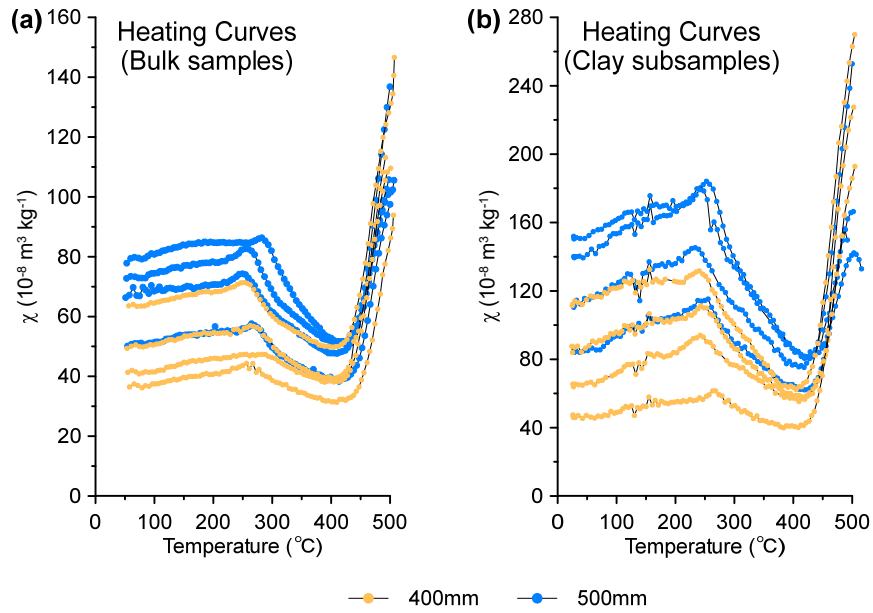
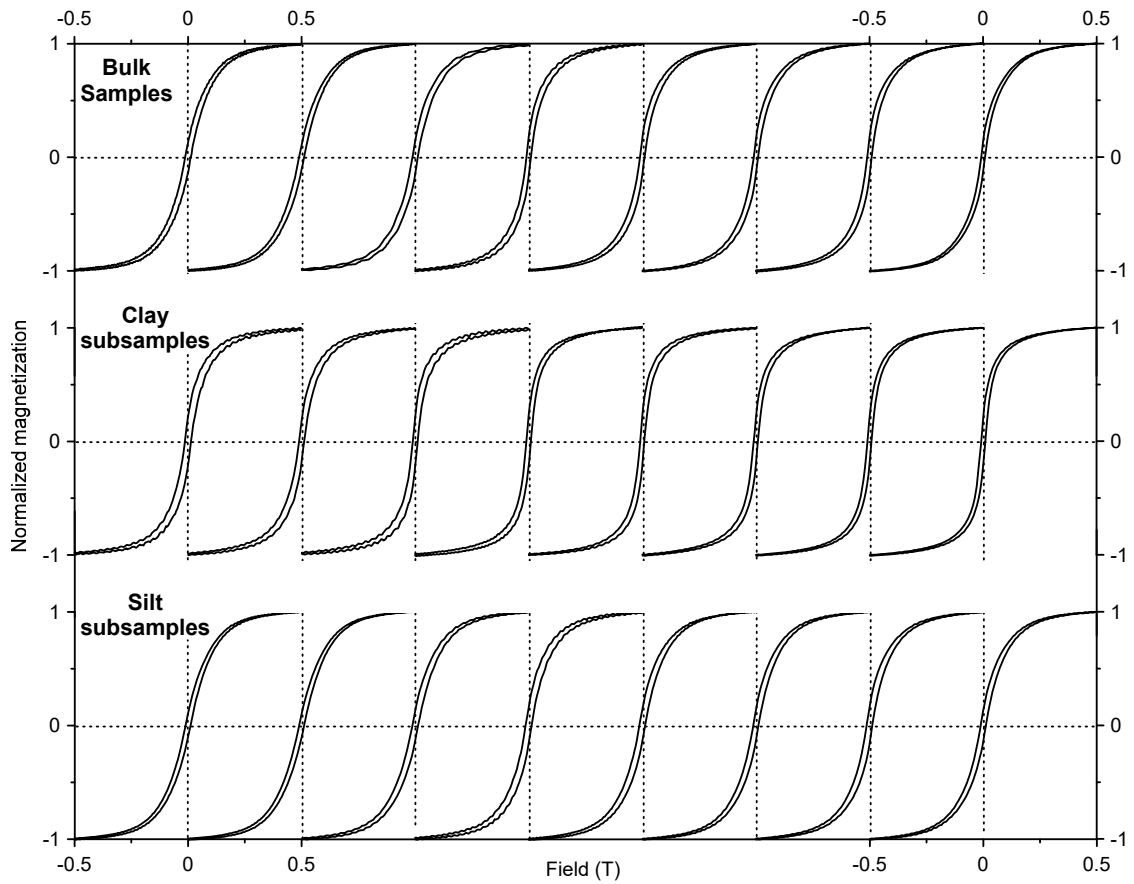


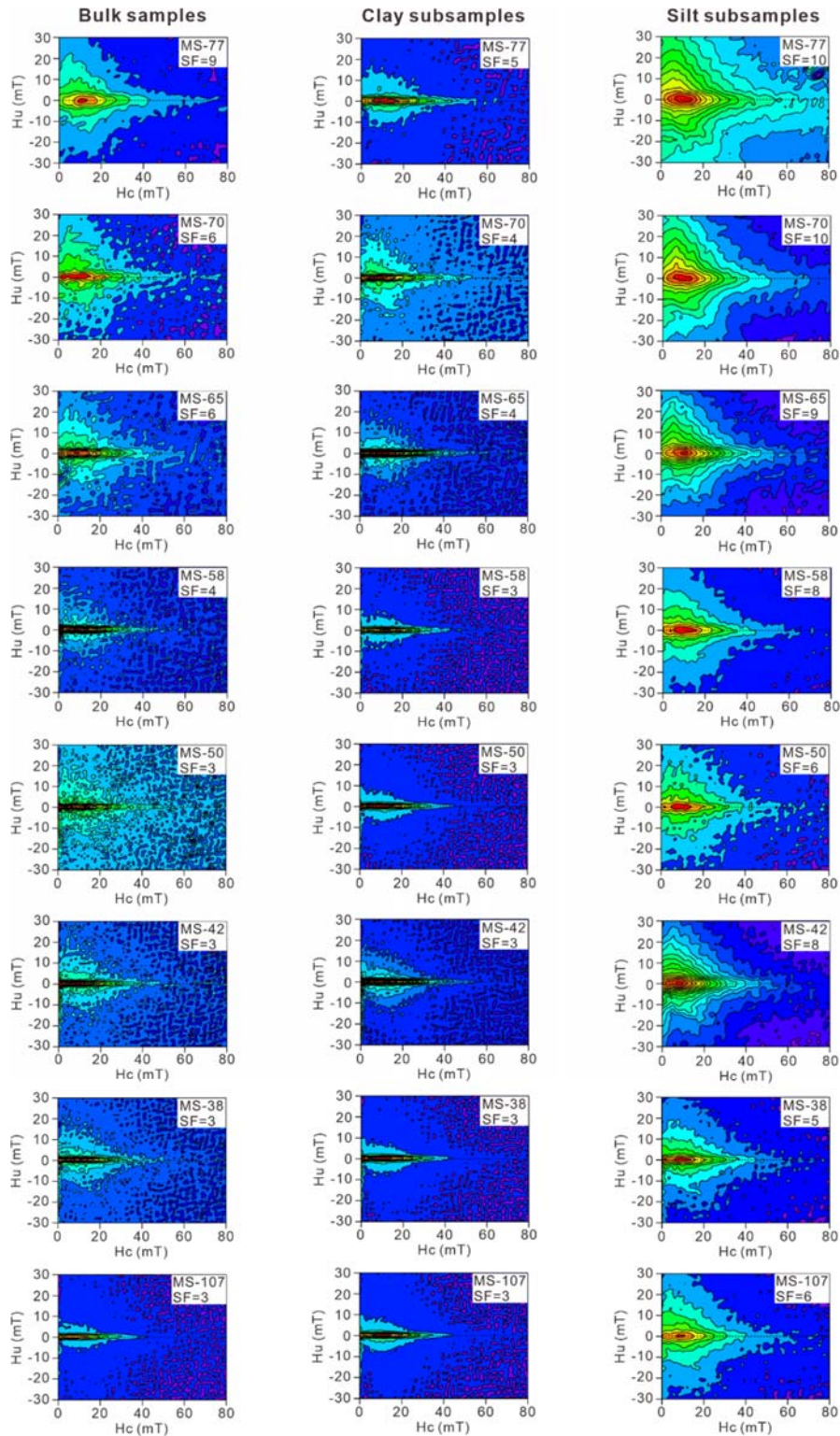
**Figure S1.** IRM acquisition curves and backfields demagnetization curves of the bulk samples (a), clay (b) and silt (c) subsamples for 8 representative modern soils collected on the MS-77 – MS-107 transect from the Chinese Loess Plateau. For each sample, the IRM has been normalized by SIRM at a field of 1T.



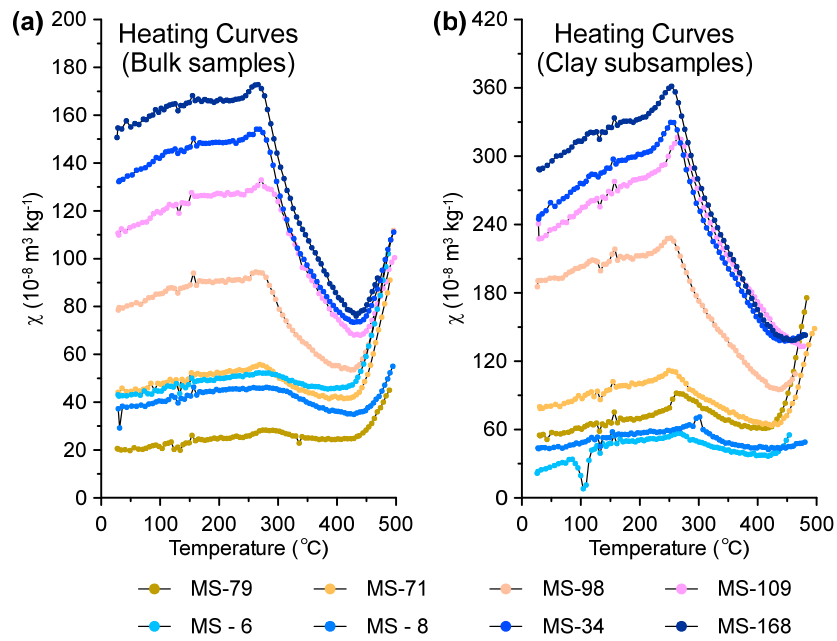
**Figure S2.** Temperature-dependence of magnetic susceptibility of the bulk samples (a) and clay subsamples (b) for 8 representative modern soils collected along two W- E transects from the Chinese Loess Plateau. All samples are heated from room temperature to 500 $^{\circ}\text{C}$  with the aim to determine the value of  $\chi_{\text{td}}$ . Open circles represent the samples from the precipitation isoline of 400 mm, solid circles represent the samples collected from the precipitation isoline of 500 mm.



**Figure S3.** Hysteresis loops corrected for paramagnetism for the bulk samples, clay and silt subsamples of 8 representative modern soils collected along the MS-77 – MS-107 transect. The left-to-right direction of the graph represents samples from north to south.



**Figure S4.** FORC diagrams for 8 representative bulk samples, clay and silt subsamples on the MS-77 – MS-107 transect. In all FORC diagrams, 180 FORCs were measured, averaging time is 0.5 s, and field step is 0.8 mT. For comparison, the same scales of  $H_u$ -axis and  $H_c$ -axis are used for all diagrams.



**Figure S5.** Temperature-dependence of magnetic susceptibility of the bulk samples (a) and clay subsamples (b) for 8 representative modern soils collected along two N-S transects from the Chinese Loess Plateau. All samples are heated from room temperature to 500 $^{\circ}\text{C}$  with the aim to determine the value of  $\chi_{\text{td}}$ .

**Table S1.** Original locations, mean annual precipitation values and magnetic parameters for all the 24 bulk samples and clay subsamples analysis in the present study, which is used for Figures 1, 2, 9, 10.

Samples	Locations		MAP (mm)	$\chi_r$	$\chi_{fd}$	$\chi_{ARM}$ ( $10^{-8}$ m <sup>3</sup> /kg)	Soft <sub>40mT</sub> ( $10^{-3}$ Am <sup>2</sup> /kg)	$\chi_{fd}$ ( $10^{-8}$ m <sup>3</sup> /kg)
				$(10^{-8}$ m <sup>3</sup> /kg)				
<b>Bulk samples</b>								
MS-77	108.01 N	38.11 E	278.63	20.57	0.52	0.51	1.30	4.27
MS-70	108.02 N	37.32 E	349.78	39.82	1.15	0.76	2.19	7.56
MS-65	108.55 N	36.64 E	458.10	43.73	2.35	1.31	2.56	21.13
MS-58	108.36 N	36.09 E	471.13	60.18	5.46	2.65	3.18	35.76
MS-50	108.64 N	35.64 E	563.31	77.76	6.33	2.81	4.16	41.33
MS-42	108.52 N	35.29 E	560.90	97.90	7.74	3.38	5.24	54.67
MS-38	109.03 N	35.09 E	568.65	118.32	10.56	4.66	6.43	80.69
MS-107	109.65 N	34.39 E	601.10	162.38	14.20	6.02	7.25	96.91
MS-5	105.16 N	35.57 E	397.85	50.97	2.63	1.28	2.55	17.80
MS-12	106.56 N	36.29 E	405.99	60.09	3.51	1.60	3.00	21.57
MS-90	107.26 N	36.66 E	404.46	38.16	0.96	0.76	2.15	9.27
MS-78	110.00 N	38.27 E	405.37	37.95	1.96	1.24	2.34	13.03
MS-89	106.86 N	35.54 E	498.48	72.76	5.12	2.28	3.78	34.67
MS-60	108.83 N	36.13 E	510.75	68.73	4.54	2.11	3.86	31.67
MS-66	109.86 N	36.69 E	499.00	47.46	2.47	1.50	2.85	19.27
MS-53	108.08 N	35.78 E	489.83	61.11	4.05	1.85	3.14	25.70
MS-6	105.21 N	37.33 E	182.82	43.82	1.17	0.80	2.37	6.77
MS-8	105.75 N	35.56 E	413.79	39.97	1.76	1.05	2.19	11.32
MS-34	106.91 N	34.77 E	569.02	131.28	11.92	5.11	6.64	80.77
MS-168	107.74 N	34.41 E	614.79	150.65	15.40	6.15	6.96	96.76
MS-79	109.34 N	38.72 E	364.02	24.39	0.64	0.60	1.43	3.97
MS-71	110.22 N	37.33 E	450.18	44.84	2.28	1.30	2.74	14.27
MS-98	110.23 N	36.18 E	508.06	82.24	6.34	2.91	4.39	40.97
MS-109	110.78 N	34.54 E	559.81	113.36	10.64	4.50	5.84	64.88
<b>Clay subsamples</b>								
MS-77	108.01 N	38.11 E	278.63	58.54	4.88	2.97	4.08	17.73
MS-70	108.02 N	37.32 E	349.78	75.00	5.00	3.27	4.80	25.51
MS-65	108.55 N	36.64 E	458.10	76.49	6.37	4.16	4.29	41.30
MS-58	108.36 N	36.09 E	471.13	102.38	9.13	6.33	6.57	71.74
MS-50	108.64 N	35.64 E	563.31	139.29	13.49	7.78	8.08	94.84
MS-42	108.52 N	35.29 E	560.90	178.17	16.67	9.34	10.43	126.97
MS-38	109.03 N	35.09 E	568.65	225.40	22.22	11.89	12.92	168.63
MS-107	109.65 N	34.39 E	601.10	251.60	23.20	15.50	17.91	192.06
MS-5	105.16 N	35.57 E	397.85	86.96	7.51	3.90	4.87	53.36
MS-12	106.56 N	36.29 E	405.99	114.17	11.02	4.92	5.48	69.43
MS-90	107.26 N	36.66 E	404.46	48.81	2.78	2.24	2.72	21.42
MS-78	110.00 N	38.27 E	405.37	67.73	4.78	4.25	4.37	37.69
MS-89	106.86 N	35.54 E	498.48	144.22	13.15	6.66	7.52	103.04
MS-60	108.83 N	36.13 E	510.75	145.20	14.40	7.87	8.08	99.74
MS-66	109.86 N	36.69 E	499.00	85.20	6.80	4.97	5.13	53.14
MS-53	108.08 N	35.78 E	489.83	110.44	9.64	5.72	6.28	70.00
MS-6	105.21 N	37.33 E	182.82	50.80	3.60	2.34	2.76	19.27
MS-8	105.75 N	35.56 E	413.79	49.00	3.61	2.04	2.92	28.68
MS-34	106.91 N	34.77 E	569.02	238.40	20.80	13.03	15.22	191.89
MS-168	107.74 N	34.41 E	614.79	274.21	27.38	15.35	15.24	223.21
MS-79	109.34 N	38.72 E	364.02	58.42	3.96	3.38	4.02	30.92
MS-71	110.22 N	37.33 E	450.18	86.40	6.40	3.96	5.47	48.29
MS-98	110.23 N	36.18 E	508.06	185.66	18.33	9.67	9.63	133.05
MS-109	110.78 N	34.54 E	559.81	215.60	17.20	11.97	15.39	164.32