Supplementary material 1 – Analyses of standard reference materials used to evaluate data quality and analytical procedures. For further details see text. Certified values are reported from Govindaraiu (1984). Data are expressed in ppm.

AGV-1

	Measured values					Mean	σ±	Certified values
^{89}Y	19.81	19.36	18.61	18.46	19.91	19.23	0.67	20
^{90}Zr	233.65	223.19	235.59	231.10	231.45	230.99	4.72	227
^{139}La	39.82	34.86	36.81	40.06	37.36	37.78	2.18	38
^{140}Ce	70.45	79.03	70.44	66.59	63.83	70.07	5.74	67
^{141}Pr	7.84	6.51	7.13	6.03	7.31	6.96	0.70	7.6
^{146}Nd	33.29	31.25	30.74	30.50	33.17	31.79	1.34	33
^{147}Sm	5.83	5.72	5.56	5.30	5.38	5.56	0.22	5.9
^{151}Eu	1.59	1.59	1.58	1.53	1.55	1.57	0.03	1.64
^{157}Gd	5.07	4.85	4.75	4.86	4.57	4.82	0.18	5
^{159}Tb	0.67	0.69	0.69	0.78	0.68	0.70	0.05	0.7
^{163}Dv	3.61	3.30	3.48	3.28	3.96	3.53	0.28	3.6
^{165}Ho	0.65	0.63	0.62	0.61	0.69	0.64	0.03	0.67
^{166}Er	1.66	1.64	1.86	1.65	1.69	1.70	0.09	1.7
^{169}Tm	0.33	0.37	0.33	0.32	0.38	0.34	0.03	0.34
^{172}Yb	1.65	1.49	1.94	1.56	1.93	1.72	0.21	1.72
^{175}Lu	0.26	0.24	0.24	0.27	0.25	0.25	0.01	0.27
^{178}Hf	5.23	5.76	5.00	4.98	5.41	5.28	0.32	5.1

MAG-1

	Measured values					Mean	σ±	Certified values
^{89}Y	25.49	30.71	31.96	29.68	29.38	29.45	2.43	28.00
^{90}Zr	126.94	126.83	123.94	126.12	137.02	128.17	5.09	130.00
^{139}La	45.20	41.98	51.01	42.81	47.30	45.66	3.65	43.00
^{140}Ce	91.48	98.93	92.57	92.34	96.13	94.29	3.15	88.00
^{141}Pr	8.50	9.95	9.62	9.35	9.41	9.37	0.54	9.30
^{146}Nd	35.30	42.52	43.58	37.50	38.94	39.57	3.45	38.00
^{147}Sm	7.32	7.59	6.98	6.72	6.34	6.99	0.49	7.50
^{151}Eu	1.66	1.51	1.89	1.60	1.48	1.63	0.16	1.55
^{157}Gd	5.33	5.89	6.45	6.40	6.24	6.06	0.47	5.80
^{159}Tb	0.96	1.11	0.99	0.99	1.00	1.01	0.06	0.96
^{163}Dv	4.88	5.59	5.93	5.01	5.51	5.39	0.43	5.20
^{165}Ho	0.98	0.89	0.94	0.83	1.09	0.95	0.10	1.02
^{166}Er	3.11	3.46	3.34	3.20	3.35	3.29	0.14	3.00
^{169}Tm	0.43	0.48	0.49	0.43	0.44	0.45	0.03	0.43
^{172}Yb	2.41	2.73	2.86	2.95	2.95	2.78	0.23	2.60
^{175}Lu	0.39	0.45	0.43	0.39	0.44	0.42	0.03	0.40
^{178}Hf	3.34	4.11	4.19	3.79	3.68	3.82	0.34	3.70

Supplementary material 2 – Mineralogical composition of studied sediments. Values are expressed in weight %.

	m	detritic minerals		authigenic minerals			
				Mg-carbonates			
basin	sampling depth	quartz	calcite	low-Mg calcite	high-Mg calcite	dolomite	halides
Tyro	4	8.8	9.8	12.5	7.5	8.5	52.9
Tyro	5	19.9	4.3	9.9	6.5	9.1	50.3
Tyro	10	17.9	7.4	12.4	6.4	10.6	45.3
Tyro	11	8.9	5.6	15.1	7.8	8.2	54.4
Tyro	1	11.8	12.5	22.5	4.1	10.9	38.2
Tyro	2	42.5	13.5		5.6	8.8	29.6
Tyro	3	29.6	11.4	13.1	3.8	9.5	32.6
Tyro	12	30.4	7.9	14.9	5.1	8.1	33.6
Tyro	18	21.9	9.3		8.3	5.2	55.3
Tyro	19	46.6	5.3		6.2	7.3	34.6
Tyro	20	37.5	6.7	20.5	2.9	10.3	22.1
Tyro	25	44.7	2.9		4.4	9.1	38.9
Tyro	26	47.5	3.5		5.8	7.9	35.3
Tyro	36	43.9	5.7		4.8	9.0	36.6
Tyro	37	36.8	8.9		9.1	5.0	40.2
Tyro	38	40.3	7.9		9.3	4.1	38.4
Tyro	39	39.5	9.4		9.0	4.5	37.6
Tyro	40	49.7	3.4		10.8	2.0	34.1
Medee	1	39.4	2.0	20.0	10.2	3.7	24.7
Medee	2	50.5	3.6		5.9	7.8	32.2
Medee	3	48.1	4.6		6.8	6.6	33.9
Medee	4	26.5	7.9	13.6	4.9	8.0	39.1
Medee	5	46.6	2.6		8.2	5.0	37.6
Medee	6	22.0	8.6	27.2	4.7	8.4	29.1
Medee	7	49.0	6.7		6.5	6.6	31.2
Medee	28	44.8	8.4		5.9	7.2	33.7
Medee	29	44.5	7.5		6.5	6.7	34.8
Medee	30	42.3	7.8		7.3	5.8	36.8
Medee	31	42.5	9.5		7.2	6.0	34.8
Medee	37	50.1	3.8	10.5	7.0	5.5	23.1
Medee	38	41.1	4.0		12.0	0.8	42.1
Medee	39	37.0	5.9		5.0	7.7	44.4
Medee	40	19.3	7.7	19.1	3.4	9.1	41.4
Medee	41	33.3	6.8		6.0	7.1	46.8
Medee	42	42.8	6.8		7.9	5.3	37.2
Kryos	1	78.2	5.8		7.0	9.0	
Kryos	5	74.1	10.3		6.5	9.1	
Kryos	25	77.4	8.6		6.0	8.0	
Kryos	47	77.0	6.0		8.0	9.0	
Thetis	1	63.2	13.9	8.0	5.9	9.0	
Thetis	5	63.6	11.5	10.2	6.0	8.7	
Thetis	26	59.0	18.6	8.9	5.2	8.3	
Thetis	51	58.4	20.6	7.5	5.0	8.5	

Supplementary material 3 – Provenance, sampling depth, biomass contents REE, Zr and Hf concentrations in studied materials. Sum of REE contents, Y/Ho, Zr/Hf, Ce and Gd anomalies are also given.

			ppm																	molar ratios				
basin	m sampling depth	biomass contents	Y	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Zr	Hf	∑[REE]	Y/Ho	Zr/Hf	Ce/Ce*	Gd/Gd*
Tyro	4	nd	7.64	10.37	21.84	2.61	10.37	2.25	0.56	2.26	0.34	1.63	0.33	0.81	0.14	0.63	0.12	37.85	0.96	61.90	42.48	76.74	0.97	0.95
Tyro	5	1.50	7.91	15.04	29.90	3.43	12.85	2.27	0.52	2.37	0.31	1.64	0.30	0.80	0.10	0.61	0.08	39.31	0.89	78.14	48.60	85.90	0.96	1.09
Tyro	10	nd	8.22	10.50	22.20	2.71	10.64	2.41	0.63	2.40	0.41	1.78	0.40	0.91	0.20	0.73	0.19	39.62	0.99	64.32	37.66	78.00	0.96	0.86
Tyro	11	1.10	8.52	11.18	23.65	2.97	11.25	2.63	0.78	2.62	0.56	1.95	0.55	1.08	0.33	0.87	0.33	49.36	1.40	69.27	28.79	68.58	0.94	0.69
Tyro	1	1.88	7.75	10.20	21.54	2.56	10.26	2.20	0.51	2.21	0.30	1.59	0.29	0.78	0.10	0.60	0.08	29.94	1.04	60.97	48.69	55.98	0.97	1.06
Tyro	2	2.40	6.81	8.96	20.13	2.28	9.12	1.97	0.45	1.96	0.27	1.41	0.26	0.69	0.08	0.51	0.07	32.76	0.89	54.97	48.81	71.91	1.03	1.07
Tyro	3	2.13	7.84	10.34	22.02	2.59	10.44	2.25	0.51	2.24	0.30	1.62	0.30	0.79	0.10	0.59	0.08	38.13	0.94	62.03	48.64	79.31	0.98	1.08
Tyro	12	3.02	8.24	11.20	23.74	2.78	11.12	2.38	0.55	2.37	0.32	1.70	0.31	0.83	0.10	0.63	0.08	40.59	0.88	66.35	49.14	90.24	0.98	1.07
Tyro	18	4.62	9.07	12.52	26.40	3.08	12.32	2.64	0.60	2.61	0.35	1.89	0.34	0.91	0.11	0.70	0.09	56.07	1.04	73.63	48.90	105.30	0.98	1.07
Tyro	19	5.61	7.96	10.36	22.17	2.60	10.51	2.25	0.52	2.26	0.30	1.64	0.30	0.80	0.09	0.61	0.08	51.46	0.92	62.48	49.31	108.96	0.99	1.09
Tyro	20	5.00	8.03	11.25	23.82	2.76	10.99	2.34	0.53	2.33	0.31	1.65	0.30	0.81	0.10	0.61	0.08	52.47	0.93	65.92	48.82	110.59	0.99	1.08
Tyro	25	nd	10.46	12.88	27.28	3.14	12.68	2.71	0.61	2.76	0.38	2.03	0.38	1.03	0.13	0.81	0.11	54.41	1.16	77.39	50.52	91.43	0.99	1.09
Tyro	26	nd	10.83	13.67	28.71	3.32	13.30	2.84	0.64	2.85	0.39	2.10	0.40	1.08	0.13	0.84	0.11	56.22	1.19	81.21	50.33	92.20	0.98	1.08
Tyro	36	nd	10.95	13.60	28.83	3.35	13.36	2.87	0.65	2.89	0.40	2.14	0.40	1.08	0.13	0.85	0.11	57.79	1.24	81.61	50.39	90.86	0.99	1.08
Tyro	37	nd	10.76	12.78	27.41	3.18	12.78	2.76	0.64	2.82	0.39	2.10	0.39	1.07	0.13	0.83	0.11	56.56	1.21	78.15	51.05	91.31	0.99	1.07
Tyro	38	nd	10.34	12.54	26.56	3.10	12.39	2.68	0.61	2.72	0.37	2.01	0.38	1.03	0.12	0.80	0.11	54.18	1.14	75.77	50.93	93.05	0.98	1.08
Tyro	39	nd	9.86	12.16	25.54	2.99	11.95	2.57	0.58	2.61	0.35	1.94	0.36	0.98	0.12	0.77	0.10	51.21	1.08	72.91	50.44	92.53	0.98	1.09
Tyro	40	nd	9.92	11.66	24.85	2.92	11.79	2.55	0.59	2.59	0.36	1.93	0.36	0.98	0.12	0.77	0.11	52.63	1.09	71.50	50.61	94.05	0.98	1.07
Medee	1	nd	8.56	12.10	26.82	2.97	11.85	2.50	0.57	2.50	0.33	1.76	0.32	0.86	0.10	0.64	0.08	37.90	0.81	71.96	48.89	90.72	1.03	1.09
Medee	2	nd	8.26	11.78	26.07	2.91	11.57	2.42	0.56	2.43	0.33	1.70	0.31	0.82	0.10	0.61	0.08	41.26	0.84	69.94	48.79	96.24	1.03	1.07
Medee	3	nd	8.69	13.24	28.34	3.22	12.70	2.65	0.60	2.62	0.34	1.81	0.33	0.88	0.10	0.65	0.09	50.21	0.92	76.26	48.61	106.77	1.00	1.09
Medee	4	3.57	9.42	13.76	28.66	3.34	13.07	2.75	0.63	2.71	0.37	1.92	0.35	0.94	0.12	0.70	0.10	59.51	1.01	78.81	49.16	115.01	0.97	1.07
Medee	5	3.57	10.56	12.89	27.50	3.13	12.45	2.66	0.60	2.71	0.37	2.00	0.37	1.03	0.12	0.81	0.11	56.93	1.11	77.33	52.15	100.43	1.00	1.10
Medee	6	nd	10.70	13.16	28.00	3.21	12.84	2.74	0.61	2.77	0.38	2.02	0.38	1.04	0.13	0.82	0.11	55.50	1.07	78.92	51.62	101.09	0.99	1.08
Medee	7	nd	10.74	13.27	27.96	3.24	13.02	2.77	0.61	2.81	0.38	2.06	0.39	1.06	0.13	0.83	0.11	54.28	1.06	79.37	51.11	99.66	0.98	1.10
Medee	28	nd	10.28	13.12	26.86	3.22	12.83	2.67	0.58	2.68	0.36	1.95	0.37	1.01	0.13	0.80	0.11	45.35	0.86	76.95	51.87	103.18	0.95	1.10
Medee	29	nd	9.92	12.45	25.82	3.04	12.18	2.54	0.55	2.56	0.34	1.88	0.36	0.97	0.12	0.77	0.11	42.96	0.81	73.61	51.41	103.12	0.97	1.12
Medee	30	4.18	8.83	10.74	22.29	2.65	10.54	2.22	0.47	2.25	0.30	1.65	0.31	0.86	0.11	0.69	0.09	36.63	0.71	64.00	52.30	100.09	0.96	1.10
Medee	31	4.42	9.77	11.43	23.92	2.82	11.34	2.41	0.53	2.46	0.33	1.83	0.35	0.95	0.12	0.75	0.10	38.98	0.73	69.11	51.93	103.70	0.97	1.12
Medee	37	7.34	8.14	7.88	15.77	1.93	7.80	1.69	0.39	1.80	0.25	1.42	0.28	0.77	0.10	0.62	0.08	24.07	0.47	48.90	54.49	99.99	0.93	1.11
Medee	38	5.48	10.00	11.86	24.88	2.89	11.57	2.50	0.55	2.54	0.34	1.87	0.35	0.96	0.12	0.76	0.10	47.46	0.93	71.29	52.38	99.45	0.98	1.11
Medee	39	3.46	10.86	13.66	29.02	3.32	13.25	2.81	0.62	2.84	0.38	2.08	0.39	1.07	0.13	0.83	0.11	57.93	1.10	81.37	51.79	102.50	0.99	1.09
Medee	40	5.02	10.64	13.27	28.32	3.22	12.89	2.75	0.60	2.78	0.38	2.02	0.38	1.03	0.13	0.81	0.11	54.17	1.05	79.31	52.02	100.17	1.00	1.08
Medee	41	4.82	10.26	12.57	26.14	3.02	12.01	2.52	0.57	2.59	0.35	1.89	0.36	0.99	0.12	0.77	0.11	47.26	0.90	74.26	52.77	102.12	0.98	1.11
Medee	42	4.98	9.30	10.95	22.30	2.62	10.32	2.18	0.49	2.25	0.31	1.66	0.33	0.90	0.12	0.72	0.11	36.39	0.72	64.56	52.34	98.85	0.96	1.07
Kryos	1	4.58	3.39	5.42	13.14	1.30	5.02	1.02	0.23	1.47	0.15	0.81	0.15	0.41	0.05	0.33	0.04	7.02	0.33	32.91	41.93	41.05	1.14	1.50
Kryos	5	2.68	2.56	4.69	11.01	1.13	4.35	0.86	0.19	1.24	0.11	0.62	0.11	0.31	0.04	0.24	0.03	6.12	0.28	27.49	42.67	42.83	1.10	1.57
Kryos	25	2.29	3.95	5.84	14.54	1.38	5.46	1.10	0.24	1.63	0.15	0.85	0.16	0.45	0.06	0.36	0.04	8.77	0.38	36.20	45.91	45.43	1.18	1.61
Kryos	47	2.29	3.09	5.68	13.84	1.38	5.49	1.14	0.25	1.58	0.15	0.77	0.14	0.37	0.04	0.29	0.03	7.96	0.37	34.23	41.61	42.27	1.14	1.54
Thetis	1	0.34	4.59	6.78	15.88	1.69	6.73	1.41	0.30	1.99	0.18	0.98	0.18	0.48	0.06	0.35	0.04	7.71	0.32	41.64	48.44	47.18	1.08	1.56
Thetis	5	0.34	4.25	5.95	14.19	1.51	6.06	1.28	0.28	1.81	0.17	0.91	0.16	0.44	0.05	0.33	0.04	6.79	0.28	37.43	48.18	46.45	1.09	1.54
Thetis	26	1.81	5.37	8.01	17.45	1.85	7.40	1.55	0.34	2.22	0.21	1.11	0.20	0.56	0.07	0.42	0.05	10.60	0.39	46.81	48.92	53.52	1.05	1.56
Thetis	51	nd	7.40	10.31	22.50	2.29	9.25	1.98	0.43	2.90	0.27	1.48	0.27	0.76	0.09	0.59	0.07	13.83	0.52	60.60	50.26	51.53	1.07	1.57