

Supplementary Table 1. Descriptive statistics of rare earth elements from the Piauí region.

Variable	Mean	Minimum	Median	Maximum	Asymmetry	Kurtosis
	mg kg ⁻¹					
⁵⁷ La	23.19	0.65	9.90	227.40	2.76	8.92
⁵⁸ Ce	48.10	1.13	24.38	377.10	2.42	6.58
⁵⁹ Pr	6.17	0.00	2.78	46.10	2.26	5.24
⁶⁰ Nd	19.09	0.05	8.28	155.00	2.51	6.79
⁶² Sm	3.64	0.10	1.60	33.00	2.65	8.11
⁶³ Eu	0.68	0.00	0.25	5.80	2.72	7.91
⁶⁴ Gd	1.81	0.00	0.50	29.15	3.91	20.25
⁶⁵ Tb	0.49	0.00	0.20	5.10	2.75	9.22
⁶⁶ Dy	2.97	0.00	0.90	51.30	4.09	23.10
⁶⁸ Er	1.07	0.00	0.35	14.35	3.52	14.54
⁷⁰ Yb	0.87	0.00	0.30	11.00	3.61	14.67
⁷¹ Lu	0.25	0.00	0.10	2.35	2.58	7.61
ΣLREEs	100.88	1.93	47.18	844.40	15.31	43.55
ΣHREEs	7.46	0.00	2.35	113.25	20.46	89.39
ΣREEs	108.34	1.93	49.53	957.65	35.77	132.94

Supplementary Table 2. Descriptive statistics of rare earth elements from the Southwest region.

Variable	Mean	Minimum	Median	Maximum	Asymmetry	Kurtosis
	mg kg ⁻¹					
⁵⁷ La	7.34	0.65	3.20	87.45	4.52	23.56
⁵⁸ Ce	17.51	1.13	8.85	165.78	3.68	15.57
⁵⁹ Pr	3.27	0.00	1.43	34.10	3.85	17.05
⁶⁰ Nd	7.36	0.48	3.53	72.45	3.61	16.39
⁶² Sm	1.63	0.10	0.78	13.25	2.91	10.73
⁶³ Eu	0.27	0.00	0.15	1.30	1.98	3.73
⁶⁴ Gd	0.98	0.00	0.40	7.20	2.33	5.69
⁶⁵ Tb	0.31	0.00	0.20	1.58	1.80	3.13
⁶⁶ Dy	0.60	0.00	0.20	4.25	2.10	4.23
⁶⁸ Er	0.41	0.00	0.20	2.33	2.05	4.21
⁷⁰ Yb	0.39	0.05	0.25	2.25	2.09	5.32
⁷¹ Lu	0.25	0.00	0.20	1.15	1.81	4.03
ΣLREEs	37.38	2.35	17.93	374.33	20.55	87.03
ΣHREEs	2.95	0.05	1.45	18.75	12.18	26.61
ΣREEs	40.33	2.40	19.38	393.08	32.73	113.65

Supplementary Table 3. Descriptive statistics of rare earth elements from the Southeast region.

Variable	Mean	Minimum	Median	Maximum	Asymmetry	Kurtosis
	mg kg ⁻¹					
⁵⁷ La	58.70	2.95	44.65	227.40	1.19	0.98
⁵⁸ Ce	113.85	7.65	98.10	377.10	1.03	0.52
⁵⁹ Pr	13.63	0.60	11.80	46.10	0.98	0.26
⁶⁰ Nd	47.16	0.05	40.00	155.00	0.95	0.12
⁶² Sm	8.74	0.30	6.75	33.00	1.16	0.88
⁶³ Eu	1.71	0.00	1.35	5.80	1.10	0.61
⁶⁴ Gd	4.69	0.00	2.60	29.15	2.06	5.21
⁶⁵ Tb	1.03	0.00	0.70	5.10	1.50	2.43
⁶⁶ Dy	8.03	0.30	5.65	51.30	2.49	8.44
⁶⁸ Er	2.69	0.20	1.95	14.35	1.93	4.03
⁷⁰ Yb	2.14	0.10	1.50	11.00	1.91	3.46
⁷¹ Lu	0.38	0.00	0.20	1.90	1.70	2.17
ΣLREEs	243.79	11.55	202.65	844.40	6.40	3.37
ΣHREEs	18.96	0.60	12.60	112.80	11.58	25.73
ΣREEs	262.75	12.15	215.25	957.20	17.97	29.10

Supplementary Table 4. Descriptive statistics of rare earth elements from the North region.

Variable	Mean	Minimum	Median	Maximum	Asymmetry	Kurtosis
	mg kg ⁻¹					
⁵⁷ La	19.15	0.83	13.70	96.10	2.06	4.88
⁵⁸ Ce	42.05	1.40	29.30	220.55	2.04	4.75
⁵⁹ Pr	4.83	0.10	3.00	25.70	2.11	4.58
⁶⁰ Nd	14.97	0.43	10.05	84.15	2.17	5.01
⁶² Sm	2.76	0.23	1.68	17.45	2.38	5.96
⁶³ Eu	0.49	0.00	0.25	4.45	3.18	10.86
⁶⁴ Gd	0.95	0.00	0.30	12.00	4.25	20.04
⁶⁵ Tb	0.34	0.00	0.10	3.40	2.89	8.57
⁶⁶ Dy	2.53	0.05	1.10	23.60	3.19	10.46
⁶⁸ Er	0.82	0.00	0.30	9.05	3.63	13.42
⁷⁰ Yb	0.61	0.00	0.18	8.00	3.91	15.81
⁷¹ Lu	0.18	0.00	0.00	2.35	3.17	10.44
ΣLREEs	84.24	2.98	57.98	448.40	13.94	36.04
ΣHREEs	5.44	0.05	1.98	58.40	21.04	78.75
ΣREEs	89.68	3.03	59.95	506.80	34.98	114.79