Contrasted release of insoluble elements (Fe, Al, REE, Th, Pa) after dust deposition in seawater: a tank experiment approach

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Electronic Supplement

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Tab. ES1: REE and Th GEOTRACES standard analyses

	light REE								medium REE										heavy REE												Thorium			
	La	2σ	Ce	2σ	Pr	2σ	Nd	2σ	Sm	2σ	Eu	2σ	Gd	2σ	Tb	2σ	Dy	2σ	Ho	2σ	Er	2σ	Tm	2σ	Yb	2σ	Lu	2σ	232Th	2σ	230Th	2σ
	(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(aM)	
BATS 2000 m_1	17.9	0.47	5.37	0.2	3.84	0.12	17.2	0.5	3.56	0.2	0.89	0.05	4.9	0.2	0.76	0.03	5.55	0.2	1.41	0.1	4.66	0.2	0.69	0.02	4.5	0.2	0.72	0.03	113	160	37.3	1.1
BATS 2000 m_2	16.9	0.35	4.86	0.1	3.77	0.12	17.22	0.4	3.57	0.2	0.91	0.06	4.7	0.2	0.75	0.03	5.65	0.2	1.4	0.0	4.66	0.1	0.68	0.03	4.42	3.43	0.69	0.02	140	165	36.1	2.1
BATS 2000 m_3	16.4	0.84	4.94	0.2	3.72	0.13	16.96	0.5	3.58	0.2	0.89	0.04	4.5	0.2	0.76	0.03	5.5	0.2	1.36	0.1	4.62	0.2	0.64	0.04	4.33	0.48	0.69	0.05	126	171	37.8	0.9
average	17.1	1.08	5.06	0.4	3.77	0.08	17.12	0.2	3.57	0.02	0.9	0.01	4.7	0.3	0.76	0.01	5.57	0.1	1.39	0.0	4.65	0.04	0.67	0.04	4.41	0.12	0.7	0.03	126	19	37	1
consensual value	23		5.0		3.9		16.9		3.4		0.9		4.7		0.8		5.7		1.5		4.9		0.7		4.6		0.8		208		38	
	2.7		2.2		0.3		1.2		0.3		0.1		0.5		0.1		0.4		0.1		0.2		0.0		0.2		0.0		42		6	

Tab. ES2: Dissolved Fe and Al data

Station	tank	time (h)	DFe (nM)	DAl (nM)	Station	tank	time (h)	DFe (nM)	DAl (nM)	Station	tank	time (h)	DFe (nM)	DAl (nM)
TYR	C1	0	1.54	46.3	ION	C1	0	2.49	69.6	FAST	C1	0	1.73	24.1
	C1	24	1.11	47.4		C1	24	1.60	80.3		C1	24	1.34	23.5
	C1	72	1.60	47.8		C1	72	1.37	81.1		C1	72	0.88	27.4
	C2	0	1.53	50.3		C2	0	2.49	79.6		C2	0	1.94	24
	C2	24	0.67	42.8		C2	24	1.78	80.2		C2	24	1.80	23.5
	C2	72	1.41	46.1		C2	72	1.55	71		C2	72	0.99	27.7
	D1	0	1.46	43.9		D1	0	2.84	70.7		D1	0	6.68	49
	D1	24	1.45	79		D1	24	1.64	115.7		D1	24	2.66	61
	D1	72	1.35	102.2		D1	72	1.64	138.4		D1	96	9.69	107.4
	D2	0	1.61	44.1		D2	0	NA	70.7		D2	0	6.14	22.4
	D2	24	0.53	81.2		D2	24	1.52	113.4		D2	24	3.93	62.7
	D2	72	0.87	98.7		D2	72	1.36	135.6		D2	96	2.01	99.3
	G1	0	1.73	45.4		G1	0	5.10	83		G1	0	3.05	25.4
	G1	24	0.71	86.6		G1	24	2.52	112.7		G1	24	2.29	62.7
	G1	72	3.21	109.9		G1	72	3.53	136.4		G1	96	2.85	107.7
	G2	0	1.13	48.8		G2	0	2.04	79.3		G2	0	1.59	23.6
	G2	24	1.05	76		G2	24	1.53	112.5		G2	24	3.89	60.5
	G2	72	0.90	101.3		G2	72	1.45	144.2		G2	96	1.16	104.3

Tab. ES3: Dissolved REE, Th and Pa data

		light REE								medium REE										heavy REE												Thorium				Protactinium	
tank	time	La	2σ	Ce	2σ	Pr	2σ	Nd	2σ	Sm	2σ	Eu	2σ	Gd	2σ	Tb	2σ	Dy	2σ	Ho	2σ	Er	2σ	Tm	2σ	Yb	2σ	Lu	2σ	232Th	2σ	230Th	2σ	231Pa (a	2σ
	(h)	(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(pM)		(aM)		(aM)	
ION C1	1	21	1	22	1	5.6	0.2	25.7	0.6	6.1	0.3	0.0	0.1	8.5	0.5	1.4	0.1	10.3	0.5	2.4	0.2	7.9	0.4	1.1	0.1	7.2	0.3	1.1	0.0	1.0	0.1	11.4	0.9		
ION C1	24	29	1	36	1	7.6	0.3	33.9	0.6	7.7	0.4	2.0	0.1	10.2	0.4	1.6	0.1	11.3	0.5	2.6	0.1	8.5	0.3	1.1	0.1	7.5	0.2	1.2	0.1	1.2	0.1	13.9	1.0		
ION C1	72	28	1	35	1	7.1	0.3	32.1	0.9	7.7	0.4	2.0	0.1	9.8	0.4	1.6	0.1	11.3	0.4	2.6	0.1	8.3	0.4	1.2	0.1	7.5	0.2	1.1	0.0	1.2	0.1	10.9	1.0		
ION C2	1	22	1	22	1	5.7	0.2	25.9	0.8	6.2	0.4	1.6	0.1	8.5	0.4	1.4	0.1	10.2	0.5	2.5	0.1	8.1	0.4	1.1	0.0	7.3	0.3	1.1	0.1	0.9	0.1	11.5	0.9		
ION C2	24	24	1	29	1	6.4	0.2	29.5	0.4	6.8	0.2	1.8	0.1	8.9	0.3	1.5	0.1	10.6	0.4	2.5	0.1	8.1	0.3	1.1	0.0	7.5	0.3	1.1	0.1	1.0	0.1	10.1	0.6		
ION C2	72	25	1	30	1	6.4	0.3	29.0	0.5	6.8	0.3	1.7	0.1	9.0	0.4	1.5	0.1	10.7	0.3	2.5	0.1	8.1	0.3	1.1	0.1	7.5	0.2	1.1	0.1	1.0	0.1	10.3	0.8		
ION D1	1	75	4	144	7	23.8	1.1	107.2	2.0	24.6	1.3	5.8	0.4	26.8	1.3	4.0	0.2	25.4	1.1	5.1	0.2	15.5	0.8	2.0	0.1	12.7	0.4	1.8	0.1	4.9	0.1	47.3	1.3		
ION D1	24	72	3	141	5	21.2	0.6	95.6	2.5	21.2	0.7	5.1	0.2	24.9	0.8	3.7	0.1	24.0	0.8	5.0	0.2	15.4	0.5	2.0	0.1	12.6	0.3	1.9	0.1	3.7	0.1	32.7	1.8		
ION D1	72	60	2	122	5	17.9	0.6	80.5	2.1	18.2	0.7	4.5	0.2	22.5	0.8	3.4	0.2	22.8	0.9	4.8	0.2	14.8	0.5	1.9	0.1	12.4	0.7	1.8	0.1	2.8	0.1	24.9	1.1		
ION D2	1	72	2	140	5	23.3	0.8	108.4	1.8	24.2	0.9	5.7	0.2	27.2	1.1	4.0	0.2	25.4	1.2	5.2	0.2	15.4	0.6	2.0	0.1	12.8	0.7	1.9	0.1	5.1	0.1	46.5	1.2		
ION D2	24	70	3	137	4	21.0	0.8	94.2	1.5	21.5	1.0	5.2	0.3	24.9	0.9	3.8	0.1	24.3	1.1	5.1	0.3	15.4	0.7	2.0	0.1	12.7	0.3	1.8	0.1	3.9	0.1	37.1	1.7		
ION D2	72	66	2	132	4	19.5	0.8	88.9	0.9	20.0	0.8	4.8	0.2	24.0	1.0	3.7	0.2	24.3	1.4	5.1	0.2	15.8	0.7	2.1	0.1	13.2	0.7	1.9	0.1	3.0	0.1	27.9	2.2		
ION G1	1	78	3	150	6	23.7	0.9	106.9	1.4	23.6	1.2	5.6	0.3	26.5	0.9	3.9	0.1	24.2	1.1	5.0	0.3	14.7	0.5	1.9	0.1	12.1	0.4	1.7	0.1	3.5	0.1	33.1	1.5		
ION G1	24	79	3	151	7	22.1	1.0	98.7	1.6	21.4	1.0	5.1	0.2	24.8	1.2	3.7	0.2	23.5	0.9	4.9	0.2	14.7	0.5	1.9	0.1	12.0	0.7	1.8	0.1	2.3	0.1	22.4	1.2		
ION G1	72	73	3	142	7	19.7	0.8	88.0	1.4	19.3	1.1	4.6	0.2	23.3	1.1	3.5	0.2	22.5	0.9	4.8	0.2	14.3	0.6	1.9	0.1	12.0	0.4	1.7	0.1	2.0	0.1	18.0	0.9		
ION G2	1	82	3	156	5	24.3	0.8	109.2	2.5	24.2	1.0	5.7	0.3	27.2	1.2	3.9	0.2	24.7	1.2	5.1	0.2	15.0	0.7	2.0	0.1	12.1	0.3	1.8	0.1	3.6	0.1	34.5	3.4		
ION G2	24	80	3	154	7	22.4	0.9	101.1	2.2	21.8	1.0	5.2	0.3	25.4	1.2	3.8	0.2	23.8	1.0	5.0	0.2	14.8	0.5	2.0	0.1	12.4	0.5	1.8	0.1	2.3	0.1	19.7	0.8		
ION G2	72	72	2	141	4	19.3	0.7	85.6	2.5	18.7	0.7	4.6	0.2	22.4	0.8	3.4	0.1	22.2	0.8	4.8	0.1	14.4	0.5	1.9	0.1	12.0	0.3	1.8	0.1	2.0	0.1	17.3	1.1		
FA C1	0	19	1	20	1	5.1	0.2	23.6	1.1	5.9	0.4	1.5	0.1	8.1	0.4	1.2	0.1	8.1	0.4	1.9	0.1	6.1	0.3	0.8	0.1	5.1	0.3	0.8	0.0	1.1	0.1	11.8	1.3	2.6	0.5
FA C1	1	20	1	23	1	5.4	0.2	26.1	1.0	6.2	0.4	1.6	0.1	8.7	0.4	1.3	0.1	8.6	0.4	2.0	0.1	6.3	0.3	0.8	0.1	5.3	0.2	0.8	0.1	1.3	0.1	16.4	1.5	2.6	0.5
FA C1	6	24	1	35	1	6.9	0.3	32.6	1.2	7.7	0.4	1.9	0.1	10.5	0.5	1.5	0.1	9.8	0.5	2.1	0.1	6.8	0.4	0.9	0.1	5.7	0.3	0.9	0.1	1.4	0.0	20.4	1.2	3.3	0.5
FA C1	12	32	1	58	3	9.6	0.4	43.1	1.8	10.2	0.5	2.5	0.1	13.4	0.6	1.7	0.1	10.9	0.5	2.3	0.1	7.0	0.3	0.9	0.0	6.0	0.2	0.9	0.0	10.9	0.1	94.7	2.5	2.5	0.5
FA C1	24	26	1	35	1	6.9	0.3	32.6	1.3	8.0	0.5	1.9	0.2	11.2	0.7	1.5	0.1	10.1	0.7	2.2	0.1	6.9	0.4	0.9	0.1	5.9	0.4	0.9	0.1	1.5	0.1	28.4	1.8	1.8	0.7
FA C1	48	29	1	38	2	7.2	0.3	33.3	1.3	8.0	0.4	1.9	0.1	11.1	0.6	1.4	0.1	9.6	0.5	2.1	0.1	6.7	0.4	0.9	0.1	5.6	0.2	0.9	0.1	1.2	0.1	10.9	1.3	2.4	0.5
FA C1	72	29	1	33	1	6.6	0.3	29.5	1.2	7.2	0.4	1.7	0.1	10.1	0.6	1.3	0.1	9.4	0.5	2.1	0.1	6.7	0.4	0.9	0.1	5.7	0.3	0.9	0.1	1.1	0.1	14.1	1.8	2.7	0.6
FA C1	96	30	1	34	1	6.7	0.3	31.2	1.2	7.5	0.5	1.8	0.1	10.6	0.6	1.4	0.1	9.5	0.5	2.1	0.1	6.8	0.4	0.9	0.1	5.7	0.3	0.9	0.1	1.1	0.1	17.9	1.8	2.3	0.5
FA C2	12	25	2	29	2	6.2	0.6	28.4	0.7	6.7	0.6	1.8	0.1	8.4	0.7	1.3	0.1	9	0.8	2.0	0.1	6.4	0.5	0.8	0.1	5.3	0.2	0.8	0.1	ND	ND	0.0	0.0		
FA C2	48	28	1	35	1	6.6	0.4	30.5	0.3	7.2	0.4	1.9	0.1	8.8	0.6	1.4	0.1	9	0.5	2.0	0.1	6.6	0.3	0.9	0.0	5.5	0.3	0.8	0.0	1.5	0.8	26.4	17		
FA C2	96	29	1	32	1	6.2	0.2	28.9	0.6	6.8	0.5	1.8	0.1	8.6	0.3	1.3	0.1	9	0.4	2.1	0.1	6.6	0.3	0.9	0.1	5.4	0.2	0.8	0.1	0.7	0.1	4.9	0.8		
FA D1	0	22	1	27	1	5.9	0.3	27.6	1.2	6.4	0.4	1.6	0.1	9.2	0.6	1.3	0.1	9	0.5	2.0	0.1	6.1	0.4	0.8	0.1	5.3	0.3	0.8	0.1	1.5	0.0	18.0	1.2	2.1	0.5
FA D1	1	71	3	151	6	24.4	1.0	110.8	4.0	25.2	1.0	6.0	0.3	33.1	1.4	4.1	0.2	25	1.0	4.8	0.2	13.7	0.6	1.7	0.1	10.8	0.4	1.5	0.1	5.9	0.1	65.5	3.0	2.7	0.4
FA D1	6	76	3	149	6	23.4	1.0	106.6	4.3	24.1	1.5	5.8	0.3	32.4	1.5	4.0	0.2	25	1.1	4.8	0.2	14.1	0.6	1.8	0.1	11.1	0.4	1.5	0.1	5.4	0.1	57.5	2.0	2.4	0.6
FA D1	12	75	2	151	5	23.1	0.9	104.6	4.1	23.3	1.1	5.6	0.3	32.3	1.7	3.9	0.2	24	1.4	4.8	0.3	14.0	0.9	1.8	0.1	11.1	0.7	1.6	0.1	10.2	0.1	85.4	2.4	2.7	0.4
FA D1	24	73	3	149	6	22.3	1.0	100.3	4.3	22.8	1.3	5.3	0.3	30.9	1.6	3.8	0.2	24	1.3	4.7	0.3	13.8	0.8	1.7	0.1	11.1	0.7	1.6	0.1	9.3	0.1	72.7	2.0	2.2	0.4
FA D1	48	58	3	127	6	19.2	0.8	89.4	3.7	20.2	1.1	5.0	0.2	28.6	1.3	3.7	0.2	23	1.1	4.8	0.2	14.2	0.7	1.8	0.1	11.4	0.4	1.6	0.1	3.0	0.1	25.1	1.9	2.0	0.8
FA D1	72	53	2	110	5	16.9	0.8	79.2	3.5	18.0	1.0	4.4	0.3	25.6	1.4	3.2	0.2	21	1.1	4.4	0.3	13.1	0.7	1.7	0.1	10.9	0.6	1.6	0.1	2.3	0.1	32.0	1.7	2.4	0.5
FA D1	96	58	2	97	3	15.5	0.6	70.7	2.7	16.7	1.1	3.9	0.3	23.4	1.4	3.0	0.2	20	1.3	4.3	0.3	12.8	0.8	1.6	0.1	9.9	0.6	1.6	0.1	2.1	0.1	44.8	2.4	2.7	0.6
FA D2	1	20	3	23	4	5.3	0.9	24.8	0.4	6.1	1.0	1.5	0.3	7.6	1.2	1.2	0.2	8	1.4	1.9	0.3	5.9	1.0	0.8	0.1	5.0	0.3	0.8	0.1	1.0	0.1	8.8	1.0		
FA D2	48	65	2	130	4	24.2	0.7	107.3	1.2	20.2	0.8	5.0	0.2	24.8	0.7	3.6	0.1	23	0.9	4.7	0.2	13.8	0.5	1.7	0.1	10.7	0.3	1.5	0.1	3.0	0.1	28.7	1.3		
FA D2	96	57	2	113	4	17.5	0.5	81.0	1.2	18.0	0.8	4.3	0.2	21.5	0.8	3.2	0.2	21	1.1	4.4	0.2	13.2	0.7	1.7	0.1	10.5	0.3	1.6	0.1	2.3	0.1	20.1	1.3		
FA G1	1	83	2	163	5	25.4	0.8	115.1	0.9	25.2	0.8	5.7	0.3	27.6	1.1	3.9	0.1	24	0.6	4.8	0.2	13.7	0.5	1.7	0.1	10.6	0.5	1.5	0.0	4.8	0.1	40.6	2.1		
FA G1	48	69	4	139	10	21.2	1.7	98.3	2.8	21.2	1.8	5.1	0.4	25.3	2.0	3.6	0.2	23	1.7	4.7	0.4	13.7	1.1	1.8	0.1	10.9	0.4	1.6	0.1	1.8	0.1	18.9	1.5		
FA G1	96	69	2	127	4	19.4	0.6	86.0	1.9	19.3	0.8	4.6	0.1	22.6	0.6	3.4	0.1	22	1.0	4.6	0.1	13.4	0.3	1.8	0.0	10.7	0.5	1.6	0.0	1.5	0.1	12.9	1.3		
FA G2	1	78	3	162	7	25.4	1.0	115.5	3.3	25.3	1.2	5.8	0.2	27.4	1.1	3.9	0.2	23	0.9	4.7	0.2	13.3	0.6	1.7	0.1	10.3	0.7	1.4	0.1	4.7	0.1	40.5	1.7		
FA G2	48	70	3	140	5	20.8	0.7	94.7	4.2	20.5	0.9	4.9	0.2	24.0	1.3	3.5	0.2	22	1.0	4.5	0.3	13.5	0.6	1.7	0.1	10.5	0.5	1.5	0.1	1.7	0.1	15.6	1.3		
FA G2	96	68	2	124	4	21.0	0.6	92.6	36	18.5	0.8	4.6	0.2	23.3	1.1	3.3	0.1	21	0.8	4.5	0.2	13.4	0.4	1.7	0.1	10.5	8.7	1.5	0.1	1.2	0.4	12.6	3.6		

Tab. ES4: Major elements in the sediment traps

Sample	sampling period	Particulate mass flux	POC fluxe	total Al flux	total Fe flux	BSi fluxe	BioFe flux	Delta Fe	BioAlFlux	deltaAl	fraction of seeded Al in the trap
-	day	mg/m2/d	mg/m2/d	mg/m2/d	mg/m2/d	mg/m2/d	mg/m2/d	nmol/L	mg/m2/d	nmol/L	
Tyr C1	3	0.8	0.3	ND	ND	ND	0.0001	0.01			
Tyr C2	3	1.5	0.5	ND	ND	ND	0.0003	0.02			
Tyr D1	3	1 704	21.1	85	45	31	0.0098	0.63	0.103	13.7	62%
Tyr D2	3	1 652	22.7	78	42	34	0.0106	0.68	0.113	15.1	57%
Tyr G1	3	1 841	24.4	87	48	40	0.0113	0.73	0.136	18.1	64%
Tyr G2	3	1 805	27.2	89	47	41	0.0126	0.82	0.139	18.5	65%
Ion C1	3	2.0	0.3	ND	ND	ND	0.0001	0.01			-
Ion C2	3	0.8	0.4	ND	ND	ND	0.0002	0.01			-
Ion D1	3	1 680	22.4	81	44	29	0.0104	0.67	0.097	13.0	59%
Ion D2	3	756	10.8	37	20	15	0.0050	0.32	0.052	6.9	27%
Ion G1	3	1 349	19.0	66	35	27	0.0089	0.57	0.091	12.2	48%
Ion G2	3	1 257	17.5	59	32	20	0.0081	0.52	0.067	8.9	43%
Fast C1	4	0.5	0.1	ND	ND	ND	0.0001	0.01			
Fast C2	4	1.0	0.2	ND	ND	ND	0.0001	0.01			
Fast D1	4	758	9.7	36	19	10	0.0045	0.39	0.035	6.2	35%
Fast D2	4	881	11.9	42	23	12	0.0056	0.48	0.040	7.2	41%
Fast G1	4	684	10.3	33	18	10	0.0048	0.41	0.033	6.0	32%
Fast G2	4	628	9.3	30	16	10	0.0043	0.37	0.035	6.2	29%

bio-Fe-flux calculated based on a Fe/C ratio of 100 µmol/mol. bio-Al-flux calculated based on a Al/Si ratio of 8000 µmol/mol.

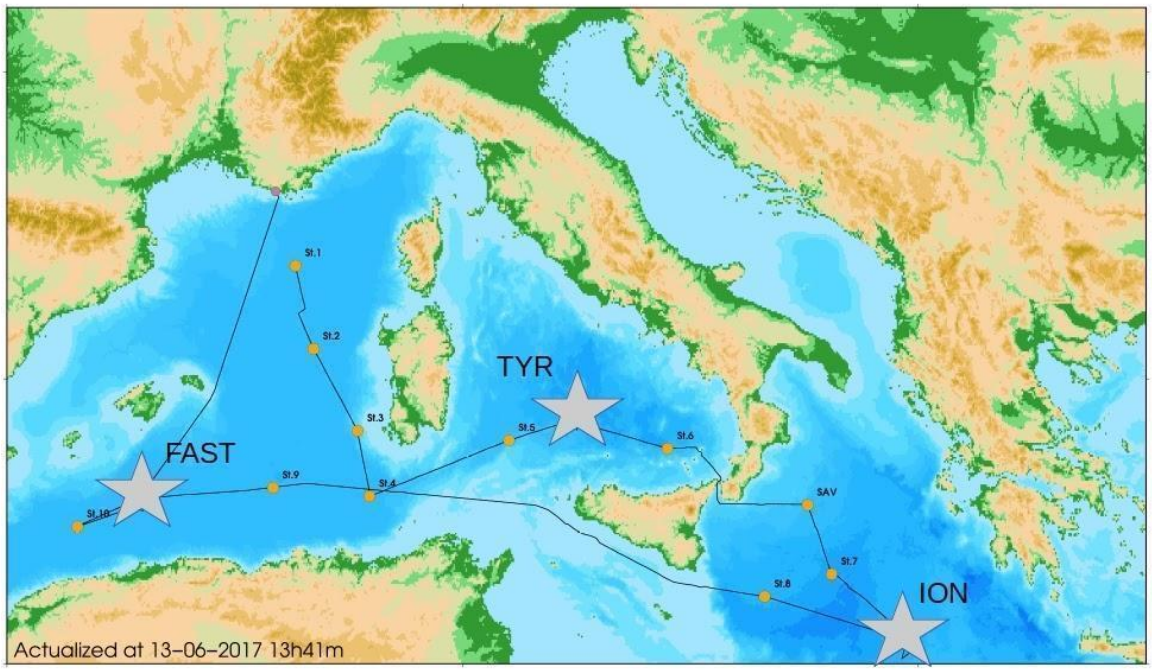

Fig. ES1: Transect of the PEACETIME cruise. 10 short stations are numbered from St.1 to St.10. Stars named TYR, ION, and FAST indicate the 3 long stations where tank experiments were conducted. This map was drawn with General Mapping Tool (Wessel et al., 2019) using the General Bathymetric Chart of the Oceans data (https://www.gebco.net/).

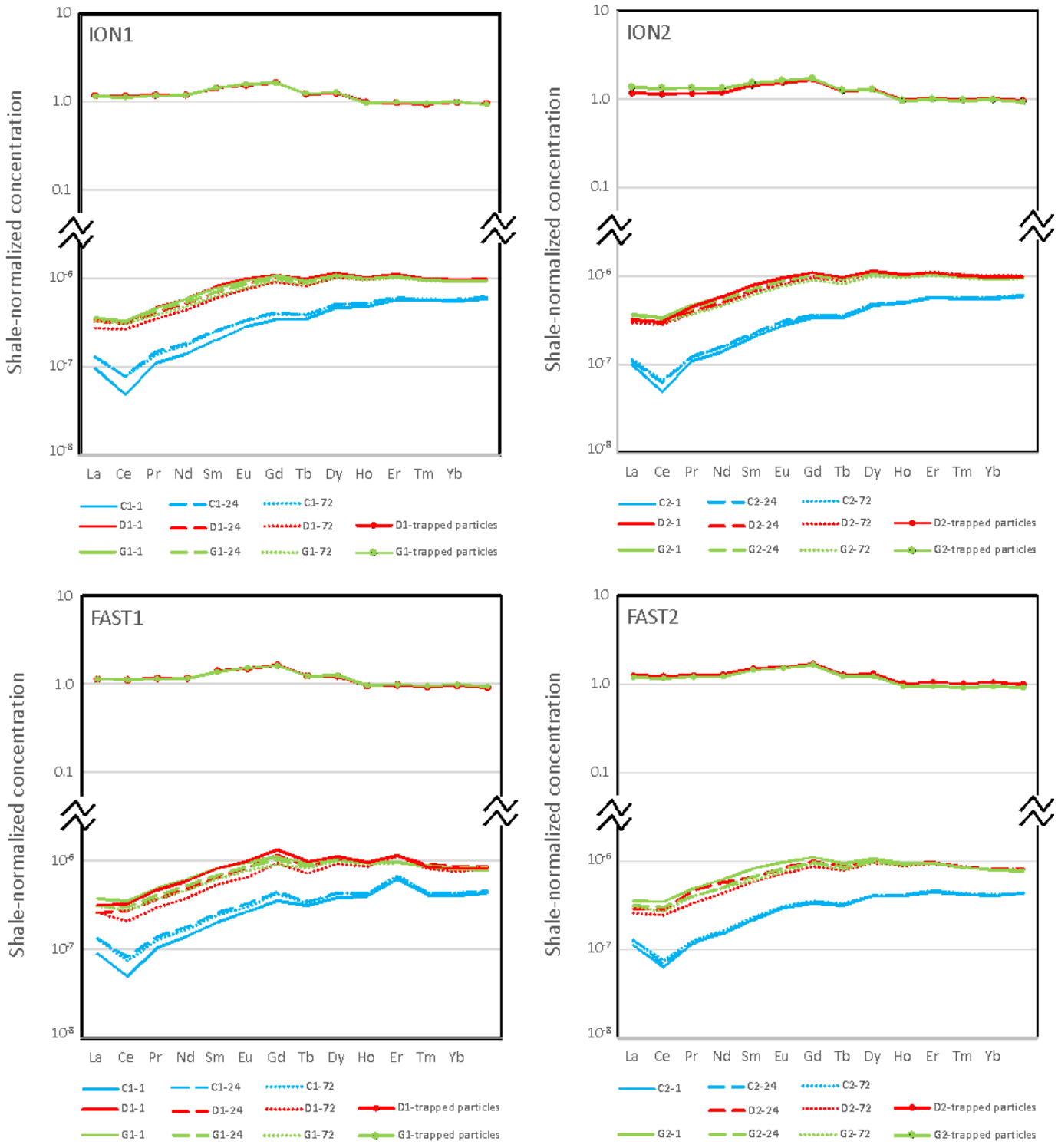

Fig. ES2: Shale-normalized concentrations of filtered seawater and trapped particles. Note the scale break in the middle of the graph.

Reference:

Wessel, P., Luis, J. F., Uieda, L., Scharroo, R., Wobbe, F., Smith, W. H. F., & Tian, D. (2019). The Generic Mapping Tools version 6. *Geochemistry, Geophysics, Geosystems*, 20, 5556–5564. https://doi.org/10.1029/2019GC008515