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Supplemental Material

Supplemental Text. Supplemental Material Overview.

Table S1. Complete list of samples used in this study.

Table S2. Sample angles and confidence ratings.

Figure S1. Sketch diagram of orientation procedure, using the data from Table 1.

Table S3. IRM component analysis results for all samples of M0077A, except 1100.

Table S4. IRM component analysis results for sample 1100 before and after heating.

Figure S2. Depth variation of hysteresis parameters along core M0077A.

Table S5.

Supplemental Data 1. Electron Probe Micro Analysis (EPMA) data file.

Supplemental Data 2. Temperature dependant magnetic susceptibility data from samples.

Supplemental Data 3. Raw temperature dependent magnetization, and respective thermomagnetic curve.

Supplemental Data 4. Raw data for heating cycle “repetition” temperature dependent susceptibility experiments.

Supplemental Data 5. Data used to calculate the Koenigsberger ratio (Q-ratio) of remnant magnetization relative to induced magnetization.

Supplemental Data 6. Raw data from each individual hysteresis measurements performed in Utrecht University.

Supplemental Data 7. Collection (.col) file with our interpretations of the paleomagnetic data.

Supplemental Data 8. Data for IRM component modelling and raw data.

Peak-ring Magnetism:
Rock and Mineral-Magnetic Properties of the Chicxulub Impact Crater

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Supplemental Text

In this file we provide a description for all the data provided in the remaining files. This includes all of our Electron Probe Micro-Analysis (EPMA) (Supplemental Data S1), all our temperature dependent magnetic susceptibility data (k-T, Supplemental Data S2); temperature dependent magnetization (m-T, Supplemental Data S3); Repeated heating experiments k-T data (Supplemental Data S4); calculations of, and involving Koeningsberger ratios (Q-ratios, Supplemental Data S5); the hysteresis parameters and individual measurements (Supplemental Data S6); and the paleomagnetism data (Supplemental Data S7). Supplemental Data S8 contains all isothermal remanent magnetization (IRM) component analysis data.

Supplemental Text 1 – Samples

1.1 – Table S1: Sample list

In the table below is a complete list of samples used in this study. Sample code corresponds to approximate depth at the top cut of the sample, in meters below sea floor (mbsf). In parathesis is an identification code, with [lithology]-[unit] format. S=Suevite; SM = Suevite+Melt; M = Melt; G = Granitoid; MGC = Melt-Granitoid Contact. Depths (mbsf), Unit, as well as IODP identification codes are also provided, namely core number, section, and Top and Bottom cut depths in cm, relative to each of the sections of the cores.

Sample #	Lithology	Depth (top)	Unit	Core	Sec	Top	Bot
639 (S-2A)	Suevite	639.28	2A	47	2	42	44.5
646 (S-2A)	Suevite	645.55	2A	49	2	36	38.5
683 (S-2B)	Suevite	683.47	2B	63	1	13	15.5
688 (S-2B)	Suevite	688.71	2B	65	1	80	82.5
700 (S-2B)	Suevite	700.13	2B	73	2	21	23.5
721 (SM-3A)	S-M mix	721.02	3A	87	2	30	31
727 (M-3A)	I. Melt	727.43	3A	89	2	56	57
732 (M-3A)	I. Melt	732.03	3A	91	1	29	31.5
738 (M-3B)	I. Melt	738.62	3B	93	1	78	80.5
744 (M-3B)	I. Melt	744.2	3B	95	1	26	28.5
747 (G-4)	Granitoid	747.07	4	96	1	8	10
763 (G-4)	Granitoid	762.57	4	111	3	30	32
804 (G-4)	Granitoid	803.67	4	115	2	60	62
810 (G-4)	Granitoid	810.48	4	118	2	50	52
847 (G-4)	Gr./Dol.	847.01	4	134	3	83	86
967 (G-4)	Granitoid	966.68	4	182	1	70	72
982 (G-4)	Granitoid	982.34	4	187	1	60	62
994 (GD-4)	Granitoid	994.16	4	191	1	9	11
995 (M-4)	Granitoid	994.89	4	191	1	87	90
995 (G-4)	Granitoid	994.89	4	191	1	108	110
996 (G-4)	Granitoid	995.61	4	191	3	40	42
997 (S-4)	S. Dyke	997.74	4	192	1	65	67
999 (M1-4)	I. Melt	998.85	4	192	2	58	60
999 (M2-4)	I. Melt	998.85	4	192	2	58	60
999 (MGC-4)	M-G contact	998.85	4	192	2	58	60
999 (G3-4)	Granitoid	998.85	4	192	2	58	60
999 (G2-4)	Granitoid	998.85	4	192	2	58	60
999 (G1-4)	Granitoid	998.85	4	192	2	58	60
1085 (G-4)	Granitoid	1085.13	4	222	1	55	57
1097 (G-4)	Granitoid	1097.59	4	226	1	61	63
1100 (G-4)	Granitoid	1100.14	4	227	1	5	7
1103 (G-4)	Granitoid	1103.45	4	228	1	31	33
1135A (G-4)	Granitoid	1134.8	4	238	1	76	78
1135B (G-4)	Granitoid	1135.02	4	238	1	98	101
1137 (G-4)	Granitoid	1137.57	4	239	1	47.5	51.5
1140 (G-4)	Granitoid	1139.69	4	239	2	116	118
1149 (G-4)	Granitoid	1149.04	4	242	3	26	28
1150 (G-4)	Granitoid	1150.42	4	243	2	21	23
1161 (G-4)	Granitoid	1161.42	4	247	2	23	26
1194 (G-4)	Granitoid	1194.17	4	258	1	15	17
1197 (G-4)	Granitoid	1197.17	4	259	1	5	7
1224A (G-4)	Granitoid	1223.82	4	267	2	100	102
1224B (G-4)	Granitoid	1224.04	4	267	3	9	11
1224C (M-4)	I.Melt	1224.15	4	267	3	24	26
1224C (G-4)	Granitoid	1224.15	4	267	3	24	26
1224D (G-4)	Granitoid	1224.25	4	267	3	32	34
1225 (G-4)	Granitoid	1225.12	4	268	1	58	60
1231 (G-4)	Granitoid	1231.43	4	270	1	59	61
1249 (G-4)	Granitoid	1249.49	4	276	1	15	17
1326 (G-4)	Granitoid	1326.86	4	301	2	28	30

1.2–Table S2. Core Azimuth Correction

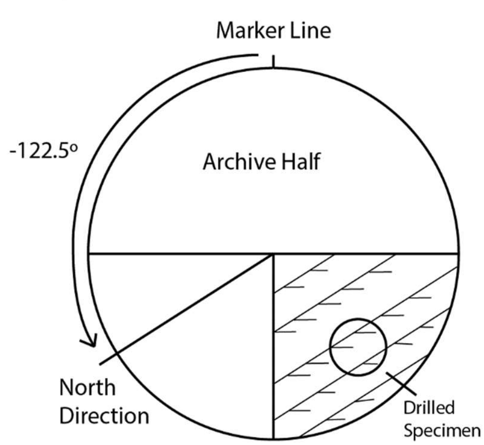
In order to correctly determine the declination of the paleomagnetic vector, as well as correct geographic directions of the main axes of susceptibility, we have applied an azimuth correction prior to the drilling of our cores.

On a first stage, the cores were marked with an arbitrary “marker line” after drilled, and an acoustic image of the hole walls was done using a slimline tool coupled with a 3-component magnetometer and accelerometer, which provides a magnetic north orientation in these acoustic images. On a second stage, CT scans of the cores were made, and aligned with the acoustic images using recognizable features, such as structures, cracks, and dipping strata. Knowing the direction of “north” in acoustic images of the borehole wall, the angle discrepancy between the “marker line” and north were recorded (+/- angles corresponding to clockwise/counter-clockwise rotations respectively). A ranking of 1-5 was attributed to the correction for each section, depending on the certainty of the correction (5 being certain, 1 being uncertain). For more details, see (McCall et al., 2017). For our sections, the angles and confidence rating are as follows:

Sample	Core	Section	mbsf Top	Rotation (°)	Certainty
646	49	2	645.55	-69.7	3
683	63	1	683.47	76.73	1
727	89	2	727.43	52.43	5
744	95	1	744.20	-122.65	5
747	96	1	747.07	-122.65	4
847	134	3	847.01	50.58	4
997	192	1	997.74	-41.36	4
1085	222	1	1085.13	-23.14	5
1135B	238	1	1135.02	66.00	3
1137	239	1	1137.57	126.72	5
1249	268	1	1225.12	97.59	1
1326	276	1	1249.49	-68.33	4

The samples were cut along a plane perpendicular to the “Marker Line”, allowing for re-orientation of these pieces accordingly. Lastly, we marked the angle corrections in our samples, prior to drilling the cylindrical specimens for demagnetization and AMS measurements. This guarantees that all our specimens have an orientation of 0/90, allowing for interpretation of the data in specimen coordinates. See diagram below (Fig.1):

Sample 747



Supplemental Text 2–Isothermal Remanent Magnetization component analysis

Figure S – Sketch diagram of orientation procedure, using the data from table 1. Quarter core on the bottom right is our working sample.

2.1–Table S3 and Table S4

In Table S3 is the IRM component analysis for our M0077A samples. Representative samples were presented in Fig. 6 in the main text. Note lithological unit is given in parenthesis next to each sample. Samples not included did not provide reliable results for IRM component modelling.

In Table S4 is the IRM component analysis for sample 1100, before and after heating (see text for details). Note the increase in $B_{1/2}$ after heating in all of the measurement pairs.

Raw data can be found in Supplemental Data 8

	Component 1					Component 2				
Sample	Cont. (%)	SIRM (A/m)	$\log(B_{1/2})$ mT	$B_{1/2}$ (mT)	DP (mT)	Cont. (%)	SIRM (A/m)	$\log(B_{1/2})$ mT	$B_{1/2}$ (mT)	DP (mT)
639 (2A)	100.0	0.1	1.7	53.7	0.2					
646 (2A)	100.0	0.0	1.7	50.1	0.2					
683 (2B)	100.0	0.1	1.6	43.7	0.2					
688 (2B)	86.8	0.0	1.6	42.7	0.2	13.2	0.0	2.2	141.3	0.3
721 (2C)	100.0	5.8	1.6	38.0	0.3					
727 (3A)	100.0	3.0	1.6	43.7	0.2					
732 (3A)	100.0	3.6	1.6	39.8	0.2					
738 (3B)	100.0	7.1	1.5	34.7	0.3					
744 (3B)	100.0	15.8	1.8	58.9	0.2					
747 (4)	100.0	2.8	1.8	61.7	0.3					
763 (4)	93.8	0.0	1.7	46.8	0.3	6.3	0.0	2.7	446.7	0.3
804 (4)	100.0	0.2	1.5	33.1	0.3					
810 (4)	100.0	0.7	1.7	44.7	0.3					
847 (4)	100.0	72.7	1.9	81.3	0.2					
967 (4)	100.0	1.1	1.7	51.3	0.3					
982 (4)	100.0	0.4	1.6	39.8	0.3					
994 (4)	100.0	1.3	1.7	45.7	0.3					
995b (4)	100.0	5.1	1.7	46.8	0.3					
995G (4)	100.0	0.1	1.7	47.9	0.2					
997 (4)	100.0	1.7	1.9	70.8	0.3					
999 G3 (4)	100.0	0.1	1.7	53.7	0.2					
999 G2 (4)	100.0	0.4	1.7	53.7	0.3					
999 M1 (4)	100.0	18.8	1.8	61.7	0.2					
999 M2 (4)	100.0	29.9	1.8	56.2	0.2					
1085 (4)	100.0	0.2	1.8	67.6	0.2					
1135A (4)	100.0	1.1	1.6	42.7	0.3					
1135B (4)	100.0	2.1	1.7	49.0	0.3					
1137 (4)	100.0	3.8	1.8	56.2	0.3					
1224A (4)	96.4	1.1	1.9	72.4	0.3	3.6	0.0	2.8	575.4	0.4
1224B (4)	100.0	2.7	1.8	63.1	0.3					
1224C (4)	92.2	1.8	1.6	42.7	0.3	7.8	0.2	2.8	616.6	0.3
1224D-g (4)	100.0	0.6	1.7	50.1	0.3					

Table S3 - IRM component analysis results for all samples of M0077A, except 1100.

Sample	Component 1 Cont. (%)	SIRM (A/m)	$\log(B_{1/2})$ mT	$B_{1/2}$ (mT)	DP (mT)	Component 2 Cont. (%)	SIRM (A/m)	$\log(B_{1/2})$ mT	$B_{1/2}$ (mT)	DP (mT)
1100 Big	95.4	20.5	1.5	30.2	0.3	4.6	1.0	2.7	467.7	0.3
1100 Big after	100.0	43.9	1.8	56.2	0.3					
1100 n	100.0	0.1	1.7	45.7	0.3					
1100 n After	92.0	0.3	1.9	72.4	0.3	8.0	0.0	2.8	562.3	0.3
1100 white	95.0	0.1	1.7	55.0	0.3	5.0	0.0	2.7	501.2	0.3
1100 white after	100.0	0.6	1.9	72.4	0.3					
1100 pink	100.0	0.1	1.8	63.1	0.3					
1100 pink after	100.0	0.2	1.9	70.8	0.3					

Table S4 – IRM component analysis results for sample 1100 before and after heating. Note the increase of $B_{1/2}$ before and after heating.

2.2–Hysteresis parameters with depth

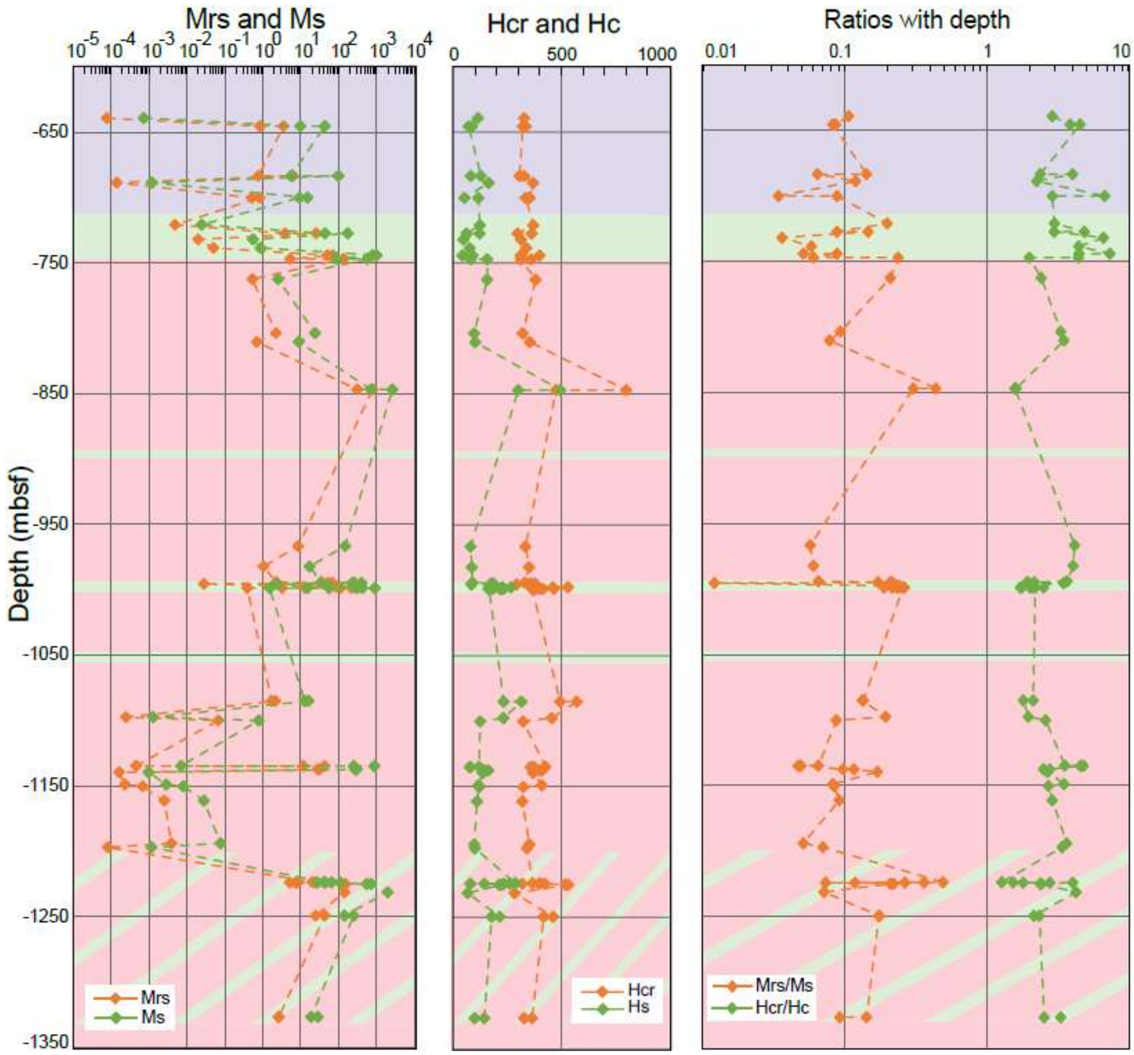


Figure S2. Depth variation of hysteresis parameters along core M0077A.

SUPPLEMENTAL DATA S1

Electron Probe Micro Analysis (EPMA) data file, with focus on oxide wt%, for all magnetite measurements. Only measurements with a total of >94% were kept. Cation formulas were calculated assuming 3 cations and 4 anions, with the exception of points 2-5 and 2-6 from sample 732 (Ilmenite), where we assumed 2 cations and 3 anions. Calibration specifications and standards used for these measurements can be found in the second table of this file.

Relevant formulas:

Mg# = 100xMg/(Mg+Fe^{2+})

Cr# = 100x[Cr/(Cr+Al)]

Ti# = 100*[2Ti/(2Ti+Al+Cr)])

Tc Calc = 852,5K – 539,5 K * x – 204,5K * x^2

Tc Calc (Al, Mg) = Tc_{calc} – 593 * [Al] – 82*[Mg]

Tc Calc (Al, Cr, Mg, Mn) = Tc_{calc} – 593 * [Al+Cr] – 82*[Mg+Mn]

SUPPLEMENTAL DATA S2

Data file containing all the temperature dependant magnetic susceptibility data from our samples. On the first page, a table with all the parameters determined from the k-T curves is found (equivalent of table 3 in main text). In each remaining sheet, the data for each Low Temperature (LT) and High Temperature (heating and cooling, HT) run can be found, as well as additional calculations performed for each of the measurements. Each sheet contains the k-T graph, a normalized susceptibility graph, and the first derivate graph used to determine both Verwey and Curie Temperatures. Each experiment followed an average heating rate of 11.9°C/min, which we used as standard for all our k-T measurements.

TEMP = Temperature

CSUSC= Corrected Susceptibility

1^{st} deriv = calculated 1^{st} derivate

knormed = Normalized Susceptibility

Tv = Verwey Transition Temperature (Tv1 in first LT run, Tv2 in the second LT run)

Tc = Curie Temperature (Tc1 in heating curve, Tc2 in cooling curve)

TvP = Verwey Peak Ratio;

HPR = Hopkinson Peak Ratio;

A40 [%] = 100*((k_{40}-K_{40})/K_{40})

SUPPLEMENTAL DATA S3

Compressed file containing the raw temperature dependent magnetization, and respective thermomagnetic curve. Each excel file contains Temperature (°C) and Magnetisation (Am^2/kg) data, as well as experiment specific details and sample mass details. JPG files are the corresponding plotted curves.

SUPPLEMENTAL DATA S4

Excel data file with the raw data for our heating cycle "repetition" temperature dependent susceptibility experiments. The data columns follow the same format and contain the same information as the columns in Supplemental material 3.

The first sheet contains the data for the repeated experiments (fig. 8a, in main text). These measurements follow the standard 11.9°C/min heating rate, and do not hold at maximum temperature.

The second sheet contains the data for the heating/cooling experiments for the slow heating rate experiments, and the follow up measurement. The slow experiment had a 7.3°C/min heating rate, holding maximum temperature for 20 minutes (maximum allowed by the instrument). The follow up experiment has the standard 11.9°C/min heating rate, without holding at maximum temperature.

The third sheet contains the raw data for the k-T experiments for repeated heating/cooling runs, with temperatures of 450°C, 520°C, and 540°C. These are all reversible measurements.

The last sheet contains the raw data for the k-T experiments for the 560°C and 580°C, done in succession with the previous measurements. These two standout as irreversible experiments, which we interpret as the onset of annealing.

SUPPLEMENTAL DATA S5

Excel sheet with the data used to calculate the Koenigsberger ratio (Q-ratio) of remnant magnetization relative to induced magnetization. This ratio is given by the formula:

Q= NRM [A/m] / (*k* * B [A/m]); where NRM is the remnant magnetization signal; *k* is the magnetic susceptibility, and B is the intensity of the present magnetic field.

SUPPLEMENTAL DATA S6

Compressed file containing all the raw data from each individual hysteresis measurements performed in Utrecht University. Three folders containing the data of each individual measurement in three measuring sessions, and one folder with the DCD measurements of reach individual measurements, for calculation of the Bcr/Bc ratio.Together follows an excel spreadsheet with the individual hysteresis parameters of each of our samples, which we used to plot the Day-Dunlop plot (Fig. 9c in the main text).Contained as well is an excel sheet with all k-T measurements obtained during heating processing of 20 samples for before-and-after heating comparisons. 5 samples were rejected from our interpretations due to paramagnetic behaviour during k-T measurements; whilst sample 1149 showed a failed hysteresis measurement.

SUPPLEMENTAL DATA S7

Compressed file containing the collection (.col) file with our interpretations of the paleomagnetic data. This is a format specific of the interpretation portal Paleomagnetism.org, and can be imported under “Statistics”. The samples in this file are named after their original, internal Freiburg designation.

Table S5

Sample	Fr.Code	Dec(°)	Inc(°)	MAD	Steps	Group	Method	Notes
646	005A	199.93	-43.80	12.54	6	NF	Thermal	GS/Anchored
646	005B	174.81	-40.82	11.14	7	NF	AF	GS/Anchored
683	013	115.87	-16.88	10.20	6	NF	Thermal	
727	026A	173.49	-42.31	1.94	8	NF	AF	-
727	026B	164.95	-41.45	3.74	7	NF	Thermal	
744	029A	184.96	-39.99	2.56	7	NF	AF	-
744	029B	182.82	-40.79	3.17	7	NF	Thermal	
747	030B 1	314.78	-46.05	9.82	5	S	Thermal	
747	030B 2	269.05	-42.97	5.27	4	S	Thermal	
847	095A	161.68	-0.60	3.83	6	S	AF	Anchored
847	095C	125.04	-4.94	6.42	6	S	Thermal	
847	095D 1	135.10	-4.86	15.16	6	S	Thermal	
847	095D 2	178.54	19.94	2.62	5	S	Thermal	
997	237	167.34	11.53	6.03	7	S	AF	-
1085	262B	107.61	4.51	3.97	5	S	Thermal	
1135B	262C	126.02	18.94	3.52	5	S	AF	-
1137	263A	250.54	-4.86	5.80	6	S	AF	-
1137	263B	248.00	-2.21	3.66	7	S	Thermal	
1137	263C	290.79	8.56	9.05	6	S	Thermal	
1225	313A	30.37	-39.77	1.12	8	S	Thermal	
1225	313B	25.92	-37.84	2.05	8	S	AF	-
1249	321	216.05	-29.31	5.00	8	S	AF	-
1326	337	264.26	-24.85	5.52	5	s	AF	-

SUPPLEMENTAL DATA S8

Compressed file containing all data for IRM component modelling and raw data. Excel file for Table S3 and Table S4 can also be found. “Raw Data” folder contains all data in folders which relate to the measurement dates. “Modeling” folder contains all component analysis performed in the data, denoted by suffix “IRM_” (See details and references in the main text). This folder contains also a folder with all data files, model draft figures, and a sub-folder with data for samples which undergone log-acquisition IRM measurements.