The role of parent lithology in nanoscale clay-mineral transformations in a subtropical monsoonal climate

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Table S1. Summary of geographical background and major features of the four study soils

Soil	Soil Taxonomy[a]	Location	Elevation (masl)	Vegetation[b]	Parent material
Gejiabei (GJB)	Purple soil (Inceptisols)	30°55'23"N, 110°42'25"E	430	*Vitex negundo, Platycarya strobilacea*	Purple siltstone sandwiched within green siltstone
Zhongbazi (ZBZ)	Yellowish-brown soil (Alfisols)	30°51'45"N, 110°54'55"E	460	*Vitex negundo, Forsythia suspensa*	Hornblende-plagioclase gneiss
Jiuqunao (JQN)	Yellowish-brown soil (Alfisols)	30°53'2"N, 110°53'1"E	480	*Vitex negundo, Quercus variabilis, Platycarya strobilacea*	Feldspathic quartz sandstone
Taishangping (TSP)	Calcareous soil (Inceptisols)	30°53'8"N, 110°50'10"E	500	*Vitex negundo, Quercus variabilis, Platycarya strobilacea*	Dolostone

a: Soils classified according to Chinese soil taxonomy (Shi et al., 2004) and USDA soil taxonomy (Soil Survey Staff, 2014).

b: Vegetation data was sourced from National Earth System Science Data Center - National Science & Technology Infrastructure of China, 2000

Table S2. Physical and chemical characterization of the investigated soils

Soil horizon	Depth (m)	Munsell color	Texture	Structure	pH	Eh (mV)	Lithology and mineral composition of parent rock
GJB soil							
A	0-0.15	5P 3/2	Silt loam	Granular	6.3	290	Siltstone—plagioclase, quartz, chlorite, and biotite
B	0.15-0.30	5P 4/2	Silt loam	Granular	6.4	266	
C	>0.30	5P 6/2	Silt	Platy	6.8	108	
Parent							
ZBZ soil							
O	0-0.10	2.5YR 1/2	Loam	Crumb	6.4	275	
A	0.10-0.20	2.5YR 4/4	Silt loam	Granular	6.5	224	Gneiss—hornblende, plagioclase, biotite, and quartz
B	0.20-0.65	2.5YR 6/2	Silt loam	Granular	6.5	203	
C	>0.65	2.5YR 7/2	Loam	Subangular blocky	6.9	211	
Parent							
JQN soil							
A	0-0.20	10YR 2/4	Loam	Granular	6.1	332	Sandstone—plagioclase, quartz, biotite, and chlorite
B	0.20-0.50	10YR 5/4	Silt loam	Granular	6.3	308	
C	>0.50	10YR 6/4	Sandy loam	Platy	6.4	270	
Parent							
TSP soil							
A	0-0.10	10YR4/2	Silt loam	Granular	7.1	194	Dolostone—dolomite and calcite
B	0.10-0.25	10YR6/8	Silty clay loam	Granular	7.2	115	
Parent							

Table S3. Chemical compositions of soils, parent rocks, and a representative QRS sample, including major elements (wt%), trace elements (ppm), and REEs (ppm)

	GTB		ZBZ		JQN		TSP		QRS[b]
	Soil	Parent[a]	Soil	Parent	Soil	Parent	Soil	Parent	
SiO_2	61.25	57.60	62.37	48.61	72.40	62.97	63.97	7.04	70.09
Al_2O_3	17.59	14.10	16.48	15.52	13.04	16.40	12.71	1.28	14.11
TiO_2	0.84	0.76	0.55	1.33	0.39	0.69	0.70	0.07	0.98
Fe_2O_3	7.57	9.13	5.65	13.88	5.06	6.26	5.39	1.50	5.51
MnO	0.06	0.09	0.10	0.16	0.12	0.04	0.07	0.11	0.05
MgO	2.10	2.60	2.49	7.53	1.43	1.26	2.56	17.80	1.07
CaO	0.83	1.12	5.32	10.18	0.86	0.78	2.54	27.00	0.19
Na_2O	1.60	3.01	3.31	0.78	4.09	3.00	0.51	0.19	0.39
K_2O	3.42	2.60	0.43	0.67	0.51	3.44	2.57	0.66	2.11
P_2O_5	0.15	0.04	0.13	0.18	0.08	0.07	0.13	0.07	0.06
LOI	4.33	-	3.07	-	2.47	4.51	8.81	43.03	5.14
Sum	99.74	-	99.90	-	100.45	-	99.96	-	-
Be	2.3	1.8	0.9	2.8	0.6	-	2.1	0.9	-
Sc	14.9	9.8	21.4	41.3	16.7	-	11.8	5.0	13.2
V	101.8	85.1	148.1	285.0	35.4	10.8	92.0	278.0	105.4
Cr	95.8	76.9	44.1	204.0	5.8	18.2	84.8	15.5	82.0
Co	16.4		21.0	54.6	6.9	2.4	14.5	3.0	14.6
Ni	50.7	24.1	29.6	125.0	4.0		42.4	28.2	39.0
Cu	34.7	12.7	26.5	-	18.5	6.0	31.9	12.6	27.1
Zn	96.7	61.3	68.0	131.0	65.6	21.0	78.3	46.5	71.0
Ga	21.9	15.9	18.4	23.7	13.7	5.3	17.1	2.3	18.2
Rb	127.1	40.0	29.0	-	12.1	47.9	94.0	13.1	114.3
Sr	117.1	299.0	359.5	-	60.3	85.7	70.8	93.7	60.7
Y	27.9	20.1	16.6	23.3	34.0	7.2	27.1	15.2	30.5
Zr	199.9	244.0	123.4	78.5	72.0	111.0	237.7	13.5	298.1
Nb	14.6	10.7	6.4	6.3	1.4	4.0	14.2	1.4	20.8
Cs	7.5	1.0	1.7	2.7	0.8	0.8	7.5	0.6	8.7
Ba	611.6	584.0	259.3	139.0	136.9	938.0	376.1	201.0	479.4
Hf	5.3	6.3	3.1	2.2	2.1	2.8	6.3	0.4	8.1
Ta	1.0	0.9	1.7	0.5	0.1	0.3	1.1	0.1	1.6
Pb	29.4	17.9	7.6	9.5	2.7	9.2	28.3	9.8	23.6
Th	13.4	11.8	4.4	0.2	1.3	3.1	15.7	1.9	16.1
U	2.3	1.9	0.8	1.2	0.5	0.5	3.7	7.9	3.9
La	38.9	43.5	23.5	9.9	6.6	12.5	42.8	12.8	40.6
Ce	80.2	83.1	34.9	22.9	16.6	22.4	89.2	19.6	84.2
Pr	8.9	9.7	4.2	3.1	2.3	2.6	10.1	2.4	8.6
Nd	33.9	33.8	17.1	16.0	11.0	9.4	36.1	8.6	31.5
Sm	6.6	6.1	3.3	4.7	3.4	1.7	6.6	1.7	5.7
Eu	1.4	1.3	1.1	1.3	0.9	0.6	1.2	0.4	1.1

Gd	5.7	6.2	2.8	4.6	4.6	1.3	5.6	1.8	4.9
Tb	0.9	0.7	0.4	0.7	0.8	0.2	0.8	0.3	0.8
Dy	5.3	4.0	2.6	4.3	5.6	1.1	5.0	2.0	4.9
Ho	1.0	0.8	0.5	0.8	1.2	0.2	1.0	0.5	1.0
Er	3.0	2.3	1.5	2.0	3.7	0.6	2.7	1.3	2.9
Tm	0.4	0.4	0.3	0.3	0.6	0.1	0.4	0.2	0.4
Yb	2.9	2.1	1.5	2.1	3.9	0.7	2.8	1.4	3.0
Lu	0.4	0.3	0.2	0.4	0.6	0.1	0.4	0.2	0.4
REE	189.6	194.2	93.9	73.0	61.7	53.4	204.8	53.0	190.0
LREE/HREE	8.65	10.59	8.51	3.83	1.95	11.45	9.92	5.98	9.31
Ce/Ce*	0.98	0.92	0.80	0.94	0.97	0.89	0.98	0.81	1.03
Eu/Eu*	1.11	0.95	1.68	1.27	1.11	1.83	0.94	0.96	0.99

a: Geochemical data for parent rocks from Wang et al. (2008), Yan et al. (2006), Feng et al. (2006), and Zhang et al. (2016) for GJB, ZBZ, JQN, and TSP, respectively.
b: Geochemical data for nearby Quaternary red soils (QRS).

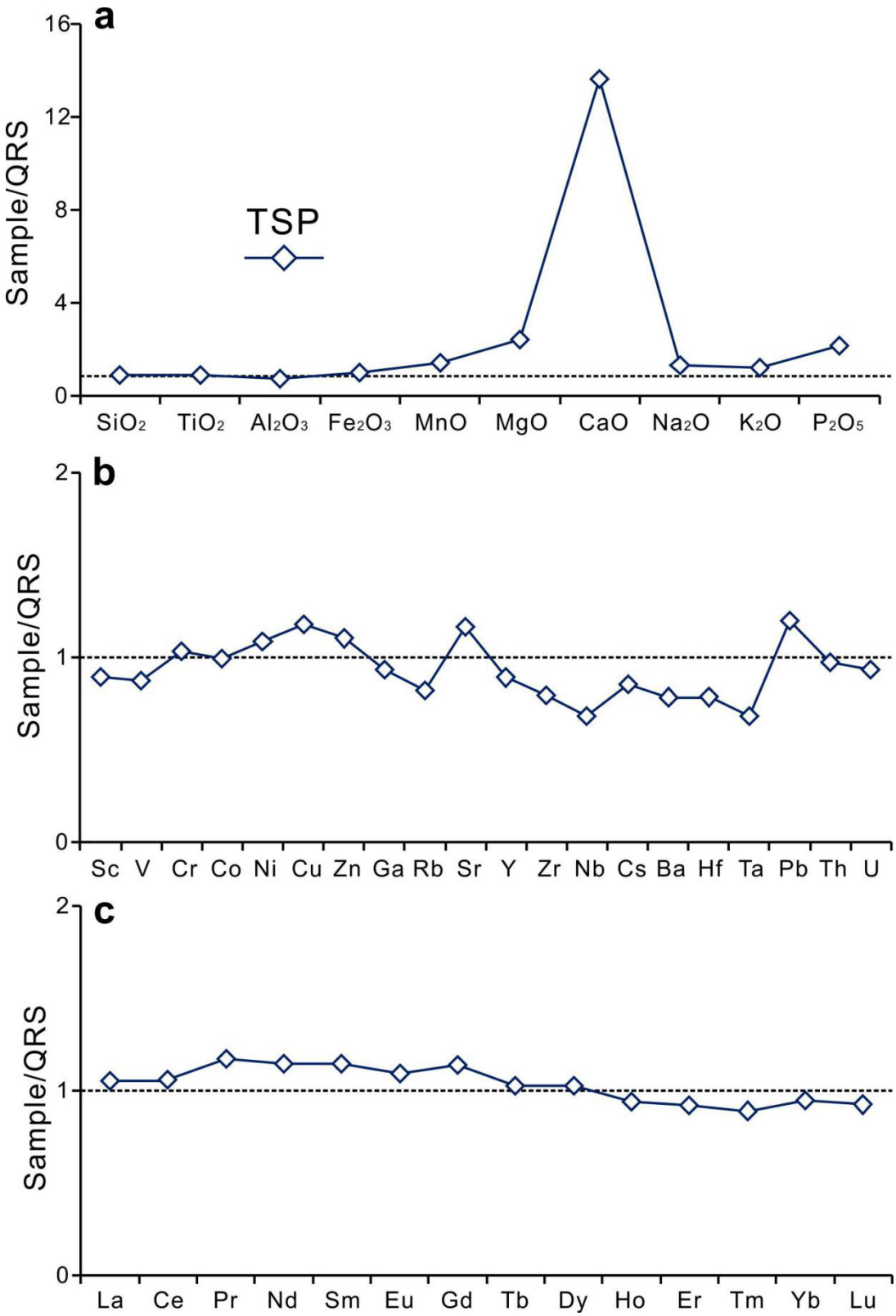

Fig. S1. Soil major element, trace element and REE concentrations normalized to a nearby Quaternary red soil.