Supplementary Materials: REEs in the North Africa P-Bearing Deposits, Paleoenvironments, and Economic Perspectives: A Review

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Table S1. Rare earth elements composition of all the Northern Africa phosphorite deposits studied in this paper. Supplementary material including the ages of each deposit/sample, values of the Ce and Eu anomalies and of $(La/Yb)_{ch}$ and $(Gd/Yb)_{ch}$ ratios.

Locality/Deposit	Age	Samples	Ce/Ce*	Eu/Eu*	$(La/Yb)_{ch}$	$(Gd/Yb)_{ch}$
TUNISIA[1]						
	Paleocene/Eocene	SRO1	0.53	0.74	7.41	1.54
	Paleocene/Eocene	SRO2	0.36	0.69	6.09	1.33
	Paleocene/Eocene	SRO3	0.58	0.70	7.52	1.65
	Paleocene/Eocene	SRO4	0.53	0.74	7.32	1.56
	Paleocene/Eocene	SRO5	0.72	0.71	8.18	1.90
	Paleocene/Eocene	SRO6	0.59	0.71	7.70	1.69
	Paleocene/Eocene	SRO7	0.42	0.71	6.32	1.30
	Paleocene/Eocene	SRO8	0.32	0.68	6.34	1.34
	Paleocene/Eocene	SRO9	0.33	0.67	6.27	1.21
	Paleocene/Eocene	P-SR1	0.31	0.71	6.09	1.29
	Paleocene/Eocene	P-SR2	0.55	0.69	7.80	1.71
	Paleocene/Eocene	P-SR3	0.41	0.68	7.59	1.48
Sra Ouertana	Paleocene/Eocene	P-SR4	0.29	0.63	5.17	1.17
	Paleocene/Eocene	P-SR5	0.32	0.70	5.94	1.17
	Paleocene/Eocene	CC-SR1	0.24	0.70	5.43	0.93
	Paleocene/Eocene	CR-SR1	0.24	0.72	5.50	1.08
	Paleocene/Eocene	CC-SR2	0.51	0.72	8.27	1.36
	Paleocene/Eocene	CR-SR2	0.52	0.62	6.84	1.34
	Paleocene/Eocene	CC-SR3	0.31	0.78	6.22	0.83
	Paleocene/Eocene	CR-SR3	0.31	0.74	5.58	0.85
	Paleocene/Eocene	CC-SR4	0.23	0.60	5.10	1.12
	Paleocene/Eocene	CR-SR4	0.23	0.57	4.51	1.08
	Paleocene/Eocene	CC-SR5	0.37	0.56	5.78	1.06
	Paleocene/Eocene	CR-SR5	0.33	0.61	6.30	1.03
	Paleocene/Eocene	SEK1	0.55	0.68	7.87	1.89
Sekarna	Paleocene/Eocene	SEK3	0.57	0.69	7.81	2.01
	Paleocene/Eocene	SEK4	0.52	0.69	8.18	1.83
	Paleocene/Eocene	JBS4	0.70	0.72	8.40	1.72
	Paleocene/Eocene	JBS5	0.69	0.70	9.10	1.82
	Paleocene/Eocene	JBS10	0.74	0.72	9.46	1.89
	Paleocene/Eocene	JBS7	0.75	0.73	9.12	1.89
	Paleocene/Eocene	JBS14	0.78	0.71	9.70	2.05
	Paleocene/Eocene	JBS18	0.78	0.71	9.47	1.96
	Paleocene/Eocene	JBS19	0.80	0.72	10.47	2.13
	Paleocene/Eocene	P-JBS1	0.75	0.73	10.62	1.67
	Paleocene/Eocene	P-JBS2	0.65	0.72	8.11	1.52
Jebel Jebs	Paleocene/Eocene	P-JBS3	0.74	0.78	8.57	1.51
	Paleocene/Eocene	P-JBS4	0.64	0.66	8.47	1.50
	Paleocene/Eocene	P-JBS5	0.72	0.71	8.33	1.80
	Paleocene/Eocene	CC-JBS1	0.73	0.59	9.42	1.67
	Paleocene/Eocene	CR-JBS1	0.72	0.59	10.17	1.97
	Paleocene/Eocene	CC-JBS2	0.56	0.62	8.31	1.28
	Paleocene/Eocene	CR-JBS2	0.67	0.66	10.08	1.75
	Paleocene/Eocene	CC-JBS4	0.73	0.62	10.16	1.85
	Paleocene/Eocene	CR-JBS4	0.73	0.68	10.17	1.94
	Paleocene/Eocene	CC-JBS5	0.69	0.74	11.73	1.51
	Paleocene/Eocene	CR-JBS5	0.64	0.70	7.99	1.41
Naguess	Paleocene/Eocene	NAGI	0.81	0.68	8.24	1.70
	Paleocene/Eocene	NAGIIa	0.72	0.68	7.31	1.48

	Paleocene/Eocene	NAGIIb	0.68	0.68	7.11	1.47
	Paleocene/Eocene	NAGIII	0.77	0.69	7.51	1.61
	Paleocene/Eocene	NAGIV	0.74	0.68	7.43	1.44
	Paleocene/Eocene	NAGV	0.61	0.65	6.89	1.22
	Paleocene/Eocene	NAGVI	0.72	0.67	7.06	1.38
	Paleocene/Eocene	NAGVII	0.68	0.67	5.91	1.21
Central Kef Eddour	Paleocene/Eocene	KECI	0.77	0.69	7.93	1.61
	Paleocene/Eocene	KECII	0.75	0.70	7.47	1.53
	Paleocene/Eocene	KECIII	0.81	0.69	8.10	1.62
	Paleocene/Eocene	KECIV	0.75	0.69	8.07	1.46
	Paleocene/Eocene	KECV	0.71	0.68	6.94	1.34
	Paleocene/Eocene	KECVI	0.75	0.69	6.92	1.45
	Paleocene/Eocene	KECVII	0.68	0.68	5.97	1.05
	Paleocene/Eocene	KECVIII	0.62	0.69	5.86	1.05
Table Metlaoui	Paleocene/Eocene	TMI	0.82	0.69	8.57	1.78
	Paleocene/Eocene	TMII	0.73	0.70	7.79	1.55
	Paleocene/Eocene	TMIII	0.81	0.70	8.17	1.65
	Paleocene/Eocene	TMIV	0.75	0.68	8.19	1.48
	Paleocene/Eocene	TMV	0.68	0.67	7.07	1.33
	Paleocene/Eocene	TMVI	0.76	0.68	7.19	1.53
	Paleocene/Eocene	TMVIIa	0.60	0.67	6.00	1.01
	Paleocene/Eocene	TMVIII	0.64	0.69	5.99	1.07
Mzinda	Paleocene/Eocene	MZ0	0.86	0.74	10.36	1.88
	Paleocene/Eocene	MZI>	0.81	0.71	9.76	1.83
	Paleocene/Eocene	MZI<	0.79	0.70	9.09	1.68
	Paleocene/Eocene	MZH1	0.80	0.70	9.32	1.67
	Paleocene/Eocene	MZH2	0.77	0.68	8.99	1.56
	Paleocene/Eocene	MZII>	0.77	0.69	8.54	1.59
	Paleocene/Eocene	MZII<	0.68	0.67	6.72	1.23
	Paleocene/Eocene	MZIII	0.65	0.69	6.95	1.16
Jellabia	Paleocene/Eocene	JLA0	0.86	0.72	10.18	1.98
	Paleocene/Eocene	JLAI	0.78	0.70	8.83	1.68
	Paleocene/Eocene	JLAH1	0.83	0.70	9.80	1.70
	Paleocene/Eocene	JLAH2	0.79	0.70	9.50	1.70
	Paleocene/Eocene	JLAII>	0.78	0.69	8.66	1.60
	Paleocene/Eocene	JLII<	0.70	0.68	7.09	1.27
	Paleocene/Eocene	JLAIII	0.67	0.69	7.28	1.22
Gafsa Metlaoui	Paleocene/Eocene	P-MZ2 SUP	0.76	0.63	8.97	1.57
	Paleocene/Eocene	P-MZ2 INF	0.66	0.59	6.86	1.05
	Paleocene/Eocene	P-KEC3	0.73	0.68	7.73	1.20
	Paleocene/Eocene	P-NAG4	0.82	0.73	9.04	1.47
	Paleocene/Eocene	P-NAG5	0.57	0.73	7.98	1.18
	Paleocene/Eocene	P-MZ3	0.71	0.64	7.89	1.51
	Paleocene/Eocene	CC-KEC3	0.57	0.74	7.90	1.01
	Paleocene/Eocene	CR-KEC3	0.56	0.67	7.41	1.15
	Paleocene/Eocene	CC-NAG5	0.66	0.76	6.80	0.85
	Paleocene/Eocene	CR-NAG5	0.62	0.55	8.42	1.26
	Paleocene/Eocene	CC-MZ3	0.54	0.76	7.73	0.92
	Paleocene/Eocene	CR-MZ3	0.70	0.75	7.38	1.15
	Paleocene/Eocene	P-ME1 (1)	0.77	0.61	9.66	1.71
	Paleocene/Eocene	P-ME1 (2)	0.97	0.61	13.35	2.20
	Paleocene/Eocene	P-ME2 (1)	0.57	0.52	5.62	0.82
	Paleocene/Eocene	P-ME2 (2)	0.68	0.63	6.99	1.59
	Paleocene/Eocene	P-ME3 (1)	0.56	0.73	6.39	0.74
	Paleocene/Eocene	P-ME3 (2)	0.64	0.63	6.96	1.48
	Paleocene/Eocene	C-ME1 (1)	0.74	0.70	8.58	1.37
	Paleocene/Eocene	C-ME1 (2)	0.81	0.69	8.76	2.11
	Paleocene/Eocene	C-ME2 (1)	0.66	0.76	6.79	0.85
	Paleocene/Eocene	C-ME2 (2)	0.70	0.69	7.63	1.58
	Paleocene/Eocene	C-ME3 (1)	0.62	0.54	8.38	1.25
	Paleocene/Eocene	C-ME3 (2)	0.72	0.66	7.87	1.61
Alima Mount	Paleocene/Eocene	ZT-2c	0.76	0.79	8.54	1.63
	Paleocene/Eocene	ZT-2s	0.78	0.69	8.20	1.31
	Paleocene/Eocene	ZT-3c	0.85	0.76	9.80	1.82
	Paleocene/Eocene	ZT-4s	0.76	0.74	7.61	1.30
	Paleocene/Eocene	ZT-6s	0.83	0.86	8.05	1.32

Chouabine Formation	Paleocene/Eocene	ZT-7c	0.88	0.78	7.85	1.41
	Paleocene/Eocene	ZT-10c	0.78	0.79	7.08	1.38
	Paleocene/Eocene	ZT-11c	0.71	0.70	6.70	1.08
	Paleocene/Eocene	CAC-4s	0.71	0.71	9.66	1.25
	Paleocene/Eocene	CAC-5s	0.78	0.64	7.88	1.18
	Paleocene/Eocene	CAC-6 s	0.88	0.81	8.75	1.33
	Paleocene/Eocene	CAC-7c	0.88	0.65	8.73	1.42
	Paleocene/Eocene	CAC-8As	0.84	0.75	11.62	1.25
	Paleocene/Eocene	CAC-9c	0.76	0.71	9.52	1.16
	Paleocene/Eocene	CAC-13 s	0.82	0.89	13.63	1.48
ALGERIA[2]						
Djebel El Kouif	Paleocene/Eocene	K_1	0.55	0.71	7.82	1.59
	Paleocene/Eocene	K_2	0.56	0.71	7.82	1.62
	Paleocene/Eocene	K_3	0.52	0.71	7.46	1.53
	Paleocene/Eocene	K_4	0.48	0.70	7.50	1.50
	Paleocene/Eocene	K_5*	0.42	0.72	6.50	1.19
	Paleocene/Eocene	K_6	0.27	0.68	6.34	1.20
	Paleocene/Eocene	K_7	0.26	0.69	6.29	1.30
	Paleocene/Eocene	K_8	0.30	0.66	6.13	1.14
	Paleocene/Eocene	K_9	0.28	0.65	7.27	1.32
	Paleocene/Eocene	K_10a	0.26	0.69	5.62	1.11
	Paleocene/Eocene	ra_20	0.56	0.67	9.77	1.84
	Paleocene/Eocene	ra_21	0.55	0.64	9.48	1.81
	Paleocene/Eocene	ra_14	0.64	0.68	9.23	1.83
	Paleocene/Eocene	rc_5	0.57	0.72	11.26	1.94
	Paleocene/Eocene	rc_16	0.70	0.69	9.40	2.32
	Paleocene/Eocene	rc_26	0.70	0.69	10.92	2.54
Djebel Dyr	Paleocene/Eocene	D_1	0.61	0.69	8.38	1.43
	Paleocene/Eocene	D_2*	0.70	0.72	8.59	1.79
	Paleocene/Eocene	D_3	0.57	0.70	8.27	1.36
	Paleocene/Eocene	D_4	0.49	0.70	7.17	1.43
	Paleocene/Eocene	D_5	0.47	0.71	7.28	1.54
	Paleocene/Eocene	D_6	0.30	0.69	6.49	1.30
	Paleocene/Eocene	D_7	0.31	0.69	6.68	1.30
	Paleocene/Eocene	D_8*	0.32	0.72	5.50	1.27
	Paleocene/Eocene	D_9	0.28	0.66	7.39	1.39
	Paleocene/Eocene	D_10	0.26	0.66	7.81	1.36
Djebel Tazbant	Paleocene/Eocene	T_1	0.28	0.67	6.82	1.29
	Paleocene/Eocene	T_2	0.22	0.68	6.75	1.39
	Paleocene/Eocene	T_3	0.30	0.66	8.06	1.59
	Paleocene/Eocene	T_4	0.22	0.70	5.74	1.24
Djebel Onk	Paleocene/Eocene	S_1	0.70	0.72	10.25	2.13
	Paleocene/Eocene	S_2	0.72	0.73	10.30	2.18
	Paleocene/Eocene	S _3	0.70	0.72	10.38	2.18
	Paleocene/Eocene	S _4	0.70	0.72	10.78	2.21
	Paleocene/Eocene	S _5	0.70	0.72	10.63	2.20
	Paleocene/Eocene	S _6	0.23	0.66	7.00	1.23
Kef Essenoun	Paleocene/Eocene	ra_12	0.40	0.63	6.61	0.91
	Paleocene/Eocene	rc_24	0.70	0.66	7.59	1.40
	Paleocene/Eocene	rc_2	0.69	0.69	8.45	1.53
	Paleocene/Eocene	rd_7	0.46	0.46	5.85	1.11
	Paleocene/Eocene	rd_6	0.47	0.62	6.65	1.54
MOROCCO[3]						
Sidi Chennane	Eocene	SC-1a	0.25	0.67	3.99	0.73
	Eocene	SC-1b	0.25	0.74	4.25	0.67
	Eocene	SC-2a	0.23	0.66	3.73	0.63
	Eocene	SC-2b	0.23	0.69	3.58	0.69
	Eocene	SC-3a	0.17	0.69	3.76	0.71
	Eocene	SC-3b	0.17	0.64	3.54	0.64
	Eocene	SC-6a	0.16	0.68	3.54	0.60
	Eocene	SC-6b	0.16	0.66	3.46	0.64
	Eocene	SC-6c	0.17	0.72	3.90	0.70
	Eocene	SC-8a	0.18	0.68	3.34	0.67
	Eocene	SC-8b	0.18	0.65	3.96	0.81
	Eocene	SC-8c	0.19	0.66	3.44	0.70
	Eocene	SC-9a	0.21	0.67	3.46	0.73

	Eocene	SC-9b	0.21	0.60	3.53	0.72
	Eocene	SC-9c	0.20	0.65	3.74	0.76
	Eocene	SC-9d	0.20	0.64	3.36	0.61
	Eocene	SC-13	0.28	0.63	3.96	0.77
	Eocene	SC-24	0.22	0.67	4.11	0.83
	Paleocene	SC-16b	0.21	0.65	4.33	0.91
	Paleocene	SC-16c	0.20	0.65	4.24	0.85
	Paleocene	SC-16a	0.21	0.67	4.18	0.83
	Paleocene	SC-17a	0.28	0.68	3.96	0.84
	Paleocene	SC-17c	0.29	0.65	4.39	1.12
	Paleocene	SC-17b	0.30	0.61	4.34	0.99
	Paleocene	SC-19a	0.32	0.63	4.48	1.00
	Paleocene	SC-19c	0.30	0.64	3.50	0.74
	Paleocene	SC-21b	0.40	0.67	2.95	0.69
	Paleocene	SC-21a	0.38	0.63	2.91	0.67
	Paleocene	SC-21c	0.37	0.65	3.20	0.70
	Paleocene	SC-21d	0.41	0.64	3.17	0.77
	Paleocene	SC-22a	0.39	0.68	2.43	0.60
	Paleocene	SC-22b	0.41	0.66	2.77	0.67
	Paleocene	SC-22c	0.41	0.67	3.11	0.72
	Paleocene	SC-27a	0.21	0.63	4.23	0.89
	Paleocene	SC-27b	0.22	0.67	4.43	0.97
	Paleocene	SC-29a	0.36	0.00	5.02	1.07
	Paleocene	SC-29b	0.34	0.62	5.92	1.02
	Paleocene	SC-29c	0.39	0.68	4.75	1.02
	Paleocene	SC-29d	0.39	0.67	5.30	1.16
	Paleocene	SC-29e	0.36	0.63	5.30	1.21
	Paleocene	SC-20d	0.34	0.63	3.71	0.86
	Paleocene	SC-20b	0.34	0.66	3.15	0.66
	Paleocene	SC-20c	0.35	0.66	3.63	0.76
	Paleocene	SC-20a	0.34	0.68	3.38	0.73
	Paleocene	SC-19b	0.28	0.64	5.56	0.87
	Upper Cretaceous	SC-30a	0.47	0.71	4.44	1.06
	Upper Cretaceous	SC-30c	0.47	0.71	4.45	1.05
	Upper Cretaceous	SC-30b	0.47	0.72	4.24	0.93
	Upper Cretaceous	SC-31d	0.49	0.73	4.73	1.10
	Upper Cretaceous	SC-31c	0.50	0.71	5.28	1.21
	Upper Cretaceous	SC-31b	0.48	0.70	4.03	0.83
	Upper Cretaceous	SC-31a	0.48	0.70	4.87	0.87
	Upper Cretaceous	SC-32a	0.47	0.74	4.18	0.77
	Paleocene	BG-L0-C4	0.27	0.66	4.17	0.76
Ben Guerir	Paleocene	BG-L0-C5	0.28	0.62	4.42	0.87
	Paleocene	BG-L0-C6	0.29	0.64	4.46	0.98

Ages of deposits from [1–3] for Tunisia, [4,5] for Algeria, [6] for Morocco.

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