQ	09IL-50	8468.8	2581.3	24.22	0.32		18.39	0.19	2.784	1.245	-2929	125	-8	2		
670	MSim-10_2DOQ	OQ	09IL-50	8468.8	2581.3	20.36	0.32		14.55	0.20	2.842	1.263	-2959	98	-8	3		
671	MSim-10_2EOQ	OQ	09IL-50	8468.8	2581.3	22.92	0.32		17.09	0.22	2.803	1.249	-2852	182	-7	3		
672	MSim-10_2FOQ	OQ	09IL-50	8468.8	2581.3	24.45	0.32		18.62	0.18	2.803	1.256	-3099	183	-9	3		
673	MSim-10_2GOQ	OQ	09IL-50	8468.8	2581.3	22.35	0.32		16.53	0.22	2.820	1.261	-3118	187	-9	3		
674	MSim-10_2HOQ	OQ	09IL-50	8468.8	2581.3	21.07	0.32		15.26	0.21	2.786	1.250	-2774	319	-7	3		
675	MSim-10_2IOQ	OQ	09IL-50	8468.8	2581.3	20.27	0.32		14.46	0.17	2.829	1.268	-2723	312	-7	3		
676	MSim-10_2JDQ	DQ	09IL-50	8468.8	2581.3	7.70	0.32		1.96	0.20	2.806	1.260	-2601	262	-7	3		
677	MSim-10_3ADQ	DQ	09IL-50	8468.8	2581.3	9.02	0.32		3.27	0.19	2.791	1.256	-3095	1238	-11	4		
678	MSim-10_3BOQ	OQ	09IL-50	8468.8	2581.3	22.50	0.32		16.68	0.17	2.785	1.256	-2980	1252	-10	4		
679	MSim-10_3COQ	OQ	09IL-50	8468.8	2581.3	19.29	0.32		13.49	0.21	2.779	1.254	-2932	1240	-10	4		
680	MSim-10_3DOQ	OQ	09IL-50	8468.8	2581.3	21.13	0.32		15.32	0.20	2.770	1.251	-3157	1073	-11	4		
681	MSim-10_3EDQ	DQ	09IL-50	8468.8	2581.3	14.18	0.32		8.41	0.26	2.729	1.239	-2925	1295	-9	8		
682	MSim-10_UWQ1	Std							6.62	0.14	2.739	1.250	-1247	-1602	4	0		
683	MSim-10_UWQ1	Std							6.76	0.18	2.773	1.266	-1247	-1577	4	0		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 μm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##
684	MSim-10_UWQ1	Std							6.69	0.16	2.764	1.263	-1247	-1552	3	0	
685	MSim-10_UWQ1	Std							6.75	0.23	2.772	1.266	-1247	-1527	3	0	
	***bracket; 663-666, 682-685						0.32	0.9943	6.57								
								MSim-10									
1	MSim-10_UWQ1	Std							6.59	0.15	2.652	1.251	-996	-2564	1	-4	
2	MSim-10_UWQ1	Std							6.45	0.17	2.669	1.248	-996	-2539	1	-5	
3	MSim-10_UWQ1	Std							6.49	0.23	2.679	1.252	-1021	-2539	2	-3	
4	MSim-10_UWQ1	Std							6.48	0.19	2.678	1.251	-1021	-2564	2	-3	
5	MSim-10_UWQ1	Std							6.44	0.20	2.651	1.245	-1171	-1523	-2	1	
6	MSim-10_UWQ1	Std							6.60	0.26	2.657	1.250	-1171	-1548	-2	1	
7	MSim-10_UWQ1	Std							6.53	0.21	2.653	1.248	-1171	-1573	-2	0	
8	MSim-10_UWQ1	Std							6.54	0.21	2.637	1.243	-1171	-1598	-2	-1	
9	MSim-10_4ADQ	DQ	09IL-50	8468.8	2581.3	7.51	0.15		1.69	0.19	2.651	1.258	-1821	3125	-17	4	
10	MSim-10_4BOQ	OQ	09IL-50	8468.8	2581.3	19.45	0.15		13.56	0.21	2.640	1.255	-1966	3030	-17	4	
~~11~~	~~MSim-10_4COQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~				~~14.55~~	~~0.21~~	~~2.630~~	~~1.251~~	~~-1987~~	~~3014~~	~~-18~~	~~5~~	Bad pit
12	MSim-10_4DOQ	OQ	09IL-50	8468.8	2581.3	26.83	0.15		20.89	0.26	2.648	1.259	-1739	3229	-17	6	
13	MSim-10_4EOQ	OQ	09IL-50	8468.8	2581.3	21.48	0.15		15.58	0.25	2.633	1.253	-1794	3227	-17	6	
14	MSim-10_4FOQ	OQ	09IL-50	8468.8	2581.3	24.22	0.15		18.30	0.18	2.619	1.245	-1766	3231	-17	5	
15	MSim-10_4GOQ	OQ	09IL-50	8468.8	2581.3	20.84	0.15		14.94	0.17	2.638	1.253	-1700	3345	-16	7	
16	MSim-10_4HOQ	OQ	09IL-50	8468.8	2581.3	24.27	0.15		18.35	0.21	2.638	1.255	-1684	3323	-16	6	
17	MSim-10_4IOQ	OQ	09IL-50	8468.8	2581.3	20.87	0.15		14.97	0.18	2.608	1.243	-1641	3286	-16	6	
22	MSim-10_UWQ1	Std							6.42	0.24	2.804	1.255	-1145	-1520	-2	0	
23	MSim-10_UWQ1	Std							6.36	0.18	2.810	1.256	-1145	-1545	-2	0	
24	MSim-10_UWQ1	Std							6.46	0.19	2.797	1.252	-1145	-1570	-2	0	
25	MSim-10_UWQ1	Std							6.46	0.20	2.769	1.239	-1145	-1595	-2	-1	
	***bracket; 5-8, 22-25						0.15	0.9942	6.48								
								MSim-9									
37	MSim-9_UWQ1	Std							6.63	0.18	2.715	1.242	-1467	2288	-8	-7	
38	MSim-9_UWQ1	Std							6.72	0.21	2.705	1.241	-983	315	3	-10	
39	MSim-9_UWQ1	Std							6.57	0.25	2.691	1.239	-641	-1522	10	-14	
40	MSim-9_UWQ1	Std							6.76	0.21	2.674	1.235	-660	-2932	16	-20	
41	MSim-9_UWQ1	Std							6.75	0.20	2.717	1.254	-711	-1606	10	-14	
42	MSim-9_UWQ1	Std							6.71	0.15	2.678	1.236	-711	-1632	10	-14	
43	MSim-9_UWQ1	Std							6.64	0.21	2.698	1.244	-711	-1656	10	-15	
44	MSim-9_UWQ1	Std							6.64	0.21	2.678	1.237	-711	-1682	10	-15	
45	MSim-9_1ADQ	DQ	09IL-47	8465.5	2580.3	10.00	0.35		4.25	0.17	2.648	1.225	-3364	-1568	-6	-11	
~~46~~	~~MSim-9_1BOQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~	~~15.66~~	~~0.35~~		~~9.87~~	~~0.21~~	~~2.673~~	~~1.235~~	~~-3207~~	~~-1608~~	~~-5~~	~~-12~~	Mixed analysis
47	MSim-9_1COQ	OQ	09IL-47	8465.5	2580.3	12.60	0.35		6.83	0.19	2.658	1.228	-3157	-1645	-4	-11	
48	MSim-9_1DOQ	OQ	09IL-47	8465.5	2580.3	12.62	0.35		6.85	0.21	2.661	1.233	-3138	-1645	-4	-11	
~~49~~	~~MSim-9_1EOQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~				~~11.84~~	~~0.16~~	~~2.669~~	~~1.239~~	~~-3096~~	~~-1858~~	~~-2~~	~~-10~~	Bad pit
50	MSim-9_1FDQ	DQ	09IL-47	8465.5	2580.3	14.24	0.35		8.46	0.23	2.621	1.218	-3136	-1851	-3	-10	
51	MSim-9_2ADQ	DQ	09IL-47	8465.5	2580.3	11.43	0.35		5.66	0.18	2.658	1.234	-2818	904	-10	-7	
52	MSim-9_2BOQ	OQ	09IL-47	8465.5	2580.3	13.18	0.35		7.40	0.20	2.656	1.233	-2560	861	-8	-8	
~~53~~	~~MSim-9_2COQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~	~~13.06~~	~~0.35~~		~~7.28~~	~~0.22~~	~~2.665~~	~~1.237~~	~~-2414~~	~~728~~	~~-6~~	~~-7~~	Mixed analysis
54	MSim-9_2DDQ	DQ	09IL-47	8465.5	2580.3	12.54	0.35		6.77	0.19	2.681	1.242	-2579	829	-11	-7	
~~55~~	~~MSim-9_2EOQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~	~~19.62~~	~~0.35~~		~~13.81~~	~~0.24~~	~~2.652~~	~~1.234~~	~~-2328~~	~~799~~	~~-7~~	~~-9~~	Mixed analysis
56	MSim-9_2FDQ	DQ	09IL-47	8465.5	2580.3	11.47	0.35		5.71	0.16	2.631	1.228	-2430	690	-6	-7	
57	MSim-9_UWQ1	Std							6.50	0.18	2.671	1.239	-686	-1682	10	-14	
58	MSim-9_UWQ1	Std							6.64	0.19	2.682	1.246	-686	-1657	10	-14	
59	MSim-9_UWQ1	Std							6.33	0.17	2.661	1.239	-686	-1632	10	-13	
60	MSim-9_UWQ1	Std							6.27	0.20	2.674	1.251	-686	-1607	10	-13	
	***bracket; 41-44, 57-60						0.35	0.9943	6.56								
61	MSim-9_3ADQ	DQ	09IL-47	8465.5	2580.3	11.05	0.23		5.17	0.27	2.610	1.229	-3774	1985	-4	-7	
~~62~~	~~MSim-9_3BOQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~				~~15.54~~	~~0.18~~	~~2.611~~	~~1.235~~	~~-3735~~	~~2046~~	~~-4~~	~~-7~~	Bad pit
~~63~~	~~MSim-9_3COQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~				~~13.63~~	~~0.23~~	~~2.633~~	~~1.248~~	~~-3776~~	~~2040~~	~~-5~~	~~-7~~	Bad pit
64	MSim-9_3DOQ	OQ	09IL-47	8465.5	2580.3	24.55	0.23		18.60	0.24	2.627	1.244	-3628	2047	-3	-6	
65	MSim-9_3EOQ	OQ	09IL-47	8465.5	2580.3	25.02	0.23		19.07	0.23	2.641	1.247	-3599	2062	-3	-6	
66	MSim-9_3FOQ	OQ	09IL-47	8465.5	2580.3	26.09	0.23		20.13	0.23	2.585	1.225	-3588	2046	-3	-7	
67	MSim-9_3GDQ	DQ	09IL-47	8465.5	2580.3	7.37	0.23		1.52	0.20	2.576	1.227	-3597	2108	-4	-6	
68	MSim-9_4ADQ	DQ	09IL-47	8465.5	2580.3	12.26	0.23		6.38	0.22	2.674	1.234	-3235	3134	-4	-6	
69	MSim-9_4BOQ	DQ	09IL-47	8465.5	2580.3	14.07	0.23		8.17	0.18	2.703	1.208	-3233	3200	-6	-8	
70	MSim-9_4CDQ	DQ	09IL-47	8465.5	2580.3	10.40	0.23		4.53	0.19	2.749	1.220	-3148	3152	-4	-7	
71	MSim-9_4DOQ	DQ	09IL-47	8465.5	2580.3	10.50	0.23		4.63	0.18	2.787	1.233	-3127	3198	-4	-7	
~~72~~	~~MSim-9_4EOQ~~	~~OQ~~	~~09IL-47~~	~~8465.5~~	~~2580.3~~	~~10.57~~	~~0.23~~		~~4.70~~	~~0.15~~	~~2.835~~	~~1.255~~	~~-2776~~	~~3002~~	~~-1~~	~~-5~~	Mixed analysis
73	MSim-9_UWQ1	Std							6.43	0.18	2.801	1.238	-661	-1682	26	-15	
74	MSim-9_UWQ1	Std							6.45	0.20	2.794	1.237	-661	-1657	26	-14	
75	MSim-9_UWQ1	Std							6.55	0.18	2.792	1.235	-661	-1632	27	-14	
76	MSim-9_UWQ1	Std							6.42	0.25	2.805	1.240	-661	-1607	26	-14	
	***bracket; 57-60, 73-76						0.23	0.9942	6.45								
77	MSim-9_5ADQ	DQ	09IL-46	8462.5	2579.4	9.94	0.20		4.16	0.17	2.796	1.257	564	-2702	12	-18	
~~78~~	~~MSim-9_5BOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~10.37~~	~~0.20~~		~~4.58~~	~~0.22~~	~~2.833~~	~~1.276~~	~~528~~	~~-2598~~	~~13~~	~~-18~~	Mixed analysis
79	MSim-9_5COQ	OQ	09IL-46	8462.5	2579.4	21.09	0.20		15.24	0.25	2.800	1.258	653	-2626	14	-19	
~~80~~	~~MSim-9_5DOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~18.16~~	~~0.20~~		~~12.33~~	~~0.22~~	~~2.810~~	~~1.259~~	~~676~~	~~-2614~~	~~14~~	~~-18~~	Mixed analysis
81	MSim-9_5EOQ	OQ	09IL-46	8462.5	2579.4	24.22	0.20		18.36	0.27	2.792	1.251	608	-2827	15	-20	
82	MSim-9_5FOQ	OQ	09IL-46	8462.5	2579.4	23.89	0.20		18.03	0.18	2.750	1.238	608	-2852	15	-19	

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 μm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
83	MSim-9_6ADQ	DQ	09IL-46	8462.5	2579.4	9.34	0.20		3.56	0.14	2.754	1.249	1103	-1233	8	-13		
84	MSim-9_6BOQ	OQ	09IL-46	8462.5	2579.4	22.24	0.20		16.39	0.19	2.716	1.237	1061	-1203	9	-12		
~~85~~	~~MSim-9_6COQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~15.07~~	~~0.20~~		~~9.26~~	~~0.22~~	~~2.781~~	~~1.269~~	~~974~~	~~-1124~~	~~9~~	~~-12~~		Mixed analysis
~~86~~	~~MSim-9_6DOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~				~~17.05~~	~~0.19~~	~~2.749~~	~~1.259~~	~~951~~	~~-1098~~	~~8~~	~~-13~~		Bad pit
~~87~~	~~MSim-9_6EOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~21.14~~	~~0.20~~		~~15.29~~	~~0.15~~	~~2.739~~	~~1.258~~	~~943~~	~~-1120~~	~~8~~	~~-12~~		Mixed analysis
88	MSim-9_6FDQ	DQ	09IL-46	8462.5	2579.4	13.67	0.20		7.87	0.20	2.728	1.256	944	-1165	8	-11		
89	MSim-9_UWQ1	Std							6.63	0.20	2.717	1.255	-634	-1682	4	-14		
90	MSim-9_UWQ1	Std							6.53	0.19	2.724	1.261	-634	-1657	4	-14		
91	MSim-9_UWQ1	Std							6.68	0.19	2.714	1.262	-634	-1632	5	-12		
92	MSim-9_UWQ1	Std							6.61	0.18	2.719	1.265	-634	-1607	4	-12		
	*****bracket; 73-76, 89-92**						**0.20**	**0.9943**	**6.54**									
93	MSim-9_7ADQ	DQ	09IL-46	8462.5	2579.4	6.30	0.30		0.56	0.18	2.702	1.260	599	470	1	-9		
~~94~~	~~MSim-9_7BOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~21.73~~	~~0.30~~		~~15.91~~	~~0.20~~	~~2.657~~	~~1.246~~	~~553~~	~~587~~	~~2~~	~~-10~~		Mixed analysis
~~95~~	~~MSim-9_7COQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~19.94~~	~~0.30~~		~~14.13~~	~~0.15~~	~~2.683~~	~~1.260~~	~~574~~	~~525~~	~~2~~	~~-9~~		Mixed analysis
96	MSim-9_7DOQ	OQ	09IL-46	8462.5	2579.4	20.12	0.30		14.31	0.17	2.690	1.263	389	595	1	-10		
97	MSim-9_7EOQ	OQ	09IL-46	8462.5	2579.4	20.63	0.30		14.82	0.23	2.672	1.252	369	599	1	-10		
98	MSim-9_7FDQ	DQ	09IL-46	8462.5	2579.4	8.58	0.30		2.84	0.18	2.673	1.252	433	603	1	-9		
99	MSim-9_8ADQ	DQ	09IL-46	8462.5	2579.4	9.57	0.30		3.82	0.18	2.652	1.251	457	2040	4	-8		
~~100~~	~~MSim-9_8BOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~23.67~~	~~0.30~~		~~17.84~~	~~0.21~~	~~2.656~~	~~1.254~~	~~362~~	~~1829~~	~~4~~	~~-9~~		Mixed analysis
101	MSim-9_8COQ	OQ	09IL-46	8462.5	2579.4	22.30	0.30		16.48	0.23	2.637	1.246	398	1866	5	-7		
102	MSim-9_8DDQ	DQ	09IL-46	8462.5	2579.4	9.23	0.30		3.48	0.19	2.623	1.244	368	1894	5	-7		
103	MSim-9_8EDQ?	DQ	09IL-46	8462.5	2579.4	9.26	0.30		3.52	0.17	2.637	1.245	336	1875	6	-7		
~~104~~	~~MSim-9_8FOQ~~	~~OQ~~	~~09IL-46~~	~~8462.5~~	~~2579.4~~	~~21.63~~	~~0.30~~		~~15.81~~	~~0.16~~	~~2.681~~	~~1.257~~	~~299~~	~~1890~~	~~6~~	~~-7~~		Mixed analysis
105	MSim-9_UWQ1	Std							6.41	0.19	2.667	1.249	-603	-1604	15	-12		
106	MSim-9_UWQ1	Std							6.83	0.17	2.692	1.257	-603	-1629	15	-11		
107	MSim-9_UWQ1	Std							6.41	0.26	2.688	1.252	-603	-1654	14	-13		
108	MSim-9_UWQ1	Std							6.42	0.17	2.664	1.245	-603	-1679	14	-14		
	*****bracket; 89-92, 105-108**						**0.30**	**0.9943**	**6.56**									
								MSim-6										
109	MSim-6_UWQ1	Std							6.68	0.22	2.628	1.242	-2343	3173	10	11		
110	MSim-6_UWQ1	Std							6.26	0.21	2.632	1.245	-2277	1309	15	8		
111	MSim-6_UWQ1	Std							6.47	0.25	2.616	1.241	-2222	-935	19	2		
112	MSim-6_UWQ1	Std							6.15	0.25	2.589	1.232	-2172	-2161	21	-4		
113	MSim-6_UWQ1	Std							6.20	0.19	2.726	1.262	-2177	-909	19	2		
114	MSim-6_UWQ1	Std							6.42	0.23	2.716	1.231	-2177	-934	20	2		
115	MSim-6_UWQ1	Std							6.30	0.18	2.730	1.241	-2177	-959	19	2		
116	MSim-6_UWQ1	Std							6.29	0.17	2.751	1.246	-2177	-984	20	1		
117	MSim-6_1ADQ	DQ	09IL-35	6154.5	1875.9	9.50	0.20		3.45	0.17	2.767	1.253	-3733	-1059	14	4		
118	MSim-6_1BOQ	OQ	09IL-35	6154.5	1875.9	21.27	0.20		15.15	0.17	2.757	1.251	-3837	-1189	14	5		
119	MSim-6_1COQ	OQ	09IL-35	6154.5	1875.9	22.14	0.20		16.01	0.18	2.755	1.252	-3828	-1167	14	5		
120	MSim-6_1DOQ	OQ	09IL-35	6154.5	1875.9	21.77	0.20		15.65	0.16	2.727	1.241	-3867	-1146	15	5		
121	MSim-6_1EOQ	OQ	09IL-35	6154.5	1875.9	20.51	0.20		14.39	0.16	2.724	1.242	-3930	-1135	15	5		
~~122~~	~~MSim-6_1FOQ~~	~~OQ~~	~~09IL-35~~	~~6154.5~~	~~1875.9~~	~~18.19~~	~~0.20~~		~~12.08~~	~~0.51~~	~~2.749~~	~~1.256~~	~~-3939~~	~~-1092~~	~~15~~	~~5~~		Mixed analysis
123	MSim-6_2ADQ	DQ	09IL-35	6154.5	1875.9	10.46	0.20		4.40	0.21	2.733	1.253	-3752	2221	12	8		
124	MSim-6_2BOQ	OQ	09IL-35	6154.5	1875.9	25.62	0.20		19.47	0.17	2.759	1.263	-3921	2334	12	8		
125	MSim-6_2COQ	OQ	09IL-35	6154.5	1875.9	25.25	0.20		19.10	0.14	2.751	1.259	-3948	2346	12	8		
126	MSim-6_2DOQ	OQ	09IL-35	6154.5	1875.9	21.62	0.20		15.49	0.25	2.748	1.260	-3922	2088	12	8		
127	MSim-6_2EOQ	OQ	09IL-35	6154.5	1875.9	21.81	0.20		15.68	0.24	2.737	1.255	-3964	2092	12	8		
128	MSim-6_2FOQ	OQ	09IL-35	6154.5	1875.9	22.17	0.20		16.04	0.16	2.720	1.247	-3582	2213	12	7		
129	MSim-6_2GOQ	OQ	09IL-35	6154.5	1875.9	18.92	0.20		12.81	0.19	2.712	1.243	-3556	2214	12	7		
~~130~~	~~MSim-6_2HOQ~~	~~OQ~~	~~09IL-35~~	~~6154.5~~	~~1875.9~~	~~10.65~~	~~0.20~~		~~4.59~~	~~0.19~~	~~2.723~~	~~1.251~~	~~-3604~~	~~2215~~	~~12~~	~~7~~		Mixed analysis
131	MSim-6_UWQ1	Std							6.16	0.21	2.688	1.240	-2146	-987	20	1		
132	MSim-6_UWQ1	Std							6.25	0.18	2.710	1.252	-2146	-962	20	2		
133	MSim-6_UWQ1	Std							6.12	0.19	2.702	1.250	-2146	-937	21	3		
134	MSim-6_UWQ1	Std							6.36	0.25	2.699	1.250	-2146	-912	21	3		
	*****bracket; 113-116, 131-134**						**0.20**	**0.9940**	**6.26**									
135	MSim-6_3ADQ	DQ	09IL-35	6154.5	1875.9	12.37	0.19		6.23	0.24	2.711	1.255	-3781	-245	14	6		
136	MSim-6_3BOQ	OQ	09IL-35	6154.5	1875.9	23.09	0.19		16.89	0.21	2.724	1.259	-3648	-32	13	7		
137	MSim-6_3COQ	OQ	09IL-35	6154.5	1875.9	18.00	0.19		11.83	0.18	2.701	1.251	-3692	0	9	7		
138	MSim-6_3DOQ	OQ	09IL-35	6154.5	1875.9	26.78	0.19		20.55	0.16	2.668	1.240	-3807	-20	14	8		
139	MSim-6_3EOQ	OQ	09IL-35	6154.5	1875.9	21.41	0.19		15.22	0.20	2.567	1.196	-3751	-7	15	7		
140	MSim-6_4ADQ	DQ	09IL-35	6154.5	1875.9	8.69	0.19		2.57	0.20	2.668	1.246	-3890	-2161	13	3		
141	MSim-6_4BOQ	OQ	09IL-35	6154.5	1875.9	19.09	0.19		12.91	0.19	2.632	1.227	-3970	-2288	12	2		
142	MSim-6_4COQ	OQ	09IL-35	6154.5	1875.9	23.54	0.19		17.34	0.27	2.657	1.238	-3992	-2254	13	2		
143	MSim-6_4DOQ	OQ	09IL-35	6154.5	1875.9	19.95	0.19		13.77	0.31	2.640	1.239	-4012	-2133	15	4		
~~144~~	~~MSim-6_4EDQ~~	~~DQ~~	~~09IL-35~~	~~6154.5~~	~~1875.9~~	~~9.56~~	~~0.19~~		~~3.44~~	~~0.21~~	~~2.642~~	~~1.244~~	~~-4134~~	~~-2248~~	~~13~~	~~3~~		Mixed analysis
145	MSim-6_4FOQ	OQ	09IL-35	6154.5	1875.9	20.24	0.19		14.06	0.21	2.627	1.237	-3912	-2419	13	2		
146	MSim-6_UWQ1	Std							6.07	0.20	2.623	1.236	-2115	-924	22	3		
147	MSim-6_UWQ1	Std							6.20	0.23	2.642	1.245	-2115	-949	22	3		
148	MSim-6_UWQ1	Std							6.12	0.20	2.629	1.242	-2115	-974	22	2		
149	MSim-6_UWQ1	Std							6.29	0.18	2.606	1.235	-2115	-999	21	1		
	*****bracket; 131-134, 146-149**						**0.19**	**0.9939**	**6.19**									
150	MSim-6_5ADQ	DQ	09IL-37	6228	1898.3	9.49	0.15		3.32	0.19	2.724	1.255	82	1996	22	9		
151	MSim-6_5BOQ	OQ	09IL-37	6228	1898.3	22.51	0.15		16.27	0.17	2.776	1.244	266	1853	22	8		
152	MSim-6_5COQ	OQ	09IL-37	6228	1898.3	19.40	0.15		13.17	0.24	2.755	1.229	268	1881	22	7		
153	MSim-6_5DOQ	OQ	09IL-37	6228	1898.3	21.23	0.15		14.99	0.20	2.775	1.236	293	1876	22	8		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
154	MSim-6_5EOQ	OQ	09IL-37	6228	1898.3	19.43	0.15		13.20	0.19	2.744	1.221	201	1722	21	9		
155	MSim-6_6ADQ	DQ	09IL-37	6228	1898.3	9.27	0.15		3.11	0.15	2.781	1.237	-287	741	23	6		
156	MSim-6_6BOQ	OQ	09IL-37	6228	1898.3	19.93	0.15		13.70	0.22	2.762	1.228	-446	636	23	5		
157	MSim-6_6COQ	OQ	09IL-37	6228	1898.3	24.34	0.15		18.08	0.14	2.788	1.238	-363	624	22	5		
158	MSim-6_6DOQ	OQ	09IL-37	6228	1898.3	25.94	0.15		19.67	0.24	2.768	1.232	-394	708	22	4		
159	MSim-6_6EOQ	OQ	09IL-37	6228	1898.3	22.23	0.15		15.99	0.24	2.774	1.237	-408	653	22	5		
160	MSim-6_6FOQ	OQ	09IL-37	6228	1898.3	19.75	0.15		13.52	0.21	2.793	1.242	-221	416	23	4		
161	MSim-6_UWQ1	Std							6.15	0.19	2.810	1.245	-2083	-994	21	1		
162	MSim-6_UWQ1	Std							6.11	0.16	2.824	1.251	-2083	-969	21	3		
163	MSim-6_UWQ1	Std							6.05	0.20	2.803	1.248	-2083	-944	22	4		
164	MSim-6_UWQ1	Std							6.17	0.15	2.826	1.256	-2083	-919	22	4		
	***bracket; 146-149, 161-164						0.15	0.9939	6.14									
165	MSim-6_7ADQ	DQ	09IL-37	6228	1898.3	8.69	0.20		2.59	0.21	2.759	1.227	-22	-978	24	1		
166	MSim-6_7BOQ	OQ	09IL-37	6228	1898.3	22.94	0.20		16.75	0.20	2.738	1.229	-120	-921	24	1		
167	MSim-6_7COQ	OQ	09IL-37	6228	1898.3	20.78	0.20		14.60	0.21	2.673	1.225	-184	-943	24	1		
168	MSim-6_7DOQ	OQ	09IL-37	6228	1898.3	26.19	0.20		19.98	0.16	2.682	1.228	-57	-873	24	0		
169	MSim-6_7EOQ	OQ	09IL-37	6228	1898.3	19.72	0.20		13.55	0.20	2.712	1.235	-187	-1097	24	1		
170	MSim-6_7FOQ	OQ	09IL-37	6228	1898.3	19.70	0.20		13.53	0.18	2.698	1.234	-229	-1120	23	1		
171	MSim-6_8ADQ	DQ	09IL-37	6228	1898.3	9.35	0.20		3.24	0.21	2.693	1.238	-1046	-2141	25	-5		
~~172~~	~~MSim-6_8BOQ~~	~~OQ~~	~~09IL-37~~	~~6228~~	~~1898.3~~	~~22.84~~	~~0.20~~		~~16.64~~	~~0.13~~	~~2.685~~	~~1.234~~	~~-992~~	~~-2015~~	~~25~~	~~-4~~	Mixed analysis	
173	MSim-6_8COQ	OQ	09IL-37	6228	1898.3	18.37	0.20		12.20	0.21	2.700	1.242	-986	-1955	26	-4		
174	MSim-6_8DOQ	OQ	09IL-37	6228	1898.3	22.16	0.20		15.97	0.21	2.697	1.241	-990	-1984	26	-3		
175	MSim-6_8EOQ	OQ	09IL-37	6228	1898.3	19.61	0.20		13.44	0.24	2.625	1.214	-778	-1851	26	-4		
176	MSim-6_8FOQ	OQ	09IL-37	6228	1898.3	24.00	0.20		17.80	0.16	2.651	1.229	-798	-1854	25	-4		
177	MSim-6_8GDQ	DQ	09IL-37	6228	1898.3	11.46	0.20		5.33	0.23	2.649	1.232	-910	-1902	24	-4		
178	MSim-6_UWQ1	Std							6.27	0.17	2.669	1.248	-2052	-920	21	3		
179	MSim-6_UWQ1	Std							6.26	0.16	2.657	1.246	-2052	-945	21	3		
180	MSim-6_UWQ1	Std							6.24	0.18	2.641	1.243	-2052	-970	21	2		
181	MSim-6_UWQ1	Std							6.36	0.22	2.645	1.245	-2052	-995	21	1		
	***bracket; 161-164, 178-181						0.20	0.9939	6.20									
	October 28-30, 2009																	
	MSim-10																	
~~313~~	~~MSim-10_UWQ1~~	~~Std~~							~~-20.12~~	~~29.80~~	~~0.020~~	~~0.009~~	~~-664~~	~~-2419~~	~~12~~	~~-81~~	electron gun off	
314	MSim-10_UWQ1	Std							6.97	0.24	2.472	1.167	-664	-2439	18	-37		
315	MSim-10_UWQ1	Std							7.18	0.39	2.384	1.130	-664	-2459	21	-36		
~~316~~	~~MSim-10_UWQ1~~	~~Std~~							~~7.58~~	~~0.26~~	~~2.257~~	~~1.071~~	~~-664~~	~~-2479~~	~~21~~	~~-35~~	low yield	
317	MSim-10_UWQ1	Std							6.73	0.36	2.377	1.135	-664	-2499	20	-35		
318	MSim-10_UWQ1	Std							7.22	0.35	2.484	1.186	-664	-2519	20	-35		
319	MSim-10_UWQ1	Std							7.64	0.34	2.203	1.059	-766	-1438	-13	-28		
320	MSim-10_UWQ1	Std							7.46	0.27	2.354	1.138	-766	-1458	-13	-28		
321	MSim-10_UWQ1	Std							7.53	0.33	2.279	1.104	-766	-1478	-13	-30		
~~322~~	~~MSim-10_UWQ1~~	~~Std~~							~~7.99~~	~~0.30~~	~~2.083~~	~~1.018~~	~~-766~~	~~-1498~~	~~-13~~	~~-28~~	low yield	
323	MSim-10_UWQ1	Std							7.17	0.34	2.283	1.126	-750	-1424	-14	-27		
324	MSim-10_9AOQ	OQ	09IL-50	8468.8	2581.3	18.86	0.27		13.92	0.18	2.196	1.095	-3099	-792	-23	-27		
325	MSim-10_9BOQ	OQ	09IL-50	8468.8	2581.3	19.30	0.27		14.36	0.25	2.076	1.036	-3084	-792	-25	-25		
326	MSim-10_9COQ	OQ	09IL-50	8468.8	2581.3	19.74	0.27		14.80	0.27	1.988	0.994	-3069	-792	-25	-25		
327	MSim-10_9DOQ	OQ	09IL-50	8468.8	2581.3	19.46	0.27		14.52	0.28	2.098	1.025	-3054	-792	-25	-26		
328	MSim-10_9EOQ	OQ	09IL-50	8468.8	2581.3	21.21	0.27		16.27	0.17	2.120	1.006	-3039	-792	-25	-26		
329	MSim-10_9FOQ	OQ	09IL-50	8468.8	2581.3	23.80	0.27		18.84	0.31	2.170	1.022	-3024	-792	-25	-26		
330	MSim-10_9GOQ	OQ	09IL-50	8468.8	2581.3	24.42	0.27		19.46	0.54	2.370	1.118	-3009	-792	-22	-26		
~~331~~	~~MSim-10_9HOQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~19.98~~	~~0.27~~		~~15.04~~	~~0.29~~	~~2.632~~	~~1.232~~	~~-2994~~	~~-792~~	~~-25~~	~~-28~~	Mixed analysis	
332	MSim-10_9IOQ	DQ	09IL-50	8468.8	2581.3	11.52	0.27		6.62	0.16	2.445	1.139	-2979	-792	-25	-24		
333	MSim-10_UWQ1	Std							7.35	0.25	2.591	1.194	-738	-1447	-12	-28		
334	MSim-10_UWQ1	Std							7.40	0.16	2.645	1.243	-738	-1467	-13	-30		
335	MSim-10_UWQ1	Std							7.42	0.26	2.567	1.210	-738	-1487	-13	-30		
336	MSim-10_UWQ1	Std							7.44	0.30	2.535	1.196	-738	-1507	-12	-30		
	***bracket; 319-321, 323, 333-336						0.27	0.9952	7.43									
	MSim-3																	
337	MSim-3_UWQ1	Std							7.60	0.21	2.522	1.179	-965	-3357	9	-42		
338	MSim-3_UWQ1	Std							7.44	0.23	2.478	1.164	-965	-3387	10	-42		
339	MSim-3_UWQ1	Std							7.59	0.22	2.514	1.174	-963	-3430	-13	-38		
340	MSim-3_UWQ1	Std							7.48	0.18	2.507	1.171	-997	-3357	-14	-40		
341	MSim-3_UWQ1	Std							7.51	0.19	2.594	1.206	-994	-3389	-14	-39		
342	MSim-3_UWQ1	Std							7.71	0.22	2.601	1.198	-994	-3419	-14	-38		
343	MSim-3_10AOQ	OQ	09IL-41	6503	1982.1	21.78	0.19		16.95	0.19	2.707	1.243	-3101	-1652	-16	-25		
344	MSim-3_10BOQ	OQ	09IL-41	6503	1982.1	21.78	0.19		16.95	0.15	2.707	1.245	-3113	-1670	-16	-27		
345	MSim-3_10COQ	OQ	09IL-41	6503	1982.1	23.07	0.19		18.24	0.32	2.643	1.216	-3123	-1681	-16	-28		
346	MSim-3_10DOQ	OQ	09IL-41	6503	1982.1	25.29	0.19		20.44	0.20	2.659	1.219	-3134	-1691	-17	-26		
~~347~~	~~MSim-3_10EOQ~~	~~OQ~~	~~09IL-41~~	~~6503~~	~~1982.1~~	~~8.61~~	~~0.19~~		~~3.84~~	~~0.66~~	~~2.680~~	~~1.228~~	~~-3145~~	~~-1706~~	~~-16~~	~~-27~~	Mixed analysis	
348	MSim-3_10FDQ	DQ	09IL-41	6503	1982.1	4.81	0.19		0.06	0.16	2.742	1.254	-3149	-1745	-17	-26		
349	MSim-3_10GDQ	DQ	09IL-41	6503	1982.1	5.02	0.19		0.27	0.19	2.753	1.254	-3173	-1795	-17	-28		
350	MSim-3_10HDQ	DQ	09IL-41	6503	1982.1	4.89	0.19		0.14	0.25	2.777	1.264	-3138	-1828	-17	-27		
351	MSim-3_10IOQ	OQ	09IL-41	6503	1982.1	21.97	0.19		17.14	0.17	2.734	1.241	-3066	-1670	-18	-30		
352	MSim-3_10JOQ	OQ	09IL-41	6503	1982.1	22.34	0.19		17.51	0.24	2.640	1.203	-3082	-1695	-16	-27		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##
353	MSim-3_UWQ1	Std							7.64	0.19	2.630	1.205	-1014	-3419	-6	-39	
354	MSim-3_UWQ1	Std							7.55	0.16	2.683	1.227	-1014	-3399	-6	-41	
355	MSim-3_UWQ1	Std							7.43	0.17	2.736	1.242	-1014	-3379	-7	-41	
356	MSim-3_UWQ1	Std							7.45	0.24	2.732	1.239	-1014	-3359	-7	-41	
	***bracket; 339-342, 353-356						0.19	0.9953	7.54								
~~357~~	~~MSim-3_12AOQ~~	~~OQ~~	~~09IL-41~~	~~6503~~	~~1982.1~~	~~19.81~~	~~0.34~~		~~15.09~~	~~0.29~~	~~2.682~~	~~1.221~~	~~-2647~~	~~4318~~	~~-22~~	~~-14~~	Mixed analysis
358	MSim-3_12BOQ	OQ	09IL-41	6503	1982.1	21.02	0.34		16.30	0.18	2.736	1.248	-2631	4318	-21	-15	
359	MSim-3_12COQ	OQ	09IL-41	6503	1982.1	22.95	0.34		18.21	0.21	2.721	1.245	-2616	4313	-22	-15	
360	MSim-3_12DOQ	OQ	09IL-41	6503	1982.1	23.93	0.34		19.19	0.18	2.742	1.256	-2599	4319	-21	-15	
~~361~~	~~MSim-3_12EOQ~~	~~OQ~~	~~09IL-41~~	~~6503~~	~~1982.1~~	~~15.02~~	~~0.34~~		~~10.32~~	~~0.18~~	~~2.767~~	~~1.277~~	~~-2584~~	~~4319~~	~~-22~~	~~-15~~	Mixed analysis
362	MSim-3_12FDQ	DQ	09IL-41	6503	1982.1	14.97	0.34		10.28	0.20	2.463	1.151	-2547	4324	-20	-12	
363	MSim-3_12GDQ	DQ	09IL-41	6503	1982.1	15.04	0.34		10.35	0.26	2.495	1.175	-2548	4278	-19	-13	
364	MSim-3_12HDQ	DQ	09IL-41	6503	1982.1	14.81	0.34		10.11	0.21	2.553	1.207	-2531	4315	-20	-13	
365	MSim-3_UWQ1	Std							7.61	0.19	2.530	1.200	-1034	-3419	-6	-42	
366	MSim-3_UWQ1	Std							7.84	0.25	2.496	1.184	-1034	-3399	-6	-41	
367	MSim-3_UWQ1	Std							7.78	0.24	2.455	1.164	-1034	-3379	-5	-39	
368	MSim-3_UWQ1	Std							7.88	0.17	2.463	1.165	-1034	-3359	-5	-38	
	***bracket; 353-356, 365-368						0.34	0.9954	7.65								
369	MSim-3_14AOQ	OQ	09IL-39	6499	1980.9	18.63	0.30		13.95	0.22	2.546	1.211	-136	-41	-3	-26	
370	MSim-3_14BOQ	OQ	09IL-39	6499	1980.9	19.55	0.30		14.86	0.17	2.622	1.246	-136	-27	-3	-26	
371	MSim-3_14COQ	OQ	09IL-39	6499	1980.9	20.39	0.30		15.70	0.20	2.641	1.255	-136	-12	-4	-28	
372	MSim-3_14DOQ	OQ	09IL-39	6499	1980.9	19.59	0.30		14.90	0.20	2.622	1.249	-136	3	-3	-27	
373	MSim-3_14EOQ	OQ	09IL-39	6499	1980.9	19.53	0.30		14.84	0.19	2.597	1.242	-136	18	-4	-26	
374	MSim-3_14FOQ	OQ	09IL-39	6499	1980.9	23.94	0.30		19.23	0.21	2.596	1.245	-136	33	-4	-27	
~~375~~	~~MSim-3_14GOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~17.01~~	~~0.30~~		~~12.34~~	~~0.33~~	~~2.618~~	~~1.250~~	~~-136~~	~~48~~	~~-5~~	~~-27~~	Mixed analysis
376	MSim-3_14HOQ	DQ	09IL-39	6499	1980.9	9.06	0.30		4.42	0.17	2.594	1.235	-136	63	-3	-27	
377	MSim-3_14IDQ	DQ	09IL-39	6499	1980.9	8.74	0.30		4.10	0.17	2.671	1.273	-159	72	-3	-26	
378	MSim-3_14JDQ	DQ	09IL-39	6499	1980.9	8.82	0.30		4.18	0.20	2.588	1.233	-126	88	-2	-24	
379	MSim-3_UWQ1	Std							7.69	0.21	2.574	1.226	-1056	-3418	-6	-42	
380	MSim-3_UWQ1	Std							7.57	0.21	2.578	1.233	-1056	-3398	-6	-41	
381	MSim-3_UWQ1	Std							7.47	0.16	2.614	1.260	-1056	-3378	-6	-44	
382	MSim-3_UWQ1	Std							7.55	0.23	2.580	1.253	-1056	-3358	-7	-41	
	***bracket; 365-368, 379-382						0.30	0.9954	7.67								
383	MSim-3_16AOQ	OQ	09IL-39	6499	1980.9	18.45	0.38		13.57	0.18	2.558	1.244	-511	-2595	-4	-38	
384	MSim-3_16BOQ	OQ	09IL-39	6499	1980.9	18.30	0.38		13.42	0.20	2.567	1.250	-511	-2582	-4	-39	
385	MSim-3_16COQ	OQ	09IL-39	6499	1980.9	19.66	0.38		14.77	0.17	2.552	1.251	-511	-2567	-5	-39	
386	MSim-3_16DOQ	OQ	09IL-39	6499	1980.9	19.82	0.38		14.93	0.22	2.539	1.253	-511	-2552	-5	-38	
387	MSim-3_16EOQ	OQ	09IL-39	6499	1980.9	19.71	0.38		14.82	0.27	2.552	1.261	-511	-2537	-5	-37	
~~388~~	~~MSim-3_16FOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~21.44~~	~~0.38~~		~~16.54~~	~~0.19~~	~~2.551~~	~~1.259~~	~~-511~~	~~-2622~~	~~-4~~	~~-36~~	Mixed analysis
~~389~~	~~MSim-3_16GOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~10.87~~	~~0.38~~		~~6.03~~	~~0.22~~	~~2.544~~	~~1.259~~	~~-511~~	~~-2507~~	~~-5~~	~~-36~~	Mixed analysis
390	MSim-3_16HOQ	DQ	09IL-39	6499	1980.9	10.85	0.38		6.00	0.21	2.529	1.253	-511	-2492	-6	-37	
391	MSim-3_16IDQ	DQ	09IL-39	6499	1980.9	10.82	0.38		5.97	0.23	2.519	1.252	-556	-2466	-6	-38	
392	MSim-3_16JDQ	DQ	09IL-39	6499	1980.9	10.74	0.38		5.90	0.21	2.503	1.252	-485	-2452	-5	-40	
393	MSim-3_UWQ1	Std							7.42	0.22	2.501	1.256	-1076	-3418	-9	-45	
394	MSim-3_UWQ1	Std							7.14	0.24	2.607	1.271	-1076	-3398	-9	-45	
395	MSim-3_UWQ1	Std							7.30	0.21	2.661	1.266	-1076	-3378	-8	-45	
396	MSim-3_UWQ1	Std							7.67	0.22	2.647	1.257	-1076	-3358	-7	-43	
	***bracket; 379-382, 393-396						0.38	0.9952	7.48								
397	MSim-3_11AOQ	OQ	09IL-41	6503	1982.1	21.31	0.33		16.34	0.20	2.707	1.278	-2512	310	-17	-28	
398	MSim-3_11BOQ	OQ	09IL-41	6503	1982.1	20.39	0.33		15.43	0.21	2.697	1.267	-2526	302	-16	-28	
399	MSim-3_11COQ	OQ	09IL-41	6503	1982.1	19.56	0.33		14.60	0.24	2.706	1.267	-2541	298	-16	-27	
400	MSim-3_11DOQ	OQ	09IL-41	6503	1982.1	19.79	0.33		14.84	0.23	2.659	1.253	-2553	285	-16	-28	
~~401~~	~~MSim-3_11EOQ~~	~~OQ~~	~~09IL-41~~	~~6503~~	~~1982.1~~	~~16.18~~	~~0.33~~		~~11.24~~	~~0.25~~	~~2.717~~	~~1.279~~	~~-2563~~	~~273~~	~~-17~~	~~-26~~	Mixed analysis
402	MSim-3_11FOQ	DQ	09IL-41	6503	1982.1	9.34	0.33		4.43	0.16	2.721	1.272	-2577	263	-17	-26	
403	MSim-3_11GDQ	DQ	09IL-41	6503	1982.1	9.51	0.33		4.60	0.22	2.712	1.266	-2608	275	-17	-27	
404	MSim-3_11HDQ	DQ	09IL-41	6503	1982.1	9.59	0.33		4.68	0.16	2.660	1.246	-2638	288	-16	-28	
405	MSim-3_UWQ1	Std							7.33	0.17	2.674	1.256	-1100	-3351	-8	-43	
406	MSim-3_UWQ1	Std							7.54	0.20	2.647	1.243	-1100	-3371	-7	-44	
407	MSim-3_UWQ1	Std							7.36	0.13	2.676	1.254	-1100	-3391	-7	-43	
408	MSim-3_UWQ1	Std							7.50	0.20	2.650	1.241	-1100	-3411	-8	-44	
	***bracket; 393-396, 405-408						0.33	0.9951	7.41								
409	MSim-3_13AOQ	OQ	09IL-39	6499	1980.9	18.72	0.16		13.75	0.17	2.725	1.277	-390	1672	-7	-25	
410	MSim-3_13BOQ	OQ	09IL-39	6499	1980.9	19.77	0.16		14.80	0.19	2.778	1.292	-375	1678	-7	-27	
411	MSim-3_13COQ	OQ	09IL-39	6499	1980.9	20.93	0.16		15.95	0.16	2.759	1.285	-360	1683	-7	-26	
412	MSim-3_13DOQ	OQ	09IL-39	6499	1980.9	21.50	0.16		16.53	0.19	2.773	1.287	-345	1683	-7	-28	
~~413~~	~~MSim-3_13EOQ~~	~~OQ~~	~~09IL-39~~	~~6499~~	~~1980.9~~	~~23.20~~	~~0.16~~		~~18.21~~	~~0.18~~	~~2.793~~	~~1.295~~	~~-330~~	~~1688~~	~~-8~~	~~-27~~	Mixed analysis
414	MSim-3_13FOQ	DQ	09IL-39	6499	1980.9	9.40	0.16		4.48	0.14	2.766	1.290	-315	1693	-8	-27	
415	MSim-3_13GOQ	DQ	09IL-39	6499	1980.9	9.35	0.16		4.43	0.18	2.738	1.277	-300	1693	-7	-27	
416	MSim-3_13HDQ	DQ	09IL-39	6499	1980.9	9.21	0.16		4.30	0.19	2.738	1.279	-252	1682	-7	-26	
417	MSim-3_UWQ1	Std							7.36	0.22	2.734	1.272	-1119	-3352	-10	-43	
418	MSim-3_UWQ1	Std							7.38	0.22	2.752	1.277	-1119	-3367	-9	-44	
419	MSim-3_UWQ1	Std							7.37	0.16	2.715	1.262	-1119	-3387	-8	-43	
420	MSim-3_UWQ1	Std							7.33	0.18	2.717	1.264	-1119	-3407	-8	-44	
	***bracket; 405-408, 417-420						0.16	0.9951	7.40								

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 μm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	pit## removing
421	MSim-5_UWQ1	Std							7.64	0.20	2.764	1.296	-2437	-504	-3	-24	
422	MSim-5_UWQ1	Std							7.55	0.20	2.764	1.300	-2437	-524	-2	-24	
423	MSim-5_UWQ1	Std							7.34	0.17	2.752	1.294	-2437	-544	-3	-26	
424	MSim-5_UWQ1	Std							7.60	0.19	2.760	1.301	-2437	-564	-2	-27	
425	MSim-5_UWQ1	Std							7.45	0.22	2.758	1.293	-2437	-584	-2	-27	
426	MSim-5_UWQ1	Std							7.60	0.20	2.743	1.287	-2437	-604	-2	-29	
427	MSim-5_9AOQ	OQ	09IL-31	5408	1648.4	18.61	0.67		14.05	0.22	2.733	1.287	505	326	4	-25	
428	MSim-5_9BOQ	OQ	09IL-31	5408	1648.4	23.76	0.67		19.18	0.19	2.762	1.294	506	312	-16	-25	
429	MSim-5_9COQ	OQ	09IL-31	5408	1648.4	22.66	0.67		18.08	0.23	2.766	1.294	491	298	-16	-22	
~~430~~	~~MSim-5_9DOQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~9.05~~	~~0.67~~		~~4.53~~	~~0.24~~	~~2.711~~	~~1.277~~	~~476~~	~~286~~	~~-16~~	~~-22~~	Mixed analysis
431	MSim-5_9EOQ	DQ	09IL-31	5408	1648.4	9.25	0.67		4.73	0.16	2.725	1.288	460	268	-16	-25	
432	MSim-5_9FDQ	DQ	09IL-31	5408	1648.4	9.01	0.67		4.49	0.18	2.705	1.286	510	201	-16	-25	
433	MSim-5_11AOQ	OQ	09IL-31	5408	1648.4	18.95	0.67		14.39	0.16	2.747	1.307	-989	5034	-15	-4	
~~434~~	~~MSim-5_11BOQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~19.00~~	~~0.67~~		~~14.44~~	~~0.18~~	~~2.772~~	~~1.312~~	~~-1000~~	~~5022~~	~~-15~~	~~-4~~	Mixed analysis
435	MSim-5_11COQ	DQ	09IL-31	5408	1648.4	11.52	0.67		6.99	0.21	2.684	1.274	-1017	5006	-15	-6	
436	MSim-5_11DDQ	DQ	09IL-31	5408	1648.4	11.74	0.67		7.21	0.27	2.673	1.276	-1006	4993	-14	-5	
437	MSim-5_UWQ1	Std							8.12	0.23	2.360	1.140	-2408	-593	-24	-19	
438	MSim-5_UWQ1	Std							8.18	0.27	2.053	0.997	-2405	-568	-24	-14	
439	MSim-5_UWQ1	Std							8.02	0.20	2.164	1.052	-2405	-495	-24	-11	
440	MSim-5_UWQ1	Std							8.08	0.27	2.158	1.051	-2398	-512	-23	-13	
	***bracket; 423-426, 437-440						0.67	0.9955	7.80								
441	MSim-5_UWQ1	Std							7.59	0.17	2.372	1.164	-1669	1247	-9	-16	
442	MSim-5_UWQ1	Std							7.82	0.23	2.484	1.222	-1669	1227	-11	-17	
443	MSim-5_UWQ1	Std							7.27	0.24	2.376	1.166	-1669	1207	-12	-19	
444	MSim-5_UWQ1	Std							7.99	0.22	2.386	1.170	-1669	1187	-8	-16	
445	MSim-5_10AOQ	OQ	09IL-31	5408	1648.4	21.77	0.47		17.08	0.21	2.546	1.252	-1203	5895	-8	10	
446	MSim-5_10BOQ	OQ	09IL-31	5408	1648.4	22.50	0.47		17.81	0.24	2.590	1.276	-1188	5895	-9	9	
447	MSim-5_10COQ	OQ	09IL-31	5408	1648.4	22.80	0.47		18.10	0.22	2.491	1.233	-1173	5895	-9	11	
~~448~~	~~MSim-5_10DOQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~20.67~~	~~0.47~~		~~15.99~~	~~0.24~~	~~2.539~~	~~1.261~~	~~-1158~~	~~5895~~	~~-9~~	~~10~~	Mixed analysis
~~449~~	~~MSim-5_10EDQ~~	~~DQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~				~~7.15~~	~~0.25~~	~~2.452~~	~~1.220~~	~~-1144~~	~~5902~~	~~-8~~	~~12~~	Bad pit
450	MSim-5_UWQ1	Std							7.44	0.24	2.395	1.187	-1694	1247	-10	-17	
451	MSim-5_UWQ1	Std							7.73	0.29	2.425	1.207	-1694	1227	-9	-17	
452	MSim-5_UWQ1	Std							7.88	0.20	2.333	1.165	-1694	1207	-9	-17	
453	MSim-5_UWQ1	Std							7.75	0.21	2.364	1.183	-1694	1187	-9	-18	
	***bracket; 441-444, 450-453						0.47	0.9954	7.68								
454	MSim-5_12AOQ	OQ	09IL-31	5408	1648.4	20.34	0.33		15.62	0.22	2.534	1.217	-773	2141	-5	-16	
455	MSim-5_12BOQ	OQ	09IL-31	5408	1648.4	22.36	0.33		17.64	0.20	2.599	1.233	-773	2156	-8	-18	
~~456~~	~~MSim-5_12COQ~~	~~OQ~~	~~09IL-31~~	~~5408~~	~~1648.4~~	~~15.62~~	~~0.33~~		~~10.92~~	~~0.21~~	~~2.618~~	~~1.230~~	~~-773~~	~~2171~~	~~-8~~	~~-16~~	Mixed analysis
457	MSim-5_12DOQ	DQ	09IL-31	5408	1648.4	9.52	0.33		4.85	0.21	2.636	1.234	-773	2186	-7	-17	
458	MSim-5_12EDQ	DQ	09IL-31	5408	1648.4	9.72	0.33		5.05	0.23	2.653	1.238	-800	2193	-9	-17	
459	MSim-5_UWQ1	Std							7.66	0.17	2.631	1.231	-1721	1188	-10	-19	
460	MSim-5_UWQ1	Std							7.78	0.19	2.669	1.249	-1721	1202	-9	-17	
461	MSim-5_UWQ1	Std							7.52	0.23	2.692	1.257	-1721	1222	-10	-17	
462	MSim-5_UWQ1	Std							7.43	0.19	2.676	1.250	-1721	1242	-10	-16	
	***bracket; 450-453, 459-462						0.33	0.9954	7.65								
								MSim-10									
463	MSim-10_UWQ1	Std							7.60	0.15	2.636	1.235	-806	236	0	-33	
464	MSim-10_UWQ1	Std							7.76	0.22	2.671	1.250	-806	211	1	-33	
465	MSim-10_UWQ1	Std							7.65	0.18	2.619	1.223	-806	186	1	-31	
466	MSim-10_UWQ1	Std							7.83	0.17	2.619	1.222	-806	161	2	-32	
467	MSim-10_UWQ1	Std							7.85	0.17	2.625	1.219	-806	136	2	-32	
468	MSim-10_UWQ1	Std							7.71	0.24	2.606	1.211	-806	111	2	-30	
469	MSim-10_10AOQ	OQ	09IL-50	8468.8	2581.3	20.80	0.31		16.08	0.21	2.498	1.169	-2114	-2437	-1	-38	
470	MSim-10_10BOQ	OQ	09IL-50	8468.8	2581.3	23.53	0.31		18.79	0.20	2.516	1.185	-2100	-2453	-2	-35	
471	MSim-10_10COQ	OQ	09IL-50	8468.8	2581.3	24.56	0.31		19.82	0.14	2.599	1.230	-2090	-2467	-2	-36	
472	MSim-10_10DOQ	OQ	09IL-50	8468.8	2581.3	21.79	0.31		17.06	0.26	2.601	1.238	-2079	-2480	-2	-38	
473	MSim-10_10EOQ	OQ	09IL-50	8468.8	2581.3	22.47	0.31		17.74	0.15	2.631	1.258	-2066	-2487	-3	-39	
474	MSim-10_10FOQ	DQ	09IL-50	8468.8	2581.3	11.37	0.31		6.69	0.18	2.536	1.219	-2053	-2496	-1	-40	
475	MSim-10_10GDQ	DQ	09IL-50	8468.8	2581.3	11.98	0.31		7.29	0.22	2.523	1.215	-1942	-2456	-1	-39	
476	MSim-10_10HDQ	DQ	09IL-50	8468.8	2581.3	11.07	0.31		6.39	0.22	2.579	1.245	-2009	-2583	-4	-39	
477	MSim-10_10IDQ	DQ	09IL-50	8468.8	2581.3	11.21	0.31		6.52	0.22	2.562	1.240	-1954	-2546	-1	-38	
478	MSim-10_9JDQ	DQ	09IL-50	8468.8	2581.3	12.31	0.31		7.63	0.20	2.554	1.234	-2872	-758	-7	-32	
479	MSim-10_9KDQ	DQ	09IL-50	8468.8	2581.3	12.03	0.31		7.35	0.20	2.555	1.232	-2945	-842	-7	-32	
480	MSim-10_9LDQ	DQ	09IL-50	8468.8	2581.3	11.98	0.31		7.29	0.22	2.517	1.217	-2815	-812	-7	-33	
481	MSim-10_UWQ1	Std							7.62	0.22	2.519	1.222	-840	111	2	-35	
482	MSim-10_UWQ1	Std							7.49	0.24	2.521	1.225	-840	136	1	-35	
483	MSim-10_UWQ1	Std							7.39	0.23	2.502	1.214	-840	161	1	-34	
484	MSim-10_UWQ1	Std							7.60	0.20	2.572	1.252	-840	186	2	-34	
	***bracket; 465-468, 481-484						0.31	0.9954	7.64								
485	MSim-10_11AOQ	OQ	09IL-50	8468.8	2581.3	19.12	0.29		14.24	0.25	2.591	1.255	-4237	-64	-13	-33	
486	MSim-10_11BOQ	OQ	09IL-50	8468.8	2581.3	19.57	0.29		14.69	0.25	2.612	1.263	-4222	-64	-13	-33	
487	MSim-10_11COQ	OQ	09IL-50	8468.8	2581.3	19.43	0.29		14.56	0.14	2.551	1.235	-4204	-61	-12	-33	
488	MSim-10_11DOQ	OQ	09IL-50	8468.8	2581.3	21.49	0.29		16.60	0.16	2.590	1.257	-4186	-58	-12	-34	

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
489	MSim-10_11EOQ	OQ	09IL-50	8468.8	2581.3	23.93	0.29		19.03	0.23	2.564	1.250	-4168	-52	-13	-34		
490	MSim-10_11FOQ	OQ	09IL-50	8468.8	2581.3	18.30	0.29		13.43	0.24	2.566	1.246	-4150	-46	-13	-32		
491	MSim-10_11GOQ	OQ	09IL-50	8468.8	2581.3	18.45	0.29		13.59	0.16	2.565	1.243	-4132	-40	-13	-33		
492	MSim-10_11HOQ	OQ	09IL-50	8468.8	2581.3	19.41	0.29		14.54	0.28	2.620	1.262	-4114	-34	-13	-34		
493	MSim-10_11IOQ	OQ	09IL-50	8468.8	2581.3	19.27	0.29		14.40	0.21	2.576	1.246	-4096	-28	-14	-34		
~~494~~	~~MSim-10_11JOQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~14.33~~	~~0.29~~		~~9.48~~	~~0.27~~	~~2.656~~	~~1.285~~	~~-4078~~	~~-22~~	~~-13~~	~~-35~~		Mixed analysis
~~495~~	~~MSim-10_11KOQ~~	~~DQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~				~~5.74~~	~~0.18~~	~~2.643~~	~~1.278~~	~~-4060~~	~~-16~~	~~-14~~	~~-35~~		Bad pit
496	MSim-10_11LDQ	DQ	09IL-50	8468.8	2581.3	9.64	0.29		4.82	0.19	2.613	1.261	-4064	22	-13	-34		
497	MSim-10_11MDQ	DQ	09IL-50	8468.8	2581.3	7.50	0.29		2.68	0.19	2.623	1.260	-4203	105	-13	-34		
498	MSim-10_11NDQ	DQ	09IL-50	8468.8	2581.3	6.65	0.29		1.84	0.14	2.577	1.239	-4144	111	-13	-35		
499	MSim-10_11ODQ	DQ	09IL-50	8468.8	2581.3	7.07	0.29		2.26	0.23	2.588	1.245	-4235	118	-14	-35		
500	MSim-10_UWQ1	Std							7.73	0.19	2.599	1.250	-866	111	0	-37		
501	MSim-10_UWQ1	Std							7.39	0.18	2.594	1.249	-866	136	0	-37		
502	MSim-10_UWQ1	Std							7.40	0.19	2.627	1.266	-866	161	0	-36		
503	MSim-10_UWQ1	Std							7.31	0.22	2.616	1.266	-866	186	-2	-38		
	*****bracket; 481-484, 500-503**						**0.29**	**0.9952**	**7.49**									
504	MSim-10_12AOQ	OQ	09IL-50	8468.8	2581.3	20.01	0.26		15.08	0.25	2.481	1.211	-4810	-4801	-16	-48		
505	MSim-10_12BOQ	OQ	09IL-50	8468.8	2581.3	24.85	0.26		19.89	0.19	2.467	1.214	-4828	-4801	-18	-47		
506	MSim-10_12COQ	OQ	09IL-50	8468.8	2581.3	23.66	0.26		18.70	0.22	2.469	1.221	-4846	-4801	-16	-48		
507	MSim-10_12DOQ	OQ	09IL-50	8468.8	2581.3	23.08	0.26		18.13	0.23	2.476	1.220	-4864	-4801	-18	-47		
508	MSim-10_12EOQ	OQ	09IL-50	8468.8	2581.3	23.09	0.26		18.14	0.17	2.479	1.221	-4882	-4801	-18	-48		
~~509~~	~~MSim-10_12FOQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~18.77~~	~~0.26~~		~~13.84~~	~~0.27~~	~~2.464~~	~~1.216~~	~~-4900~~	~~-4801~~	~~-18~~	~~-47~~		Mixed analysis
~~510~~	~~MSim-10_12GOQ~~	~~OQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~	~~10.09~~	~~0.26~~		~~5.21~~	~~0.20~~	~~2.478~~	~~1.226~~	~~-4918~~	~~-4801~~	~~-18~~	~~-48~~		Mixed analysis
511	MSim-10_12HDQ	DQ	09IL-50	8468.8	2581.3	9.11	0.26		4.23	0.24	2.410	1.219	-4956	-4830	-18	-46		
~~512~~	~~MSim-10_12IDQ~~	~~DQ~~	~~09IL-50~~	~~8468.8~~	~~2581.3~~				~~5.08~~	~~0.24~~	~~2.465~~	~~1.239~~	~~-4955~~	~~-4750~~	~~-18~~	~~-44~~		Bad pit
513	MSim-10_UWQ1	Std							7.40	0.23	2.535	1.266	-894	106	1	-38		
514	MSim-10_UWQ1	Std							7.36	0.24	2.545	1.269	-894	131	0	-38		
515	MSim-10_UWQ1	Std							7.40	0.13	2.565	1.276	-894	156	0	-38		
516	MSim-10_UWQ1	Std							7.46	0.20	2.571	1.273	-894	181	-1	-38		
	*****bracket; 500-503, 513-516**						**0.26**	**0.9952**	**7.43**									
							December 10-11, 2009 MSim-12											
153	MSim-12_UWQ-1	Std							6.23	0.16	2.375	1.131	-860	-422	-17	8		
154	MSim-12_UWQ-1	Std							6.07	0.23	2.366	1.131	-860	-447	-17	8		
155	MSim-12_UWQ-1	Std							5.95	0.25	2.359	1.138	-860	-472	-17	7		
156	MSim-12_UWQ-1	Std							6.22	0.20	2.361	1.137	-860	-497	-16	7		
157	MSim-12_UWQ-1	Std							5.82	0.20	2.346	1.133	-860	-547	-16	8		
158	MSim-12_UWQ-1	Std							5.75	0.22	2.351	1.139	-860	-572	-17	6		
159	MSim-12_UWQ-1	Std							6.05	0.20	2.354	1.140	-829	-424	-17	7		
160	MSim-12_1ADQ	DQ	09IL-29	2176.60	663.4	8.81	0.33		2.45	0.43	2.274	1.136	-1961	4812	-24	26		
161	MSim-12_1BOQ§§§	OQ	09IL-29	2176.60	663.4	19.07	0.33		12.65	0.26	2.312	1.105	-2164	4778	-22	31		
162	MSim-12_1COQ§§§	OQ	09IL-29	2176.60	663.4	13.60	0.33		7.21	0.21	2.311	1.101	-2141	4821	-24	27		
163	MSim-12_1DOQ§§§	OQ	09IL-29	2176.60	663.4	16.69	0.33		10.29	0.18	2.327	1.109	-2152	4796	-25	27		
164	MSim-12_1EOQ	OQ	09IL-29	2176.60	663.4	25.64	0.33		19.18	0.22	2.315	1.106	-1837	4813	-24	26		
~~165~~	~~MSim-12_1FOQ~~	~~OQ~~	~~09IL-29~~	~~2176.60~~	~~663.4~~	~~11.32~~	~~0.33~~		~~4.95~~	~~0.24~~	~~2.319~~	~~1.110~~	~~-1858~~	~~4973~~	~~-24~~	~~28~~		Mixed analysis
166	MSim-12_1GOQ	OQ	09IL-29	2176.60	663.4	25.73	0.33		19.26	0.17	2.322	1.113	-1881	4928	-24	27		
167	MSim-12_1HOQ	OQ	09IL-29	2176.60	663.4	26.15	0.33		19.68	0.23	2.317	1.113	-1857	4954	-24	28		
168	MSim-12_1IDQ	DQ	09IL-29	2176.60	663.4	7.42	0.33		1.08	0.17	2.307	1.112	-1811	4943	-24	28		
169	MSim-12_1JDQ	DQ	09IL-29	2176.60	663.4	7.79	0.33		1.44	0.19	2.298	1.109	-1897	5039	-24	30		
170	MSim-12_UWQ-1	Std							6.04	0.16	2.266	1.096	-827	-448	-2	5		
171	MSim-12_UWQ-1	Std							6.05	0.20	2.257	1.093	-827	-473	-3	3		
172	MSim-12_UWQ-1	Std							5.85	0.22	2.255	1.092	-827	-498	-3	4		
173	MSim-12_UWQ-1	Std							5.82	0.22	2.261	1.100	-827	-523	-3	2		
	*****bracket; 156-159, 170-173**						**0.33**	**0.9937**	**5.95**									
174	MSim-12_2ADQ	DQ	09IL-29	2176.60	663.4	8.45	0.27		2.15	0.29	2.248	1.093	-4156	-1359	-22	4		
175	MSim-12_2BOQ	OQ	09IL-29	2176.60	663.4	24.94	0.27		18.54	0.19	2.254	1.092	-4121	-1267	-22	2		
176	MSim-12_2COQ	OQ	09IL-29	2176.60	663.4	23.25	0.27		16.87	0.26	2.239	1.088	-4128	-1213	-21	3		
177	MSim-12_2DOQ	OQ	09IL-29	2176.60	663.4	25.02	0.27		18.63	0.19	2.285	1.109	-4086	-1249	-21	3		
178	MSim-12_2EDQ	DQ	09IL-29	2176.60	663.4	9.08	0.27		2.78	0.23	2.217	1.075	-4124	-1098	-22	5		
~~179~~	~~MSim-12_2FOQ~~	~~OQ~~	~~09IL-29~~	~~2176.60~~	~~663.4~~				~~18.84~~	~~0.28~~	~~2.242~~	~~1.088~~	~~-4215~~	~~-1067~~	~~-22~~	~~2~~		Bad pit
180	MSim-12_2GOQ	OQ	09IL-29	2176.60	663.4	25.08	0.27		18.68	0.32	2.258	1.097	-4315	-1298	-22	7		
181	MSim-12_3ADQ	DQ	09IL-29	2176.60	663.4	11.91	0.27		5.59	0.23	2.297	1.115	-2852	2105	-23	11		
182	MSim-12_3BDQ	DQ	09IL-29	2176.60	663.4	12.18	0.27		5.87	0.19	2.287	1.112	-2940	2060	-23	11		
~~183~~	~~MSim-12_3COQ~~	~~OQ~~	~~09IL-29~~	~~2176.60~~	~~663.4~~	~~15.14~~	~~0.27~~		~~8.81~~	~~0.18~~	~~2.281~~	~~1.111~~	~~-2766~~	~~2232~~	~~-22~~	~~12~~		Mixed analysis
184	MSim-12_3DOQ	OQ	09IL-29	2176.60	663.4	26.02	0.27		19.62	0.20	2.241	1.092	-2852	2364	-23	11		
185	MSim-12_UWQ-1	Std							6.00	0.18	2.229	1.094	-792	-457	-2	5		
186	MSim-12_UWQ-1	Std							5.98	0.16	2.232	1.096	-792	-482	-3	3		
187	MSim-12_UWQ-1	Std							6.17	0.23	2.227	1.094	-792	-507	-2	4		
188	MSim-12_UWQ-1	Std							6.21	0.25	2.228	1.096	-792	-532	-2	4		
	*****bracket; 170-173, 185-188**						**0.27**	**0.9938**	**6.01**									
189	MSim-12_4ADQ	DQ	09IL-29	2176.60	663.4	9.11	0.34		2.76	0.24	2.214	1.088	-3343	2459	-17	9		
190	MSim-12_4BOQ	OQ	09IL-29	2176.60	663.4	24.56	0.34		18.11	0.17	2.216	1.088	-3432	2432	-17	10		
191	MSim-12_4COQ	OQ	09IL-29	2176.60	663.4	25.10	0.34		18.65	0.21	2.244	1.101	-3479	2347	-17	10		
192	MSim-12_4DOQ	OQ	09IL-29	2176.60	663.4	24.05	0.34		17.60	0.16	2.233	1.096	-3522	2366	-17	9		
~~193~~	~~MSim-12_4EOQ~~	~~OQ~~	~~09IL-29~~	~~2176.60~~	~~663.4~~				~~19.27~~	~~0.21~~	~~2.220~~	~~1.092~~	~~-3563~~	~~2334~~	~~-17~~	~~9~~		Bad pit
194	MSim-12_4FOQ	OQ	09IL-29	2176.60	663.4	26.51	0.34		20.05	0.18	2.224	1.096	-3543	2339	-17	8		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 μm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
195	MSim-12_5ADQ	DQ	09IL-29	2176.60	663.4	9.94	0.34		3.58	0.19	2.178	1.077	-2464	312	-10	4		
196	MSim-12_5BOQ	OQ	09IL-29	2176.60	663.4	23.96	0.34		17.51	0.28	2.142	1.060	-2372	245	-10	4		
197	MSim-12_5COQ	OQ	09IL-29	2176.60	663.4	27.14	0.34		20.67	0.23	2.183	1.078	-2409	251	-10	3		
198	MSim-12_5DOQ	OQ	09IL-29	2176.60	663.4	23.96	0.34		17.51	0.25	2.172	1.072	-2341	290	-10	3		
~~199~~	~~MSim-12_5EOQ~~	~~OQ~~	~~09IL-29~~	~~2176.60~~	~~663.4~~	~~17.28~~	~~0.34~~		~~10.88~~	~~0.26~~	~~2.195~~	~~1.085~~	~~-2540~~	~~544~~	~~-10~~	~~5~~		Mixed analysis
200	MSim-12_UWQ-1	Std							5.91	0.29	2.167	1.078	-760	-409	7	4		
201	MSim-12_UWQ-1	Std							5.83	0.22	2.158	1.074	-760	-434	7	3		
202	MSim-12_UWQ-1	Std							5.71	0.32	2.151	1.072	-760	-459	6	3		
203	MSim-12_UWQ-1	Std							5.84	0.23	2.164	1.077	-760	-484	6	2		
	*****bracket; 185-188, 200-203**						**0.34**	**0.9937**	**5.96**									
204	MSim-12_6ADQ	DQ	09IL-27	2118.40	645.7	8.96	0.14		2.49	0.23	2.236	1.077	277	1279	2	5		
~~205~~	~~MSim-12_6BOQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~	~~26.88~~	~~0.14~~		~~20.29~~	~~0.29~~	~~2.279~~	~~1.076~~	~~436~~	~~1217~~	~~2~~	~~5~~		Mixed analysis
206	MSim-12_6COQ	OQ	09IL-27	2118.40	645.7	23.18	0.14		16.62	0.19	2.286	1.073	426	1262	2	5		
207	MSim-12_6DOQ	OQ	09IL-27	2118.40	645.7	26.00	0.14		19.42	0.19	2.286	1.070	436	1231	2	5		
208	MSim-12_6EOQ	OQ	09IL-27	2118.40	645.7	24.86	0.14		18.29	0.18	2.287	1.071	168	1103	2	5		
~~209~~	~~MSim-12_6FOQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~				~~15.26~~	~~0.21~~	~~2.177~~	~~1.019~~	~~218~~	~~1124~~	~~1~~	~~5~~		Epoxy
210	MSim-12_6GOQ	OQ	09IL-27	2118.40	645.7	23.69	0.14		17.13	0.16	2.279	1.066	213	1144	2	6		
211	MSim-12_6HOQ	OQ	09IL-27	2118.40	645.7	24.72	0.14		18.15	0.22	2.309	1.079	191	1124	2	4		
212	MSim-12_7ADQ	DQ	09IL-27	2118.40	645.7	9.36	0.14		2.89	0.25	2.280	1.063	1074	2549	2	8		
213	MSim-12_7BOQ	OQ	09IL-27	2118.40	645.7	24.73	0.14		18.15	0.23	2.204	1.029	746	2705	0	8		
214	MSim-12_7COQ	OQ	09IL-27	2118.40	645.7	24.78	0.14		18.20	0.19	2.275	1.061	1161	2299	3	8		
~~215~~	~~MSim-12_7DOQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~				~~4.57~~	~~0.30~~	~~2.292~~	~~1.071~~	~~1178~~	~~2380~~	~~2~~	~~9~~		Bad pit
216	MSim-12_UWQ-1	Std							5.83	0.17	2.303	1.081	-724	-425	1	5		
217	MSim-12_UWQ-1	Std							5.94	0.16	2.297	1.080	-724	-450	1	6		
218	MSim-12_UWQ-1	Std							5.77	0.24	2.288	1.080	-724	-475	1	5		
219	MSim-12_UWQ-1	Std							5.86	0.15	2.288	1.080	-724	-500	1	4		
	*****bracket; 200-203, 216-219**						**0.14**	**0.9936**	**5.84**									
220	MSim-12_8ADQ	DQ	09IL-27	2118.40	645.7	7.67	0.16		1.23	0.22	2.274	1.070	1161	5783	2	33		
221	MSim-12_8BOQ	OQ	09IL-27	2118.40	645.7	25.14	0.16		18.59	0.22	2.302	1.082	1000	5856	1	33		
~~222~~	~~MSim-12_8COQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~				~~19.43~~	~~0.26~~	~~2.301~~	~~1.081~~	~~1037~~	~~5836~~	~~1~~	~~34~~		Bad pit
223	MSim-12_8DOQ	DQ	09IL-27	2118.40	645.7	9.05	0.16		2.60	0.25	2.247	1.057	1172	6005	2	37		
224	MSim-12_9ADQ	DQ	09IL-27	2118.40	645.7	9.09	0.16		2.64	0.27	2.188	1.033	1507	389	8	2		
~~225~~	~~MSim-12_9BOQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~				~~15.93~~	~~0.29~~	~~2.153~~	~~1.017~~	~~1438~~	~~222~~	~~7~~	~~-1~~		Epoxy
226	MSim-12_9COQ	OQ	09IL-27	2118.40	645.7	26.41	0.16		19.84	0.20	2.220	1.047	1442	248	8	2		
227	MSim-12_9DOQ	OQ	09IL-27	2118.40	645.7	24.12	0.16		17.57	0.20	2.207	1.042	1378	443	6	5		
~~228~~	~~MSim-12_9EOQ~~	~~OQ~~	~~09IL-27~~	~~2118.40~~	~~645.7~~				~~18.76~~	~~0.20~~	~~2.151~~	~~1.017~~	~~1150~~	~~241~~	~~8~~	~~1~~		Epoxy
229	MSim-12_9FDQ	DQ	09IL-27	2118.40	645.7	7.85	0.16		1.40	0.25	2.225	1.053	1275	292	6	2		
230	MSim-12_UWQ-1	Std							5.75	0.20	2.302	1.089	-689	-432	-8	6		
231	MSim-12_UWQ-1	Std							5.81	0.17	2.307	1.090	-689	-456	-8	6		
232	MSim-12_UWQ-1	Std							5.94	0.21	2.300	1.089	-689	-482	-8	5		
233	MSim-12_UWQ-1	Std							5.96	0.20	2.295	1.086	-689	-506	-8	4		
	*****bracket; 216-219, 230-233**						**0.16**	**0.9936**	**5.86**									
								MSim-13										
234	MSim-13_UWQ-1	Std							6.18	0.23	2.401	1.133	-1965	1483	-38	13		
235	MSim-13_UWQ-1	Std							6.11	0.18	2.395	1.131	-1940	1483	-38	14		
236	MSim-13_UWQ-1	Std							6.14	0.26	2.395	1.131	-1915	1483	-38	14		
237	MSim-13_UWQ-1	Std							6.15	0.24	2.382	1.127	-1890	1483	-37	16		
238	MSim-13_UWQ-1	Std							6.07	0.18	2.383	1.128	-1865	1483	-37	14		
239	MSim-13_UWQ-1	Std							6.05	0.17	2.378	1.127	-1840	1483	-36	15		
240	MSim-13_1ADQ	DQ	09IL-34	6151.00	1874.8	12.36	0.38		6.02	0.24	2.396	1.137	-3194	2581	-45	15		
~~241~~	~~MSim-13_1BOQ~~	~~OQ~~	~~09IL-34~~	~~6151.00~~	~~1874.8~~				~~16.39~~	~~0.24~~	~~2.392~~	~~1.136~~	~~-3142~~	~~2504~~	~~-45~~	~~15~~		Bad pit
~~242~~	~~MSim-13_1COQ~~	~~OQ~~	~~09IL-34~~	~~6151.00~~	~~1874.8~~	~~23.86~~	~~0.38~~		~~17.45~~	~~0.14~~	~~2.384~~	~~1.132~~	~~-3058~~	~~2632~~	~~-44~~	~~16~~		Mixed analysis
243	MSim-13_1DOQ	OQ	09IL-34	6151.00	1874.8	20.56	0.38		14.17	0.21	2.388	1.134	-3146	2807	-46	15		
244	MSim-13_1EDQ	DQ	09IL-34	6151.00	1874.8	6.61	0.38		0.31	0.24	2.385	1.134	-3006	2435	-44	15		
245	MSim-13_2ADQ	DQ	09IL-34	6151.00	1874.8	11.15	0.38		4.82	0.27	2.387	1.134	-2760	1926	-43	15		
246	MSim-13_2BOQ	OQ	09IL-34	6151.00	1874.8	23.68	0.38		17.26	0.21	2.379	1.130	-2664	1788	-42	18		
247	MSim-13_2COQ	OQ	09IL-34	6151.00	1874.8	19.24	0.38		12.85	0.24	2.374	1.128	-3005	1842	-43	16		
248	MSim-13_2DOQ	OQ	09IL-34	6151.00	1874.8	19.37	0.38		12.99	0.25	2.352	1.121	-3024	1791	-43	13		
249	MSim-13_2EOQ	DQ	09IL-34	6151.00	1874.8	11.15	0.38		4.81	0.23	2.379	1.132	-2726	1996	-42	14		
250	MSim-13_2FOQ	OQ	09IL-34	6151.00	1874.8	20.03	0.38		13.64	0.16	2.378	1.136	-2663	1991	-42	15		
251	MSim-13_UWQ-1	Std							5.71	0.17	2.316	1.110	-1844	1458	-36	11		
252	MSim-13_UWQ-1	Std							6.18	0.22	2.373	1.131	-1868	1458	-36	13		
253	MSim-13_UWQ-1	Std							5.72	0.20	2.339	1.117	-1894	1458	-36	12		
254	MSim-13_UWQ-1	Std							5.90	0.21	2.344	1.130	-1918	1458	-36	13		
	*****bracket; 236-239, 251-254**						**0.38**	**0.9937**	**5.99**									
255	MSim-13_3ADQ	DQ	09IL-34	6151.00	1874.8	9.67	0.49		3.41	0.18	2.360	1.128	-4677	-1457	-39	9		
256	MSim-13_3BDQ	DQ	09IL-34	6151.00	1874.8	9.57	0.49		3.30	0.21	2.337	1.120	-4644	-1426	-39	10		
257	MSim-13_3COQ	OQ	09IL-34	6151.00	1874.8	25.43	0.49		19.07	0.19	2.316	1.120	-4687	-1564	-39	10		
~~258~~	~~MSim-13_3DOQ~~	~~OQ~~	~~09IL-34~~	~~6151.00~~	~~1874.8~~	~~21.55~~	~~0.49~~		~~15.21~~	~~0.28~~	~~2.344~~	~~1.129~~	~~-4724~~	~~-1578~~	~~-40~~	~~10~~		Mixed analysis
259	MSim-13_3EOQ	OQ	09IL-34	6151.00	1874.8	25.22	0.49		18.86	0.20	2.359	1.127	-4517	-1494	-39	9		
260	MSim-13_4ADQ	DQ	09IL-34	6151.00	1874.8	9.82	0.49		3.56	0.29	2.349	1.122	-3438	-1828	-38	9		
261	MSim-13_4BOQ	OQ	09IL-34	6151.00	1874.8	24.03	0.49		17.68	0.22	2.351	1.125	-3345	-1832	-38	8		
262	MSim-13_4COQ	OQ	09IL-34	6151.00	1874.8	20.61	0.49		14.28	0.17	2.348	1.124	-3470	-1597	-37	8		
263	MSim-13_4DOQ	OQ	09IL-34	6151.00	1874.8	21.94	0.49		15.60	0.21	2.332	1.118	-3575	-1582	-37	7		
264	MSim-13_4EOQ	OQ	09IL-34	6151.00	1874.8	19.47	0.49		13.15	0.20	2.315	1.124	-3477	-1525	-37	8		
~~265~~	~~MSim-13_4FOQ~~	~~OQ~~	~~09IL-34~~	~~6151.00~~	~~1874.8~~	~~24.83~~	~~0.49~~		~~18.48~~	~~0.29~~	~~2.292~~	~~1.112~~	~~-3507~~	~~-1510~~	~~-36~~	~~8~~		Mixed analysis

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##	
266	MSim-13_UWQ-1	Std							6.07	0.15	2.313	1.124	-1844	1440	-35	13		
267	MSim-13_UWQ-1	Std							6.34	0.25	2.326	1.126	-1869	1435	-35	15		
268	MSim-13_UWQ-1	Std							6.23	0.26	2.332	1.126	-1894	1435	-36	15		
269	MSim-13_UWQ-1	Std							6.25	0.29	2.325	1.127	-1919	1435	-36	12		
	*****bracket; 251-254, 266-269**						**0.49**	**0.9938**	**6.05**									
270	MSim-13_5ADQ	DQ	09IL-38	6236.50	1900.9	16.64	0.31		10.53	0.26	2.266	1.093	177	-668	-25	6		
271	MSim-13_5BOQ	OQ	09IL-38	6236.50	1900.9	19.47	0.31		13.35	0.24	2.224	1.075	201	-733	-23	7		
272	MSim-13_5COQ	OQ	09IL-38	6236.50	1900.9	24.26	0.31		18.10	0.28	2.227	1.083	45	-509	-25	8		
273	MSim-13_5DOQ	OQ	09IL-38	6236.50	1900.9	19.19	0.31		13.06	0.25	2.225	1.086	340	-593	-24	5		
274	MSim-13_5EOQ	OQ	09IL-38	6236.50	1900.9	19.58	0.31		13.45	0.26	2.169	1.063	394	-596	-23	5		
275	MSim-13_6ADQ	DQ	09IL-38	6236.50	1900.9	12.29	0.31		6.21	0.25	2.293	1.110	359	1292	-29	10		
276	MSim-13_6BOQ	OQ	09IL-38	6236.50	1900.9	21.47	0.31		15.33	0.18	2.282	1.109	476	1285	-27	10		
277	MSim-13_6COQ	OQ	09IL-38	6236.50	1900.9	20.87	0.31		14.73	0.24	2.312	1.123	516	1309	-27	11		
278	MSim-13_6DOQ	OQ	09IL-38	6236.50	1900.9	24.18	0.31		18.02	0.26	2.317	1.122	520	1345	-27	12		
279	MSim-13_6EOQ	OQ	09IL-38	6236.50	1900.9	24.70	0.31		18.55	0.18	2.304	1.118	536	1312	-28	11		
280	MSim-13_6FOQ	OQ	09IL-38	6236.50	1900.9	19.83	0.31		13.71	0.22	2.307	1.121	494	1042	-27	11		
281	MSim-13_6GDQ	DQ	09IL-38	6236.50	1900.9	8.13	0.31		2.07	0.20	2.315	1.124	547	1137	-27	12		
282	MSim-13_UWQ-1	Std							5.98	0.22	2.321	1.127	-1848	1417	-35	13		
283	MSim-13_UWQ-1	Std							6.31	0.24	2.331	1.139	-1873	1417	-35	13		
284	MSim-13_UWQ-1	Std							6.46	0.21	2.335	1.135	-1898	1412	-35	14		
285	MSim-13_UWQ-1	Std							6.33	0.19	2.342	1.138	-1923	1412	-35	14		
	*****bracket; 266-269, 282-285**						**0.31**	**0.9940**	**6.25**									
286	MSim-13_7ADQ	DQ	09IL-38	6236.50	1900.9	9.41	0.32		3.33	0.25	2.309	1.125	-760	1196	-27	12		
287	MSim-13_7BOQ	OQ	09IL-38	6236.50	1900.9	19.77	0.32		13.63	0.23	2.309	1.126	-604	1190	-27	12		
288	MSim-13_7COQ	OQ	09IL-38	6236.50	1900.9	21.66	0.32		15.51	0.18	2.302	1.125	-843	1096	-28	11		
289	MSim-13_7DOQ	OQ	09IL-38	6236.50	1900.9	19.91	0.32		13.77	0.19	2.283	1.115	-893	1276	-28	11		
290	MSim-13_7EOQ	OQ	09IL-38	6236.50	1900.9	22.67	0.32		16.52	0.17	2.300	1.123	-917	1252	-27	11		
291	MSim-13_8ADQ	DQ	09IL-38	6236.50	1900.9	10.32	0.32		4.24	0.19	2.279	1.116	-465	-1536	-23	5		
292	MSim-13_8BOQ	OQ	09IL-38	6236.50	1900.9	24.79	0.32		18.62	0.25	2.255	1.106	-308	-1506	-22	4		
293	MSim-13_8COQ	OQ	09IL-38	6236.50	1900.9	20.97	0.32		14.82	0.22	2.266	1.112	-331	-1459	-23	4		
294	MSim-13_8DOQ	OQ	09IL-38	6236.50	1900.9	25.51	0.32		19.34	0.19	2.279	1.115	-317	-1482	-23	4		
295	MSim-13_8EOQ	OQ	09IL-38	6236.50	1900.9	22.35	0.32		16.20	0.19	2.276	1.113	-290	-1489	-24	4		
296	MSim-13_8FDQ	DQ	09IL-38	6236.50	1900.9	9.57	0.32		3.49	0.19	2.280	1.120	-278	-1424	-23	5		
297	MSim-13_UWQ-1	Std							6.07	0.24	2.306	1.127	-1868	1392	-35	14		
298	MSim-13_UWQ-1	Std							6.31	0.23	2.314	1.131	-1893	1392	-35	14		
299	MSim-13_UWQ-1	Std							6.13	0.21	2.311	1.131	-1918	1387	-35	14		
300	MSim-13_UWQ-1	Std							6.28	0.16	2.309	1.131	-1943	1387	-35	14		
	*****bracket; 282-285, 297-300**						**0.32**	**0.9940**	**6.23**									
								MSim-11										
301	MSim-11_UWQ-1	Std							5.85	0.23	2.260	1.114	-793	993	-21	17		
302	MSim-11_UWQ-1	Std							5.96	0.24	2.255	1.111	-793	968	-21	17		
303	MSim-11_UWQ-1	Std							6.04	0.24	2.253	1.112	-793	943	-20	16		
304	MSim-11_UWQ-1	Std							5.87	0.16	2.250	1.111	-793	918	-20	15		
305	MSim-11_UWQ-1	Std							5.79	0.17	2.246	1.111	-793	893	-20	15		
306	MSim-11_UWQ-1	Std							5.69	0.22	2.251	1.116	-793	868	-20	15		
307	MSim-11_UWQ-1	Std				12.28	0.30		5.77	0.20	2.228	1.109	-901	442	-20	9		
308	MSim-11_UWQ-1	Std				12.38	0.30		5.88	0.17	2.227	1.107	-901	417	-19	9		
309	MSim-11_1ADQ	DQ	09IL-24	2016.00	614.5	9.88	0.30		3.39	0.28	2.244	1.115	-2195	-712	-25	7		
310	MSim-11_1BOQ	OQ	09IL-24	2016.00	614.5	24.56	0.30		17.98	0.30	2.255	1.119	-2359	-753	-26	7		
~~311~~	~~MSim-11_1COQ~~	~~OQ~~	~~09IL-24~~	~~2016.00~~	~~614.5~~				~~18.99~~	~~0.19~~	~~2.244~~	~~1.118~~	~~-2162~~	~~-635~~	~~-25~~	~~6~~	Bad pit	
~~312~~	~~MSim-11_1DOQ~~	~~OQ~~	~~09IL-24~~	~~2016.00~~	~~614.5~~				~~18.68~~	~~0.15~~	~~2.241~~	~~1.119~~	~~-2313~~	~~-410~~	~~-26~~	~~7~~	Bad pit	
313	MSim-11_2ADQ	DQ	09IL-24	2016.00	614.5	9.41	0.30		2.92	0.27	2.219	1.116	-2667	312	-26	16		
~~314~~	~~MSim-11_2BDQ~~	~~DQ~~	~~09IL-24~~	~~2016.00~~	~~614.5~~	~~9.54~~	~~0.30~~		~~3.06~~	~~0.26~~	~~2.234~~	~~1.119~~	~~-2731~~	~~320~~	~~-27~~	~~14~~	Mixed analysis	
~~315~~	~~MSim-11_2COQ~~	~~OQ~~	~~09IL-24~~	~~2016.00~~	~~614.5~~				~~14.87~~	~~0.24~~	~~2.225~~	~~1.113~~	~~-2633~~	~~348~~	~~-26~~	~~15~~	Bad pit	
316	MSim-11_3ADQ	DQ	09IL-24	2016.00	614.5	8.73	0.30		2.25	0.24	2.244	1.123	-3192	3346	-30	33		
317	MSim-11_3BOQ	OQ	09IL-24	2016.00	614.5	24.79	0.30		18.21	0.24	2.253	1.129	-3221	3156	-30	30		
318	MSim-11_4ADQ	DQ	09IL-24	2016.00	614.5	9.18	0.30		2.69	0.23	2.235	1.117	-3404	5212	-33	57		
319	MSim-11_4BOQ	DQ	09IL-24	2016.00	614.5	9.98	0.30		3.48	0.23	2.208	1.099	-3318	5333	-33	59		
320	MSim-11_4COQ	DQ	09IL-24	2016.00	614.5	9.32	0.30		2.83	0.27	2.158	1.082	-3246	5423	-28	63		
321	MSim-11_UWQ-1	Std							5.99	0.21	2.304	1.107	-827	866	-21	13		
322	MSim-11_UWQ-1	Std							5.85	0.25	2.349	1.114	-827	891	-21	16		
323	MSim-11_UWQ-1	Std							5.59	0.22	2.348	1.115	-827	916	-21	17		
324	MSim-11_UWQ-1	Std							5.76	0.25	2.335	1.110	-827	941	-20	17		
	*****bracket; 303-306, 321-324**						**0.30**	**0.9936**	**5.82**									
325	MSim-11_5ADQ	DQ	09IL-24	2016.00	614.5	9.17	0.36		2.66	0.18	2.355	1.115	-3193	1261	-30	15		
326	MSim-11_5BOQ	OQ	09IL-24	2016.00	614.5	26.87	0.36		20.25	0.20	2.366	1.115	-3253	1373	-31	16		
327	MSim-11_5COQ	OQ	09IL-24	2016.00	614.5	24.40	0.36		17.79	0.27	2.324	1.096	-3310	1318	-31	15		
328	MSim-11_5DOQ	OQ	09IL-24	2016.00	614.5	23.82	0.36		17.21	0.27	2.275	1.078	-3362	1280	-30	14		
329	MSim-11_6ADQ	DQ	09IL-28	2167.00	660.5	9.77	0.36		3.26	0.16	2.273	1.079	555	4049	-12	28		
~~330~~	~~MSim-11_6BOQ~~	~~OQ~~	~~09IL-28~~	~~2167.00~~	~~660.5~~	~~25.79~~	~~0.36~~		~~19.17~~	~~0.21~~	~~2.303~~	~~1.094~~	~~639~~	~~4118~~	~~-12~~	~~30~~	Mixed analysis	
331	MSim-11_7ADQ	DQ	09IL-28	2167.00	660.5	9.29	0.36		2.77	0.26	2.254	1.070	1547	2250	-11	18		
332	MSim-11_7BOQ	OQ	09IL-28	2167.00	660.5	24.79	0.36		18.17	0.23	2.246	1.067	1632	2331	-11	18		
333	MSim-11_7COQ	OQ	09IL-28	2167.00	660.5	24.83	0.36		18.22	0.23	2.302	1.091	1546	2099	-12	15		
334	MSim-11_8ADQ	DQ	09IL-28	2167.00	660.5	10.75	0.36		4.23	0.22	2.298	1.083	808	-538	-10	7		
335	MSim-11_8BOQ	OQ	09IL-28	2167.00	660.5	24.48	0.36		17.87	0.17	2.328	1.095	720	-409	-9	6		
336	MSim-11_8COQ	OQ	09IL-28	2167.00	660.5	23.35	0.36		16.75	0.26	2.178	1.035	478	-361	-14	2		

TABLE DR1. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 15 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Error (2SE)§§	Counts ^{16}O (10^9 cps)	Yield (10^9cps/nA primary beam)	Stage X	Stage Y	DTFA-X	DTFA-Y	removing pit##
337	MSim-11_9ADQ	DQ	09IL-28	2167.00	660.5	6.22	0.36		-0.28	0.28	2.259	1.073	2276	-373	-5	10	
~~338~~	~~MSim-11_9BOQ~~	~~OQ~~	~~09IL-28~~	~~2167.00~~	~~660.5~~	~~12.19~~	~~0.36~~		~~5.66~~	~~0.27~~	~~2.297~~	~~1.086~~	~~2222~~	~~-244~~	~~-5~~	~~13~~	Mixed analysis
339	MSim-11_9COQ	OQ	09IL-28	2167.00	660.5	24.60	0.36		17.98	0.21	2.306	1.090	2177	-220	-6	12	
~~340~~	~~MSim-11_9DOQ~~	~~OQ~~	~~09IL-28~~	~~2167.00~~	~~660.5~~	~~25.62~~	~~0.36~~		~~19.00~~	~~0.30~~	~~2.288~~	~~1.081~~	~~2208~~	~~-243~~	~~-5~~	~~11~~	Mixed analysis
341	MSim-11_UWQ-1	Std							5.79	0.29	2.332	1.102	-868	869	-21	14	
342	MSim-11_UWQ-1	Std							5.96	0.18	2.356	1.115	-868	894	-21	14	
343	MSim-11_UWQ-1	Std							5.93	0.20	2.356	1.112	-868	919	-20	15	
344	MSim-11_UWQ-1	Std							5.50	0.17	2.347	1.101	-868	944	-21	15	
	*****bracket; 321-324, 341-344**						**0.36**	**0.9935**	**5.79**								

Note: Samples 09IL-1 through 30 come from core C12996 (UPH-3; 42.4373ºN, -89.8579ºW), 09IL-31 through 41 come from core C13639 (40.1271ºN, -87.5596ºW), 09IL-42 through 50 come from core C4831 (38.5522ºN, -89.0225ºW)

*Spot number indicates the analysis number in a given session. Samples analyzed during the same session for other projects are not included in this list.

†Spot names give the mount analyzed, the area, the order of the spot, and whether the spot was intended as a detrital or overgrowth analysis; i.e., MSim-1_1ADQ is epoxy mount 1, area 1, spot 1 (A), detrital.

§Type of spot actually analyzed. Std=standard, DQ=detrital, OQ=overgrowth.

#External error is given as 2 standard deviations of the standard values for a given bracket.

**Instrumental Mass Fractionation is calculated for each set of bracketing standards.

††Uncorrected value measured on ion probe.

§§Internal error is given as 2*the standard error of an individual spot.

##Analyses labeled mixed are analyses that overlapped the overgrowth/detrital grain boundary. Analyses labeled bad pit are pits with an uneven surface (I.e., holes, cracks, etc.) that may not be quartz. Analyses labeled epoxy overlap the overgrowth/epoxy boundary. None of these are considered in the discussion of OQ vs DQ.

***Average value of bracketing standards used to correct sample data

†††Values from overgrowth #24 are distinctly different from the other 11 overgrowths analyzed in this rock and are not considered further

§§§Values from overgrowth #62 are distinctly different from the other 14 overgrowths analyzed in this rock and are not considered further

TABLE DR2. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 5 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Internal Error (2SE)§§	Counts ^{16}O (10^9 cps)	Stage X	Stage Y	DTFA-X	DTFA-Y	Reason for removing pit##
November 13, 2009																
MSim-10																
7	MSim-10_UWQ-1	Std							1.20	0.54	25.073	-2428	-2389	-10	-8	
8	MSim-10_UWQ-1	Std							1.03	0.58	25.522	-2428	-2399	-11	-10	
9	MSim-10_UWQ-1	Std							0.84	0.50	25.728	-2428	-2409	-10	-10	
10	MSim-10_UWQ-1	Std							0.76	0.54	26.123	-2428	-2419	-10	-10	
11	MSim-10_9Asmall	OQ	09IL-50	8468.8	2581.3	17.96	0.36		6.59	0.57	26.600	-3576	260	-23	-5	
12	MSim-10_9Bsmall	OQ	09IL-50	8468.8	2581.3	17.09	0.36		5.73	0.50	27.369	-3587	263	-23	-4	
13	MSim-10_9Csmall	OQ	09IL-50	8468.8	2581.3	23.80	0.36		12.36	0.63	27.468	-3598	264	-22	-6	
14	MSim-10_9Dsmall	OQ	09IL-50	8468.8	2581.3	22.38	0.36		10.96	0.56	27.191	-3642	243	-23	-5	
15	MSim-10_9Esmall	OQ	09IL-50	8468.8	2581.3	18.50	0.36		7.12	0.56	26.929	-3592	257	-23	-6	
16	MSim-10_9Fsmall	OQ	09IL-50	8468.8	2581.3	17.59	0.36		6.22	0.49	26.685	-3608	372	-24	-5	
17	MSim-10_9Gsmall	OQ	09IL-50	8468.8	2581.3	18.92	0.36		7.53	0.55	24.022	-3604	365	-24	-6	
18	MSim-10_9Hsmall	OQ	09IL-50	8468.8	2581.3	22.17	0.36		10.75	0.72	24.346	-3600	284	-23	-6	
19	MSim-10_9Ismall	OQ	09IL-50	8468.8	2581.3	24.25	0.36		12.81	0.66	24.518	-3592	273	-24	-6	
20	MSim-10_9Jsmall	OQ	09IL-50	8468.8	2581.3	24.62	0.36		13.17	0.73	24.860	-3584	280	-23	-7	
21	MSim-10_UWQ-1	Std							1.14	0.61	24.410	-2441	-2418	-11	-10	
22	MSim-10_UWQ-1	Std							1.16	0.66	25.497	-2441	-2408	-11	-12	
	*****bracket; 7-10, 21-22**						**0.36**	**0.9888**	**1.02**							
23	MSim-10_UWQ-1†††	Std							-1.23	0.42	27.719	-2441	-2398	-11	-11	
24	MSim-10_UWQ-1†††	Std							-1.07	0.50	27.169	-2441	-2388	-13	-11	
25	MSim-10 UWQ-1†††	Std							-0.41	0.80	25.430	-2451	-2388	-12	-11	
26	MSim-10 UWQ-1†††	Std							0.87	0.61	26.791	-2451	-2398	-11	-11	
27	MSim-10_UWQ-1†††	Std							-1.34	0.92	26.004	-2461	-2398	-11	-12	
28	MSim-10_UWQ-1†††	Std							-0.65	0.55	28.467	-2464	-2457	-9	-10	
29	MSim-10_UWQ-1†††	Std							-0.77	0.68	26.996	-2583	-2373	-13	-11	
30	MSim-10 UWQ-1†††	Std							-1.00	0.53	26.589	-2862	-2484	-13	-13	
31	MSim-10 UWQ-1†††	Std							-0.23	0.59	24.813	-2311	-2276	-10	-8	
32	MSim-10_UWQ-1	Std							-0.38	0.54	22.230	-2540	-2330	-7	-3	
33	MSim-10_UWQ-1	Std							-0.52	0.53	23.492	-2540	-2340	-7	-4	
34	MSim-10_UWQ-1	Std							-0.59	0.69	23.580	-2540	-2350	-8	-4	
35	MSim-10_UWQ-1	Std							-0.20	0.67	23.754	-2540	-2360	-7	-5	
36	MSim-10_9Ksmall	OQ	09IL-50	8468.8	2581.3	23.35	0.75		10.34	0.63	23.754	-3580	272	-18	0	
37	MSim-10_9Lsmall	OQ	09IL-50	8468.8	2581.3	23.81	0.75		10.79	0.70	23.111	-3558	280	-18	-2	
38	MSim-10_9Msmall	OQ	09IL-50	8468.8	2581.3	18.50	0.75		5.55	0.63	23.333	-3552	271	-18	-1	
39	MSim-10_9Nsmall	OQ	09IL-50	8468.8	2581.3	23.43	0.75		10.42	0.85	24.021	-3558	288	-18	0	
40	MSim-10_9Osmall	OQ	09IL-50	8468.8	2581.3	19.76	0.75		6.80	0.85	23.240	-3587	298	-18	0	
41	MSim-10_9Psmall	OQ	09IL-50	8468.8	2581.3	18.02	0.75		5.08	0.64	22.491	-3615	363	-19	-1	
42	MSim-10_9Qsmall	DQ	09IL-50	8468.8	2581.3	12.43	0.75		-0.45	0.74	22.220	-3573	218	-19	0	
43	MSim-10_9Rsmall	DQ	09IL-50	8468.8	2581.3	11.90	0.75		-0.97	0.68	23.191	-3518	237	-18	0	
44	MSim-10_UWQ-1	Std							-0.17	0.75	22.464	-2550	-2359	-6	-5	
45	MSim-10_UWQ-1	Std							-1.16	0.72	22.715	-2550	-2349	-7	-4	
46	MSim-10_UWQ-1	Std							-0.27	0.67	22.813	-2550	-2339	-8	-4	
47	MSim-10_UWQ-1	Std							-1.04	0.64	23.040	-2550	-2329	-7	-6	
	*****bracket; 32-35, 44-47**						**0.75**	**0.9873**	**-0.54**							
February 18-19, 2010																
MSim-3																
5	MSim-3_UWQ-1	Std							0.40	0.68	23.508	-1042	-2828	-3	7	
6	MSim-3_UWQ-1	Std							0.73	0.73	23.487	-1042	-2838	-1	10	
7	MSim-3_UWQ-1	Std							1.49	0.69	23.531	-1042	-2848	-1	10	
8	MSim-3_UWQ-1§§§	Std							1.28	0.67	24.186	-1042	-2858	-1	10	
9	MSim-3_14Asmall	DQ	09IL-39	6499	1980.9	10.17	0.79		-1.25	0.54	23.833	-66	418	1	22	
10	MSim-3_14Bsmall	OQ	09IL-39	6499	1980.9	24.18	0.79		12.61	0.47	24.033	-66	413	1	23	
11	MSim-3_14Csmall	OQ	09IL-39	6499	1980.9	23.87	0.79		12.29	0.69	24.644	-66	402	0	23	
12	MSim-3_14Dsmall	OQ	09IL-39	6499	1980.9	23.96	0.79		12.38	0.60	24.288	-55	413	0	23	
13	MSim-3_14Esmall	OQ	09IL-39	6499	1980.9	17.73	0.79		6.22	0.68	23.793	-62	313	1	22	
14	MSim-3_14Fsmall	OQ	09IL-39	6499	1980.9	17.50	0.79		6.00	0.69	24.127	-66	318	1	22	
15	MSim-3_14Gsmall	OQ	09IL-39	6499	1980.9	18.32	0.79		6.81	0.67	23.426	-93	333	0	22	
16	MSim-3_14Hsmall	OQ	09IL-39	6499	1980.9	18.23	0.79		6.72	0.77	23.833	-90	346	-1	22	
17	MSim-3_14Ismall	OQ	09IL-39	6499	1980.9	19.55	0.79		8.03	0.68	24.280	-57	363	1	22	
18	MSim-3_14Jsmall	OQ	09IL-39	6499	1980.9	18.91	0.79		7.39	0.61	24.210	-56	386	0	22	
19	MSim-3_14Ksmall	DQ	09IL-39	6499	1980.9	8.43	0.79		-2.97	0.75	23.651	-58	443	1	22	
20	MSim-3_UWQ-1	Std							0.89	0.69	24.334	-1052	-2854	-1	11	
21	MSim-3_UWQ-1	Std							1.09	0.55	24.363	-1052	-2844	-1	10	
22	MSim-3_UWQ-1	Std							0.36	0.60	24.187	-1052	-2834	-1	10	
23	MSim-3_UWQ-1	Std							0.86	0.72	24.160	-1052	-2824	-2	10	
	*****bracket; 5-8, 20-23**						**0.79**	**0.9887**	**0.89**							
24	~~MSim-3_10Asmall~~	~~OQ~~	09IL-41	6503	1982.1	~~26.04~~	~~0.77~~		~~14.15~~	~~0.73~~	~~26.386~~	~~-3078~~	~~-1316~~	~~-10~~	~~16~~	Overlaps 10 µm spot
25	MSim-3_10Bsmall	OQ	09IL-41	6503	1982.1	24.60	0.77		12.73	0.61	23.857	-3080	-1324	-7	20	
26	~~MSim-3_10Csmall~~	~~OQ~~	09IL-41	6503	1982.1	~~23.58~~	~~0.77~~		~~11.72~~	~~0.73~~	~~24.287~~	~~-3074~~	~~-1332~~	~~-7~~	~~20~~	Mixed analysis
27	MSim-3_10Dsmall	OQ	09IL-41	6503	1982.1	26.30	0.77		14.40	0.70	23.850	-3068	-1336	-8	19	
28	MSim-3_10Esmall	OQ	09IL-41	6503	1982.1	25.91	0.77		14.02	0.50	23.963	-3062	-1328	-7	20	
29	MSim-3_10Fsmall	OQ	09IL-41	6503	1982.1	24.07	0.77		12.21	0.59	23.861	-3059	-1312	-7	19	
30	MSim-3_10Gsmall	OQ	09IL-41	6503	1982.1	21.21	0.77		9.38	0.68	23.500	-3048	-1301	-7	19	

TABLE DR2. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 5 μm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Internal Error (2SE)§§	Counts ^{16}O (10^9 cps)	Stage X	Stage Y	DTFA-X	DTFA-Y	Reason for removing pit##
31	MSim-3_10Hsmall	OQ	09IL-41	6503	1982.1	21.87	0.77		10.03	0.59	23.622	-3042	-1287	-6	20	
32	MSim-3_10Ismall	OQ	09IL-41	6503	1982.1	22.03	0.77		10.19	0.78	23.611	-3032	-1270	-6	20	
33	MSim-3_10Jsmall	OQ	09IL-41	6503	1982.1	21.68	0.77		9.84	0.60	23.727	-3017	-1260	-6	20	
34	MSim-3_10Ksmall	OQ	09IL-41	6503	1982.1	22.50	0.77		10.65	0.69	23.858	-3029	-1266	-7	20	
35	MSim-3_10Lsmall	DQ	09IL-41	6503	1982.1	4.72	0.77		-6.92	0.75	23.417	-3098	-1341	-9	20	
36	MSim-3_UWQ-1	Std							-0.07	0.54	23.624	-1058	-2857	-1	10	
37	MSim-3_UWQ-1	Std							0.26	0.53	23.660	-1058	-2847	-1	10	
38	MSim-3_UWQ-1	Std							0.61	0.59	24.305	-1058	-2837	-1	10	
39	MSim-3_UWQ-1	Std							0.80	0.64	24.290	-1058	-2827	-1	10	
	*****bracket; 20-23, 36-39**						**0.77**	**0.9884**	**0.60**							
40	MSim-3_13Asmall	OQ	09IL-39	6499	1980.9	19.70	0.77		7.62	0.58	24.295	-297	2041	2	24	
41	MSim-3_13Bsmall	OQ	09IL-39	6499	1980.9	21.87	0.77		9.76	0.72	23.953	-268	2045	2	25	
42	MSim-3_13Csmall	OQ	09IL-39	6499	1980.9	25.59	0.77		13.44	0.66	23.757	-264	2072	2	25	
43	MSim-3_13Dsmall	OQ	09IL-39	6499	1980.9	24.77	0.77		12.63	0.70	24.722	-261	2031	2	25	
44	MSim-3_13Esmall	OQ	09IL-39	6499	1980.9	19.66	0.77		7.58	0.78	23.701	-281	2036	1	25	
45	MSim-3_13Fsmall	OQ	09IL-39	6499	1980.9	20.65	0.77		8.56	0.51	24.004	-312	2035	1	25	
46	MSim-3_13Gsmall	OQ	09IL-39	6499	1980.9	18.00	0.77		5.94	0.63	23.709	-339	2039	2	25	
47	MSim-3_13Hsmall	DQ	09IL-39	6499	1980.9	9.01	0.77		-2.94	0.60	24.226	-239	2048	2	25	
48	MSim-3_UWQ-1	Std							-0.18	0.66	24.140	-1070	-2860	-1	11	
49	MSim-3_UWQ-1	Std							0.75	0.48	24.150	-1070	-2850	-1	11	
50	MSim-3_UWQ-1	Std							-0.01	0.60	24.149	-1070	-2840	-1	10	
51	MSim-3_UWQ-1	Std							0.53	0.59	24.058	-1070	-2830	-1	10	
	*****bracket; 36-39, 48-51**						**0.77**	**0.9882**	**0.34**							
52	MSim-12_UWQ-1	Std							0.75	0.68	23.969	-301	-138	18	19	
53	MSim-12_UWQ-1	Std							-0.52	0.76	24.302	-301	-148	-1	22	
54	MSim-12_UWQ-1	Std							0.03	0.73	24.308	-301	-158	-2	22	
55	MSim-12_UWQ-1	Std							0.16	0.51	24.315	-301	-168	-2	21	
56	MSim-12_UWQ-1	Std							-0.01	0.56	24.333	-301	-178	-1	21	
57	MSim-12_UWQ-1	Std							0.27	0.46	24.393	-301	-188	-2	21	
						MSim-12										
58	MSim-12 1Asmall###	OQ	09IL-29	2176.60	663.4	24.28	0.49		11.73	0.62	22.899	-2247	4826	-16	35	
59	MSim-12_1Bsmall###	OQ	09IL-29	2176.60	663.4	22.54	0.49		10.01	0.69	23.126	-2235	4822	-15	35	
60	MSim-12_1Csmall###	OQ	09IL-29	2176.60	663.4	20.50	0.49		7.99	0.42	23.095	-2234	4837	-4	35	
61	MSim-12_1Dsmall###	OQ	09IL-29	2176.60	663.4	18.35	0.49		5.87	0.79	23.006	-2228	4847	-3	35	
62	MSim-12 1Esmall###	OQ	09IL-29	2176.60	663.4	15.97	0.49		3.52	0.61	23.065	-2216	4858	-3	35	
63	MSim-12 1Fsmall###	OQ	09IL-29	2176.60	663.4	14.03	0.49		1.61	0.74	23.324	-2212	4864	-4	35	
64	MSim-12_1Gsmall###	OQ	09IL-29	2176.60	663.4	15.60	0.49		3.15	0.56	23.115	-2198	4871	-2	36	
65	MSim-12_1Hsmall###	OQ	09IL-29	2176.60	663.4	14.21	0.49		1.79	0.48	23.114	-2195	4864	-3	35	
66	MSim-12_1Ismall###	OQ	09IL-29	2176.60	663.4	13.88	0.49		1.45	0.57	24.140	-2204	4853	-3	36	
67	MSim-12 1Jsmall###	OQ	09IL-29	2176.60	663.4	16.92	0.49		4.46	0.76	23.974	-2221	4841	-4	35	
68	MSim-12 1Ksmall###	OQ	09IL-29	2176.60	663.4	22.31	0.49		9.78	0.64	23.940	-2250	4838	-5	35	
69	MSim-12_1Lsmall	DQ	09IL-29	2176.60	663.4	9.19	0.49		-3.17	0.59	23.884	-2263	4810	-4	35	
70	MSim-12_UWQ-1	Std							-0.47	0.67	24.363	-310	-185	10	20	
71	MSim-12_UWQ-1	Std							-0.11	0.69	24.485	-310	-175	11	20	
72	MSim-12_UWQ-1	Std							-0.09	0.65	24.187	-310	-165	11	20	
73	MSim-12_UWQ-1	Std							-0.37	0.69	24.329	-310	-155	11	20	
	*****bracket; 54-57, 70-73**						**0.49**	**0.9877**	**-0.07**							
						MSim-5										
74	MSim-5_UWQ-1	Std							0.14	0.79	23.475	-1631	2501	-7	31	
75	MSim-5_UWQ-1	Std							0.31	0.57	24.027	-1631	2491	-8	31	
76	MSim-5_UWQ-1	Std							0.02	0.71	24.066	-1631	2481	-7	31	
77	MSim-5_UWQ-1	Std							-0.08	0.57	23.957	-1631	2471	-7	31	
78	MSim-5_12Asmall	OQ	09IL-31	5408	1648.4	22.17	0.54		9.74	0.65	23.060	-665	2099	-7	25	
79	~~MSim-5_12Bsmall~~	~~OQ~~	09IL-31	5408	1648.4	~~21.06~~	~~0.54~~		~~8.65~~	~~0.67~~	~~22.884~~	~~-635~~	~~2106~~	~~-6~~	~~24~~	Mixed analysis
80	MSim-5_12Csmall	OQ	09IL-31	5408	1648.4	23.35	0.54		10.91	0.54	23.578	-633	2098	-5	25	
81	MSim-5_12Dsmall	OQ	09IL-31	5408	1648.4	21.39	0.54		8.97	0.52	23.586	-638	2091	-5	25	
82	MSim-5_12Esmall	OQ	09IL-31	5408	1648.4	23.64	0.54		11.19	0.67	23.344	-632	2086	-5	25	
83	MSim-5_12Fsmall	OQ	09IL-31	5408	1648.4	20.03	0.54		7.62	0.68	23.416	-638	2078	-6	25	
84	MSim-5_12Gsmall	OQ	09IL-31	5408	1648.4	20.25	0.54		7.84	0.59	23.413	-626	2076	-5	25	
85	MSim-5_12Hsmall	OQ	09IL-31	5408	1648.4	24.55	0.54		12.09	0.52	23.385	-629	2102	-6	24	
86	MSim-5_12Ismall	DQ	09IL-31	5408	1648.4	9.65	0.54		-2.62	0.68	23.272	-630	2112	-6	25	
87	MSim-5_UWQ-1	Std							-0.51	0.76	23.254	-1644	2474	-5	30	
88	MSim-5_UWQ-1	Std							-0.17	0.59	23.446	-1644	2484	-5	31	
89	MSim-5_UWQ-1	Std							0.26	0.68	23.424	-1644	2494	-4	31	
90	MSim-5_UWQ-1	Std							0.18	0.67	23.287	-1644	2504	-4	30	
	*****bracket; 74-77, 87-90**						**0.54**	**0.9878**	**0.02**							
						February 24-25, 2010										
						MSim-10										
1	MSim-10_UWQ-1	Std							-2.49	0.67	20.126	-926	-1458	-5	4	
2	MSim-10_UWQ-1	Std							-1.81	0.62	20.520	-926	-1468	-4	5	
3	MSim-10_UWQ-1	Std							-1.42	0.69	21.640	-926	-1478	-5	5	
4	MSim-10_UWQ-1	Std							-2.05	0.79	21.598	-926	-1488	-5	5	
5	MSim-10_UWQ-1	Std							-0.92	0.68	21.588	-926	-1498	-5	5	
6	MSim-10_UWQ-1	Std							-1.26	0.59	22.205	-926	-1508	-5	4	

TABLE DR2. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 5 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Internal Error (2SE)§§	Counts ^{16}O (10^9 cps)	Stage X	Stage Y	DTFA-X	DTFA-Y	Reason for removing pit##
7	~~MSim-10_9-1Asmall****~~	~~OQ~~	09IL-50	8468.8	2581.3	~~24.55~~	~~0.69~~	~~0.9868~~	~~10.98~~	~~0.68~~	~~21.810~~	~~-2809~~	~~-917~~	~~-15~~	~~7~~	Mixed analysis
8	~~MSim-10_9-1Bsmall****~~	~~OQ~~	09IL-50	8468.8	2581.3	~~20.26~~	~~0.69~~	~~0.9869~~	~~6.89~~	~~0.67~~	~~21.757~~	~~-2787~~	~~-888~~	~~-15~~	~~6~~	Mixed analysis
9	MSim-10_9-1Csmall****	OQ	09IL-50	8468.8	2581.3	18.49	0.69	0.9870	5.24	0.73	22.117	-2787	-881	-15	5	
10	MSim-10_9-1Dsmall****	OQ	09IL-50	8468.8	2581.3	19.76	0.69	0.9871	6.61	0.69	21.793	-2764	-860	-15	6	
11	MSim-10_9-1Esmall****	OQ	09IL-50	8468.8	2581.3	21.72	0.69	0.9872	8.66	0.69	22.123	-2759	-865	-14	7	
12	MSim-10_9-1Fsmall****	DQ	09IL-50	8468.8	2581.3	11.69	0.69	0.9873	-1.13	0.61	22.098	-2749	-883	-15	6	
13	MSim-10_9-1Gsmall****	OQ	09IL-50	8468.8	2581.3	23.57	0.69	0.9874	10.71	0.57	21.180	-2805	-859	-15	6	
14	MSim-10_9-1Hsmall****	OQ	09IL-50	8468.8	2581.3	19.78	0.69	0.9876	7.10	0.62	21.585	-2823	-854	-14	6	
15	MSim-10_UWQ-1	Std							-0.31	0.77	21.849	-933	-1517	-5	5	
16	MSim-10_UWQ-1	Std							0.11	0.66	22.508	-935	-1507	-5	5	
	*****bracket; 3-6, 15-16**						**0.69††††**	**0.9869**	**-0.98**							
17	MSim-10_UWQ-1	Std							0.75	0.58	22.179	-935	-1497	-3	6	
18	MSim-10_UWQ-1	Std							0.76	0.68	22.103	-935	-1487	-4	7	
19	MSim-10_UWQ-1	Std							0.30	0.62	22.120	-935	-1477	-3	6	
20	MSim-10_UWQ-1	Std							0.17	0.63	22.015	-935	-1467	-3	7	
21	MSim-10_10Asmall	OQ	09IL-50	8468.8	2581.3	22.86	0.42		10.89	0.60	21.225	-1735	-2531	-6	2	
22	MSim-10_10Bsmall	OQ	09IL-50	8468.8	2581.3	22.46	0.42		10.50	0.70	21.098	-1742	-2524	-6	2	
23	MSim-10_10Csmall	DQ	09IL-50	8468.8	2581.3	12.04	0.42		0.20	0.76	21.463	-1728	-2531	-6	3	
24	MSim-10_10Dsmall	OQ	09IL-50	8468.8	2581.3	19.97	0.42		8.03	0.77	20.872	-1747	-2516	-7	2	
25	MSim-10_10Esmall	OQ	09IL-50	8468.8	2581.3	18.86	0.42		6.93	0.73	21.003	-1757	-2508	-7	1	
26	MSim-10_10Fsmall	OQ	09IL-50	8468.8	2581.3	19.08	0.42		7.15	0.60	20.912	-1807	-2445	-8	1	
27	MSim-10_10Gsmall	OQ	09IL-50	8468.8	2581.3	19.28	0.42		7.35	0.54	21.521	-1808	-2453	-7	2	
28	MSim-10_10Hsmall	OQ	09IL-50	8468.8	2581.3	23.80	0.42		11.81	0.83	20.727	-1764	-2499	-7	2	
29	MSim-10_10Ismall	OQ	09IL-50	8468.8	2581.3	22.82	0.42		10.85	0.72	21.288	-1761	-2490	-6	1	
30	MSim-10_10Jsmall	OQ	09IL-50	8468.8	2581.3	20.47	0.42		8.53	0.70	20.923	-1777	-2490	-8	1	
31	MSim-10_10Ksmall	OQ	09IL-50	8468.8	2581.3	22.83	0.42		10.86	0.67	21.645	-1762	-2508	-8	1	
32	MSim-10_10Lsmall	OQ	09IL-50	8468.8	2581.3	20.13	0.42		8.19	0.64	21.248	-1785	-2481	-8	1	
33	MSim-10_10Msmall	OQ	09IL-50	8468.8	2581.3	19.78	0.42		7.84	0.75	21.172	-1793	-2470	-7	1	
34	MSim-10_10Nsmall	OQ	09IL-50	8468.8	2581.3	19.24	0.42		7.31	0.77	21.424	-1799	-2456	-6	2	
35	MSim-10_UWQ-1	Std							0.60	0.71	21.571	-947	-1509	-4	6	
36	MSim-10_UWQ-1	Std							0.49	0.47	21.736	-947	-1499	-5	6	
37	MSim-10_UWQ-1	Std							0.39	0.74	21.708	-947	-1489	-5	6	
38	MSim-10_UWQ-1	Std							0.38	0.71	21.560	-947	-1479	-4	7	
	*****bracket; 17-20, 35-38**						**0.42**	**0.9883**	**0.48**							
						MSim-6										
39	MSim-6_UWQ-1	Std							0.20	0.76	21.890	-2115	1406	22	17	
40	MSim-6_UWQ-1	Std							1.02	0.62	21.907	-2125	1396	-5	19	
41	MSim-6_UWQ-1	Std							0.66	0.49	22.474	-2097	1384	-3	19	
42	MSim-6_UWQ-1	Std							0.68	0.79	22.474	-2097	1374	-1	18	
43	MSim-6_UWQ-1	Std							0.52	0.77	22.428	-2097	1364	-2	19	
44	MSim-6_UWQ-1	Std							-0.04	0.56	22.471	-2097	1354	-3	18	
45	MSim-6_1Asmall	OQ	09IL-35	6154.5	1875.9	26.73	1.01		14.52	0.77	20.958	-3632	-1106	0	13	
46	MSim-6_1Bsmall	OQ	09IL-35	6154.5	1875.9	23.84	1.01		11.66	0.66	21.611	-3634	-1114	0	13	
47	MSim-6_1Csmall	OQ	09IL-35	6154.5	1875.9	25.80	1.01		13.59	0.71	21.594	-3638	-1124	-1	14	
48	MSim-6_1Dsmall	OQ	09IL-35	6154.5	1875.9	25.33	1.01		13.13	0.72	21.267	-3620	-1108	0	13	
49	MSim-6_1Esmall	OQ	09IL-35	6154.5	1875.9	22.51	1.01		10.35	0.62	21.639	-3642	-1132	-1	13	
50	MSim-6_1Fsmall	OQ	09IL-35	6154.5	1875.9	19.07	1.01		6.94	0.61	21.586	-3659	-1155	-1	14	
51	MSim-6_3Asmall	DQ	09IL-35	6154.5	1875.9	10.46	1.01		-1.56	0.77	21.453	-3486	12	1	17	
52	~~MSim-6_3Bsmall~~	~~OQ~~	09IL-35	6154.5	1875.9	~~19.77~~	~~1.01~~		~~7.64~~	~~0.77~~	~~21.500~~	~~-3540~~	~~4~~	~~0~~	~~18~~	Mixed analysis
53	MSim-6_3Csmall	OQ	09IL-35	6154.5	1875.9	24.77	1.01		12.57	0.63	21.435	-3552	4	-1	18	
54	MSim-6_3Dsmall	OQ	09IL-35	6154.5	1875.9	22.14	1.01		9.98	0.75	21.710	-3545	2	0	18	
55	MSim-6_3Esmall	OQ	09IL-35	6154.5	1875.9	19.01	1.01		6.88	0.68	21.378	-3567	15	0	16	
56	MSim-6_3Fsmall	OQ	09IL-35	6154.5	1875.9	19.58	1.01		7.45	0.65	21.195	-3570	31	0	17	
57	MSim-6_3Gsmall	OQ	09IL-35	6154.5	1875.9	18.91	1.01		6.79	0.61	22.275	-3571	55	-2	18	
58	MSim-6_3Hsmall	OQ	09IL-35	6154.5	1875.9	17.49	1.01		5.39	0.63	22.338	-3581	71	-3	20	
59	MSim-6_UWQ-1	Std							-0.25	0.59	21.864	-2109	1350	-2	17	
60	MSim-6_UWQ-1	Std							-0.26	0.54	22.149	-2109	1360	-3	17	
61	MSim-6_UWQ-1	Std							-0.10	0.78	22.121	-2109	1370	-3	18	
62	MSim-6_UWQ-1	Std							1.06	0.68	21.997	-2109	1380	-2	20	
63	MSim-6_UWQ-1	Std							0.86	0.64	21.947	-2109	1390	-2	18	
	*****bracket; 41-44, 59-63**						**1.01**	**0.9881**	**0.28**							
						MSim-4										
64	MSim-4_UWQ-1	Std							0.51	0.68	21.223	-50	1686	-2	13	
65	MSim-4_UWQ-1	Std							0.31	0.77	21.583	-50	1676	-2	13	
66	MSim-4_UWQ-1	Std							-0.43	0.67	21.610	-50	1666	-2	12	
67	MSim-4_UWQ-1	Std							-0.41	0.85	21.570	-50	1656	-1	12	
68	MSim-4_UWQ-1	Std							0.09	0.69	21.662	-50	1646	-2	13	
69	MSim-4_4Asmall	OQ	09IL-11	1540.5	469.5	26.32	0.76		13.92	0.67	21.013	-3727	-1963	-6	7	
70	MSim-4_4Bsmall	OQ	09IL-11	1540.5	469.5	28.17	0.76		15.75	0.70	21.504	-3719	-1979	-7	8	
71	MSim-4_4Csmall	OQ	09IL-11	1540.5	469.5	26.87	0.76		14.46	0.74	20.709	-3707	-1952	-7	7	
72	MSim-4_8aAsmall	OQ	09IL-16	1705.8	519.9	24.43	0.76		12.05	0.63	20.330	2568	-1585	10	4	
73	MSim-4_8aBsmall	OQ	09IL-16	1705.8	519.9	26.36	0.76		13.96	0.62	19.747	2587	-1550	10	3	
74	~~MSim-4_8aCsmall~~	~~OQ~~	09IL-16	1705.8	519.9	~~24.61~~	~~0.76~~		~~12.23~~	~~0.60~~	~~19.784~~	~~2590~~	~~-1533~~	~~10~~	~~4~~	Mixed analysis
75	MSim-4_8aDsmall	OQ	09IL-16	1705.8	519.9	25.62	0.76		13.23	0.77	19.590	2534	-1620	10	4	

TABLE DR2. OXYGEN ISOTOPE COMPOSITION OF DETRITAL AND DIAGENETIC QUARTZ MEASURED ON THE WiscSIMS ION MICROPROBE USING A 5 µm SPOT SIZE.

Spot number*	Spot name†	Type of spot§	Sample name	Depth (feet)	Depth (meters)	$\delta^{18}O$ VSMOW	External Error (2SD)#	IMF**	$\delta^{18}O$ raw††	Internal Error (2SE)§§	Counts ^{16}O (10^9 cps)	Stage X	Stage Y	DTFA-X	DTFA-Y	Reason for removing pit##
76	MSim-4_UWQ-1	Std							0.47	0.79	21.068	-73	1649	-6	13	
77	MSim-4_UWQ-1	Std							-0.02	0.63	21.030	-73	1659	-5	13	
78	MSim-4_UWQ-1	Std							0.47	0.62	21.021	-73	1669	-5	13	
79	MSim-4_UWQ-1	Std							0.30	0.84	21.003	-73	1679	-5	13	
	***bracket; 65-68, 76-79						0.76	0.9879	0.10							

Note: Samples 09IL-1 through 30 come from core C12996 (UPH-3; 42.4373ºN, -89.8579ºW), 09IL-31 through 41 come from core C13639 (40.1271ºN, -87.5596ºW), 09IL-42 through 50 come from core C4831 (38.5522ºN, -89.0225ºW).

*Spot number indicates the analysis number in a given session. Samples analyzed during the same session for other projects are not included in this list.

†Spot names give the mount analyzed, the area, the order of the spot, and whether the spot was intended as a detrital or overgrowth analysis; i.e., MSim-1_1ADQ is epoxy mount 1, area 1, spot 1 (A), detrital.

§Type of spot actually analyzed. Std=standard, DQ=detrital, OQ=overgrowth.

#External error is given as 2 standard deviations of the standard values for a given bracket.

**Instrumental Mass Fractionation is calculated for each set of bracketing standards.

††Uncorrected value measured on ion probe.

§§Internal error is given as 2*the standard error of an individual spot.

##Mixed analyses are analyses that overlapped the overgrowth/detrital grain boundary. These values are not considered in the discussion of OQ vs DQ.

***Average value of bracketing standards used to correct sample data.

†††These spots were used for tuning and calibration of the ion probe.

§§§e-beam was turned on 10 seconds into presputtering.

###Values from overgrowth #62 are distinctly different from the other 14 overgrowths analyzed in this rock and are not considered further.

****$\delta^{18}O$ VSMOW values for spots 7-14 are calculated using time-dependent drift calculation of the bias for each spot. The bracketing standard spots 3-6 are considerably lower than spots 15 and 16 and define a trend with time. The IMF was calculated for each spot based on the linear drift correction to the bias.

††††The standard deviation of spots 3-6 and 15-16 is based on deviations from the linear fit used for drift correction.