

**Table 3 supplementary file.** Rare earth element concentrations (ppm) and geochemical parameters of samples. PAAS and UCC (data from Taylor and McLennan, 1985) are also given.  $Eu = Eu_N / (Sm_N \times Gd_N)^{0.5}$ , where the subscript N denotes chondrite-normalized values,  $Ce^* = \log [3Ce_N / (2La_N + Nd_N)]$  (Elderfield and Greaves, 1982).  $Ce/Ce^* = Ce_N / (La_N \times Pr_N)^{0.5}$  (Cullers and Berendsen, 1998). N=Chondrite normalized values, from Sun and McDonough, 1989.

Sample Numb.	Rare Earth Elements (ppm)													
	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
D288	40.80	80.20	9.52	33.80	7.00	1.40	5.80	0.85	4.89	0.92	2.51	0.36	2.39	0.35
D289	44.30	84.30	10.99	40.20	7.54	1.74	6.52	1.03	5.99	1.13	3.05	0.45	2.80	0.42
D290	45.60	86.20	11.16	40.80	7.74	1.87	7.19	1.09	5.82	1.17	3.15	0.49	2.98	0.44
D291	47.50	93.90	11.27	41.30	7.93	1.81	6.88	1.02	5.82	1.12	3.02	0.45	2.75	0.42
D292	42.70	83.30	10.46	38.80	6.96	1.56	6.24	0.99	5.40	1.05	2.77	0.44	2.68	0.41
D293	43.10	80.30	10.47	38.40	7.36	1.67	6.53	1.01	5.39	1.05	2.83	0.42	2.71	0.41
D294	50.80	97.90	11.63	42.90	8.45	1.82	6.91	1.05	5.96	1.05	2.99	0.44	3.06	0.40
D295	42.70	83.20	10.60	40.20	7.38	1.59	6.47	1.00	5.54	1.03	2.72	0.43	2.66	0.43
D296	48.60	92.80	11.18	40.20	7.76	1.68	6.54	1.03	5.94	1.11	3.00	0.44	2.92	0.39
D297	51.20	100.50	11.88	43.50	8.37	1.84	6.96	1.07	6.25	1.22	3.05	0.46	3.37	0.42
D298	45.10	84.90	10.95	41.10	7.78	1.75	6.97	1.04	5.97	1.09	3.18	0.45	2.95	0.43
D299	45.60	85.60	11.04	40.20	7.34	1.72	6.99	1.05	5.91	1.12	3.03	0.46	2.95	0.43
D300	37.90	72.40	8.87	33.50	6.41	1.36	5.40	0.83	4.77	0.95	2.43	0.36	2.43	0.34
D301	38.00	73.40	8.97	34.40	6.51	1.42	5.67	0.86	5.15	0.94	2.41	0.38	2.48	0.34
D302	35.30	64.10	7.97	30.50	6.00	1.30	5.20	0.80	4.80	0.90	2.60	0.40	2.60	0.30
D303	41.80	81.70	10.52	39.70	7.60	1.50	6.70	1.00	5.50	1.10	3.10	0.40	2.80	0.50
D304	40.10	72.80	9.78	36.70	7.13	1.57	6.75	1.04	5.73	1.14	3.17	0.47	3.13	0.47
D305	50.10	96.10	11.64	44.60	8.60	1.90	7.20	1.10	6.00	1.20	3.10	0.50	3.10	0.40
D306	44.70	80.20	9.84	35.90	7.05	1.49	6.14	0.92	5.45	1.12	2.87	0.44	2.99	0.43
D307	39.30	69.60	10.07	39.10	7.43	1.61	7.18	1.06	5.92	1.17	3.09	0.48	3.39	0.50
Average	43.76	83.17	10.44	38.79	7.41	1.63	6.51	0.99	5.61	1.08	2.91	0.43	2.85	0.41
St. dev.	4.36	9.50	1.00	3.54	0.65	0.17	0.58	0.09	0.42	0.09	0.24	0.04	0.27	0.05
PAAS	38.20	79.80	8.83	33.90	5.55	1.08	4.66	0.77	4.68	0.99	2.85	0.40	2.82	0.43
UCC	30.00	64.00	7.10	26.00	4.50	0.88	3.80	0.64	3.50	0.80	2.30	0.33	2.20	0.32



Sample Numb.	$\Sigma$ REE	$\Sigma$ LREE	$\Sigma$ HREE	LREE/HREE	Eu/Eu*	(La/Sm) <sub>c</sub>	(Gd/Yb) <sub>c</sub>	(La/Yb) <sub>c</sub>	Ce/Ce*	Ce*
D288	190.70	172.70	18.07	9.56	0.66	3.80	2.01	12.62	0.96	0.11
D289	210.40	189.00	21.39	8.84	0.74	3.83	1.93	11.69	0.90	0.19
D290	215.70	193.30	22.33	8.66	0.75	3.84	2.00	11.31	0.90	0.20
D291	225.10	203.70	21.48	9.48	0.73	3.91	2.07	12.77	0.96	0.20
D292	203.70	183.70	19.98	9.20	0.71	4.00	1.93	11.78	0.93	0.17
D293	201.60	181.30	20.35	8.91	0.72	3.82	1.99	11.76	0.89	0.17
D294	235.30	213.50	21.86	9.77	0.75	3.92	1.87	12.27	0.95	0.22
D295	205.90	185.60	20.28	9.16	0.67	3.77	2.01	11.86	0.92	0.19
D296	223.50	202.20	21.37	9.46	0.70	4.08	1.85	12.30	0.94	0.19
D297	240.00	217.20	22.80	9.53	0.79	3.99	1.71	11.23	0.96	0.22
D298	213.60	191.50	22.08	8.68	0.73	3.78	1.95	11.30	0.90	0.20
D299	213.40	191.50	21.94	8.73	0.67	4.05	1.96	11.43	0.90	0.19
D300	177.90	160.40	17.51	9.16	0.64	3.86	1.84	11.53	0.93	0.11
D301	180.90	162.70	18.23	8.92	0.64	3.81	1.89	11.33	0.94	0.12
D302	162.70	145.10	17.60	8.25	0.58	3.86	1.69	10.23	0.90	0.07
D303	203.90	182.80	21.00	8.69	0.64	3.61	1.99	11.15	0.92	0.18
D304	189.90	168.10	21.90	7.67	0.67	3.67	1.78	9.47	0.87	0.15
D305	235.50	212.90	22.60	9.44	0.84	3.81	1.91	11.91	0.94	0.23
D306	199.54	179.20	20.40	8.80	0.70	4.14	1.70	11.05	0.90	0.14
D307	189.90	167.10	22.80	7.33	0.73	3.45	1.75	8.57	0.83	0.18
Average	205.96	185.18	20.80	8.91	0.70	3.85	1.89	11.38	0.92	0.17
St. dev.	19.87	18.64	1.68	0.61	0.06	0.16	0.11	0.98	0.03	0.04
PAAS	185.00	166.00	17.60	9.43	0.65	4.30	1.36	9.20	1.03	-0.01
UCC	146.30	132.48	13.89	9.54	0.65	4.19	1.40	9.21	1.03	0.16

Sample Num.	Rare Earth Elements (ppm)													
	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
C263	28.40	55.50	6.64	25.10	4.78	0.99	4.52	0.68	3.98	0.80	2.18	0.29	2.02	0.27
C265	47.90	92.80	11.21	40.20	7.67	1.82	6.94	1.04	6.11	1.06	2.87	0.44	3.05	0.39
C266	48.80	94.40	11.45	42.50	8.34	1.86	7.34	1.13	6.35	1.23	3.31	0.50	3.62	0.44
C267	48.70	94.80	11.54	39.70	8.46	1.86	6.99	1.09	6.04	1.22	3.31	0.48	3.34	0.45
C269	49.70	97.30	11.73	44.80	8.15	1.81	7.13	1.09	5.96	1.21	3.35	0.49	3.10	0.42
C271	51.90	98.50	11.97	43.60	8.35	1.86	7.18	1.10	6.40	1.16	3.29	0.49	3.32	0.43
C273	42.10	81.50	9.85	37.20	6.98	1.58	6.23	0.96	5.41	1.04	2.90	0.44	2.87	0.41
C274	35.10	66.80	8.33	30.20	6.15	1.31	5.29	0.84	4.90	0.99	2.61	0.38	2.45	0.35
C276	33.70	62.50	7.78	27.50	5.73	1.26	5.15	0.79	4.43	0.91	2.51	0.37	2.35	0.32
C277	42.70	81.90	10.55	39.60	7.24	1.59	6.50	1.01	5.74	1.12	3.00	0.47	2.88	0.45
C278	41.20	76.30	10.05	38.60	7.01	1.62	6.64	1.02	5.49	1.07	3.09	0.45	2.82	0.45
C279	45.20	80.60	10.47	38.50	7.48	1.65	6.66	1.03	6.23	1.14	3.07	0.46	3.09	0.42
Average	42.95	81.91	10.13	37.29	7.20	1.60	6.38	0.98	5.59	1.08	2.96	0.44	2.91	0.40
St. dev.	6.98	13.81	1.64	6.06	1.10	0.27	0.87	0.13	0.75	0.13	0.35	0.06	0.44	0.06
PAAS	38.20	79.80	8.83	33.90	5.55	1.08	4.66	0.77	4.68	0.99	2.85	0.40	2.82	0.43
UCC	30.00	64.00	7.10	26.00	4.50	0.88	3.80	0.64	3.50	0.80	2.30	0.33	2.20	0.32

Sample Numb.	ΣREE	ΣLREE	ΣHREE	LREE/HREE	Eu/Eu*	(La/Sm) <sub>c</sub>	(Gd/Yb) <sub>c</sub>	(La/Yb) <sub>c</sub>	Ce/Ce*	Ce*
D288	190.70	172.70	18.07	9.56	0.66	3.80	2.01	12.62	0.96	0.11
D289	210.40	189.00	21.39	8.84	0.74	3.83	1.93	11.69	0.90	0.19
D290	215.70	193.30	22.33	8.66	0.75	3.84	2.00	11.31	0.90	0.20
D291	225.10	203.70	21.48	9.48	0.73	3.91	2.07	12.77	0.96	0.20
D292	203.70	183.70	19.98	9.20	0.71	4.00	1.93	11.78	0.93	0.17
D293	201.60	181.30	20.35	8.91	0.72	3.82	1.99	11.76	0.89	0.17
D294	235.30	213.50	21.86	9.77	0.75	3.92	1.87	12.27	0.95	0.22
D295	205.90	185.60	20.28	9.16	0.67	3.77	2.01	11.86	0.92	0.19
D296	223.50	202.20	21.37	9.46	0.70	4.08	1.85	12.30	0.94	0.19
D297	240.00	217.20	22.80	9.53	0.79	3.99	1.71	11.23	0.96	0.22
D298	213.60	191.50	22.08	8.68	0.73	3.78	1.95	11.30	0.90	0.20
D299	213.40	191.50	21.94	8.73	0.67	4.05	1.96	11.43	0.90	0.19
D300	177.90	160.40	17.51	9.16	0.64	3.86	1.84	11.53	0.93	0.11
D301	180.90	162.70	18.23	8.92	0.64	3.81	1.89	11.33	0.94	0.12
D302	162.70	145.10	17.60	8.25	0.58	3.86	1.69	10.23	0.90	0.07
D303	203.90	182.80	21.00	8.69	0.64	3.61	1.99	11.15	0.92	0.18
D304	189.90	168.10	21.90	7.67	0.67	3.67	1.78	9.47	0.87	0.15
D305	235.50	212.90	22.60	9.44	0.84	3.81	1.91	11.91	0.94	0.23
D306	199.54	179.20	20.40	8.80	0.70	4.14	1.70	11.05	0.90	0.14
D307	189.90	167.10	22.80	7.33	0.73	3.45	1.75	8.57	0.83	0.18
Average	205.96	185.18	20.80	8.91	0.70	3.85	1.89	11.38	0.92	0.17
St. dev.	19.87	18.64	1.68	0.61	0.06	0.16	0.11	0.98	0.03	0.04
PAAS	185.00	166.00	17.60	9.43	0.65	4.30	1.36	9.20	1.03	-0.01
UCC	146.30	132.48	13.89	9.54	0.65	4.19	1.40	9.21	1.03	0.16

Sample Num.	Rare Earth Elements (ppm)													
	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
C263	28.40	55.50	6.64	25.10	4.78	0.99	4.52	0.68	3.98	0.80	2.18	0.29	2.02	0.27
C265	47.90	92.80	11.21	40.20	7.67	1.82	6.94	1.04	6.11	1.06	2.87	0.44	3.05	0.39
C266	48.80	94.40	11.45	42.50	8.34	1.86	7.34	1.13	6.35	1.23	3.31	0.50	3.62	0.44
C267	48.70	94.80	11.54	39.70	8.46	1.86	6.99	1.09	6.04	1.22	3.31	0.48	3.34	0.45
C269	49.70	97.30	11.73	44.80	8.15	1.81	7.13	1.09	5.96	1.21	3.35	0.49	3.10	0.42
C271	51.90	98.50	11.97	43.60	8.35	1.86	7.18	1.10	6.40	1.16	3.29	0.49	3.32	0.43
C273	42.10	81.50	9.85	37.20	6.98	1.58	6.23	0.96	5.41	1.04	2.90	0.44	2.87	0.41
C274	35.10	66.80	8.33	30.20	6.15	1.31	5.29	0.84	4.90	0.99	2.61	0.38	2.45	0.35
C276	33.70	62.50	7.78	27.50	5.73	1.26	5.15	0.79	4.43	0.91	2.51	0.37	2.35	0.32
C277	42.70	81.90	10.55	39.60	7.24	1.59	6.50	1.01	5.74	1.12	3.00	0.47	2.88	0.45
C278	41.20	76.30	10.05	38.60	7.01	1.62	6.64	1.02	5.49	1.07	3.09	0.45	2.82	0.45
C279	45.20	80.60	10.47	38.50	7.48	1.65	6.66	1.03	6.23	1.14	3.07	0.46	3.09	0.42
Average	42.95	81.91	10.13	37.29	7.20	1.60	6.38	0.98	5.59	1.08	2.96	0.44	2.91	0.40
St. dev.	6.98	13.81	1.64	6.06	1.10	0.27	0.87	0.13	0.75	0.13	0.35	0.06	0.44	0.06
PAAS	38.20	79.80	8.83	33.90	5.55	1.08	4.66	0.77	4.68	0.99	2.85	0.40	2.82	0.43
UCC	30.00	64.00	7.10	26.00	4.50	0.88	3.80	0.64	3.50	0.80	2.30	0.33	2.20	0.32

Sample Numb.	$\Sigma$ REE	$\Sigma$ LREE	$\Sigma$ HREE	LREE/HREE	Eu/Eu*	(La/Sm) <sub>c</sub>	(Gd/Yb) <sub>c</sub>	(La/Yb) <sub>c</sub>	Ce/Ce*	Ce*
C263	136.15	121.40	14.74	8.24	0.64	3.87	1.85	10.39	0.95	-0.01
C265	223.50	201.60	21.90	9.21	0.74	4.07	1.88	11.61	0.94	0.19
C266	231.27	207.30	23.92	8.67	0.71	3.82	1.68	9.96	0.94	0.21
C267	227.98	205.00	22.92	8.95	0.72	3.75	1.73	10.78	0.95	0.18
C269	236.24	213.40	22.75	9.38	0.71	3.98	1.90	11.85	0.93	0.24
C271	239.55	216.10	23.37	9.25	0.72	4.05	1.79	11.55	0.94	0.22
C273	199.47	179.20	20.26	8.85	0.72	3.93	1.80	10.84	0.92	0.16
C274	165.70	147.80	17.81	8.30	0.69	3.72	1.79	10.59	0.91	0.07
C276	155.30	138.40	16.83	8.23	0.69	3.84	1.81	10.60	0.91	0.02
C277	204.75	183.50	21.17	8.67	0.69	3.85	1.87	10.96	0.91	0.18
C278	195.81	174.70	21.03	8.31	0.71	3.83	1.95	10.80	0.88	0.17
C279	206.00	183.90	22.10	8.32	0.70	3.94	1.78	10.81	0.87	0.17
Average	201.81	181.08	20.73	8.70	0.70	3.89	1.82	10.90	0.92	0.15
St.dev.	32.25	29.58	2.73	0.41	0.02	0.10	0.07	0.52	0.02	0.08
PAAS	185.00	166.00	17.60	9.43	0.65	4.30	1.36	9.20	1.03	-0.01
UCC	146.30	132.48	13.89	9.54	0.65	4.19	1.40	9.21	1.03	0.16