Mineralogic Causes of Variations in Magnetic Susceptibility of Late Pleistocene and Holocene Sediment from Great Salt Lake, Utah

By Richard L. Reynolds, Joseph G. Rosenbaum, and Robert S. Thompson

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Conversion Factors

SI to Inch/feet

Multiply	By	To obtain
Length		
centimeter (cm)	0.3937	inch (in.)
meter (m)	3.281	foot (ft)

Horizontal coordinate information is referenced to the World Geodetic System 84 (WGS84).

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By Richard L. Reynolds[1], Joseph G. Rosenbaum[1], and Robert S. Thompson[1]

Introduction and Methods

We describe here results of magnetic susceptibility (MS) measurements and magnetic mineralogy of sediments sampled in three cores from the south basin of Great Salt Lake (fig. 1). The cores were obtained in 1996 with a Kullenburg-type piston corer at sites in close proximity: core 96-4 at 41° 01.00' N, 112° 28.00' W and cores 96-5 and 96-6 at 41° 00.09' N, 112° 23.05' W. These sites are close to the locations of cores C and D described by Spencer and others (1984). Cores 96-5 (2.16 m long) and -6 combine to make a composite 11.31-m sediment record. Sediments in core 96-4 (5.54 m long) correspond to the approximate depth interval of 3.9–9.6 m in the composite core of 96-5 and -6 based on similarities in the MS records as described below.

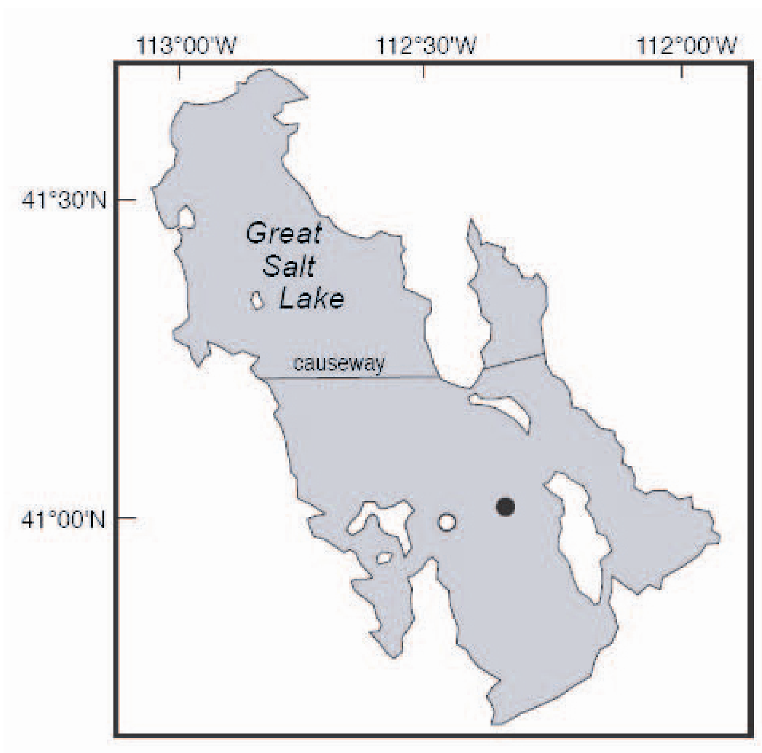

Figure 1. Map of Great Salt Lake, Utah, showing locations of 1996 sediment cores: open circle, core 96-4; closed circle, cores 96-5 and 96-6.

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The central goal of the research was to provide a sediment record of paleoenvironmental change in the northeastern Basin and Range Province over the past 40,000 years. Specific targets included a sedimentologic record of lake-level change combined with a pollen record of climatic change. The late Quaternary lake-level history at Great Salt Lake is summarized by Oviatt and others (1992) and Godsey and others (2005).

Measurements of MS were made using a Sapphire II pass-through coil on continuous u-channel samples (Tauxe and others, 1983) to determine variations in the concentration of magnetic minerals. Such variations may result from environmentally important factors in a lake-catchment system, including changes in sediment source areas, in weathering and sediment transport, and in post-depositional alteration that may reflect changes in water chemistry (for example, Rosenbaum and others, 1996; Rosenbaum, 2005; Reynolds and others, 1994; Reynolds and Rosenbaum, 2005).

Magnetic minerals were identified petrographically in selected samples from the cores. The petrographic observations reported here elucidate the mineralogic causes of variations in MS and thereby assist paleoenvironmental interpretations that may be difficult or impossible to infer from MS alone. Moreover, petrographically observed textures (size and shape) of the detrital magnetic minerals may provide clues to their origins, including erosional and depositional processes. Special attention was given to post-depositional alteration of the lake sediments, expressed by authigenic magnetic minerals and dissolution of detrital grains, because these factors commonly have strong influences on magnetic property variations in lake sediments. Such alteration provides clues to changes in lake-water chemistry.

Magnetic grains were separated from bulk sediment by pumping a slurry of the sediment past a stationary magnet (Reynolds and others, 2001). Grains, mounted in epoxy and polished, were examined using reflected-light microscopy at magnifications as high as 400x. The 18 samples examined in this study were considered sufficient to understand the large range of variation in the magnetic susceptibility.

Age, Features, and Magnetic Susceptibility of the Sediments

Age control was obtained by accelerator mass spectrometry (AMS) radiocarbon analyses and by the presence of two tephra layers. The base of the composite 96-5 and -6 core is dated by ^{14}C at 37.1 ka. More than sixty additional radiocarbon ages and two volcanic ashes provide chronologic control for the lake deposits (Thompson and Oviatt, unpub. data). The bottom 2.7 m of the core is characterized by laminated mud that represents shallow-lake conditions prior to Lake Bonneville high stands and that has low to intermediate magnetic susceptibility (typically $<1\times10^{-4}$ volume SI; table 1). Near the top of this interval, at a depth of about 8.98 m in composite core 96-5 and -6, lies a basaltic tephra, tentatively identified informally as the Hansel Valley ash (26.5 ka; fig 2*A*) (Oviatt and others, 1992). This ash bed is also found at a 3.84-m depth in core 96-4 (fig. 2*C*). Above the ash bed, gray-banded to massive mud, which represents relatively high lake level, is characterized by relatively high ($>1\times10^{-4}$ volume SI) magnetic susceptibility. Highest MS is found at an approximately 7.74–7.90-m composite depth in core 96-6 and approximately 3.36–3.53-m depth in core 96-4, in sediments that are estimated to be between 16 and 18 ^{14}C ka based on AMS dates on bulk sediments from core 96-6. The sharp decline in MS directly above the interval of highest MS spans the time of the highest late Pleistocene lake level that produced the Lake Bonneville shoreline. Younger sediment has low and mostly uniform magnetic susceptibility (typically $<0.6\times10^{-4}$ volume SI). This sediment includes light-gray banded mud representing the regression from the Provo shoreline (approx. 7.48–7.12-m depths), as well as overlying black-laminated, brine-shrimp mud (approx. 7.12–6.7-m depths) and brine-shrimp pelletal mud that represent most of the Holocene record. We did not obtain MS data on core segment 96-6 1B, representing 4.75–5.98-m depths in the composite core. The strong similarities in MS in the cores, especially the pattern of high MS between about 7.5 and 8.8 m in core 96-5 and -6 (table 1) and between about 3.2 and 3.9 m in core 96-4 (table 2), allowed correlation of their sediment (see figure 2). The Mazama ash (7.627±150 cal ka; Zdanowicz and others, 1999) was found at a 5.38-m depth in composite core 96-5 and -6 and at a 0.92-m depth in core 96-4.

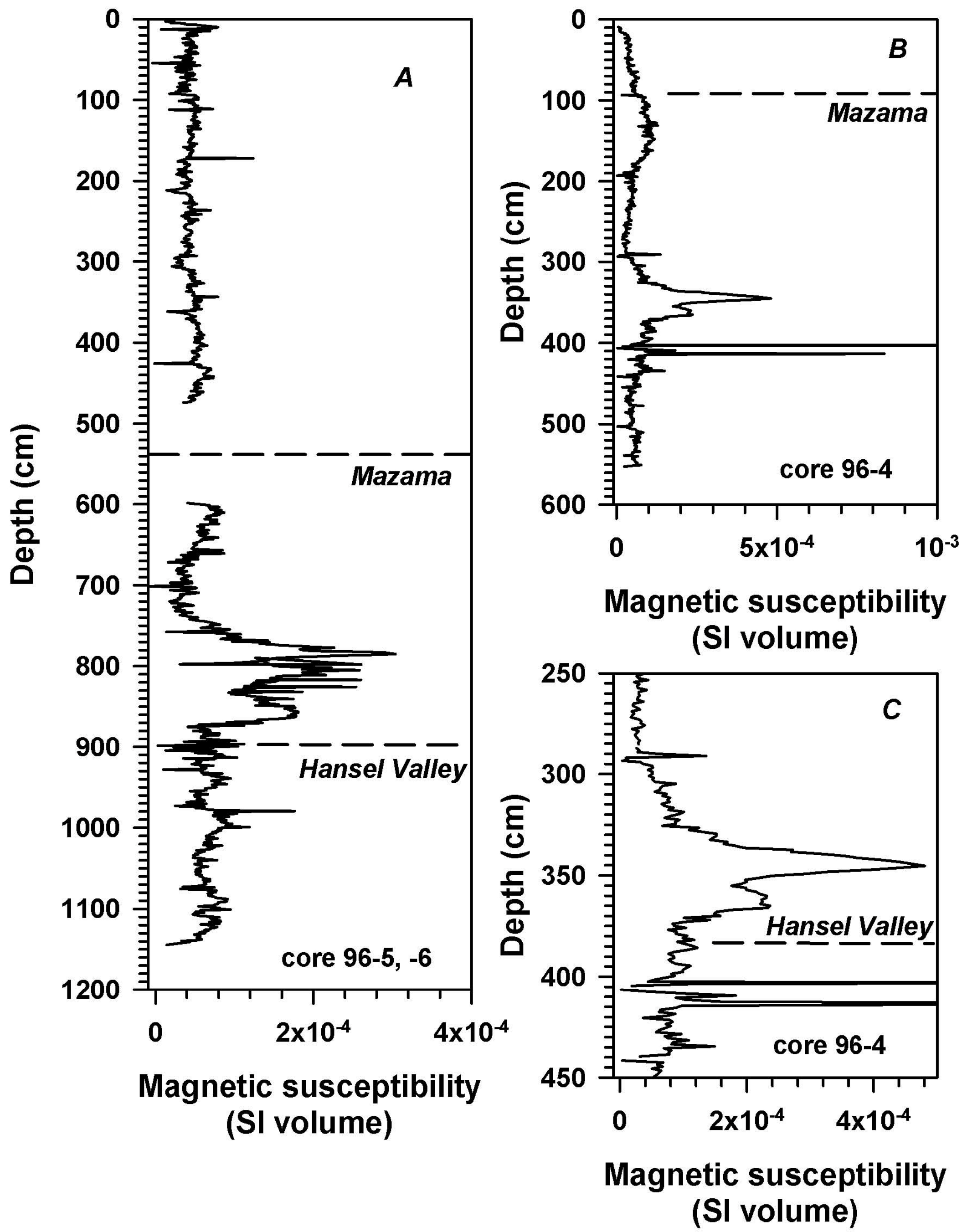

Figure 2. Plots of magnetic susceptibility with depth in composite cores 96-5 and 96-6 (*A*), in core 96-4 (*B*), and in an expanded part (250–450 cm) of core 96-4 (*C*). Positions of the Hansel Valley and Mazama ash beds are indicated by dashed lines.

Summary of Petrographic Observations

Petrographic observations indicate the presence of both detrital iron-titanium (Fe-Ti) oxide minerals and authigenic iron-sulfide minerals (table 3). Magnetic minerals that are observed petrographically can account for the large variations in magnetic susceptibility. In general, samples having low values of MS have relatively low amounts of detrital Fe-Ti oxide minerals because these minerals have undergone substantial dissolution or replacement. Relatively high MS is related to the presence of abundant authigenic iron sulfide mineral greigite (Fe_3S_4). In core 96-4, we did not examine the two samples that represent the highest spikes of MS values at 403.0-cm and 413.5-cm depths (table 2). The principal observations are:

- Post-depositional iron sulfide minerals are present in each examined sample. Greigite is abundant in samples having highest values of magnetic susceptibility. Pyrite coexists with greigite in most samples but was not observed in samples of highest magnetic susceptibility.
- Detrital magnetite is the most plentiful magnetic mineral in many samples. All of these samples are characterized by either low MS ($<0.6x10^{-4}$) or intermediate MS ($0.6–1.0x10^{-4}$). The magnetite occurs primarily as grains of titaniferous magnetite and low-titanium magnetite, as well as particles within rock fragments and silicate grains.
- In nearly all samples, detrital Fe-Ti oxide minerals, especially magnetite, have been replaced by iron sulfide minerals, mostly pyrite but also greigite where the latter is abundant.
- Detrital titanohematite, referring to a range of compositions in the hematite-ilmenite solid-solution series that are highly magnetic, is generally sparse but likely controls the magnetic signal in two or three samples. A relatively high abundance of titanohematite in samples with few magnetic minerals usually indicates severe post-depositional destruction of detrital magnetite particles (for example, Reynolds and others, 1994; Force and others, 2001). In some samples, even the detrital titanohematite has been degraded during post-depositional alteration by sulfide replacement and dissolution.
- Particles of titanohematite are commonly small (fine silt-sized; typically <10 μm) and angular, in contrast to many magnetite particles that range up to fine sand-size and are typically rounded. (Such textures of some fine silt-sized magnetite particles can be discerned, even though they have been largely replaced by iron sulfide.) Unique interpretations about the sources of the small particles of detrital Fe-Ti oxide minerals are not possible, but their textures are consistent with their transport as atmospheric dust, as found for similar particles in Bear Lake (Utah and Idaho) sediments (Reynolds and Rosenbaum, 2005).
- The shallowest sample examined (from core 96-5, 0.4–5.4 cm) contains abundant iron oxide minerals and only a small amount of pyrite. The most abundant types of magnetic minerals are those that have been produced by human activities and include magnetic fly-ash spherules generated by coal combustion. Particles of rock-derived magnetite are mostly in the size range 10–20 μm.

Preliminary Interpretations Linking Magnetic Susceptibility, Magnetic Mineralogy, and Late Quaternary Chemical Conditions in Great Salt Lake

The strong variations in MS in late Quaternary sediments in the south basin of Great Salt Lake appear to be strongly linked to major changes in lake level and related variation in lake-water chemistry. The connection among MS, lake level, and water chemistry is established mainly through post-depositional alterations that involve both detrital and authigenic iron-bearing minerals. Detrital Fe-Ti oxide minerals, especially magnetite, apparently have been partly to completely destroyed by reactions involving pore-water sulfide. The post-depositional destruction of magnetite appears to be a leading contributor to the low magnetic susceptibility of shallow-water sediments (above a depth of about 7.5 m) in composite core 96-5 and -6. This interpretation is based on petrographic evidence for originally more abundant detrital Fe oxides minerals indicated now by (1) titanium-rich relicts of former magnetite, and (2) numerous examples of former magnetite replaced by pyrite. Petrographic observations of pyritic replacement of magnetite qualitatively indicate a high degree of sulfidization in these relatively shallow-water sediments. Such conditions reflect high pore-water salinity, whether related to low inputs of fresh-water runoff or high rates of evaporation, or both. Dilution of lithogenic sediment by abundant brine shrimp pellets may contribute to low MS in this interval.

Greigite is responsible for the high MS of sediments spanning the glacial-age sediments, corresponding partly to Marine Isotope Stage 2. The abundance of greigite in sediments that represent deeper water conditions is consistent with sulfide-mineral formation under salinity conditions lower than those that produced pyrite. Such relatively low-salinity conditions are likely related to greater fresh-water inputs and (or) diminished evaporation. This interpretation is consistent with geochemical data from core D (Spencer and others, 1984). Ostracodal mud in core D, which appears to be generally equivalent in age to high-MS, greigite-dominated sediment in core 96-6, contains sulfur having relatively heavy sulfur isotopic composition (greater than -10 per mil). Such values were interpreted to indicate relatively low sulfate concentrations during lake-level rise leading to the Bonneville highstand.

High MS also characterizes glacial sediments in Bear Lake, upstream from Great Salt Lake (Dean and others, 2006). The high MS in the Bear Lake sediments, however, is carried by detrital magnetite introduced as atmospheric dust into the catchment (Rosenbaum, 2005; Reynolds and Rosenbaum, 2005). The detrital magnetite did not undergo discernible post-depositional alteration. The similarities and differences between the MS records at Great Salt Lake and Bear Lake are instructive. High MS in glacial-age sediments characterizes both settings that are connected by the Bear River—the primary drainage system in the northeastern Basin and Range Province. Nevertheless, the magnetic minerals responsible for the MS records at the two settings are completely different. With respect to magnetic properties, glacial conditions in Bear Lake supported the preservation of detrital iron oxide minerals, whereas glacial conditions in Great Salt Lake promoted destruction of detrital iron oxides and the simultaneous formation of authigenic iron sulfide minerals.

The magnetic minerals in the uppermost sample examined (0.4–5.4 cm in core 96-5) provide evidence for eolian dust sedimentation in Great Salt Lake. Most of the minerals in this sample likely represent recently deposited eolian dust on the basis of: (1) the presence of fly-ash particles that are typically introduced as airborne emissions during coal combustion, and (2) the predominance of fine-silt-sized Fe-oxide particles (commonly 10–20 µm) that are typical of eolian dust in this region (for example, Reynolds and Rosenbaum, 2005; Reynolds and others, 2006). The presence of similar Fe-oxide particles deeper in the core suggests that at least some of detrital sediments in the middle of Great Salt Lake were introduced to the catchment as atmospheric dust. Accounting for the very large area of Great Salt Lake and its catchment, it is not possible to know the proportion of eolian dust that fell directly into the lake and the proportion that fell onto the catchment and resided there until transport into the lake. Relatively large particles, such as fine-sand-sized rock fragments and silicate grains that are likely too large for far-distance atmospheric transport, imply their derivation from bedrock in the watershed and fluvial transport to these lake sediments. An important issue in landscape development and condition of the western United States centers on recent (past 150 years, approximately) and contemporary dust flux compared to past dust flux. The abundance of magnetic eolian dust in shallow sediment provides a snapshot of post-industrial eolian inputs. Nevertheless, it is unlikely that magnetic studies of sediments of Great Salt Lake will reveal reliable records of changes in dust flux over past centuries, because highly reducing conditions in these sediments rapidly destroy magnetic Fe-oxide minerals and because of the unknown and perhaps long residence times of eolian dust in the watershed before transport into the lake.

Acknowledgments

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Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
0.0	1.74E-05	47.1	2.44E-05	93.4	3.44E-05	143.5	4.54E-05
0.9	1.47E-05	48.0	4.71E-05	94.4	5.15E-05	144.5	4.71E-05
1.8	2.41E-05	49.0	3.81E-05	95.4	4.95E-05	145.5	4.84E-05
2.8	1.20E-05	49.9	4.58E-05	96.3	5.38E-05	146.5	4.78E-05
3.7	1.97E-05	50.8	3.47E-05	97.3	5.48E-05	147.5	4.41E-05
4.6	1.97E-05	51.7	3.84E-05	98.3	4.81E-05	148.5	4.61E-05
5.5	3.78E-05	52.7	3.47E-05	99.3	5.45E-05	149.4	4.28E-05
6.5	3.71E-05	53.6	5.01E-05	100.3	3.71E-05	150.4	4.41E-05
7.4	5.38E-05	54.5	-4.34E-06	101.3	3.01E-05	151.4	4.28E-05
8.3	6.08E-05	55.4	3.01E-05	102.2	4.84E-05	152.4	4.18E-05
9.2	7.18E-05	56.4	3.94E-05	103.2	4.21E-05	153.4	4.74E-05
10.2	7.92E-05	57.3	5.65E-05	104.2	4.98E-05	154.4	5.31E-05
11.1	7.72E-05	58.2	2.94E-05	105.2	4.78E-05	155.3	4.38E-05
12.0	4.81E-05	59.1	4.61E-05	106.2	4.78E-05	156.3	4.31E-05
12.9	6.68E-06	60.1	2.54E-05	107.2	5.38E-05	157.3	4.91E-05
13.9	6.75E-05	61.0	3.81E-05	108.1	5.28E-05	158.3	3.54E-05
14.8	6.95E-05	61.9	4.61E-05	109.1	4.91E-05	159.3	4.44E-05
15.7	5.18E-05	62.8	4.01E-05	110.1	5.61E-05	160.3	4.61E-05
16.6	4.88E-05	63.8	2.74E-05	111.1	7.28E-05	161.2	4.04E-05
17.6	4.08E-05	64.7	2.61E-05	112.1	1.77E-05	162.2	4.81E-05
18.5	5.28E-05	65.6	3.34E-05	113.1	4.74E-05	163.2	4.81E-05
19.4	3.98E-05	66.5	4.81E-05	114.0	5.68E-05	164.2	4.58E-05
20.3	5.35E-05	67.5	4.21E-05	115.0	5.21E-05	165.2	4.38E-05
21.3	4.01E-05	68.4	5.01E-05	116.0	5.05E-05	166.2	4.61E-05
22.2	4.08E-05	69.3	3.81E-05	117.0	4.88E-05	167.1	4.28E-05
23.1	4.21E-05	70.2	4.81E-05	118.0	5.08E-05	168.1	4.38E-05
24.0	3.44E-05	71.1	4.34E-05	119.0	4.91E-05	169.1	4.51E-05
24.9	4.38E-05	72.1	3.17E-05	119.9	4.74E-05	170.1	4.14E-05
25.9	4.54E-05	73.0	3.81E-05	120.9	5.25E-05	171.1	3.94E-05
26.8	4.48E-05	73.9	4.01E-05	121.9	5.01E-05	172.1	1.24E-04
27.7	4.71E-05	74.8	5.18E-05	122.9	4.88E-05	173.0	3.91E-05
28.6	4.88E-05	75.8	4.01E-05	123.9	4.68E-05	174.0	3.47E-05
29.6	3.51E-05	76.7	4.04E-05	124.9	4.54E-05	175.0	3.07E-05
30.5	4.34E-05	77.6	3.94E-05	125.8	5.28E-05	176.0	2.84E-05
31.4	4.94E-05	78.5	3.54E-05	126.8	5.48E-05	177.0	3.98E-05
32.3	3.81E-05	79.5	3.01E-05	127.8	5.65E-05	178.0	3.68E-05
33.3	5.11E-05	80.4	3.17E-05	128.8	4.84E-05	178.9	3.64E-05
34.2	5.31E-05	81.3	4.41E-05	129.8	5.01E-05	179.9	4.38E-05
35.1	5.28E-05	82.2	3.34E-05	130.8	5.25E-05	180.9	4.28E-05
36.0	4.34E-05	83.2	3.14E-05	131.7	5.45E-05	181.9	4.14E-05
37.0	4.58E-05	84.1	2.81E-05	132.7	4.11E-05	182.9	3.81E-05
37.9	4.44E-05	85.0	4.14E-05	133.7	5.01E-05	183.9	3.68E-05
38.8	3.88E-05	85.9	3.27E-05	134.7	5.05E-05	184.8	3.94E-05
39.7	3.81E-05	86.9	4.18E-05	135.7	5.75E-05	185.8	2.84E-05
40.7	5.18E-05	87.8	2.94E-05	136.7	4.14E-05	186.8	3.47E-05
41.6	4.14E-05	88.7	4.44E-05	137.6	4.64E-05	187.8	3.71E-05
42.5	5.41E-05	89.6	2.61E-05	138.6	4.18E-05	188.8	4.61E-05
43.4	4.41E-05	90.6	2.94E-05	139.6	4.18E-05	189.8	2.97E-05
44.4	3.84E-05	91.5	2.81E-05	140.6	4.48E-05	190.7	3.91E-05
45.3	4.48E-05	92.3	1.80E-05	141.6	4.31E-05	191.7	2.67E-05
46.2	3.21E-05	92.4	3.14E-05	142.6	4.84E-05	192.7	3.07E-05

Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
193.7	3.91E-05	243.3	3.34E-05	294.1	3.41E-05	343.8	7.95E-05
194.7	3.41E-05	244.3	4.21E-05	295.1	2.64E-05	344.7	4.95E-05
195.7	4.04E-05	245.3	3.74E-05	296.1	2.41E-05	345.7	4.91E-05
196.6	4.11E-05	246.3	3.77E-05	297.1	3.11E-05	346.7	4.95E-05
197.6	4.04E-05	247.3	5.31E-05	298.1	2.91E-05	347.7	5.91E-05
198.6	4.58E-05	248.3	5.45E-05	299.1	3.47E-05	348.7	4.74E-05
199.6	4.31E-05	249.3	4.18E-05	300.1	3.31E-05	349.7	5.75E-05
200.6	4.58E-05	250.3	4.98E-05	301.1	2.71E-05	350.7	5.35E-05
201.6	4.24E-05	251.3	4.34E-05	302.1	3.37E-05	351.7	4.88E-05
202.5	3.27E-05	252.3	4.71E-05	303.1	3.47E-05	352.7	5.08E-05
203.5	3.64E-05	253.3	4.18E-05	304.1	3.17E-05	353.7	4.88E-05
204.5	4.21E-05	254.3	3.77E-05	305.0	3.41E-05	354.7	5.58E-05
205.5	4.38E-05	255.3	3.88E-05	305.1	2.74E-05	355.7	5.11E-05
206.5	3.78E-05	256.3	3.64E-05	306.1	2.11E-05	356.6	4.98E-05
207.5	3.68E-05	257.3	3.74E-05	307.1	2.61E-05	357.6	4.88E-05
208.4	4.04E-05	258.3	3.71E-05	308.1	3.78E-05	358.6	5.88E-05
209.4	3.27E-05	259.2	3.91E-05	309.1	3.44E-05	359.6	4.48E-05
210.4	2.71E-05	260.2	4.04E-05	310.1	4.04E-05	360.6	5.11E-05
211.3	2.07E-05	261.2	4.54E-05	311.0	4.98E-05	361.5	2.57E-05
211.4	1.37E-05	262.2	4.64E-05	312.0	4.24E-05	361.6	1.47E-05
212.4	1.67E-05	263.2	4.48E-05	313.0	4.41E-05	362.6	2.91E-05
213.4	2.64E-05	264.2	4.64E-05	314.0	4.48E-05	363.6	3.54E-05
214.4	2.44E-05	265.2	4.48E-05	315.0	5.11E-05	364.6	4.18E-05
215.4	3.94E-05	266.2	4.21E-05	316.0	4.68E-05	365.6	4.41E-05
216.4	3.94E-05	267.2	4.44E-05	317.0	4.24E-05	366.6	4.41E-05
217.4	4.41E-05	268.2	3.88E-05	318.0	4.34E-05	367.6	5.15E-05
218.4	4.21E-05	269.2	3.91E-05	319.0	4.68E-05	368.6	4.94E-05
219.4	4.54E-05	270.2	3.74E-05	320.0	5.05E-05	369.6	4.48E-05
220.4	4.68E-05	271.2	3.64E-05	321.0	4.44E-05	370.6	3.88E-05
221.4	4.38E-05	272.2	4.34E-05	322.0	5.01E-05	371.6	4.51E-05
222.4	4.48E-05	273.2	4.18E-05	322.9	4.81E-05	372.6	5.11E-05
223.4	4.71E-05	274.2	3.88E-05	323.9	4.64E-05	373.6	4.61E-05
224.4	4.31E-05	275.2	3.67E-05	324.9	5.71E-05	374.6	4.64E-05
225.4	4.74E-05	276.2	3.34E-05	325.9	5.18E-05	375.6	5.35E-05
226.4	4.91E-05	277.2	4.14E-05	326.9	6.15E-05	376.7	5.61E-05
227.3	3.57E-05	278.2	4.44E-05	327.9	4.54E-05	377.7	5.11E-05
228.3	5.28E-05	279.2	4.61E-05	328.9	4.08E-05	378.7	5.28E-05
229.3	4.84E-05	280.2	4.58E-05	329.9	5.31E-05	379.7	5.35E-05
230.3	4.68E-05	281.2	3.71E-05	330.9	4.08E-05	380.7	5.51E-05
231.3	4.64E-05	282.2	4.81E-05	331.9	4.01E-05	381.7	5.48E-05
232.3	4.14E-05	283.2	4.28E-05	332.9	4.48E-05	382.7	5.18E-05
233.3	4.58E-05	284.2	4.21E-05	333.8	4.28E-05	383.7	5.58E-05
234.3	4.41E-05	285.2	4.18E-05	334.8	4.58E-05	384.7	5.51E-05
235.3	4.74E-05	286.2	4.11E-05	335.8	4.61E-05	385.7	5.55E-05
236.3	7.02E-05	287.2	4.48E-05	336.8	3.91E-05	386.7	5.55E-05
237.3	4.48E-05	288.2	4.51E-05	337.8	4.88E-05	387.7	5.85E-05
238.3	4.28E-05	289.2	3.84E-05	338.8	4.78E-05	388.7	5.28E-05
239.3	3.81E-05	290.1	3.91E-05	339.8	4.81E-05	389.7	5.81E-05
240.3	4.61E-05	291.1	4.24E-05	340.8	4.95E-05	390.7	6.18E-05
241.3	5.85E-05	292.1	3.11E-05	341.8	4.68E-05	391.7	5.88E-05
242.3	3.71E-05	293.1	5.24E-05	342.8	4.88E-05	392.7	5.51E-05

Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
393.7	4.98E-05	444.9	5.81E-05	618.3	6.25E-05	668.8	2.67E-05
394.7	6.01E-05	445.9	5.68E-05	619.3	7.82E-05	669.8	4.34E-05
395.7	5.58E-05	446.9	5.35E-05	620.3	6.95E-05	670.8	4.38E-05
396.7	5.05E-05	447.9	5.41E-05	621.3	7.78E-05	671.8	1.57E-05
397.7	5.65E-05	448.9	5.18E-05	622.3	6.98E-05	672.8	4.04E-05
398.7	5.08E-05	449.9	4.98E-05	623.3	7.38E-05	673.7	4.38E-05
399.7	4.91E-05	450.9	5.91E-05	624.2	8.05E-05	674.7	4.88E-05
400.7	5.61E-05	451.9	4.88E-05	625.2	5.68E-05	675.7	4.38E-05
401.7	6.08E-05	452.9	5.41E-05	626.2	5.78E-05	676.7	3.57E-05
402.7	6.01E-05	453.9	5.11E-05	627.2	5.35E-05	677.7	3.54E-05
403.7	6.55E-05	454.9	5.01E-05	628.2	6.18E-05	678.7	3.64E-05
404.8	5.55E-05	455.9	5.75E-05	629.2	5.81E-05	679.7	2.81E-05
405.8	5.51E-05	456.9	4.98E-05	630.2	6.08E-05	680.7	3.37E-05
406.8	5.25E-05	457.9	4.94E-05	631.2	5.65E-05	681.7	2.64E-05
407.8	5.35E-05	458.9	5.28E-05	632.2	6.78E-05	682.7	4.01E-05
408.8	5.81E-05	459.9	4.51E-05	633.2	5.48E-05	683.6	3.74E-05
409.8	5.38E-05	461.0	6.08E-05	634.1	5.31E-05	684.6	3.27E-05
410.8	4.64E-05	462.0	5.25E-05	635.1	5.65E-05	685.6	2.84E-05
411.8	5.05E-05	463.0	5.71E-05	636.1	6.68E-05	686.6	3.61E-05
412.8	4.74E-05	464.0	5.61E-05	637.1	5.61E-05	687.6	3.61E-05
413.8	5.35E-05	465.0	5.35E-05	638.1	5.55E-05	688.6	4.48E-05
414.8	5.25E-05	466.0	4.38E-05	639.1	6.21E-05	689.6	4.11E-05
415.8	5.58E-05	467.0	4.78E-05	640.1	6.28E-05	690.6	3.81E-05
416.8	5.55E-05	468.0	4.21E-05	641.1	7.95E-05	691.6	3.37E-05
417.8	4.94E-05	469.0	4.81E-05	642.1	6.01E-05	692.6	3.27E-05
418.8	4.84E-05	470.0	5.04E-05	643.1	7.35E-05	693.5	4.14E-05
419.8	4.71E-05	471.0	4.94E-05	644.0	5.78E-05	694.5	3.54E-05
420.8	5.25E-05	472.0	4.44E-05	645.0	5.88E-05	695.5	4.61E-05
421.8	4.74E-05	473.0	4.54E-05	646.0	5.58E-05	696.5	3.11E-05
422.8	4.68E-05	474.0	3.91E-05	647.0	5.41E-05	697.0	1.87E-05
423.8	4.44E-05	475.0	3.54E-05	648.0	4.84E-05	697.5	4.65E-05
424.8	4.84E-05	598.5	4.08E-05	649.0	4.84E-05	698.5	3.38E-05
425.8	-1.67E-06	599.5	5.01E-05	650.0	5.31E-05	699.5	3.51E-05
426.8	5.48E-05	600.5	6.21E-05	651.0	5.08E-05	700.5	2.94E-05
427.8	5.78E-05	601.5	6.88E-05	652.0	4.91E-05	701.4	-1.54E-05
428.8	5.85E-05	602.5	6.72E-05	653.0	4.84E-05	702.4	4.91E-05
429.8	5.35E-05	603.5	8.09E-05	653.9	4.71E-05	703.4	5.21E-05
430.8	5.85E-05	604.4	6.85E-05	654.9	4.58E-05	704.4	4.91E-05
431.8	7.02E-05	605.4	7.32E-05	655.9	5.88E-05	705.4	4.34E-05
432.9	6.72E-05	606.4	6.98E-05	656.9	8.52E-05	706.4	1.90E-05
433.9	7.05E-05	607.4	8.39E-05	657.9	5.75E-05	707.4	4.18E-05
434.9	6.52E-05	608.4	7.55E-05	658.9	4.78E-05	708.3	4.21E-05
435.9	6.72E-05	609.4	8.39E-05	659.9	4.14E-05	709.3	5.51E-05
436.9	6.45E-05	610.4	8.72E-05	660.9	8.72E-05	710.3	4.78E-05
437.9	6.35E-05	611.4	8.15E-05	661.9	4.61E-05	711.3	3.17E-05
438.9	6.08E-05	612.4	7.35E-05	662.9	3.27E-05	712.3	3.64E-05
439.9	6.18E-05	613.4	8.12E-05	663.8	4.64E-05	713.3	3.11E-05
440.9	6.31E-05	614.3	6.68E-05	664.8	5.41E-05	714.3	3.21E-05
441.9	7.42E-05	615.3	6.45E-05	665.8	4.34E-05	715.2	3.34E-05
442.9	6.21E-05	616.3	6.98E-05	666.8	3.54E-05	716.2	2.84E-05
443.9	7.35E-05	617.3	6.95E-05	667.8	5.41E-05	717.2	3.14E-05

Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
718.2	2.71E-05	768.4	1.43E-04	817.8	1.28E-04	868.3	1.29E-04
719.2	2.34E-05	769.4	9.69E-05	818.8	1.53E-04	869.2	9.02E-05
720.2	1.80E-05	770.4	1.45E-04	819.8	1.45E-04	870.2	1.36E-04
721.1	2.84E-05	771.4	1.34E-04	820.8	1.24E-04	871.2	8.22E-05
722.1	2.04E-05	772.4	1.32E-04	821.7	1.24E-04	872.2	5.51E-05
723.1	3.81E-05	773.4	1.50E-04	822.7	1.21E-04	873.0	6.08E-05
724.1	4.41E-05	774.4	1.58E-04	823.7	1.40E-04	873.2	1.13E-04
725.1	4.85E-05	775.3	1.84E-04	824.7	1.13E-04	874.2	5.61E-05
726.1	3.24E-05	776.3	1.99E-04	825.7	2.54E-04	875.2	4.11E-05
727.1	2.31E-05	777.3	2.26E-04	826.7	1.12E-04	876.2	5.98E-05
728.0	3.11E-05	778.3	1.89E-04	827.7	1.27E-04	877.1	5.98E-05
729.0	3.17E-05	779.3	1.83E-04	828.7	1.14E-04	878.1	6.55E-05
730.0	2.67E-05	780.3	1.87E-04	829.7	9.73E-05	879.1	6.95E-05
731.0	3.74E-05	781.3	2.02E-04	830.7	9.99E-05	880.1	4.81E-05
732.0	2.51E-05	782.2	2.62E-04	831.6	1.86E-04	881.1	7.01E-05
733.0	3.48E-05	783.2	2.91E-04	832.6	9.26E-05	882.1	6.31E-05
734.0	4.71E-05	784.2	2.98E-04	833.6	1.01E-04	883.0	8.12E-05
734.9	3.74E-05	785.2	3.04E-04	834.6	9.56E-05	884.0	6.08E-05
735.9	3.58E-05	786.2	2.73E-04	835.6	1.16E-04	885.0	8.05E-05
736.9	3.11E-05	787.2	2.29E-04	836.6	1.15E-04	886.0	6.51E-05
737.9	3.91E-05	788.1	2.05E-04	837.6	1.26E-04	887.0	5.81E-05
738.9	4.18E-05	789.1	1.71E-04	838.6	1.38E-04	888.0	6.31E-05
739.9	5.38E-05	790.1	1.52E-04	839.6	1.44E-04	888.9	5.78E-05
740.9	4.88E-05	791.1	1.45E-04	840.5	1.75E-04	889.9	6.48E-05
741.8	4.31E-05	792.1	1.44E-04	841.5	1.25E-04	890.9	7.65E-05
742.8	4.78E-05	793.1	1.40E-04	842.5	1.35E-04	891.9	9.65E-05
743.8	5.48E-05	794.1	1.31E-04	843.5	1.42E-04	892.9	1.02E-04
744.8	6.32E-05	795.0	1.16E-04	844.5	1.37E-04	893.9	3.64E-05
745.8	6.78E-05	796.0	1.01E-04	845.5	1.32E-04	894.9	6.35E-05
746.8	7.28E-05	797.0	6.35E-05	846.5	1.48E-04	895.8	6.88E-05
747.8	7.65E-05	797.5	3.11E-05	847.5	1.56E-04	896.8	1.13E-04
748.7	8.19E-05	798.0	2.60E-04	848.5	1.27E-04	897.8	8.55E-05
749.7	6.88E-05	789.6	1.27E-04	849.5	1.75E-04	898.8	2.67E-06
750.7	7.28E-05	800.0	1.50E-04	850.4	1.64E-04	899.8	1.05E-04
751.7	6.68E-05	801.0	1.72E-04	851.4	1.77E-04	900.8	2.30E-05
752.7	5.78E-05	802.0	2.23E-04	852.4	1.63E-04	901.7	7.31E-05
753.7	7.95E-05	802.9	2.16E-04	853.4	1.70E-04	902.7	6.48E-05
754.6	9.42E-05	803.9	1.86E-04	854.4	1.70E-04	903.7	4.61E-05
755.6	8.89E-05	804.9	2.58E-04	855.4	1.76E-04	904.7	1.24E-05
756.6	8.62E-05	805.9	2.14E-04	856.4	1.81E-04	905.7	7.72E-05
757.6	1.34E-05	806.9	1.99E-04	857.4	1.81E-04	907.7	5.04E-05
758.6	7.38E-05	807.9	1.86E-04	858.4	1.75E-04	908.6	6.91E-05
759.6	7.69E-05	808.9	2.06E-04	859.3	1.72E-04	909.6	8.48E-05
760.6	1.08E-04	809.9	1.94E-04	860.3	1.78E-04	911.6	8.75E-05
761.5	9.22E-05	810.9	2.16E-04	861.3	1.68E-04	912.6	7.48E-05
762.5	9.09E-05	811.9	1.64E-04	862.3	1.78E-04	913.6	1.03E-04
763.5	9.26E-05	812.8	1.53E-04	863.3	1.75E-04	914.5	3.54E-05
764.5	1.08E-04	813.8	1.55E-04	864.3	1.66E-04	915.5	7.45E-05
765.5	8.69E-05	814.8	1.45E-04	865.3	1.52E-04	916.5	5.75E-05
766.5	8.29E-05	815.8	1.48E-04	866.3	1.29E-04	917.5	5.21E-05
767.5	1.08E-04	816.8	2.60E-04	867.3	1.34E-04	918.5	5.81E-05

Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
919.5	5.28E-05	969.7	4.64E-05	1019.1	7.15E-05	1069.6	6.42E-05
920.4	5.71E-05	970.6	6.48E-05	1020.1	6.42E-05	1070.6	6.18E-05
921.4	4.61E-05	971.6	4.54E-05	1021.1	6.08E-05	1071.6	5.48E-05
922.4	5.41E-05	972.6	3.78E-05	1022.1	8.46E-05	1072.6	4.24E-05
923.4	7.35E-05	973.0	2.54E-05	1023.1	6.58E-05	1073.0	3.48E-05
924.4	5.75E-05	973.6	3.34E-05	1024.1	7.52E-05	1073.6	7.48E-05
925.4	6.21E-05	974.6	6.25E-05	1025.1	7.12E-05	1074.6	6.01E-05
926.4	6.48E-05	975.6	5.08E-05	1026.1	7.19E-05	1075.5	3.17E-05
927.3	6.35E-05	976.6	6.22E-05	1027.1	6.22E-05	1076.5	6.51E-05
928.3	9.35E-06	977.6	6.65E-05	1028.1	5.18E-05	1077.5	7.72E-05
929.3	6.01E-05	978.6	7.82E-05	1029.0	6.25E-05	1078.5	6.72E-05
930.3	5.75E-05	979.5	1.76E-04	1030.0	5.85E-05	1079.4	7.65E-05
931.3	6.01E-05	980.5	8.79E-05	1031.0	5.48E-05	1080.4	6.88E-05
932.3	5.88E-05	981.5	7.49E-05	1032.0	5.05E-05	1081.4	6.65E-05
933.2	8.49E-05	982.5	1.04E-04	1033.0	5.41E-05	1082.4	7.12E-05
934.2	6.11E-05	983.5	9.16E-05	1034.0	4.81E-05	1083.3	6.68E-05
935.2	8.08E-05	984.5	7.29E-05	1035.0	4.85E-05	1084.3	6.98E-05
936.2	7.12E-05	985.5	7.35E-05	1036.0	5.01E-05	1085.3	7.52E-05
937.2	7.92E-05	986.5	9.29E-05	1037.0	4.78E-05	1086.2	7.58E-05
938.2	8.89E-05	987.5	7.95E-05	1038.0	6.18E-05	1087.2	8.55E-05
939.1	9.55E-05	988.5	8.46E-05	1038.9	5.48E-05	1088.2	9.15E-05
940.1	8.55E-05	989.4	7.89E-05	1039.9	7.82E-05	1089.2	8.75E-05
941.1	7.92E-05	990.4	8.99E-05	1040.9	5.38E-05	1090.1	8.89E-05
942.1	7.08E-05	991.4	8.99E-05	1041.9	5.38E-05	1091.1	9.02E-05
943.1	8.22E-05	992.4	8.26E-05	1042.9	5.75E-05	1092.1	7.95E-05
944.1	7.62E-05	993.4	8.62E-05	1043.9	5.85E-05	1093.1	7.98E-05
945.1	7.52E-05	994.4	8.82E-05	1044.9	4.95E-05	1094.0	7.82E-05
946.0	9.05E-05	995.4	9.73E-05	1045.9	5.35E-05	1095.0	7.58E-05
947.0	7.18E-05	996.4	9.12E-05	1046.9	5.92E-05	1096.0	7.32E-05
948.0	7.52E-05	997.4	8.89E-05	1047.9	6.68E-05	1096.9	5.45E-05
949.0	7.32E-05	998.4	9.29E-05	1048.8	5.75E-05	1097.9	6.92E-05
950.0	7.72E-05	999.3	1.19E-04	1049.8	5.75E-05	1098.9	8.15E-05
951.0	6.98E-05	1000.3	7.99E-05	1050.8	5.25E-05	1099.9	7.52E-05
951.9	6.28E-05	1001.3	8.42E-05	1051.8	5.15E-05	1100.8	9.56E-05
952.9	6.31E-05	1002.3	7.89E-05	1052.8	5.28E-05	1101.8	5.71E-05
953.9	6.45E-05	1003.3	8.32E-05	1053.8	5.78E-05	1102.8	6.08E-05
954.9	4.41E-05	1004.3	7.95E-05	1054.8	5.08E-05	1103.8	5.08E-05
955.9	5.75E-05	1005.3	7.25E-05	1055.8	5.71E-05	1104.7	6.18E-05
956.9	5.11E-05	1006.3	7.72E-05	1056.8	5.35E-05	1105.7	4.91E-05
957.9	5.68E-05	1007.3	7.15E-05	1057.8	5.15E-05	1106.7	4.74E-05
958.8	6.65E-05	1008.3	6.88E-05	1058.7	5.92E-05	1107.6	5.11E-05
959.8	4.91E-05	1009.2	6.82E-05	1059.7	5.58E-05	1108.6	5.65E-05
960.8	5.45E-05	1010.2	6.42E-05	1060.7	5.88E-05	1109.6	6.82E-05
961.8	5.01E-05	1011.2	7.39E-05	1061.7	6.05E-05	1110.6	8.12E-05
962.8	5.71E-05	1012.2	6.52E-05	1062.7	6.25E-05	1111.5	6.95E-05
963.8	5.58E-05	1013.2	7.89E-05	1063.7	6.95E-05	1112.5	7.05E-05
964.7	5.28E-05	1014.2	6.45E-05	1064.7	6.05E-05	1113.5	7.15E-05
965.7	6.18E-05	1015.2	6.52E-05	1065.7	6.92E-05	1114.4	8.22E-05
966.7	6.25E-05	1016.2	7.05E-05	1066.7	6.42E-05	1115.4	8.29E-05
967.7	4.68E-05	1017.2	7.09E-05	1067.7	6.18E-05	1116.4	6.85E-05
968.7	3.94E-05	1018.2	6.18E-05	1068.6	6.22E-05	1117.4	6.88E-05

Table 1. Magnetic susceptibility (MS) in volume SI units with depth, cores GSL-96-5 and 96-6.—Continued

Depth (cm)	MS volume SI
1118.3	8.12E-05
1119.3	5.78E-05
1120.3	7.08E-05
1121.3	6.98E-05
1122.2	7.85E-05
1123.2	7.55E-05
1124.2	6.95E-05
1125.1	6.98E-05
1126.1	6.25E-05
1127.1	6.72E-05
1128.1	6.08E-05
1129.0	5.58E-05
1130.0	6.31E-05
1131.0	5.41E-05
1132.0	4.91E-05
1132.9	5.71E-05
1133.9	5.55E-05
1134.9	5.68E-05
1135.8	5.25E-05
1136.8	5.61E-05
1137.8	5.91E-05
1138.8	5.31E-05
1139.7	3.31E-05
1140.7	4.38E-05
1141.7	3.74E-05
1142.7	2.84E-05
1143.6	2.07E-05
1144.6	1.37E-05

Table 2. Magnetic susceptibility (MS) in volume SI units with depth, core GSL-96-4.

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
10.3	1.17E-05	49.5	4.91E-05	88.6	4.81E-05	134.1	9.44E-05
11.1	8.69E-06	50.3	3.37E-05	89.4	5.48E-05	135.1	1.08E-04
11.9	1.34E-05	51.1	3.74E-05	90.2	5.61E-05	136.1	9.01E-05
12.8	1.07E-05	51.9	3.54E-05	91.1	5.75E-05	137.1	9.44E-05
13.6	7.69E-06	52.7	3.17E-05	91.9	6.08E-05	138.1	1.07E-04
14.4	1.20E-05	53.5	3.71E-05	92.7	6.05E-05	139.0	8.39E-05
15.2	1.04E-05	54.4	3.88E-05	93.0	6.72E-05	140.0	1.05E-04
16.0	1.40E-05	55.2	3.47E-05	93.5	1.59E-05	141.0	1.10E-04
16.8	2.24E-05	56.0	3.78E-05	94.5	7.90E-05	142.0	9.50E-05
17.7	2.91E-05	56.8	5.51E-05	95.5	6.56E-05	143.0	1.13E-04
18.5	2.37E-05	57.6	3.71E-05	96.5	9.01E-05	144.0	8.09E-05
19.3	3.31E-05	58.4	3.71E-05	97.5	8.52E-05	145.0	1.08E-04
20.1	3.61E-05	59.2	3.44E-05	98.5	8.39E-05	146.0	1.10E-04
20.9	3.41E-05	60.1	3.51E-05	99.4	8.09E-05	147.0	1.11E-04
21.7	3.74E-05	60.9	3.68E-05	100.4	8.52E-05	148.0	1.19E-04
22.5	3.27E-05	61.7	4.31E-05	101.4	7.97E-05	148.9	1.14E-04
23.4	2.57E-05	62.5	3.78E-05	102.4	9.25E-05	149.9	1.12E-04
24.2	4.18E-05	63.3	4.28E-05	103.4	8.88E-05	150.9	9.86E-05
25.0	3.64E-05	64.1	3.78E-05	104.4	8.70E-05	151.9	1.07E-04
25.8	4.04E-05	65.0	6.58E-05	105.4	1.01E-04	152.9	9.80E-05
26.6	3.74E-05	65.8	5.41E-05	106.4	8.88E-05	153.9	1.03E-04
27.4	2.97E-05	66.6	5.81E-05	107.4	1.04E-04	154.9	9.01E-05
28.3	3.37E-05	67.4	4.44E-05	108.4	9.31E-05	155.9	8.88E-05
29.1	2.67E-05	68.2	5.15E-05	109.3	7.84E-05	156.9	9.31E-05
29.9	3.68E-05	69.0	5.28E-05	110.3	8.27E-05	157.9	8.88E-05
30.7	3.68E-05	69.8	5.88E-05	111.3	9.56E-05	158.8	8.76E-05
31.5	4.51E-05	70.7	5.58E-05	112.3	8.76E-05	159.8	9.74E-05
32.3	3.68E-05	71.5	6.18E-05	113.3	8.46E-05	160.8	9.56E-05
33.2	3.81E-05	72.3	7.02E-05	114.3	8.82E-05	161.8	1.13E-04
34.0	4.21E-05	73.1	6.35E-05	115.3	7.29E-05	162.8	7.97E-05
34.8	3.68E-05	73.9	5.85E-05	116.3	8.33E-05	163.8	1.00E-04
35.6	3.11E-05	74.7	5.85E-05	117.3	8.64E-05	164.8	9.31E-05
36.4	3.27E-05	75.6	5.48E-05	118.3	9.19E-05	165.8	9.68E-05
37.2	3.37E-05	76.4	5.01E-05	119.2	9.86E-05	166.8	9.80E-05
38.0	4.28E-05	77.2	6.25E-05	120.2	8.70E-05	167.8	8.70E-05
38.9	4.21E-05	78.0	5.31E-05	121.2	9.31E-05	168.7	8.95E-05
39.7	4.31E-05	78.8	4.68E-05	122.2	9.74E-05	169.7	8.58E-05
40.5	4.11E-05	79.6	4.48E-05	123.2	1.00E-04	170.7	8.88E-05
41.3	3.68E-05	80.5	4.74E-05	124.2	9.62E-05	171.7	7.29E-05
42.1	3.58E-05	81.3	4.34E-05	125.2	1.02E-04	172.7	8.33E-05
42.9	3.64E-05	82.1	6.05E-05	126.2	9.37E-05	173.7	7.17E-05
43.8	3.71E-05	82.9	4.51E-05	127.2	1.18E-04	174.7	7.66E-05
44.6	3.61E-05	83.7	4.94E-05	128.2	1.24E-04	175.7	6.49E-05
45.4	3.51E-05	84.5	5.61E-05	129.1	1.09E-04	176.7	6.56E-05
46.2	3.51E-05	85.3	5.51E-05	130.1	9.37E-05	177.7	6.80E-05
47.0	4.11E-05	86.2	5.65E-05	131.1	1.28E-04	178.6	4.78E-05
47.8	2.61E-05	87.0	4.91E-05	132.1	6.80E-05	179.6	5.33E-05
48.6	4.61E-05	87.8	5.78E-05	133.1	8.70E-05	180.6	6.00E-05

Table 2. Magnetic susceptibility (MS) in volume SI units with depth, core GSL-96-4.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
181.6	4.90E-05	230.2	5.71E-05	279.5	2.67E-05	329.5	1.52E-04
182.6	7.23E-05	231.2	4.21E-05	280.5	2.37E-05	330.5	1.52E-04
183.6	6.31E-05	232.2	4.18E-05	281.4	2.57E-05	331.5	1.46E-04
184.6	6.74E-05	233.1	3.17E-05	282.4	2.84E-05	332.5	1.42E-04
185.6	5.58E-05	234.1	4.58E-05	283.4	3.14E-05	333.5	1.69E-04
186.6	6.86E-05	235.1	2.91E-05	284.3	2.94E-05	334.4	1.64E-04
187.6	4.96E-05	236.0	3.14E-05	285.3	2.97E-05	335.4	1.81E-04
188.5	5.02E-05	237.0	3.17E-05	287.2	2.64E-05	336.4	1.96E-04
189.5	2.14E-05	238.0	3.58E-05	288.2	3.07E-05	337.4	2.72E-04
190.5	5.51E-05	238.9	4.11E-05	289.2	2.81E-05	338.4	2.69E-04
191.5	4.41E-05	239.9	3.68E-05	290.1	6.41E-05	339.4	3.17E-04
192.5	1.10E-05	240.9	3.64E-05	291.1	1.36E-04	340.4	3.53E-04
193.0	1.84E-06	241.8	3.98E-05	292.1	9.69E-06	341.4	3.74E-04
193.5	5.01E-05	242.8	3.91E-05	293.0	1.30E-05	342.3	4.12E-04
194.5	6.48E-05	243.8	3.81E-05	293.5	4.01E-06	343.3	4.41E-04
195.4	2.94E-05	244.7	3.54E-05	294.0	3.19E-05	344.3	4.60E-04
196.4	3.98E-05	245.7	3.51E-05	295.0	3.68E-05	345.3	4.80E-04
197.4	4.48E-05	246.6	4.08E-05	296.0	5.09E-05	346.3	4.40E-04
198.3	5.08E-05	247.6	4.08E-05	297.0	5.21E-05	347.3	3.93E-04
199.3	5.38E-05	248.6	4.64E-05	297.9	4.41E-05	348.3	3.25E-04
200.3	5.45E-05	249.5	3.78E-05	298.9	5.15E-05	349.2	2.93E-04
201.2	2.61E-05	250.5	3.54E-05	299.9	5.15E-05	350.2	2.40E-04
202.2	4.61E-05	251.5	2.67E-05	300.9	4.60E-05	351.2	2.19E-04
203.2	4.78E-05	252.4	2.94E-05	301.9	5.33E-05	352.2	1.97E-04
204.1	5.38E-05	253.4	4.48E-05	302.9	5.15E-05	353.2	2.00E-04
205.1	4.71E-05	254.4	2.27E-05	303.9	5.58E-05	354.2	1.91E-04
206.1	5.18E-05	255.3	3.07E-05	304.9	8.82E-05	355.2	1.76E-04
207.0	3.78E-05	256.3	2.74E-05	305.8	6.80E-05	356.1	1.99E-04
208.0	3.91E-05	257.3	2.87E-05	306.8	6.37E-05	357.1	1.99E-04
209.0	3.78E-05	258.2	4.24E-05	307.8	6.31E-05	358.1	2.15E-04
209.9	6.05E-05	259.2	3.01E-05	308.8	5.51E-05	359.1	2.19E-04
210.9	6.08E-05	260.2	3.01E-05	309.8	7.35E-05	360.1	2.31E-04
211.9	4.41E-05	261.1	3.11E-05	310.8	6.74E-05	361.1	2.30E-04
212.8	5.75E-05	262.1	2.81E-05	311.8	7.90E-05	362.1	2.23E-04
213.8	4.91E-05	263.1	2.77E-05	312.7	7.54E-05	363.1	2.24E-04
214.8	4.91E-05	264.0	3.74E-05	313.7	7.84E-05	364.0	2.21E-04
215.7	4.81E-05	265.0	2.17E-05	314.7	6.62E-05	365.0	2.37E-04
216.7	4.95E-05	266.0	2.04E-05	315.7	7.05E-05	366.0	2.33E-04
217.7	4.95E-05	266.9	2.61E-05	316.7	8.46E-05	367.0	1.77E-04
218.6	4.78E-05	267.9	3.17E-05	317.7	7.66E-05	368.0	1.53E-04
219.6	5.11E-05	268.9	1.90E-05	318.7	1.01E-04	369.0	1.48E-04
220.6	5.28E-05	269.8	2.24E-05	319.6	9.50E-05	370.0	1.58E-04
221.5	4.58E-05	270.8	1.97E-05	320.6	8.09E-05	370.9	1.01E-04
222.5	4.31E-05	271.8	1.77E-05	321.6	7.05E-05	371.9	1.42E-04
223.5	4.68E-05	272.7	2.97E-05	322.6	9.37E-05	372.9	1.03E-04
224.4	3.54E-05	273.7	3.41E-05	323.6	8.70E-05	373.9	8.33E-05
225.4	5.08E-05	274.7	3.31E-05	324.6	8.82E-05	374.9	8.58E-05
226.4	4.34E-05	275.6	3.94E-05	325.6	6.68E-05	375.9	1.04E-04
227.3	4.91E-05	276.6	3.44E-05	326.6	1.24E-04	376.9	7.60E-05
228.3	5.28E-05	277.6	1.94E-05	327.5	1.09E-04	377.9	8.95E-05
229.3	3.81E-05	278.5	2.97E-05	328.5	1.30E-04	378.8	8.82E-05

Table 2. Magnetic susceptibility (MS) in volume SI units with depth, core GSL-96-4.—Continued

Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI	Depth (cm)	MS volume SI
379.8	1.06E-04	428.6	9.69E-05	482.7	3.88E-05	530.2	5.78E-05
380.8	9.93E-05	429.6	7.08E-05	483.7	5.08E-05	531.1	6.11E-05
381.8	1.17E-04	430.6	7.62E-05	484.7	5.18E-05	532.1	5.58E-05
382.8	9.07E-05	431.6	1.09E-04	485.7	2.74E-05	533.1	5.85E-05
383.8	1.03E-04	432.6	8.45E-05	486.7	3.37E-05	534.1	7.18E-05
384.8	1.14E-04	433.6	8.15E-05	487.7	4.81E-05	535.1	4.88E-05
385.7	1.22E-04	434.6	1.49E-04	488.7	4.48E-05	536.0	5.01E-05
386.7	1.07E-04	435.6	6.95E-05	489.7	4.24E-05	537.0	4.74E-05
387.7	8.58E-05	436.6	8.12E-05	490.7	4.74E-05	538.0	4.98E-05
388.7	7.66E-05	437.6	7.68E-05	491.7	4.44E-05	539.0	2.31E-05
389.7	8.46E-05	438.6	7.78E-05	492.7	4.64E-05	540.0	6.62E-05
390.7	8.58E-05	439.6	3.17E-05	493.7	5.35E-05	540.9	5.35E-05
391.7	7.72E-05	441.6	4.01E-06	494.7	4.78E-05	541.9	5.55E-05
392.6	8.15E-05	442.6	6.82E-05	495.7	5.25E-05	542.9	4.88E-05
393.6	8.88E-05	443.6	5.88E-05	496.7	4.71E-05	543.9	5.31E-05
394.6	1.11E-04	444.6	6.75E-05	497.7	5.21E-05	544.9	5.65E-05
395.6	1.05E-04	445.6	5.08E-05	498.7	5.11E-05	545.8	5.78E-05
396.6	9.93E-05	446.6	6.48E-05	499.7	4.01E-05	546.8	5.88E-05
397.6	9.93E-05	447.6	6.18E-05	500.7	4.61E-05	547.8	6.48E-05
398.6	8.09E-05	448.6	5.81E-05	501.7	4.68E-05	548.8	6.18E-05
399.6	8.64E-05	449.6	5.38E-05	502.7	3.07E-05	549.8	6.01E-05
400.5	7.11E-05	450.6	5.21E-05	503.0	3.01E-06	550.7	7.65E-05
401.5	5.39E-05	451.6	7.32E-05	503.7	2.71E-05	551.7	4.24E-05
402.5	4.41E-05	453.6	7.42E-05	504.7	4.14E-05	552.7	2.34E-05
403.0	1.32E-03	454.6	1.74E-05	505.7	4.04E-05		
403.5	1.24E-04	455.6	5.71E-05	506.6	5.81E-05		
404.5	1.90E-05	456.6	3.94E-05	507.6	6.15E-05		
406.5	2.34E-06	458.6	3.71E-05	508.6	6.18E-05		
407.5	4.51E-05	459.6	4.38E-05	509.6	7.18E-05		
408.5	1.08E-04	460.6	5.88E-05	510.6	8.29E-05		
409.5	1.83E-04	461.6	4.28E-05	511.5	6.15E-05		
410.5	8.82E-05	462.6	4.81E-05	512.5	7.42E-05		
411.5	1.03E-04	464.6	4.61E-05	513.5	6.78E-05		
412.5	1.61E-04	465.6	3.14E-05	514.5	6.55E-05		
413.5	8.36E-04	466.6	3.17E-05	515.5	4.21E-05		
414.5	9.76E-05	467.6	4.28E-05	516.4	7.28E-05		
415.5	8.82E-05	468.6	2.77E-05	517.4	6.62E-05		
416.5	6.38E-05	469.6	3.68E-05	518.4	5.75E-05		
417.5	6.21E-05	470.6	5.11E-05	519.4	6.98E-05		
418.5	8.72E-05	471.6	2.74E-05	520.4	5.18E-05		
419.5	7.28E-05	472.6	3.51E-05	521.3	6.52E-05		
420.5	3.67E-05	473.6	3.58E-05	522.3	7.28E-05		
421.5	7.85E-05	474.6	4.38E-05	523.3	5.45E-05		
422.5	8.32E-05	475.6	3.91E-05	524.3	5.91E-05		
423.5	7.28E-05	476.6	4.01E-05	525.3	5.95E-05		
424.5	8.02E-05	477.6	8.25E-05	526.2	5.55E-05		
425.5	7.12E-05	479.7	5.25E-05	527.2	6.35E-05		
426.5	6.21E-05	480.7	5.11E-05	528.2	6.05E-05		
427.5	5.75E-05	481.7	3.98E-05	529.2	6.25E-05		

Table 3. Petrographic descriptions of magnetic mineral separates from Great Salt Lake core 96-4 and composite cores 96-5 and 96-6.

Drive/sect, drive and section in a core; Sample depth, depth in the drive and section from which magnetic particles were extracted; Depth in core, overall depth of a sample in a core. Depths for cores 96-5 and -6 are indicated for the combined cores; Magnetic susceptibility: Very high ($>2x10^{-4}$); high ($1.0x10^{-4}$–$2.0x10^{-4}$); intermediate ($0.6\ x10^{-4}$–$1.0x10^{-4}$); low ($<0.6x10^{-4}$). Mag Mins 1, magnetic mineral having dominant effect on magnetic susceptibility in a sample; Mag Mins 2, other magnetic mineral that likely strongly influences magnetic susceptibility in a sample; Fe-S mins, iron sulfide minerals; mt, magnetite; ht, hematite; ti-ht, titanohematite; ilm, ilmenite

Core	Drive/sect	Sample depth (cm)	Depth in core (cm)	Magnetic susceptibility	Mag Mins 1	Mag Mins 2	Magnetic minerals-details, observations, interpretations	Fe-S mins
1996-5	1A	8–13	0.4–5.4	intermediate	mt	magnetic fly-ash	mt particles, most 10–20 μm; fly-ash mt and other ferrites rock fragments and silicate grains with mt particles detrital pyrrhotite	pyrite (minor)
	1A	70–79	62.4–71.4	low	mt		mt particles replaced by pyrite to varying degrees rock fragments and silicate grains with mt particles	pyrite
	1B	14–25	106.4–117.4	low	mt		mt particles replaced by pyrite to varying degrees rock fragments and silicate grains with mt particles	pyrite
	1B	94–105	186.4–197.4	low	mt		mt particles replaced by pyrite to varying degrees rock fragments with mt particles, also partly replaced by pyrite	pyrite
1996-6	1C	39.5–49.5	245.4–255.4	low	mt		mt particles replaced by pyrite to varying degrees rock fragments with mt particles, some of which are partly replaced by pyrite	pyrite
	1A	60–72	421.6–433.6	low to intermediate	mt		mt particles replaced by pyrite to varying degrees rock fragments with mt particles, also partly replaced by pyrite	pyrite
	1B	54–68	529–543	low to intermediate	mt		mt particles replaced by pyrite to varying degrees rock fragments with mt particles, also partly replaced by pyrite	pyrite
	2B	66–68.5	763.5–765.5	intermediate	ti-ht; mt	greigite	mt in rock fragments and mineral grains; ti-ht mt particles replaced by pyrite; some ti-ht shows possible dissolution many mt particles replaced by pyrite; some by greigite	pyrite greigite
	2B	87–89	784.5–786.5	very high	greigite		greigite abundant; pyrite lacking ti-ht	greigite
	2C	6.5–8.5	804.5–806.5	very high	greigite		greigite abundant; pyrite lacking small (<10 μm), angular ti-ht	greigite
	2C	23–23.5	821–821.5	high	greigite		greigite abundant; replaces large (ca. 50 μm) mt particles; pyrite lacking small (<30 μm) ti-ht	greigite
	2C	61–63.5	859–861.5	intermediate to high	greigite		pyrite appears more abundant than greigite; may be intergrown Fe sulfides replace detrital Fe-Ti oxides small (~10 μm), rounded ti-ht	pyrite greigite
	3A	68–72.5	941.2–945.7	intermediate	ti-ht	mt	ti-ht, typically 5–20 μm mt and ilm-ht lamellar intergowth particles, partly replaced by pyrite framboidal pyrite pyrrhotite (fine- to medium-silt sized), probably detrital	pyrite
	3C	49.5–52.5	1123.1–1126.1	intermediate	ti-ht; mt	greigite	ti-ht and remnants of mt particles replaced by pyrite and greigite minor mt in rock fragment some pyrite and greigite not associated with Fe-Ti oxides; pyrite in plant fragments	pyrite greigite
1996-4	1D	45–56	339–350	very high	greigite	mt	greigite abundant mt particles partly replaced by Fe-sulfide (greigite and (or) pyrite)	greigite pyrite
	1D	68–76	362–370	high	greigite	ti-ht	greigite and pyrite relict ti-ht, partly dissolved	pyrite greigite
	2A	28–34	431.5–437.5	intermediate	mt		mt particles replaced by pyrite small mt crystallites in volcanic rock fragments	pyrite
	2B	5–11	508.7–514.7	intermediate	mt		small mt crystallites in volcanic rock fragments (coarse silt to fine sand size) large mt (fine sand size) partly replaced by pyrite	pyrite