

Supporting Information for

**THE SIERRA MADRE ORIENTAL OROCLINE.
PALEOMAGNETISM OF THE NAZAS SYSTEM IN NORTH-CENTRAL
MÉXICO**

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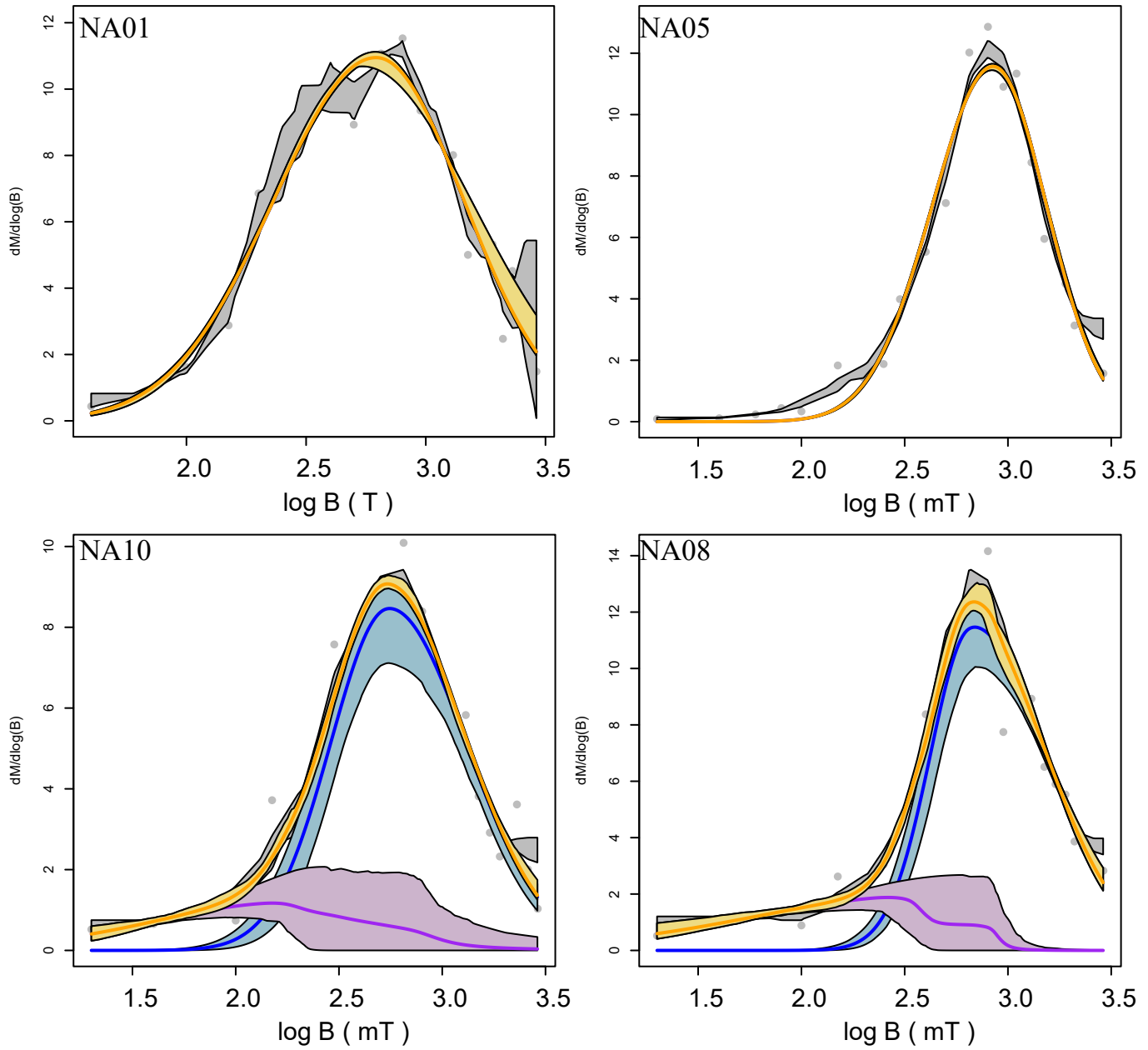
ST3-Charcas Site Means

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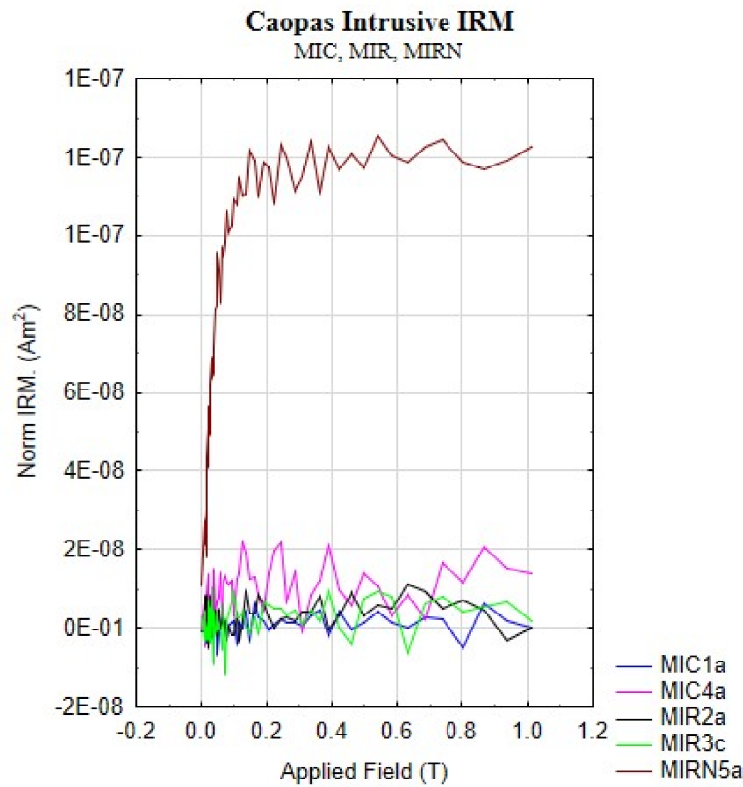
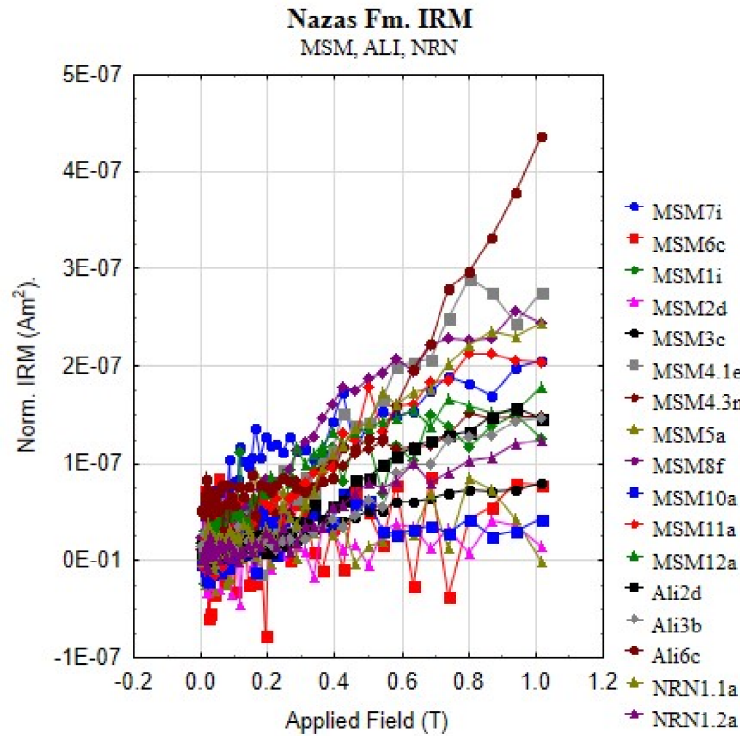
ST5-Huizachal site means

Introduction

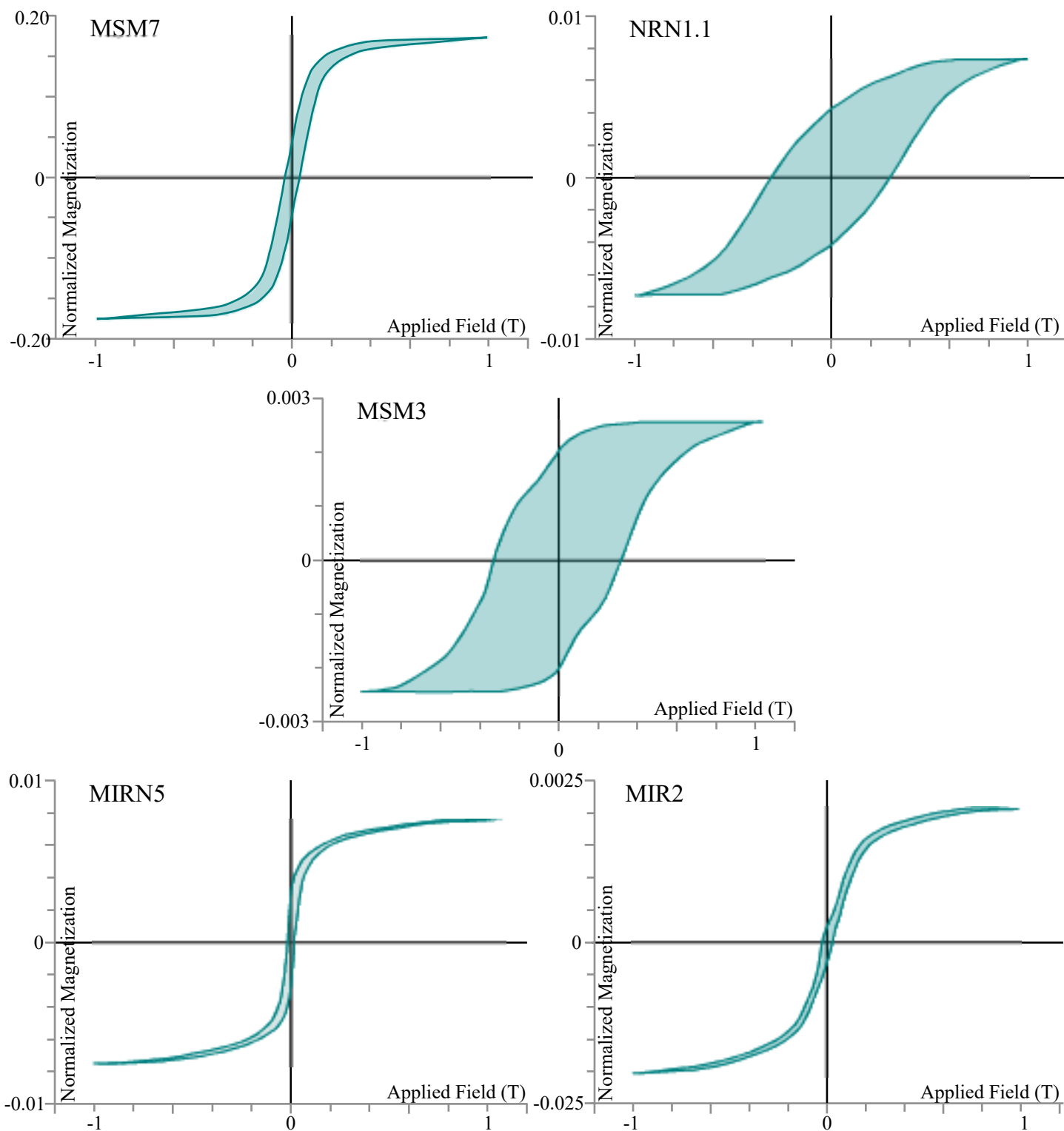
The figures and tables included here are supplementary to the main Rock magnetics and paleomagnetic analysis or are the raw uninterpreted results of the work. Here all of the graphs are included in the cases where only representative samples are shown in the manuscript.



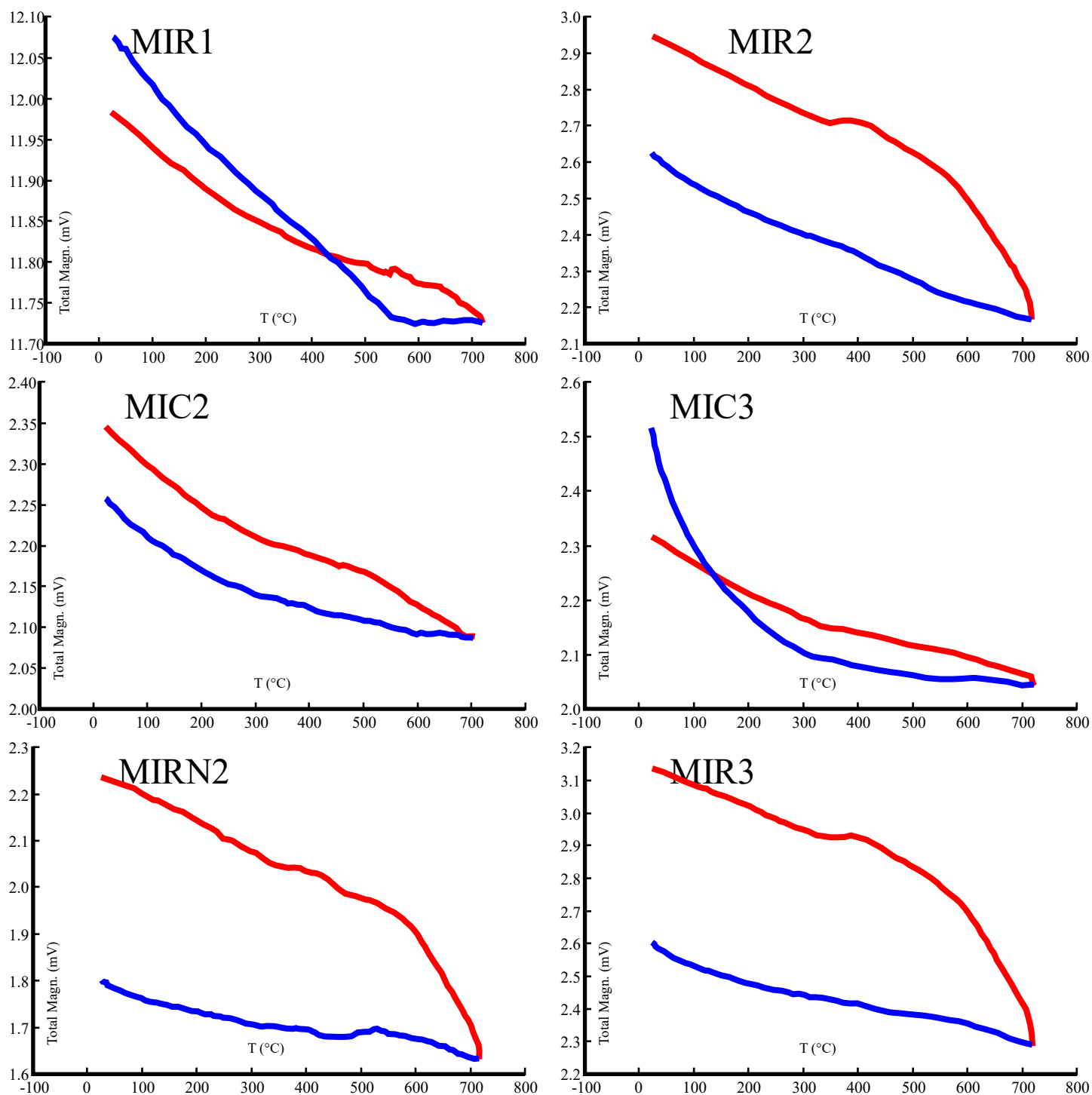
SF1. Gradient Acquisition plots of IRM acquisition curves of the Villa Juarez Locality using MAX UnMix (Maxbauer et al., 2016):Runs of representative samples of NA01, NA05, NA10 and NA08. Runs were carried in temperatures from 0° to 700°C in an Ar atmosphere. . Grey dots and the yellow curve represent the smoothed IRM data and modeled coercivity distribution, respectively. Shaded areas represent 95% confidence intervals associated with each component.



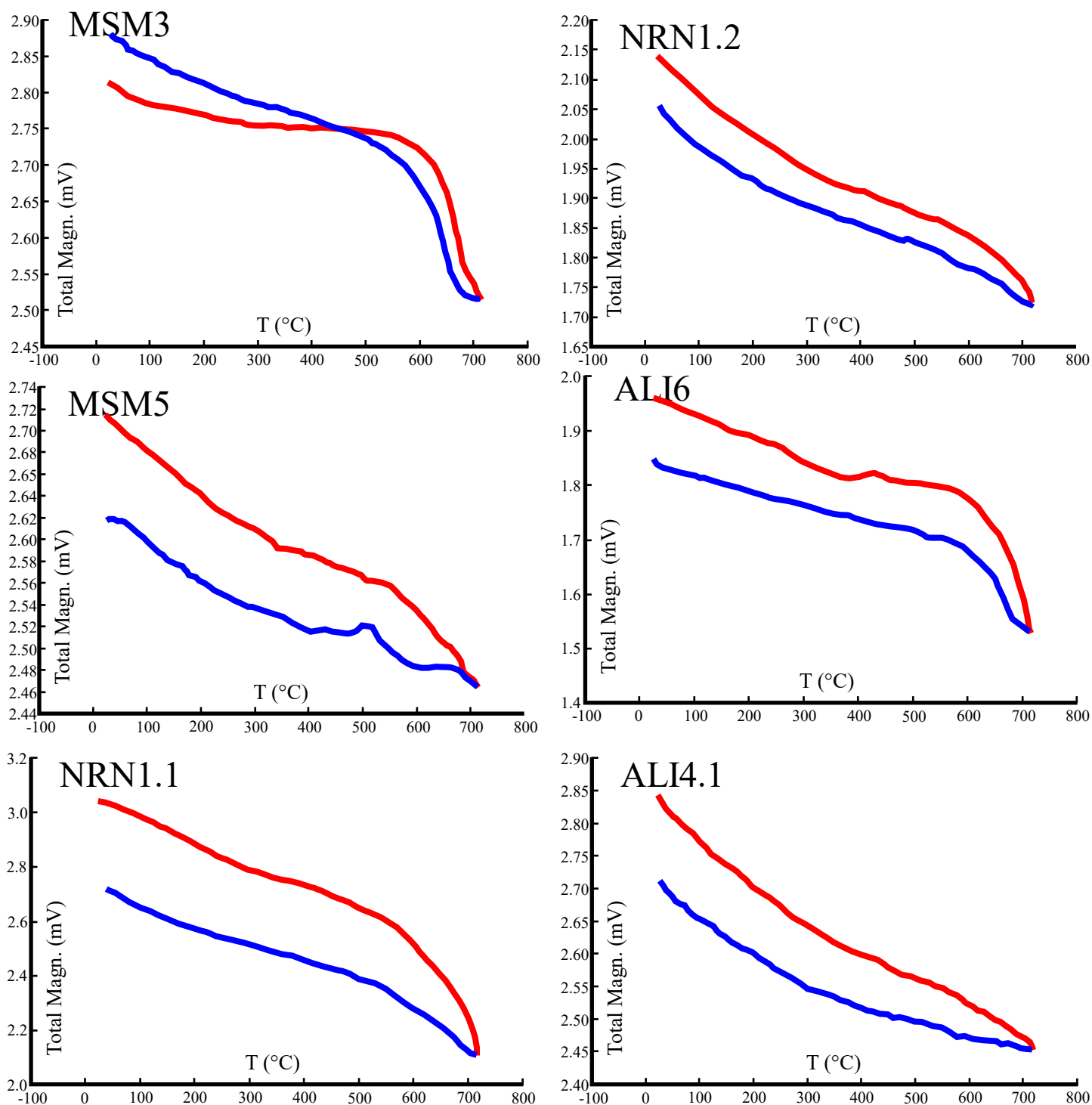
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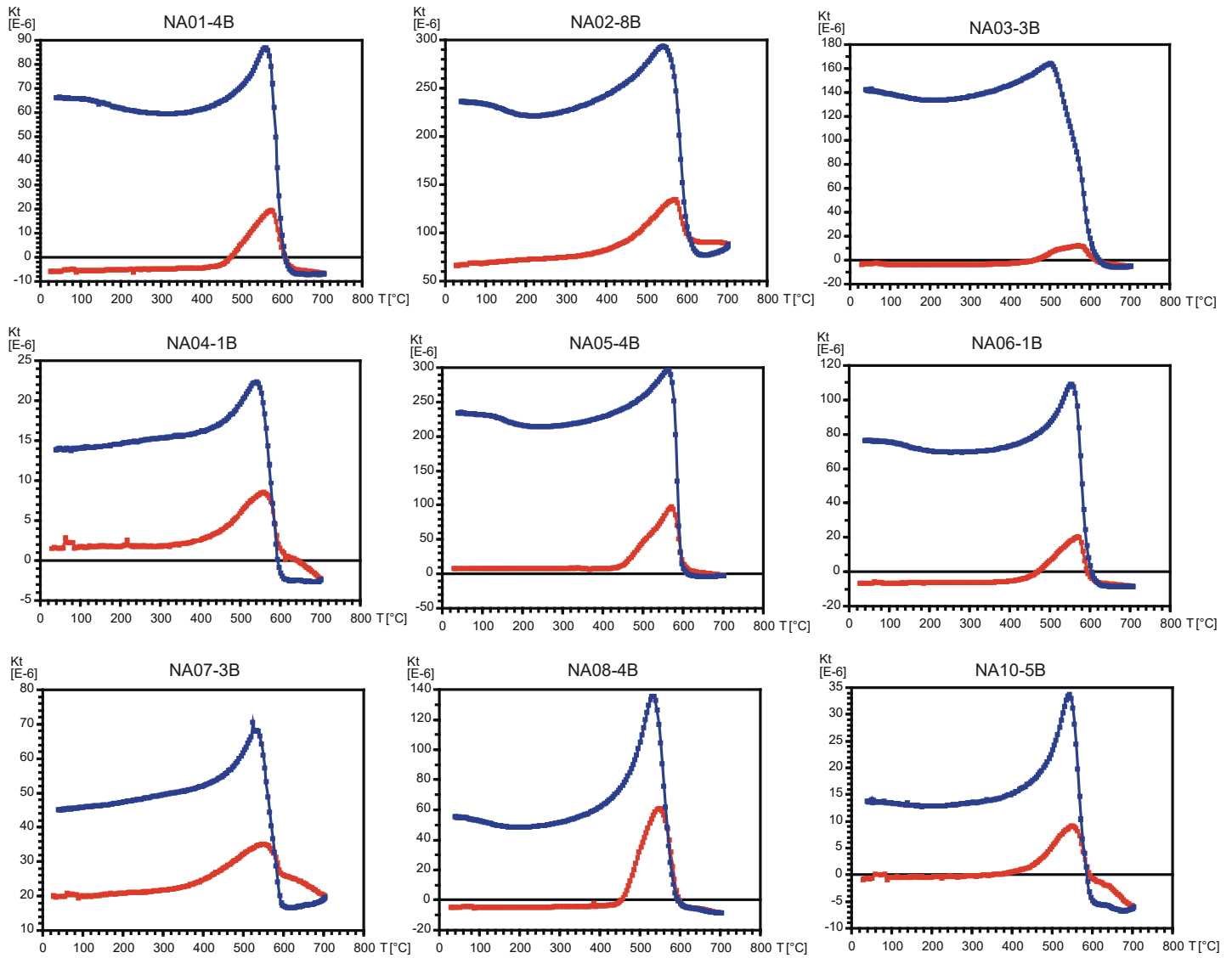
SF3. Hysteresis Loops of San Julián Uplift Locality (MSM and Nazas North): Thermomagnetic Runs of representative samples of MsM, NRN and ALI.



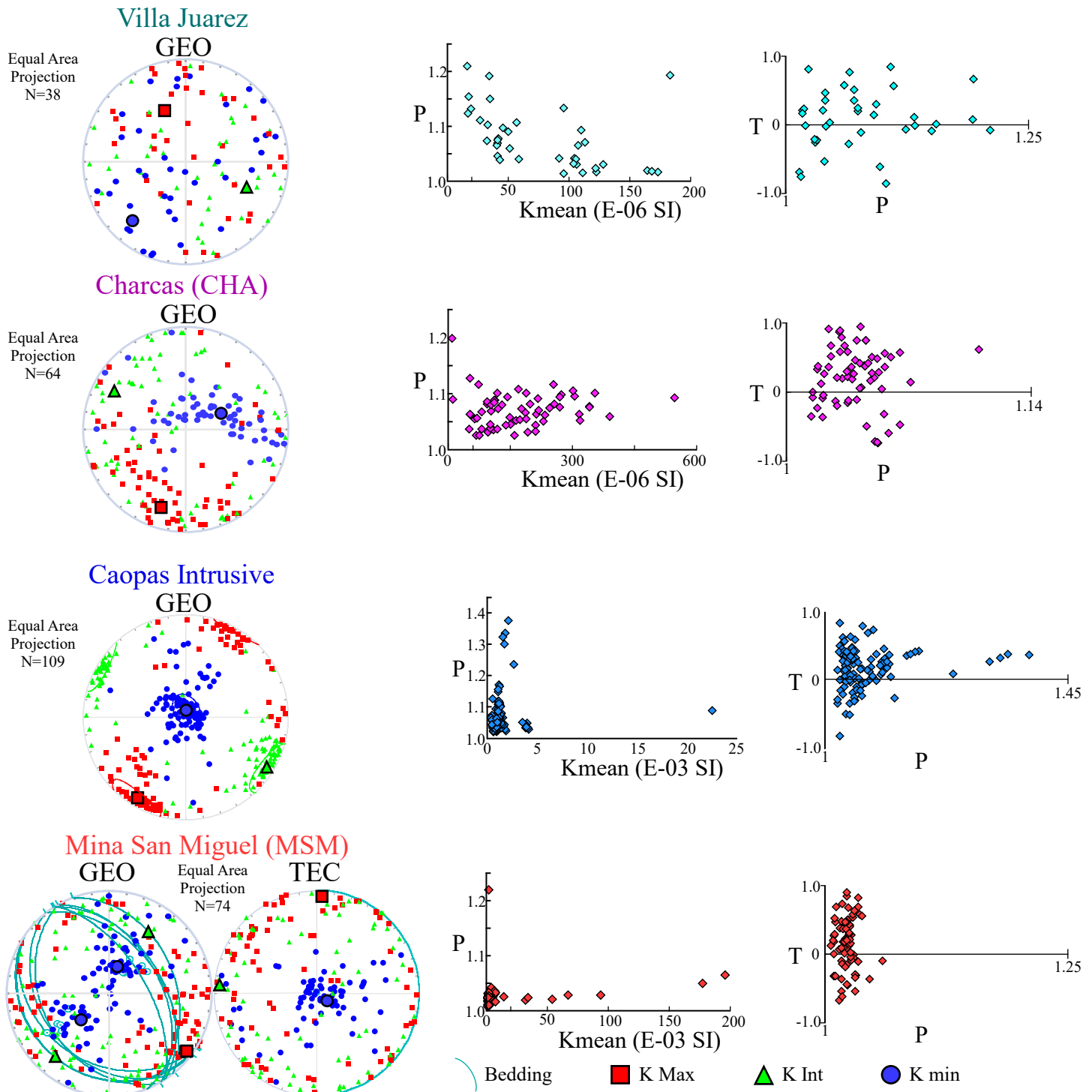
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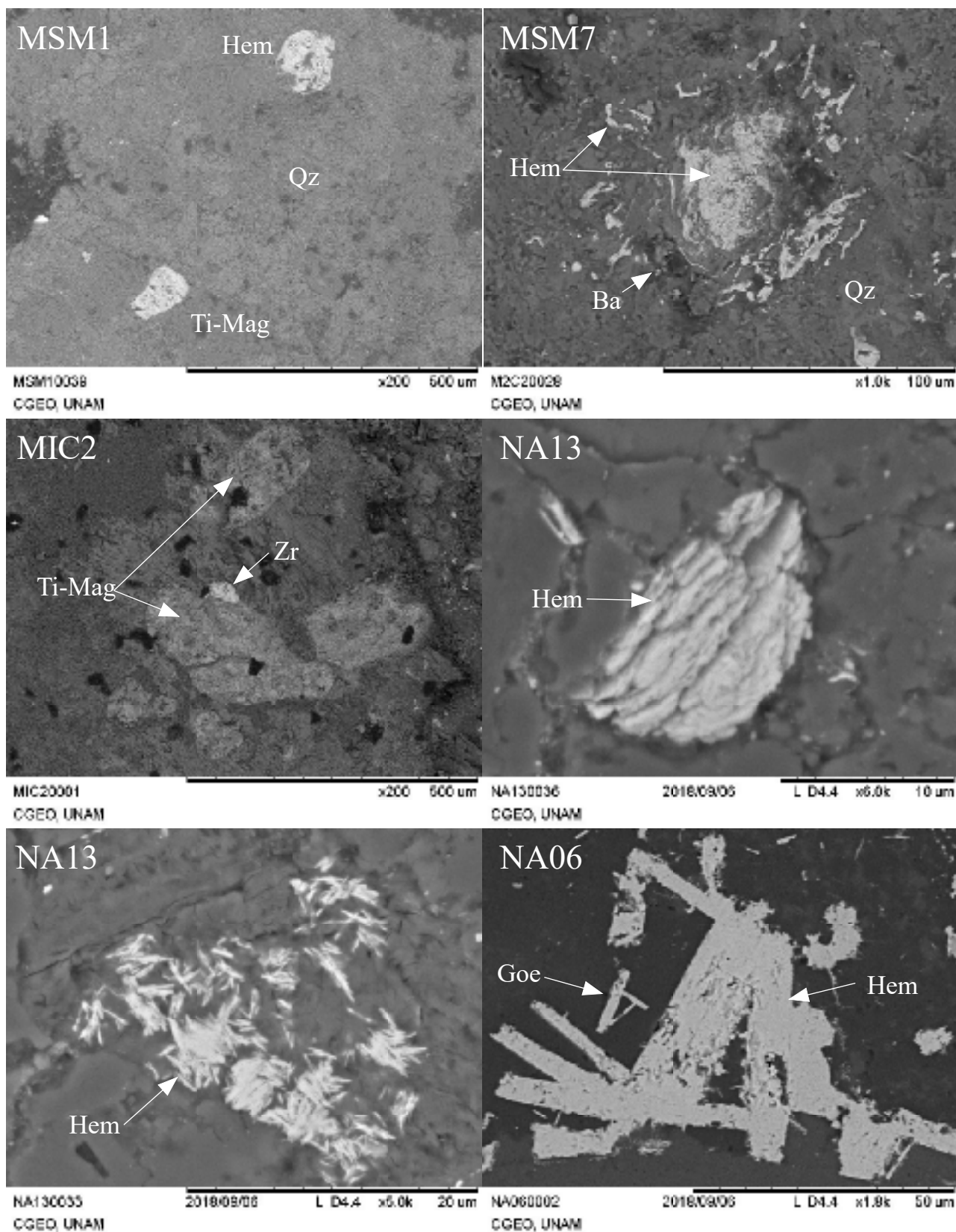
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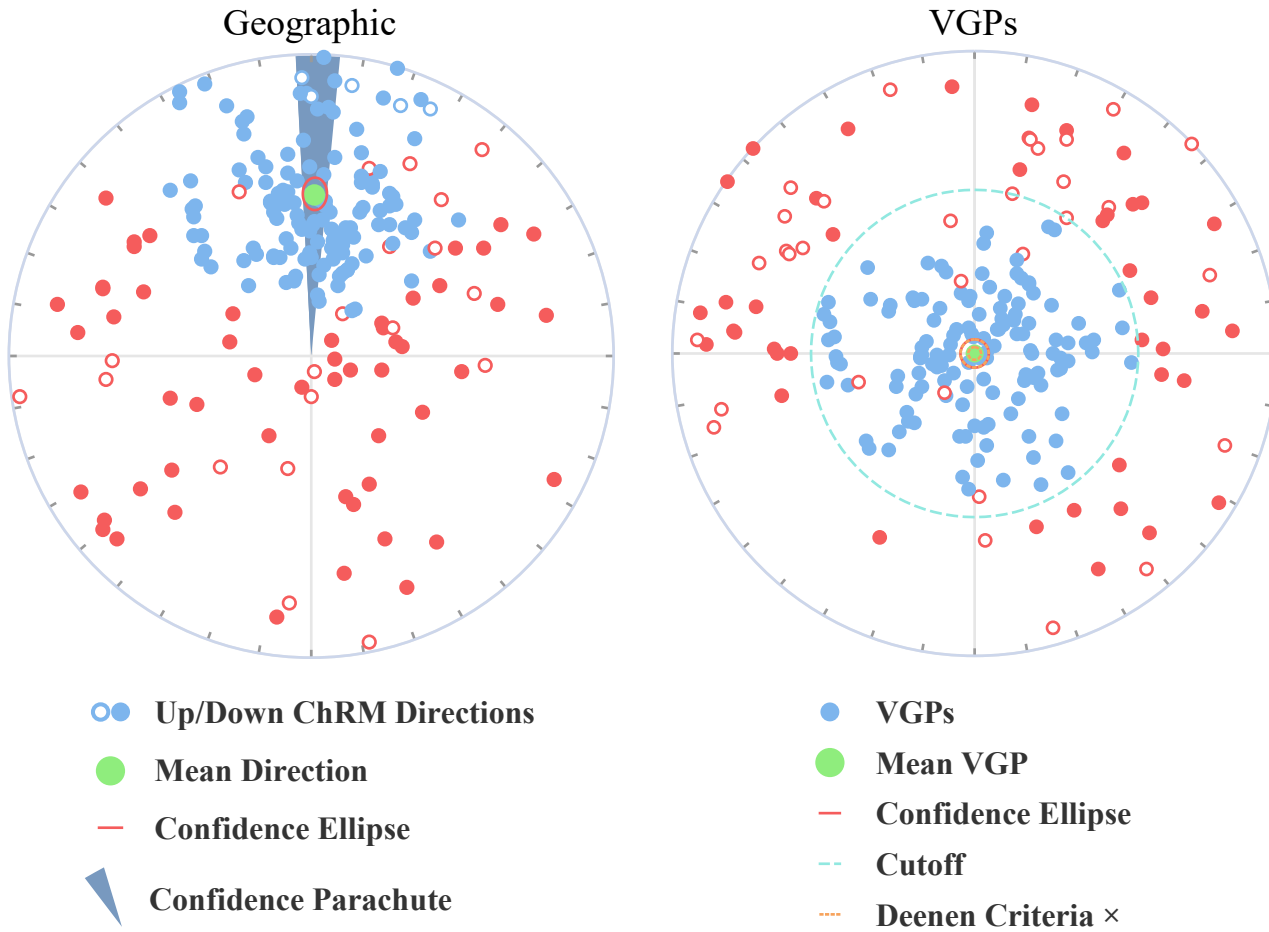


SF6. Anisotropy of Magnetic Suseptibility of the Villa Juárez, Charcas and San Julián Uplift Localites (MSM, Caopas): . Results are represented in an equal area projection for the analyzed sites. Larger symbols represent site mean. Light blue lines represent structural data. Shape parameter T vs Mean magnetic susceptibility Km and shape parameter T vs Anisotropy parameter P graphs show low degree of anisotropy.



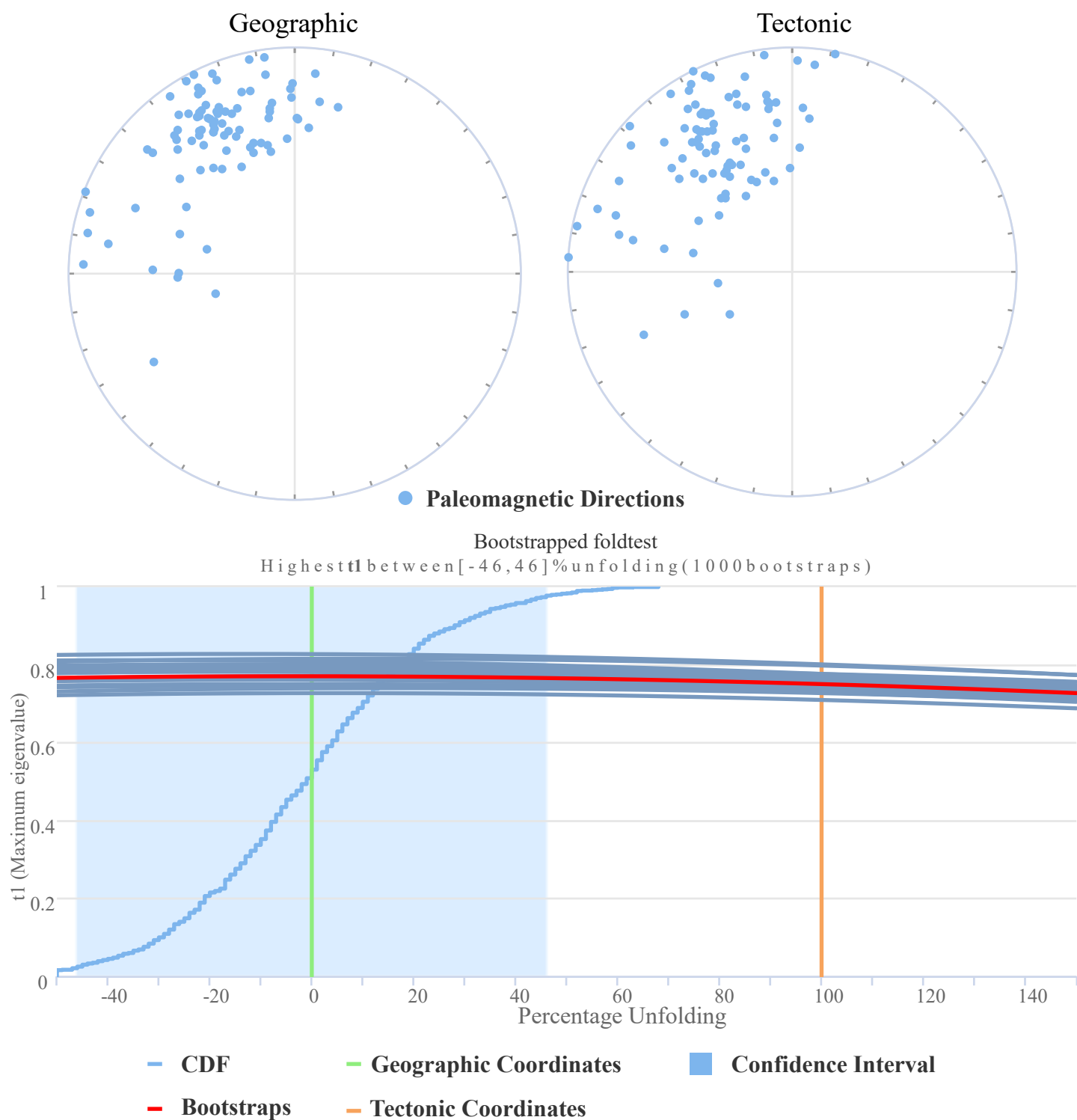
SF7. Scanning Electron Microscope images of selected samples from the Villa Juárez and San Julián Uplift localities. (**Hem**: hematite; **Mag**: Magnetite; **Ti-Mag**: Titanomagnetite; **Ba**: Barite; **Goe**: Goethite; **Qz**: Quartz).

Viscous Component



SF8. Viscous component present in all the samples collected in this work. This component was isolated below 200 °C and 16 mT. It resembles the present day magnetic field.

Huizachal Fold Test



SF9. Fold Test for the Huizachal locality. Inconclusive due to little to no change in the grouping of the geographic to the tilt corrected (Tectonic) directions.

Table ST1. Villa Juarez site mean directions in geographic coordinate system.

Geographic	N	Ns	mDec	mInc	k	a95	K	A95	A95		ΔD_x	ΔI_x	Pole Lng	Pole Lat	Coordinates	
									Min	Max					Lat.	Long.
NA-01	10	10	241.3	52.53	32.09	8.66	19.35	11.26	4.78	19.22	13.49	11.89	208.42	-6.39	25.495	-103.6
NA-02	11	11	263.1	62.28	136.1	3.93	67.28	5.61	4.6	18.1	7.75	4.62	209.16	12.61	25.495	-103.6
NA-03	8	8	152	-78.43	125.2	4.97	39.32	8.94	5.22	22.12	24.23	5.01	62	-44.09	25.495	-103.6
NA-04	6	6	175	-51.85	167.5	5.19	127.5	5.96	5.86	26.52	7.06	6.39	46.98	-81.64	25.497	-103.6
NA-05	6	8	9.6	10.73	29.75	12.49	72.54	7.92	5.86	26.52	7.95	15.43	48.58	68.79	25.492	-103.6
NA-06	7	7	0.02	30.98	156.7	4.84	345.1	3.25	5.51	24.07	3.4	5.22	76.2	81.35	25.498	-103.6
NA-07	12	12	305.1	65.84	36.52	7.28	20.82	9.74	4.44	17.14	14.68	7.32	211.14	42.42	25.519	-103.6
NA-08	5	5	14.41	58.14	18.9	18.06	11.78	23.26	6.3	29.75	30.45	21.35	289.06	73.02	25.511	-103.6
NA-10	8	8	257.4	83	58.89	7.28	17.26	13.72	5.22	22.12	83.97	7.16	241.6	21.96	25.508	-103.6
NA-12	2	2	344.6	24.8	46.6	37.45	47.4	37.12	9.09	52.99	38.27	64.44	128.09	71.04	25.526	-103.6
NA-13	1	1	277.4	12.98	0	NaN	NaN	NaN	12	82	NaN	NaN	169.15	9.51	25.544	-103.6
NA-17	5	5	331.9	33.15	224.3	5.12	404.8	3.81	6.3	29.75	4.01	5.91	156.34	62.89	25.516	-103.6

N number of demagnetized Specimens, *Ns* number of specimens that passed the Cutoff, *mDec* mean declination, *mInc* mean inclination, *k* recision parameter, *a95* radius of the 95% confidence cone about site-mean direction, *K* precision parameter of the poles, *A95* radius of 95% confidence circle around paleomagnetic pole, *A95min* and *A95max* describe the minimum and maximum values of *A95* allowed to considered the average representative. ΔD_x , uncertainty in declination; ΔI_x , uncertainty in inclination

Table ST2. San Julián Uplift site mean directions in geographic coordinate system.

Geographic	N	Ns	mDec	mInc	k	a95	K	A95	A95		ΔD_x	ΔI_x	Pole Lng	Pole Lat	Coordinates	
									Min	Max					Lat.	Long.
MSM1	9	13	296.21	15.53	26.28	10.23	47.57	7.54	4.98	20.54	7.61	14.27	170.14	9.3	24.9056	-102.154
MSM2	7	7	278.35	-2.02	55.17	8.2	166.7	4.69	5.51	24.07	4.69	9.37	163.44	7.19	24.901	-102.155
MSM3	5	5	291.2	8.53	453.94	3.6	591.5	3.15	6.3	29.75	3.16	6.19	162.69	21.02	24.895	-102.149
MSM4-1	5	5	270.07	-21.83	124.32	6.89	122.6	6.94	6.3	29.75	7.08	12.44	157.48	-4.63	24.895	-102.147
MSM4-2	5	5	274.03	47.56	95.3	7.88	63.78	9.65	6.3	29.75	11.02	11.42	193.1	14.79	24.895	-102.148
MSM4-3	14	14	289.57	35.35	26.35	7.89	22.99	8.47	4.18	15.55	8.99	12.69	178.83	25.76	24.895	-102.147
MSM5	6	6	287.82	18.63	204.13	4.7	263.74	4.13	5.86	26.52	4.19	7.63	169.3	20.15	24.892	-102.147
MSM6	6	6	294.27	12.59	46.92	9.88	94.96	6.91	5.86	26.52	6.95	13.33	163.42	24.78	24.892	-102.148
MSM7	6	6	286.05	-17.23	20.09	15.32	23.89	13.99	5.86	26.52	14.16	26.14	152.63	10.68	24.892	-102.148
MSM8	4	6	190.9	52.36	28.04	17.66	23.64	19.3	6.89	34.24	23.19	20.44	250.51	-20.24	24.888	-102.15
MSM9	6	6	274.55	35.75	18.5	15.99	23.07	14.25	5.86	26.52	15.16	21.2	185.84	12.7	24.888	-102.15
MSM10	4	4	276	49.39	13.97	25.48	10.43	29.87	6.89	34.24	35.21	33.92	195.35	17.21	24.887	-102.15
MSM11	6	6	285.92	34.43	44.59	10.14	42.91	10.34	5.86	26.52	10.94	15.73	179.51	22.04	24.885	-102.15
MSM12	6	6	287.22	37.04	24.39	13.84	20.81	15.03	5.86	26.52	16.09	21.88	180.86	24.21	24.884	-102.149
NRN1-2	4	4	102.14	-5.07	916.21	3.04	2253.6	1.94	6.89	34.24	1.94	3.85	344.98	-12.07	24.873	-102.2
NRN1-1	3	3	237.62	20.87	239.36	7.99	221.94	8.29	7.73	41.04	8.45	15.01	193.04	-23.48	24.873	-102.2
ALI6	3	3	247.3	23.37	70.48	14.8	75.22	14.32	7.73	41.04	14.65	25.25	188.98	-14.52	24.949	-102.238
ALI5	4	4	248.95	18.35	12.33	27.26	12.68	26.84	6.89	34.24	27.24	49.69	185.6	-14.07	24.954	-102.247
ALI4-2	3	3	332.9	20.46	100.81	12.34	125.72	11.04	7.73	41.04	11.23	20.06	143.57	60.48	24.953	-102.25
ALI4-1	4	4	273.61	11.61	21.8	20.13	48.59	13.31	6.89	34.24	13.39	25.82	171.81	6.03	24.953	-102.25
ALI3	4	4	216.97	34.82	336.22	5.02	257	5.74	6.89	34.24	6.08	8.68	215.08	-33.07	24.956	-102.253
ALI1	7	7	297.57	31.76	86.3	6.53	141.92	5.08	5.51	24.07	5.32	8.06	173.44	31.95	24.948	-102.261
MIC1	4	4	245.74	8.57	48.54	13.32	106.62	8.94	6.89	34.24	8.96	17.58	182.65	-19.81	24.818	-102.185
MIC2	8	8	284.04	26.56	16.84	13.9	21.77	12.14	5.22	22.12	12.52	20.64	176.09	18.72	24.816	-102.186
MIC3	8	8	280.89	8.65	6.89	22.74	8.64	19.98	5.22	22.12	20.04	39.28	167.33	12	24.815	-102.188
MIC4	7	7	266.54	15.8	42.23	9.4	86.07	6.54	5.51	24.07	6.61	12.36	176.74	0.24	24.813	-102.19
MIC6	4	4	213.38	29.03	127.8	8.16	361.75	4.84	6.89	34.24	5.02	7.97	215.47	-38.07	24.8	-102.201
MIC7	4	4	269.96	17.94	23.32	19.44	27.8	17.74	6.89	34.24	17.98	32.95	176.41	3.62	24.801	-102.198
MIR1	4	6	304.23	-8.69	4.22	50.95	6.46	39.19	6.89	34.24	39.33	77.05	164.17	7.64	24.856	-102.194
MIR2	2	4	281.48	21.37	72.88	29.69	70.67	30.16	9.09	52.99	30.79	54.31	209.43	44.63	24.8472	-102.2
MIR3	6	6	294.47	25.32	4.38	36.2	6.69	27.96	5.86	26.52	28.8	48.25	173.38	28.37	24.843	-102.208
MIR4	4	4	193.23	47.84	181.72	6.83	194.82	6.6	6.89	34.24	7.54	7.76	243.76	-34.61	24.836	-102.213
MIR5	2	2	273.86	36.21	15.17	69.36	17.7	63.4	9.09	52.99	72.21	93.62	184.99	12.89	24.831	-102.217
MIRN3	2	2	272.43	24.98	17.04	64.82	22.76	55.03	9.09	52.99	57.29	95.35	179.28	7.22	24.875	-102.228
MIRN4	2	2	331.71	41.24	9.15	95.67	7.2	114.69	9.09	52.99	82.79	154.6	172.71	62.67	24.88	-102.235
MIRN5	4	4	240.5	4.39	477.33	4.21	836.72	3.18	6.89	34.24	3.18	6.33	183.3	-25.48	24.88	-102.235

MIRN7	4	4	300.1	19.92	5.42	43.56	7.73	35.35	6.89	34.24	36.01	64.54	166.27	32.82	24.884	-102.248
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N number of demagnetized Specimens, *Ns* number of specimens that passed the Cutoff, *mDec* mean declination, *mInc* mean inclination, *k* recision parameter, *a95* radius of the 95% confidence cone about site-mean direction, *K* precision parameter of the poles, *A95* radius of 95% confidence circle around paleomagnetic pole, *A95min* and *A95max* describe the minimum and maximum values of *A95* allowed to considered the average representative. ΔD_x , uncertainty in declination; ΔI_x , uncertainty in inclination

Table ST3. Charcas site mean directions in Geographic coordinate system.

Geographic	N	Ns	mDec	mInc	k	a95	K	A95	A95		ΔD_x	ΔI_x	Pole Lng	Pole Lat	Coordinates	
									Min	Max					Lat.	Long.
CHA1	5	6	238.9	38.67	73.98	8.95	62.03	9.79	6.3	29.75	10.55	13.85	203.9	-16.97	23.106	-101.2
CHA2	7	11	135.5	-33.47	25.19	12.26	21.9	13.19	5.51	24.07	13.9	20.36	347.31	-13.16	23.106	-101.2
CHA3	5	5	9.97	3.86	245.2	4.9	278.5	4.59	6.3	29.75	4.6	9.16	52.84	66.73	23.096	-101.2
CHA4	6	6	23.31	-4.8	66.8	8.26	105.8	6.54	5.86	26.52	6.55	13.02	34.07	55.83	23.096	-101.2
CHA5	6	6	26.44	-10.11	91.94	7.02	154.8	5.4	5.86	26.52	5.42	10.55	33.03	51.68	23.096	-101.2
CHA6	4	5	25.92	-2.79	123.9	8.29	190.5	6.67	6.89	34.24	6.68	13.32	15.17	45.93	23.096	-101.2
CHA7	6	6	26.54	-5.54	114	6.3	207.1	4.67	5.86	26.52	4.67	9.27	30.36	53.4	23.096	-101.2
CHA8	4	4	29.92	-1.81	265.1	5.65	372.8	4.76	6.89	34.24	4.77	9.52	24.23	52.28	23.096	-101.2
CHA9	5	6	13.48	-14.03	79.25	8.65	89.09	8.15	6.3	29.75	8.21	15.58	37.92	53.34	23.096	-101.2
CHA10	5	5	20.63	-2.85	53.48	10.56	82.04	8.5	6.3	29.75	8.5	16.96	36.69	58.3	23.096	-101.2

N number of demagnetized Specimens, *Ns* number of specimens that passed the Cutoff, *mDec* mean declination, *mInc* mean inclination, *k* recision parameter, *a95* radius of the 95% confidence cone about site-mean direction, *K* precision parameter of the poles, *A95* radius of 95% confidence circle around paleomagnetic pole, *A95min* and *A95max* describe the minimum and maximum values of *A95* allowed to considered the average representative. ΔD_x , uncertainty in declination; ΔI_x , uncertainty in inclination

Table ST4. Real de Catorce site mean directions in geographic coordinate system.

Geographic	N	Ns	mDec	mInc	k	a95	K	A95	A95		ΔD_x	ΔI_x	Pole Lng	Pole Lat	Coordinates	
									Min	Max					Lat.	Long.
RC11-R	5	5	162.9	-33.04	133	6.66	246.3	4.88	6.3	29.75	5.14	7.59	333.28	-73.12	23.7	-100.9
RC11-N	3	3	354.4	46.44	40.72	19.57	26.69	24.35	7.73	41.04	27.77	29.52	208.76	83.39	23.7	-100.9
RC12-R	7	7	162.8	-40.01	399.4	3.02	601	2.46	5.51	24.07	2.67	3.4	349.44	-74.25	23.7	-100.9
RC13-R	9	9	171.3	-39.56	217.6	3.5	221.2	3.47	4.98	20.54	3.75	4.83	342.58	-81.88	23.7	-100.9
RC14-R	5	5	160.5	-42	282.6	4.56	349.3	4.1	6.3	29.75	4.5	5.45	355.14	-72.09	23.7	-100.9
RC14-N	2	2	22.62	57.54	167.7	19.41	141	21.19	9.09	52.99	27.37	19.76	306.29	65.84	23.7	-100.9
RC15-R	6	6	136.9	-52.6	82.27	7.43	46.9	9.88	5.86	26.52	11.84	10.41	13.33	-50.93	23.7	-100.9
RC15-N	2	2	356.2	29.94	8.77	98.54	11.48	82.27	9.09	52.99	NaN	133.8	116.56	81.67	23.7	-100.9
RC16-R	6	6	151.9	-59.04	49.98	9.57	29.32	12.58	5.86	26.52	16.47	11.28	31.04	-60.49	23.7	-100.9
RC16-N	1	1	348.4	30.32	0	NaN	NaN	NaN	12	82	NaN	NaN	137.06	76.83	23.7	-100.9
RC17-R	7	7	175.4	-49.35	120.9	5.51	85.3	6.57	5.51	24.07	7.61	7.47	48.74	-82.21	23.7	-100.9
RC17-N	6	6	20.56	26.61	94.73	6.92	160.3	5.31	5.86	26.52	5.47	9.02	11.61	68.47	23.7	-100.9
RC18-R	6	6	174.1	-46.14	118.3	6.18	104.2	6.59	5.86	26.52	7.44	8.04	26.92	-83.16	23.701	-100.9
RC19-R	6	7	170.5	-43.66	71.58	7.97	73.21	7.88	5.86	26.52	8.74	10.13	26.1	-74.72	23.701	-100.9
RC21-R	6	6	173.1	-42.04	511.5	2.97	672.5	2.59	5.86	26.52	2.84	3.43	356.29	-83.7	23.701	-100.9
RC22-R	5	5	163.8	-44.24	90.86	8.07	71.2	9.13	6.3	29.75	10.16	11.59	1.66	-74.83	23.701	-100.9
RC23-R	6	6	170.9	-36.66	133.1	5.83	134.9	5.79	5.86	26.52	6.18	8.48	329.79	-81.14	23.701	-100.9
RC24-R	6	6	171.2	-31.67	16.91	16.77	24.3	13.87	5.86	26.52	14.52	22	320.29	-79.43	23.701	-100.9
RC25-R	4	4	169.3	-34.87	128.1	8.15	131.4	8.04	6.89	34.24	8.52	12.14	327.36	-79.07	23.702	-100.9
RC26-R	5	6	175.8	-40.02	301.8	4.41	280.5	4.58	6.3	29.75	4.96	6.32	57.31	-79.94	23.702	-100.9

N number of demagnetized Specimens, *Ns* number of specimens that passed the Cutoff, *mDec* mean declination, *mInc* mean inclination, *k* recision parameter, *a95* radius of the 95% confidence cone about site-mean direction, *K* precision parameter of the poles, *A95* radius of 95% confidence circle around paleomagnetic pole, *A95min* and *A95max* describe the minimum and maximum values of *A95* allowed to considered the average representative. ΔD_x , uncertainty in declination; ΔI_x , uncertainty in inclination

Table ST5. Huizachal site mean directions in geographic coordinate system.

Geographic	N	Ns	mDec	mInc	k	a95	K	A95	A95		ΔD_x	ΔI_x	Pole Lng	Pole Lat	Coordinates	
									Min	Max					Lat.	Long.
HUI28	5	5	155.1	-25.99	22.97	16.31	31.9	13.75	6.3	29.75	14.17	23.55	333.94	-64.25	23.588	-99.22
HUI29	6	6	98.71	3.74	21.35	14.84	28.56	12.75	5.86	26.52	12.76	25.42	345.59	-7.23	23.589	-99.22
HUI31	5	5	147.6	-30.56	54.51	10.46	55.69	10.34	6.3	29.75	10.79	16.67	343.73	-59.13	23.589	-99.22
HUI32-5	6	7	113.2	-1.76	4.42	35.98	10.48	21.71	5.86	26.52	21.71	43.38	331.83	-18.81	23.589	-99.22
HUI35	7	7	121	20.77	8.6	21.83	13.47	17.06	5.51	24.07	17.37	30.9	326.22	-22.56	23.589	-99.22
HUI36	7	7	86.12	7.99	9.54	20.6	18.11	14.57	5.51	24.07	14.61	28.72	348.02	5.31	23.589	-99.22
HUI37	6	6	158.6	-33.73	88.31	7.17	127.3	5.96	5.86	26.52	6.29	9.16	340.85	-69.65	23.59	-99.22
HUI38	7	7	164.5	-36.34	25	12.31	24.19	12.52	5.51	24.07	13.36	18.45	341.48	-75.58	23.59	-99.22
HUI40	7	7	86.05	12.42	18.67	14.34	26.19	12.02	5.51	24.07	12.09	23.2	346.44	6.55	23.59	-99.22
HUI42	6	7	357	60.25	24.69	13.75	12.86	19.41	5.86	26.52	26.21	16.88	254.54	65.25	23.585	-99.23
HUI43	4	4	149.9	-10.66	70.77	11	138.3	7.84	6.89	34.24	7.87	15.28	323.53	-55.76	23.585	-99.23
HUI44	5	5	175.7	-29.78	46.94	11.28	52.12	10.7	6.3	29.75	11.13	17.44	291.7	-81.44	23.584	-99.23
HUI45	5	5	357.4	43.1	56.51	10.27	58.84	10.06	6.3	29.75	11.12	13.07	209.67	86.42	23.584	-99.23
HUI46	5	5	150.6	-20.98	38.28	12.52	38.71	12.45	6.3	29.75	12.68	22.51	331.42	-59.31	23.584	-99.23
HUI47	5	6	164.9	-21.39	39.98	12.25	53.36	10.57	6.3	29.75	10.77	19.03	312.25	-66.06	23.584	-99.24
HUI48	6	7	161.6	-17.57	12.27	19.91	18.96	15.79	5.86	26.52	15.99	29.42	323.85	-65.65	23.584	-99.24

N number of demagnetized Specimens, *Ns* number of specimens that passed the Cutoff, *mDec* mean declination, *mInc* mean inclination, *k* recision parameter, *a95* radius of the 95% confidence cone about site-mean direction, *K* precision parameter of the poles, *A95* radius of 95% confidence circle around paleomagnetic pole, *A95min* and *A95max* describe the minimum and maximum values of *A95* allowed to considered the average representative. ΔD_x , uncertainty in declination; ΔI_x , uncertainty in inclination