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Woods Hole Oceanographic Institution

A Compilation of the Rare Earth Element Composition of Rivers, Estuaries and the Oceans

by

Edward R. Sholkovitz

November 1996

Technical Report

Funding was provided by the Woods Hole Oceanographic Institution.

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Woods Hole, Massachusetts 02543

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Michael Bacon, Chair
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Abstract

This technical report serves as an appendix to a recent article by Byrne and Sholkovitz (1996) in the Handbook on the Physics and Chemistry of Rare Earths (vol. 23, chapter 158, pg. 497-592) edited by K. A. Gschneidner Jr. and L. Eyring and published by Elsevier Science. This article, *Marine Chemistry and Geochemistry of the Lanthanides*, discusses the physical chemistry of the lanthanides in natural waters, describes the major features of the lanthanides in rivers, estuaries and oceans and discusses the chemical and biogeochemical processes controlling the speciation and distribution of the lanthanides in the ocean.

The article by Byrne and Sholkovitz (1996) refers to a large set of published and unpublished data on the rare earth (RE) composition of rivers, estuaries, seawater, marine pore waters and marine hydrothermal waters. In order to conserve space in the Handbook article, a compilation of concentration data for natural waters will be presented in this report. Publications through 1995 are cited.

Introduction

This technical report serves as an appendix to a recent article by Byrne and Sholkovitz (1996) in the Handbook on the Physics and Chemistry of Rare Earths (vol. 23, chapter 158, pg. 497-592) edited by K. A. Gschneidner Jr. and L. Eyring and published by Elsevier Science. This article, *Marine Chemistry and Geochemistry of the Lanthanides*, discusses the physical chemistry of the lanthanides in natural waters, describes the major features of the lanthanides in rivers, estuaries and oceans and discusses the chemical and biogeochemical processes controlling the speciation and distribution of the lanthanides in the ocean. The focus of this article is on rivers, estuaries and the oceans; this includes a discussion of pore waters and hydrothermal waters. The extensive literature on the lanthanide geochemistry of marine sediments is not discussed.

The article by Byrne and Sholkovitz (1996) refers to a large set of published and unpublished data on the rare earth (RE) composition of rivers, estuaries, seawater, pore waters and hydrothermal waters. In order to conserve space in the Handbook, this compilation of data will be presented in this report. Each section of this report corresponds to a section number in the Handbook article of Byrne and Sholkovitz (1996). The identification of tables in both the Handbook article and in this technical report will be the same, that is tables A1 through A14. These tables appear in the same order as they are referred to in the Handbook chapter. After going to press with Byrne and Sholkovitz (1996), it was decided to delete Table A4 from this technical report. Table A4 was meant to sort and to list the various studies of RE in the published literature by ocean basin (e.g., Atlantic, Pacific, Indian). The reference list in this technical report is formatted to cover this type of bibliography.

Most of the data in tables A1-A14 refer to either the dissolved concentrations of rare earths or to the RE concentration of unfiltered seawater. In a few specific cases, data has been reported for the suspended particulate matter. Each table will indicate the type of filtration used to yield the dissolved fraction for RE analyses; most samples refer to filtrates passing through either 0.45 or 0.2 μm membrane filters. All concentration data for water samples (filtered or unfiltered) are given in units of pmol/kg of water. Particulate RE data have units of either pmol/kg of water or ppm with respect to the weight of particles.

The geographical location of the oceanic data presented in this report can be found by referring to the map in figure 1. Each table in this technical report contains a map # which can be traced to the same map # in figure 1. This map appears as figure 13 in the Handbook article.

Microsoft EXCEL (PC, 6.0) files of tables A1-A14 are available on request to the author of this report. Table 1 lists the names of each EXCEL file in the different "A" tables. The EXCEL file name of each sub-table also can be found at the beginning of each section and on each of the printed sub-tables in this report.

Table 1
List of EXCEL File Names in the Tables A1-14.

Table A1: Section 5.1 of Handbook - Lanthanide composition and aquatic chemistry of river water

File name: RIV_DIS.XLS. Compilation of dissolved RE concentrations of river water.

Table A2: Section 5.1 of Handbook - Lanthanide composition and aquatic chemistry of river water

File name: RIV_PART.XLS. Compilation of RE concentrations of river suspended particles and sediments.

Table A3: Section 5.2 of Handbook - The estuarine chemistry of the lanthanides.

File name: GWHALE.XLS. Great Whale River estuary, Quebec

File name: GIRONDE.XLS. Gironde River estuary, France

File name: AMAZON.XLS. Amazon River Estuary, Brazil

File name: CBAYSE.XLS. Surface waters, subsurface waters and shelf waters of Chesapeake Bay

File name: CBAY92.XLS. Chesapeake Bay bottom water time-series

File name: FLY.XLS. Fly River estuary, Papua New Guinea.

File name: ELDERF.XLS. Data from a suite of estuaries presented in Elderfield et al. (1990)

Table A4: Not applicable, see text

Table A5: Section 6.1 of Handbook. Atlantic Ocean seawater

File name: NdSm_A.XLS. Concentration of Nd and Sm only for the Atlantic Ocean.

Table 1 Cont'd

Table A6: Section 6.1 of Handbook. Atlantic Ocean seawater

File name: ASW_CONC.XLS. Concentration of RE in the Atlantic Ocean.

File name: SARG_DIS.XLS. Concentration of dissolved RE in the Sargasso Sea from Sholkovitz et al. (1994)

File name: SARG_PAR.XLS. Concentration of suspended particles in the Sargasso Sea from Sholkovitz et al. (1994). Data on the chemical leaching of particles [acetic acid, strong mineral acid and bomb/strong acid dissolution]. Data in per kg of seawater

Table A7: Handbook section 6.1. Pacific Ocean seawater

File name: PSW_CONC.XLS. Concentration of RE in Pacific Ocean seawater

Table A8: Handbook section 6.1. Indian Ocean seawater

File name: IND_CONC.XLS. Concentration of RE in Indian Ocean seawater

Table A9: Handbook section 6.1. Pacific Ocean seawater

File names: HE1.XLS, HE2.XLS and HE3.XLS
H. Elderfield's unpublished data on the concentration of RE in Pacific Ocean seawater

Table A10: Handbook section 6.1. Arctic Ocean seawater

File name: ARC_CONC.XLS. Concentration of RE in Arctic Ocean seawater (North Atlantic sector)

Table A11: Handbook section 6.1 and 7.1. Mediterranean Sea.

File name: MED_CONC.XLS. Concentration of RE in the Mediterranean Sea, including the anoxic brines of Bannock Basin

Table 1 Cont'd

Table A12: Handbook section 7.1. Anoxic Basins

File name: BLACKSEA.XLS. Concentration of RE in the Black Sea

File name: SAANICH.XLS. Dissolved and suspended concentrations of RE in Saanich Inlet, British Columbia, Canada

File name: CARIACO.XLS. Concentration of RE in the Cariaco Trench.

See also Chesapeake Bay data in Table A3 files

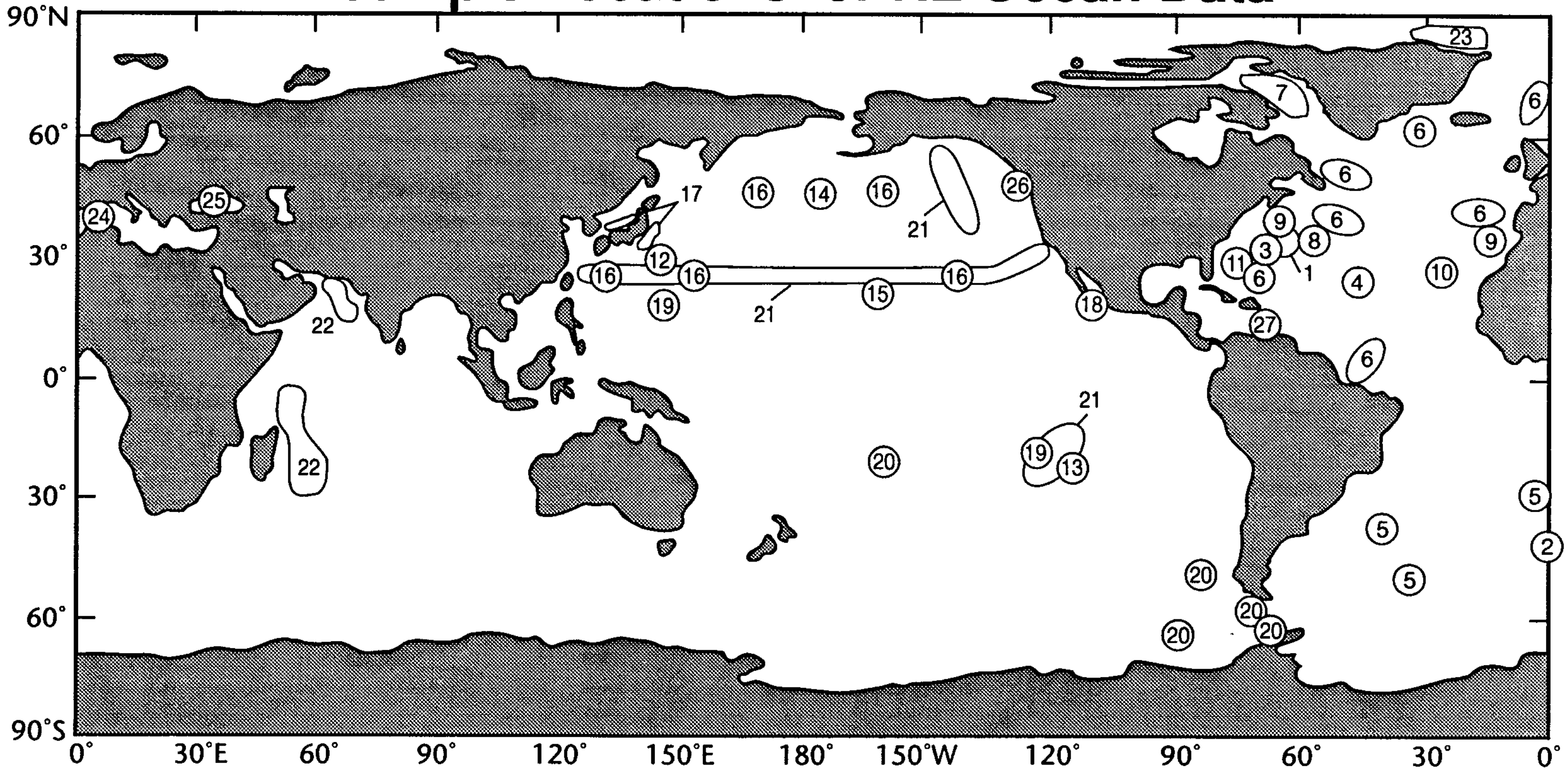
Table A13: Handbook section 7.2. Marine Pore Waters

File name: PW_REE.XLS. Concentration of RE in pore waters

Table A14: Handbook section 7.3. Marine hydrothermal vent waters

File name: VENTS.XLS. Concentration of RE in the hydrothermal waters of the Atlantic and Pacific Oceans.

Sample Locations for RE Ocean Data



Atlantic Ocean
1. Jeandel, et. al. (1995)
2. German, et. al. (1995)
3. Shollkovitz, et. al. (1994)
4. Mitra, et. al. (1994)
5. Jeandel, C., (1993)
3. DeBarr, H., (1991)
3. Sholkovitz & Schneider (1991)
6. Piepgras and Wasserburg (1987)
7. Stordal and Wasserburg (1986)
8. DeBarr, et. al. (1983)
9. Piepgras and Wasserburg (1983)
10. Elderfield and Greaves (1982)
11. Piepgras and Wasserburg (1980)

Pacific Ocean
12. Zhang, et. al. (1994)
13. Moller, et. al. (1994)
14. Shimizu, et. al. (1994)
15. Esser, et. al. (1994)
16. Piepgras and Jacobsen (1988, 92)
17. Tanaka, et. al. (1990)
18. DeBarr, et. al. (1985)
19. Klinkhammer, et. al. (1983)
20. Piepgras and Wasserburg (1982)
20. Piepgras and Wasserburg (1979, 80)
21. Elderfield, in preparation

Indian Ocean
22. Bertram and Elderfield (1993)
22. German and Elderfield (1990)

Arctic Ocean
23. Westerlund and Ohman (1992)

Mediterranean Sea
24. Greaves, et. al.(1991)
24. Spivak & Wasserburg (1988)

Anoxic Basins
25. Schijf, et. al. (1991)
25. German, et. al. (1991)
26. German and Elderfield (1989)
27. DeBarr, et. al. (1988)

References Associated with Tables A1-A14

Rivers: Table A1 and A2

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[Data presented in section on Estuaries]

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Hydrothermal Water: Table A14

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Acknowledgments

I would like to thank David Schneider (WHOI) for his help in producing the compilation of data in this report from the data in the literature. Harry Elderfield generously provided his unpublished data from the Pacific Ocean. I would to thank the Woods Hole Oceanographic Institution for financial support during the production of this report.

Table A1: Section 5.1 of Handbook - Lanthanide composition and aquatic chemistry of river water

File name: RIV_DIS.XLS. Compilation of dissolved RE concentrations of river water.

riv_dis.xls												
	Concentrations of River Water:											
Dissolved, Colloidal and Ultrafiltrated Fractions												
		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Er/Nd
						[pmol/kg]						
	filter size	(um)***										
Martin et al. (1976)												
Garrone & Dordogne	0.45	344	564	363	51.9	9.7	5.4		25.1	21	3.7	0.95
Goldstein and Jacobsen (1988a)												
Amazon	0.45	532	1514	880	229	52		193	99.3	88.4		0.113
Great Whale	0.22	1634	2405	1158	158	25.1	105	68.3	34.4	33.2	5.38	0.030
Indus	0.22	20.9	17.2	22.2	4.72	1.45	7.69	5.68	5.43	0.97		0.245
Isua-F	0.22	4384	8708	3134	482	71.1	320	223	105	83.2	12.1	0.034
Mississippi.	0.22	142	69.1	138	29.9	7.3		46.5	39.1	35.0		0.283
Ohio	0.22	45.4	74.9	74.8	16.9	4.34		34.6	27.1	20.9	3.31	0.362
Pampanga	0.22	30.8	67.7	59.6	16.6	5.39		23.9	17.5	15.7		0.294
Shinano	0.22	269	596	344	73.1	17.2		74.5	44.1	41	9.14	0.128
Avg. River		222	460	283	71.9	17.5		70.8	50.5	35.2		0.178
Elderfield et al. (1990)		{date, salinity after name of each river}										
Amazon	0.45	355	847	570	145	35.3	185	121	65	52.2	6.93	0.114
Connecticut, 27.04.83	1	4130	5450	2710	507	98.4	454	328	170	197	21.7	0.063
Connecticut, 28.04.84	1	2600	4340	2240	422	81.4	348	269	140	132	17.6	0.063
Mullica, 24.04.84	0.45	2410	4970	3000	602	127		340	247	190	29.4	0.082
Mullica, 24.04.85	0.45	1790	4100	2700	556	125	49.4	363	210	182	28.3	0.078
Delaware, 29.04.84	0.45	215	402	232	50.5	11	61.2	43.7	29.6	40.2	6.01	0.128
Delaware, 29.04.85, 0.05	0.45	135	168	124	28.6	6.69	37.1	33.3	22.3	28.7	4.65	0.180
Tamar, 17.04.85	0.45	310	745	722	176	41.9	182	124	68.5	62.2	10.1	0.095
Tamar, 12.08.85, 0.04	0.45	577	1010	914	238	59.5	255	174	98	95.2	15.6	0.107
Tamar, 12.08.85, 0.043	0.45	540	368	614	162	40.5	191	116	75.6		13.4	0.123
Tamar, 12.08.85, 0.044	0.45	480	497	779	203	50.6	220	145	79.5	73.6	12.1	0.102
Tamar, 12.08.85, 0.049	0.45		640	854	218	53.6		150	82.8	84.5	12.7	0.097
Tamar, 12.08.85, 0.064	0.45	400			319	74.4	333	204	93.6		14.1	
Tamar, 19.08.85, 0.02	0.45		239	260	62.8	15.4	70.6	47.3	30	30.6	5.63	0.115
Tamar, 19.08.85, 0.02	0.45	182	269	268	64	15.4	66.1	47	28.9	30	5.01	0.108
Tamar, 19.08.85, 0.02	0.45	173	258	241	57	13.7	62.4	39.9	24.7	27.3	4.31	0.102
Tamar, 19.08.85, 0.04	0.45		307	212	49.7	11.8		34.4	22	24.6	4.27	0.104
Swale 02.02.86	0.45	2400	4800	3320	810	208	1000	610	267	190	27	0.080
Dove, 02.02.86	0.45	654	1530		330	80		250	118	109	16	
Warfe, 02.02.86	0.45	724	1130	755	163	31.7		101	50	41.1	6.1	0.066
Rye, 02.02.86	0.45		1350	725	195	48	206	151	72.3	64.5	11.1	0.100
Nidd, 02.02.86	0.45	664	1250	1650	261	65.6		190	94.4			0.057
Derwent, 02.02.86	0.45	557	1130	670	151	33.2	150	113	59.1	53.9	8.06	0.088
high flow												
Derwent, 08.02.86	0.45	127	297	190	45.6	11.3	54.6	39.2	22.8	18.4	3.2	0.120
low flow												

		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Er/Nd
Elderfield et al. (1990) -cont'd												
Ribble, 16.04.86	0.45		2990	2320	526	139	501	362	176	107	19.3	0.076
Hodder, 16.04.86	0.45		3160	2150	484	122	401	340	150	125	18.7	0.070
Conwy, 02.05.86	0.45	189	430	372	115	28.9				57.5		
Water of Luce, 19.02.87	5		1950	1330	269	53.5	301	200	110	175		0.083
Water of Luce, 19.02.87	2		1930	1340	271	53.2	293	195	115	175		0.086
Water of Luce, 19.02.87	0.45		1790	1340	270		300	199	107	156		0.080
Water of Luce, 19.02.87	0.2		1250	927	193	41.6		145	79.3	122		0.086
Sholkovitz (1995)												
Mississippi												
Vicksburg (#484)	0.22	59.9	52.5	80	19.9	4.26	27	27.1	25.4	25.3	3.51	0.318
Aug. 1993												
Sholkovitz (unpubl.)												
Mississippi, (#595)^	0.22	39	46	64.3	17.1	3.91	23.7	28.6	26.4	22.8	3.06	0.411
COMUS III, 6/4/1994^^												
Mississippi, (#611)	0.22			79.6	19.6			29.7	26.0	22.2	2.95	0.327
COMUS III , 3 June 1994												
Mississippi, (#612)	0.22			76.2	18.2	4.3	27.8	28.6	25.9	22.5	3.08	0.340
COMUS III, 6/4/1994												
Achafayla R. (#596)	0.22	71.6	75.8	96.8	24.2	5.53	29.7	28.5	19.7	11.9	1.35	0.204
COMUS III, '6 June 1994												
^, Sample # I.D.												
^^, cruise name, date												
Sholkovitz (1993)												
Amazon, Aug. 1989	0.22	373	930	579	146	35	150	130	70.4	56.8	7.25	0.122
Amazon, Aug. 1989	0.22	305	754	471	123	29.8	137	111	61.3	50.2	6.44	0.130
Sholkovitz (unpubl.)												
Fly River (PNG)												
Jan'94 Sta 605 (#562)	0.22	108	252	178	50.3	13.9	55.5	39.6	18.6	13.6	1.7	0.104
Jan'94 Sta 605, (#566)	0.22	108	260	178	51	8.4	57	38.8	16	13.8	1.69	0.090
Sholkovitz and Elderfield (1988)												
Susquehanna River	0.22	62.6	103	86.5	21.4	5.25	29.3	32.6	24.3	24.1	4.12	0.281
(Chesapeake Bay)												
Aug. 1985												

		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Er/Nd
Sholkovitz (1992, 1995)			Connecticut River									
17-Jun-91												
#80	0.45	195	292	180	36.0	6.92	38.1	27.9	21.6	27.6	4.67	0.120
#81	0.22	78.8	85.8	82.9	17.0	3.26	22.0	15.9	14.8	22.6	4.08	0.178
#83	0.025 (1	38.8	45.6	49.2	10.9	2.00	16.7	11.8	13.1	21.3	3.87	0.266
#84	0.025 (2	42.6	43.8	48.6	11.1	2.08	16.9	12.1	13.4	21.6	3.94	0.275
22-Sep-91												
#105	0.45	168	222	178	36.4	7.05	40.3	28.9	22.9	30.7	5.36	0.129
#106	0.22	154	196	166	33.5	6.52	37.3	27.2	21.9	30.2	5.11	0.132
#107	0.025	101	122	112	24.4	4.72	29.2	21.4	19.0	27.5	4.83	0.169
#108	0.025	95.3	119	109	23.5	4.61	28.7	21.0	19.1	27.9	4.60	0.175
20 JULY 1992												
#224	< 5 K*	12.8	13.5	16.1	3.95	0.90	8.57	7.02	9.70	18.7	3.59	0.604
#223	< 50 K	19.1	22.3	25.7	6.33	1.38	11.9	9.35	11.7	21.2	4.04	0.457
#222	0.22	148	184	143	27.6	5.72	29.8	23.0	18.3	27.0	4.44	0.128
17 DEC. 1992												
#339	< 5 K		74.4	87.3	17.1	3.58	27.2	19.1	18.5	29.7	5.00	0.212
#340	< 50 K		163	179	33.0	7.60	50.4	34.6	28.9	40.0	5.60	0.161
#394	0.22 um		680	576	89.4	19.6	114	87.7	59.8	68.0	8.83	0.104
Sholkovitz (1992, 1995)												
23 Oct. 1992	Ultrafiltrates*											
Hudson River												
#289	<5K(1)**		110	111	20.8	5.42	34.5	26.4	22.2	22.4	2.77	0.200
#308	<5K(2)		102	109	21.9	4.31	32.2	24.7	18.0	21.9	2.95	0.165
#303	<50K		213	209	41.4	8.22	60.1	46.5	30.3	34.7	4.00	0.145
#305	0.025		320	310	56.4	12.6	89.9	62.8	39.5	44.1	5.19	0.128
#304	0.22		443	423	78.8	17.0	121	81.6	49.5	52.4	3.91	0.117
	Colloids**											
#302	>50K		2843	2547	492	88.1	593	401	227	221	27.9	0.089
#301	>5K(1)**		4142	3903	719	132	981	654	390	363	45.8	0.100
#309	>5K(2)		4071	3901	719	144	1028	642	391	370	47.9	0.100
Colloids												
Conn R. 20 July 1992												
#225	> 50 K**	2059	2523	1905	354	71.0	324					
#226	> 5 K	3305	4045	3143	590	120	544	412	253	223	31.4	0.081
Conn R. 17 Dec. 1992												
#343	>50K		5677	4726	815	168	999	673	366	353	40.9	0.077
#344	>5K		4852	4099	657	165	837	622	359	360	46.8	0.088
#, I.D number for analyses in Sholkovitz's laboratory												
* ultrafiltrate												
**retentate from ultrafiltration												
***, filter size in unit of um except for ultrafiltration where nomimal molecular wt. cuts are used												

Table A2: **Section 5.1 of Handbook - Lanthanide composition and aquatic chemistry of river water**

File name: RIV_PART.XLS. Compilation of RE concentrations of river suspended particles and sediments.

	Rivers: Suspended Particles and Sediments														
riv_part.xls															
						[ppm]									
		La	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**
Goldstein and Jacobsen (1988a), [TIMS]															
Amazon		35	73		33	5.9	1.1	4.2		2.6		1.2		1	0.2
Gr. Whale		52	103		39	5.8	1.1			2.9		1.5		1.3	0.2
Indus		19	41		19	3.7	0.9	3		2.5		1.2		1.1	0.2
Isua-F		73	143		52	8	1.1	5.5		3.7		1.5		1.4	0.2
Miss.		44	93		40	7.5	1.5	5.9		5.1		2.4		2.1	0.3
Ohio		41	84		37	6.9	1.4	5.1		4		1.9		1.5	
Murray		38	71		35	7	1.6	5.7		4.6		2.1		1.8	0.3
Pampanga		7.7	18		13	3.6	1.1	4.9		4.7		2.9		2.7	0.4
Shinano		29	63		27	5.8	1.2	5.4		4.7		2.5		2.3	0.4
Avg. River		40	81		36	6.9	1.4	5.3		4.2		2		1.7	0.3
Martin et al. (1976), [INAA]															
Amazon		48	112			9.7	1.8							3.7	0.6
Congo		47	104				1.5		1.6					2.4	0.4
Ganges		42	98		48	9.7	1.2		0.7				0.4	3.2	0.5
Mekong		48	93	8.5	47	5.4	1.5	5.3	0.9		0.9	2.7	0.5	3.6	0.6
Garrone		44	93	8.2	36	6.2	1.1	6.1	0.9		0.9	2.4	0.4	2.8	0.4
Martin and Maybeck (1979), [INAA]															
Amazon		48	112			9.7	1.8							3.7	0.6
Congo		50	90				1.6	2.5	1.6					2.6	0.4
Danube		28	65			6.3	1.5		0.6					4.6	0.5
Ganges		42	98		48	9.7	1.2		0.7				0.4	3.2	0.5
Garonne		44	93	8.2	36	6.2	1.1	6.1	0.9		0.9	2.4	0.4	2.8	0.4
Magdelena		37				6.7	1.4							3.7	
Mekong		48	93	8.5	47	5.4	1.5	5.3	0.9		0.9	2.7	0.5	3.2	0.6
Parana		50				9.1	2							3.5	0.6
Somayajulu et al. (1993), [INAA] Indian Rivers															
Godavari	#14	40	78		32	6.2	1.6		0.9					2.7	
Godavari	#13	30	63		26	4.9	1.2		0.8					2	
Gordeev et al., (1985), [INAA] Amazon Rivers															
Rio Negro		46	112		49	7.6	1.6		2.7				1.3	8.6	1.5
Clear Water Rivers		55	132		60	12	2.3	10	2				1	8	1.4
Maderia		44	92		37	5	0.9		1.1					3.2	
Amazon		44	114		42	8.7	1.7		1.2				0.5	2.8	0.5
TIMS = thermal ionization mass spectrometry															
INAA = instrumental neutron activation analysis															

		La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Sholkovitz (1995, unpubl.) TIMS															
Amazon	ICP,#420	49	99		48	8.7	1.7	7.3		6.4		3.6		3.5	0.5
S'd part.	fusion														
Aug-89															
Miss. R	TIMS, #494	35	74		34	6.2	1.3	6.5		5.1		3.5		2.8	0.4
S'd part.	fusion														
V'sBurg	Aug. 1993														
Fly R	TIMS, #583	35	74		35	7.7	1.5	6.7		4.4		2.6		2.5	0.3
Papua New Guinea															
S'd part.	fusion														
Jan-94															
Fly R	TIMS, #581		71		32	7.4	1.4	6.9		5		3		2.8	0.4
river bank sediment															
Jan-94															
fusion															
Conn R	TIMS, #550	32	71		34	6.7	1.4	6.2		5.8		3.4		3.2	0.4
S'd part.	fusion														
Jun-91															
Sepik R.	ICP, #405	21	47	25	4.7	1.1	4.2	4.2	2.4	2.5	0.4				
Papua New Guinea															
25 km up river from mouth															
bottom sediment															
fusion															
fusion = total dissolution of solid by metaborate fusion															
ICP = inductively coupled plasma -emission spectroscopy															

Table A3: Section 5.2 of Handbook - The estuarine chemistry of the lanthanides.

File name: GWHALE.XLS. Great Whale River estuary, Quebec

File name: GIRONDE.XLS. Gironde River estuary, France

File name: AMAZON.XLS. Amazon River Estuary, Brazil

File name: CBAYSE.XLS. Surface waters, subsurface waters and shelf waters of Chesapeake Bay

File name: CBAY92.XLS. Chesapeake Bay bottom water time-series

File name: FLY.XLS. Fly River estuary, Papua New Guinea.

File name: ELDERF.XLS. Data from a suite of estuaries presented in Elderfield et al. (1992)

GWHALE.XLS

gwhale.xls			Great Whale River (Quebec) Estuary							
				and Hudson Bay						
Goldstein and Jacobsen (1988b)										
* 0.22 um filtrate										
Salinity	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
				[pmol/kg]						
0.004	1634	2405	1158	158	25.1	105	68.3	34.4	33.2	5.38
0.37	1375	2048	1040	144	22.5		59.7	29.4		
1.69	711	1056	540	76.5	12.2		33.4	19.4	18.8	3.00
3.93	542	928	449	69.8	11.0		29.8	17.4		
5.22	384	785	384	60.0	8.56		29.3	19.9		
14.9	366	449	239	31.1	5.33		16.9	11.1		
21.9	246	226	139	20.0	4.01		17.3	12.7	14.8	2.12
Hudson Bay										
31	170	123	100	15	2.82	13.9	13.2	10.2	10.1	

GIRONDE.XLS

			Gironde River (France) Estuary											
gironde.xls														
Martin et al. (1976)														
0.45 um filtrate														
Salinity	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
						[pmol/l]								
0.1 [river]	344	564	52.0	263	51.9	9.7	54	7.8		8.7	25.1	3.6	21.0	3.7
0.42	142	228	25.6	96.4	20	3.9							18.5	3.5
7.0	39.6	80.6	10.6	68	8.0	2.4	11.5	1.6		2.2			8.7	1.7
28.3	56.1	78.4	6.4	35.4		0.86	6.2	0.80		0.97	4.2	0.72	3.1	0.49
35 [ocean]	24.5	8.6	4.5	19.4	3.0	0.85	4.4	0.88	5.6	1.3	5.2	1.0	4.7	0.86

amazon.xls												
					Amazon Estuary							
					[AmasSeds I Cruise - Aug. 1989]							
Sholkovitz (1993)												
0.22 um filtrates												
Surface Waters		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce
Sta. #	Sal					pmol/kg						Anom.
I-1-18a	0.3	373	930	579	146	35	150	130	70.4	56.8	7.25	1.00
I-1-18b	0.3	305	754	471	123	29.8	137	111	61.3	50.2	6.44	0.99
I-1-19	0.84	211	504	346	84.2	20	94.5	72.3	39.4	32.0	3.8	0.93
I-1-20	5.5	22.8	36.6	33.5	9.3	2.49	13.3					0.66
I-1-53	5.8	20.6	34.6	29.4	8.7	2.4	13	12.7	8.7	7.8	1.07	0.70
I-1-29	6.6	17.9	29.0	26.3	7.6	2.08	11.1	11.2	7.7	6.9	0.96	0.66
I-1-30	9.5	20.1	31.2	27.7	8.0	2.21	11.9	12.3	8.9	7.8	1.07	0.65
I-1-30	11.8	22.6	34.5	28.2	7.5		12.2	12.1	8.8	7.7	1.1	0.67
I-1-21	17.8	27.5	38.2	30.7	7.7	2.03	12.1					0.64
I-1-22	21.9	29.7	41.5	34.1	8.7	2.45	14.3		11.8	9.7	1.34	0.64
I-1-50	24.3	29.4	32.1	33.6	8.8	2.49	14.5	16.0	12.3	9.8	1.32	0.50
I-1-35	27.6	35.7	33.3	41.2	10.6	2.98	17.2	18.9	14.4	12.0	1.64	0.42
I-1-23, r	33.4	30.0	35.4	35.3	8.8	2.42	14	15.1	11.4	9.4	1.26	0.53
I-1-23, r	33.4	29.8	35.1	36.5	9.9	2.43	14.8	15.0	11.3	9.2	1.25	0.52
I-1-14, r	34.5	35.5	29.5	40.8	10.4	2.96	17.4	19.8	14.5	12.6	1.77	0.38
I-1-14, r	34.5	35.4	30.2	42.4	11.8	2.94	18.3	19.5	15.2	12.6	1.79	0.38
I-1-3	35.5	11.1	13.8	13.6	4.0	0.69	5.0	4.4	3.7	3.2	0.44	0.55
I-1-24	36.4	19.0	22.3	24.8	4.3	1.14	6.1	6.6	5.1	4	0.54	0.51
I-1-12	36.4	10.4	14.3	12.8	3.5	0.63	4.6					0.61
I-1-9	36.6	15.6	15.6	16.6	4.2	0.77	5.1	4.3	3.4	2.7	0.36	0.47
Deep Waters												
50-16M*	33.9	36.2	33.8	42.3	11.2	2.84	17.2	17.3	12.8	10.6	1.42	0.42
20-10M	35.0	45.6	38.5	52	14.0	3.47	22.1	24.3	18.0	15.5	2.09	0.39
22-10M	35.8	21.6	25.1	27.1	7.6	1.69	10.0	9.2	6.2	5.1	0.69	0.51
53-19M	36.2	55.0	35.1	60.8	15.5	3.93	24.2	25.3	19.4	15.8	2.11	0.29
30-21M	36.5	39.1	36.5	46.7	12.7	3.26	20.0	20.9	15.8	12.8	1.73	0.42
r = replicates												
* Sta #- Depth												

cbayse.xls					Chesapeake Bay							
					[July-Aug 1985]							
Sholkovitz and Elderfield (1988)												
0.22 um	Sal		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
filtrate						[pmol/kg]						
1. Near Surface (1 or 2 m) Samples												
Sta. #												
CB-20,a	1.21		17.5			7.07	1.83		13.6	17.0	19.8	3.40
CB-20,b	1.21			21.6	23.1	7.04	1.79	13.5	14.0	16.5	22.5	3.70
CB-19,a	0.09		53.3	95.4	82.1	19.4	4.92	37.9	31.0	23.2	30.0	6.88
CB-19,b	0.06		62.6	103.2	86.5	21.4	5.25	29.3	32.6	24.3	24.1	4.12
CB-18	2.73		14.9	14.7	17.6	5.22	1.39		11.8	15.3	18.5	
CB-17	7.24		6.02	12.7	18.0	5.16	1.34	8.69	10.2	11.9	13.9	1.85
CB-16	8.97		19.5	12.9	16.4	4.43	1.16	6.92	11.5	10.6	19.1	2.45
CB-15	11.6		26.4	11.4	21.4	5.30	1.38		10.5	10.9	13.7	2.39
CB-14,a	14.2		33.4	30.3	23.5	5.39	1.40	8.28	9.03	8.62	10.8	1.98
CB-14,b	14.7			30.1	23.4	5.79	1.39		9.25	8.74	11.0	
CB-12	15.6		14.4	10.2	13.0	3.25	0.89	5.50	7.34	7.10	19.0	1.85
CR-1	15.8		22.2	12.6	20.5	5.85	1.45	13	10.4	9.25	11.5	1.96
CB-10	16.7		15.9	10.0	14.0	3.28	0.87	5.29	6.08	6.06	8.34	1.59
CB-7	20.1		16.0	15.1	15.7	3.81	0.97		7.90	7.38	9.83	1.71
CB-5	23.4			22.1	19	4.45	1.11	7.70	8.91	8.45	9.74	1.83
CB-2	27.0			30.0	23.6	5.34	0.95		10.9	9.75	17.0	
CB-1	30.6			34.7	27.2	6.05	1.46		11.0	9.75	1.47	
	Sal	Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
		(m)					pmol/kg					
2. Subsurface waters												
CR-1	15.9	5.0	21.4	11.2	17.6	4.39	1.17		8.54	8.42	11.1	2.01
CR-1	16.5	8.7	32.1	25.5	26.1	6.75	1.64	9.69	9.29	8.25	10.3	1.93
CR-1	19	13.0	43.7	36.0	27.7	6.11	1.55	10.1	8.00	7.14	9.89	1.32
CR-1	19.4	16.0	45.8	39.6	29.7	6.49	1.63	9.89	8.53	7.30	8.95	1.59
CR-1	20.4	21.5	51.7	39.3	32.9	6.88	1.73	10.4	9.26	7.61	8.89	1.66
CB-10	21.5	10.0	29.8	29.2	17.7	3.60	0.92	5.13	5.89	5.70	7.42	1.5
CB-12	20.9	22.0	68.3	91.5	47.3	9.27	1.77		15.3	13.5	12.8	2.18
CB-14	19.1	37.0		56.2	34.8	7.34	1.86		10.3	8.63	10	
3. Shelf Waters outside of Chesapeake Bay												
CS-1 (a)	32.9	2	35.1	18.3	27.9	5.79	1.4	8.08	10.5	8.91	9.18	1.54
CS-1 (b)	32.9	2	30.2	17	25.9	5.38	1.18		10.9	8.37		1.57
CS-1	35.4	90	23.5	10	17.7	3.62	0.9	5.16	5.93	4.97	4.7	0.76
CS-2	33.1	3				4.69	1.5			7.45		3.97
CS-4	32.8	2	32.1	16.7	25	5.17	1.25		9.04	7.93	8.11	1.37

CBAY92.XLS

			Chesapeake Bay Bottom Water Time-Series								
cbay92.xls											
Sholkovitz et al. (1992)											
0.22 um filtrate											
Sample	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce
				[pmol/kg]							Anom.
10-Feb-88	59.5	32.6	49.8	11.4	2.95	11.7	19.1	16.3	17.2	2.52	0.28
12-Apr-88	56.6	46.7	47.8	11.7	2.89	17.1	17.4	14.8	15.6	2.33	0.42
17-May-88	115	109	79.5	18.2	4.55	25.4					0.65
14-Jun-88	108	156	85.1	18.6	4.59	24.2	22.6	16.5	15.9	2.37	0.75
6-Jul-88	81.3	107	59.9	13.3	3.27	18.5	17.1	13.5	13.9	2.11	0.7
26-Jul-88	209	301	163	30.7	7.95	39.3	35.5	24.9	21.1	2.35	0.73
16-Aug-88	249	380	192	38.6	9.16	48.6	40.3	27.3	22.3	3.04	0.80
21-Sep-88	70.7	68.1	45.8	10.5	2.72	16.2	15.6	12.3	11.6	1.77	0.53
24-Oct-88	52	29.5	41.5	9.90	2.59	15.3	15.5	12.1	12.2	1.89	0.29
15-Nov-88											
20-Dec-88	52.5	24.6	46.8	11.4	2.95	17.6	19.0	17.9	17.1	2.50	0.23
15-Feb-89	51.7	25.4	46.0	10.6	2.78	16.5	18.3	15.6	16.3	2.46	0.25

FLY.XLS

fly.xls			Fly River (Papua New Guinea) Estuary									
				[Jan.1994]								
Sholkovitz (unpubl.)												
0.22 um filtrates												
SAMPLE	LAB #	Sal	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
							[pmol/kg]*					
-	-	-	-	-	-	-	-	-	-	-	-	-
Sta 605 (R)	562	0	108	252	178	50.3	13.9	55.5	39.6	18.6	13.6	1.70
Sta 605 (R)	566	0.2	108	260	178	51.0	8.4	57.0	38.8	16.0	13.8	1.69
Sta 610	568	2.6	14.4	38.2	27.5	10.1	2.2	13.2	8.36	4.95	4.21	0.59
Sta 612	569	4.2	10.5	26.7	21.9	8.54	1.74	11.4	7.23	4.44	3.86	0.55
Sta 613	575	5.1	10.3	18.8	20.1	8.05	1.54	10.7	6.67	4.24	3.60	0.57
Sta 614	570	7.4	12.4	24.0	23.1	8.54	1.79	11.7	8.01	4.95	4.26	0.61
Sta 616	571	10.3	11.6	19.9	21.6	8.31	1.69	11.4	7.63	5.01	4.24	0.60
Sta 617	572	14.5	16.8	35.1	27.7	9.78	2.34	14.1	10.5	6.85	5.69	0.00
Sta 620	573	21.0	18.5	29.7	29.3	10.5	2.37	15.2	11.4	7.47	6.07	0.85
Sta 622	574	27.3	23.8	34.3	33.9	11.8	2.92	17.3	13.4	8.77	0.00	0.98
Sta 589 (R)	561	34.7	25.1	34.9	38.6	12.2	3.30	19.3	15.8	10.5	8.32	1.14
Sta 589 (R)	567	34.7	25.8	38.73	37.0	12.7	3.25	18.8	15.5	10.0	8.10	1.09
R= replicates												

		Dissolved Concentrations of Estuarine Waters									
elderf.xls											
Elderfield et al. (1990)											
	Sal	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
						[pmol/kg]					
Connecticut River [1 um filtrate]											
	0	4130	5450	2710	507	98.4	454	328	170	197	21.7
	0	2600	4340	2240	422	81.4	348	269	140	132	17.6
	2.6	1280	2580	1370	259	49.9	166	172	94.2	35.8	13.4
	4.3		2600	1350	253	48.8	160	171	91.1	93.2	13.7
	4.7	923	1640	898	171	33.1	133	120	61.9	64	9.93
	7.1	1190	2020	1060	200	37.4	145	135	74.1	71.7	10.5
	10.3	1030	1790	1660	196	37.7	160	125	68.3	65.5	9.77
	12.2	1020	1740	885	165	31.8	140	117	65	61.6	8.98
	16.5	551	876	547	97.1	19.3	72.7	67.7	38	36.3	5.87
	20.9	475	1070	461	78.8	15.4	73.1	55.5	31.8	30.3	5.5
	24.5	287	456	265		9.35	65.7	39.8	22	23.5	3.73
Delware River [0.45 um filtrate]											
	0	215	402	232	50.5	11	61.2	43.7	29.6	40.2	6.01
	0.5	135	168	124	28.6	6.69	37.1	33.3	22.3	28.7	4.65
	5.8		70.6	52.6	13.7	2.86	22.8	16.9	13.5	17.8	3.32
	7.9	72.2		47.7	11.1	2.6	19.6		13.3	17.1	3.81
	12.6	262	37.8	32.4	7.87	1.97	19.8	14.3	12.2	21.5	3.64
	12.9	78.9	52.5	39.5	8.98	2.13	18	14.7	12.3	18	3.19
	17.0	60.9	70.3	42.9	9.3	2.17	20	14.5	13.1	21.9	
	20.9	54.9	65.1	44.8	11.1	2.71	14.8	13.9	13.7	17.5	3.15
	23.0		80.1	49.5	12.6	3.49	15.4	15.2	13.1	14.7	2.57
Mullica River [0.45 um filtrate]											
	< 0.3	2410	4970	3000	602	127		340	247	190	29.4
	< 0.3	1790	4100	2700	556	125	49.4	363	210	182	28.3
	9.4	438	991	574	123	27.4	121	94.5	58.1	58.2	9.02
	11.9	306	583	370	81.8	18.3	77.6	70.1	42.3		6.39
	17.7	183	316	153	33.6	7.75	36	33.5	22.3	23.7	4.9
	21.8	85.9	125	80.1	16.8	3.83	27.3	18.7	14.6	15	2.42
	22.8	80.6	94.4	65.7	13.8	3.25	21.9	17.6	14.2	15.7	
	24.4	59.1	83.3	53.9	11.2	2.54	20.1	16.6	11.5	15.4	2.6

ELDERF.XLS

	Sal	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
Tamar (Sring Tide) River [0.45 um filtrate]											
	0.02		239	260	62.8	15.4	70.6	47.3	30	30.6	5.63
	0.02	182	269	268	64	15.4	66.1	47	28.9	30	5.01
	0.02	173	258	241	57	13.7	62.4	39.9	24.7	27.3	4.31
	0.04		307	212	49.7	11.8		34.4	22	24.6	4.27
	4.2	73.9	83.1	81.4	20.4	5.19	26.7	18.9	13.4		3.33
	6.95	61	70	67.3	17	4.36	22.4	14.4	11.9	23	3.28
	9.25	56.4	60.7	58.5	14.4	3.73	21.5	11.4	10.7	12.4	2.61
	12.6	60.8	51.4	52.6	12.6	3.24	22	11.8	9.65	12	2.03
	16.5	55	40.2	45.8	10.6	2.72	23.6	12.1	9.13	11.6	2.21
	19.6	39.4	25.2	33.5	7.78	2.04	11.2	9.94	6.45		1.48
	22.8	40.8		35.2	8.13	2.1	13.4	8.44	7.23	9.43	1.4
Tamar (Neap Tides) [0.45 um filtrate]											
	0.04	577	1010	914	238	59.5	255	174	98	95.2	15.6
	0.043	540	368	614	162	40.5	191	116	75.6		13.4
	0.044	480	497	779	203	50.6	220	145	79.5	73.6	12.1
	0.049		640	854	218	53.6		150	82.8	84.5	12.7
	0.064	400			319	74.4	333	204	93.6		14.1
	11.2	130	158	132	30.3	7.33	34.3		19.4	17.4	2.9
	18.7	55	60.6	58.1	13.8	3.43	14.8	15.3	10.2	15.5	1.72
	21.6		36.5	41.9	9.86	2.52	12.8	9.97	8.27	9.45	1.58
	25.6	39.1	33.7	41.7	9.13	2.32	11.2	8.78	7.94	8.91	1.57
Amazon River [0.45 um filtrate]											
	0	355	847	570	145	35.3	185	121	65	52.2	6.93
	4.16	1690	3820	1690	356	79.6	335	222	100	78.5	11.8
	9.16	406	786	383	82.8	18.9	107	58	29	24.9	3.29

Table A5: **Section 6.1 of Handbook. Atlantic Ocean seawater**

File name: NdSm_A.XLS. Concentration of Nd and Sm only for the Atlantic Ocean.

			ATLANTIC OCEAN						
NdSm_A.xls			[Nd and Sm Data Only]						
				(pmol/kg)					
Jeandel (1993)		**Map # 5**			**Stordal & Wasserburg (1986)**				
Cruise Name		**Depth**	**Nd**		**Map #7**	**Depth**	**Nd**	**Sm**	
SAVE 217		108	8.5		Sta 43	10	34.7	6.32	
		264	9.6			110	27.2	4.99	
		435	9.6			300	21.2	4.06	
		869	10.5			410	21.6	4.19	
		1087	11.7				20.9	3.92	
		1835	14.5			680	22.2	4.26	
		2443	18.4			760	30.8	5.52	
		3454	22.9				30.6		
		4675	25.9		Sta 45	0	39.4		
SAVE 302		49	9.2			65	30.1	5.25	
		173	11.8			190	44.4		
		470	10.4		Sta 48	10	40.7		
		795	9.9			150	40.0		
		893	10.1			600	25.1		
		1586	12.7		Sta 113	400	26.1		
		2763	18.9			1200	26.8		
		3156	19.7			1600	31.6		
		3937	28.8			2200	42.8		
		4564	38.2		Sta 53	60	32.0		
SAVE 271		48	8.7		Sta 87	35	34.8		
		147	10.5			135	41.4		
		347	10.9		Sta 104	90	38.4		
		1027	14.4			180	33.6		
		1434	15.9						
		1973	19.4		**Piepgras & Wasserburg (1983)**				
		2562	27.0			Depth	Nd	Sm	
		3537	27.0		A-II,109-1-	0	12.5	2.50	
		4792	27.7		**Map # 9**	200	13.9	2.77	
		5060	27.0			500	15.7	3.14	
						800	17.2	3.51	
Spivak & Wasserburg (1988)						1000	16.2	3.45	
		Depth	Nd			1150	18.1	3.54	
TTO-TAS 80		0	13.8			1300	17.3	3.54	
Map # 6		389	13.9			2000	17.1	3.31	
		1152	17.9			3000	19.7	3.70	
		1260	16.3			4000	23.1	4.28	
		1990	17.1						
		2984	20.2		**Piepgras & Wasserburg (1980)**				
		4724	26.3		**Map # 11**	Depth	Nd	Sm	
					OCE63-1-1	300	13.9	3.07	
					OCE63-2-2	2200	17.8	3.43	
					OCE63-2-3	3400	22.1	4.14	

Piepgras and Wasserburg (1987)									
Map # 6				**Depth**	**Nd**				
Hudson	83-036	abrad	Current	100m	32				
Hudson	83-036	Sta 9		5 m	25				
				1200	18.2				
				2550	20				
Hudson	83-036	ta. 11		5	21.1				
				125	21.7				
				500	19.2				
				800	18.2				
				1000	18.1				
				1500	18.1				
				2000	17.7				
				2500	16.7				
				3000	17.3				
				3500	18.2				
				3850	19.4				
Piepgras and Wasserburg (1987)					**Map # 6**				
TTO/NAS		Sta. 142		750	21.4				
		Sta. 144		65	14.3				
				3750	16.3				
		Sta. 149		2800	16.8				
		Sta. 167		840	16.5				
				2310	20.6				
All-109-1		Sta. 30		5	14.4				
				200	13.6				
				400	14.6				
				600	14.6				
				800	15.2				
				1100	18				
				1800	18.4				
				3000	18.9				
				4000	26.3				
				4850	62.5				
All 109-1		Sta. 39		5	7.9				
		Sta. 79		5	9.29				
		Sta. 95		0	12.5				
OCE63		Sta. 1		300	13.9				
		Sta. 2		2000	17.8				
				3400	22.1				
TTO/TAS		Sta. 63	Chelex	0	18.2				
			Extraction	200	15.2				
			data	390	15.5				
				590	14.8				
				790	15.9				
				980	16.2				
				1990	17.3				
				2910	18.4				
				3890	25.7				
				4280	26.5				
				4810	30.1				

Table A6: Section 6.1 of Handbook. Atlantic Ocean seawater

File name: ASW_CONC.XLS. Concentration of RE in the Atlantic Ocean.

File name: SARG_DIS.XLS. Concentration of dissolved RE in the Sargasso Sea from Sholkovitz et al. (1994)

File name: SARG_PAR.XLS. Concentration of suspended particles in the Sargasso Sea from Sholkovitz et al. (1994). Data on the chemical leaching of particles [acetic acid, strong mineral acid and bomb/strong acid dissolution]. Data in per kg of seawater

Atlantic Ocean Seawater

asw_conc.xls

CONC = pmol/kg

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu		Ce/Ce*
-	-	-	-	-	-	-	-	-	-	-		-
Sholkovitz & Schneider (1991)	**Map # 3**											
Sta 10 (30 35'N & 64 45'W)												
20	16.6	16.3	16.9	3.73	0.99	5.38	6.09	4.85	4.13	0.57		0.47
40	16.2	16.8	17.1	3.60	0.97	5.21	6.02	4.77	4.09	0.56		0.49
60	16.0	15.3	16.5	3.55	0.95	5.15						0.45
120	15.8	12.8	16.0	3.50	0.95	5.15						0.39
160	16.8	11.5	16.2	3.53	0.94	5.11						0.33
200	16.4	12.6	16.3	3.59	0.97	5.34	6.00	4.80	4.11	0.54		0.37
Sta 8 (31 46'N & 64 12'W)												
15	16.0	15.7	15.9	3.51	0.92	5.33	5.84	4.74	4.04	0.55		0.47
15	15.7	15.1	17.6	4.55	0.93	6.07						0.44
30	15.5	15.0	15.6	3.49	0.92	5.12	6.02	4.71	4.07	0.56		0.46
45	15.5	14.0	16.0	3.50	0.93	5.10						0.43
60	15.7	13.5	15.5	3.46	0.91	5.07	5.86	4.77	4.15	0.57		0.41
105	14.9	12.1	15.5	3.46	0.94	5.27	5.89	4.77	4.12	0.56		0.38
200	15.4	10.8	15.9	3.48	0.88	5.27	5.86	4.75	4.08	0.56		0.33
255	15.5	11.1	16.8	4.18	0.90	5.83	5.83	4.77	4.09	0.56		0.33
340	15.3	9.6	16.2	3.95	0.87	5.57	5.59	4.58	3.98	0.53		0.29
440	15.4	8.2	15.2	3.29	0.88	4.80	5.47	4.56	3.97	0.55		0.25
550	16.9	6.3										0.28
750	20.5	5.1	16.0	3.27		7.28	5.15	4.45	4.20	0.52		0.13
1000	24.4	5.9	21.2	5.25	0.88	6.73	5.59	4.94	4.59	0.69		0.12
1500	26.0	6.8	21.4	5.41	0.89	6.85	5.71	5.08	4.76	0.70		0.13
2000	23.3	6.3	19.4	5.10	0.82	6.48	5.40	4.93	4.56	0.66		0.14
3000	24.8	5.8	20.8	5.27	0.87	6.78	5.80	4.99	4.68	0.69		
4000	40.8	9.5	31.8	7.21	1.27	8.71	7.25	6.11	5.90	0.86		
Elderfield & Greaves (1982)				**Map #10**								
Sta 1B/79 (28 01'N & 25 59'W)												
0	36.7	66.3	34.3	6.01	0.62	5.59	5.00	3.63	3.15			0.89
100	13.0	16.8	12.8	2.67	0.64	3.41	4.78	4.07	3.55			0.62
200	17.0	22.3	15.8	4.52	0.85		5.31	4.62	4.07			0.64
600	22.5	18.4	19.7	3.86	0.80	4.85	5.41	4.58	4.14			0.41
700	25.2	24.7	21.9	4.23	0.76	5.23	5.43	4.57	4.07			0.49
900	20.8	9.6	21.1	4.32	0.82	5.20	5.61	4.94	4.66			0.22
1000		20.8	22.8	4.51	1.01		6.00					1.22
1500	22.8	9.7	19.0	3.72	0.95	5.31	6.03	5.30	4.99			0.22
2500	29.4	26.1	25.0	4.75	0.90	7.19	6.10	5.09	4.79			0.45
3000	32.6	19.3	25.4	4.69	0.99	5.80	6.14	5.33	5.21			0.31
4500	54.4	55.1	45.8	8.25	1.22	8.27	6.830	5.34	5.16			0.51
DeBarr et. al. (1983)				**Map # 8**	**Sargasso Sea (33 58'N & 58 05'W)**							
Depth	La	Ce	Pr	Nd	Sm	Eu	Tb	Ho	Tm	Yb	Lu	Ce/Ce*
-	-	-	-	-	-	-	-	-	-	-	-	-
10	15.0	86	4.5	18.5	3.7	0.78	0.75	1.8	0.74	4.3	0.68	2.53
49	12.0	80	3.0	15.4	3.4	0.75	0.73	1.5	1.00	5.1	0.78	2.90
98	12.3	42	3.0	14.2	3.0	0.60	0.69	1.6	0.68	3.8	0.61	1.55
147	12.9	30	3.4	17.0	3.7	0.75	0.68	1.8	0.93	4.6	0.72	1.00
491	16.7	23	3.4	16.1	3.4	0.70	0.69	1.7	0.76	4.1	0.66	0.67

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu		Ce/Ce*
638	17.8	18	4.1	16.2	3.2	0.65	0.68	1.5	0.62	3.9	0.64	0.50
783	21.3	16	4.0	16.1	3.2	0.64	0.79	1.5	0.73	4.1	0.68	0.39
981	22.2	15	4.0	17.2	3.5	0.73	0.77	1.9	0.95	5.1	0.85	0.35
1179	27.2	23	5.3	19.1	3.6	0.76	0.82	1.9	0.88	4.9	0.82	0.45
1379	26.2	15	4.1	14.9	2.8	0.60	0.67	1.8	0.66	3.7	0.83	0.32
1719	26.2	14	3.8	15.4	3.1	0.65	0.65	1.2	0.70	3.9	0.88	0.30
2486			7.2	20.4	3.3	0.72	0.78	1.6	0.89	5.0	1.10	
2874		20	5.3	18.8	3.5	0.80	0.80	1.6	0.90	5.2	1.17	1.42
3264	46.6	16	4.6	21.4	4.5	1.04	0.97	2.0	1.03	6.1	1.36	0.20
4328	83.8	44	10.7	40.8	7.9	1.67	1.57	2.7	1.27	7.3	1.59	0.31
4378	80.8	44	10.4	39.4	7.6	1.66	1.53	2.6	1.21	7.4	1.59	0.32
4427	82.2	55	10.3	39.8	7.8	1.65	1.40	2.5	1.14	7.0	1.54	0.39
German et. al. (1995)				**Map # 2**								
Sta 47 (39 00.5'S &00 59.2'E)												
Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu		Ce/Ce*
3	10.8	5.56	7.92	1.44	0.39	2.28	2.95	2.74	2.19	0.34		0.27
40	10.9	5.34	7.74	1.45	0.39	2.31	2.91	2.78	2.24	0.34		0.26
78	10.8	5.58	7.97	1.48	0.40	2.43	2.97	2.84	2.32	0.35		0.27
118	11.6	6.31	8.35	1.51	0.41	2.33	2.98	2.80	2.31	0.35		0.29
142	11.0	5.22	8.01	1.48	0.40	3.02	2.38	2.88	2.41	0.37		0.25
166	11.2	5.02	7.80	1.47	0.40	2.33	3.02	2.94	2.47	0.39		0.24
202	12.3	5.58	8.94	1.74	0.47	2.67	3.39	3.22	2.79	0.44		0.24
241	13.2	5.72	9.99	1.96	0.52	3.00	3.70	3.49	3.14	0.50		0.23
286	14.7	5.97	10.7	2.08	0.56	3.12	4.00	3.82	3.53	0.57		0.22
331	13.2	4.56	9.56	1.85	0.50	3.07	3.60	3.61	3.24	0.53		0.18
375		3.99	9.93	1.92	0.56	3.09	3.82	3.68		0.53		
418	13.3	3.64	9.21	1.76	0.47	2.75	3.53	3.53	3.49	0.58		0.15
495	15.3	3.38	10.2	1.94	0.53	3.38	3.93	3.98	4.00	0.67		0.12
565	14.8	3.17	9.43	1.78	0.48	3.02	3.82	3.92	3.93	0.68		0.12
643	16.0	2.98	10.4	1.94	0.53	3.17	4.03	4.31	4.29	0.72		0.10
741	15.7	3.81	10.0	1.94	0.53	3.24	3.99	4.08	4.04	0.66		0.13
839	17.0	3.56	10.5	1.96	0.54	3.23	4.12	4.24	4.43	0.75		0.12
936	18.3	3.38	10.9	2.04	0.56	3.45	4.39	4.56	4.78	0.84		0.10
1082	19.1	3.80	11.1	2.10	0.57	3.46	4.43	4.60	4.89	0.84		0.11
1273	20.3	4.08	12.0	2.23	0.61	3.77	4.69	4.84	5.14	0.89		0.11
1466	24.3	4.80	14.4	2.66	0.73	4.59	5.51	5.56	6.01	1.02		0.11
1657	23.4	5.03	13.9	2.59	0.71	4.61	5.26	5.27	5.60	0.96		0.12
1841	23.4	5.17	14.3	2.64	0.72	4.20	5.23	5.16	5.47			0.12
2088	25.8	5.21	15.8	2.96	0.80	4.75	5.74	5.58	5.87	0.98		0.11
2332		5.43	17.9	3.36	0.91	5.22	6.29	6.00	6.24	1.05		
2581	27.5	5.40	17.8	3.30	0.88	5.07	6.04	5.60	5.82	0.99		0.11
2832	26.0	5.42	16.9	3.11	0.82	4.68	5.43	5.09	5.25	0.87		0.11
3082	30.5	5.25	19.8	3.60	0.95	5.22	6.16	5.65	5.84	0.98		0.09
3330	32.1	6.86	21.1	3.79	0.98	5.44	6.30	5.78	5.97	1.00		0.12
3532	37.9	7.09	25.0	4.58	1.18	6.44	7.83	6.70	6.96			0.10
3737	39.5	7.78	26.6	4.75	1.22	6.76	7.44	6.61	6.91	1.16		0.11
3945	38.6	5.59	26.5	4.86	1.24		8.25	6.53	6.70	1.15		0.08
4202	46.3	7.76	32.0	5.89	1.48	7.83	8.50	7.33	7.59	1.27		0.09
4458	48.9	9.38	34.8	6.42	1.60	8.56	9.05	8.10	7.74	1.30		0.10
4700	44.8	10.47	32.9	6.12	1.51	7.70	8.39	7.17	7.30	1.21		0.12
4995	50.0	14.34	36.8	6.88	1.72	8.50	9.43	7.87	8.14	1.34		0.15

sarg-dis.xls													
			Sargasso Seawater - Dissolved Concentrations										
Sholkovitz et al. (1994)		**Map #3**											
						[pmol / Kg]							
ID	DEPTH	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce-Anom	Salinity
-	-	-	-	-	-	-	-	-	-	-	-	-	
C-1	15	16.0	15.7	15.9	3.5	0.92	5.3	5.8	4.7	4.0	0.55	0.64	36.6
C-1R	15	15.7	15.1	17.6	4.6	0.93	6.1					0.74	36.6
C-2	30	15.5	15.0	15.6	3.5	0.92	5.1	6.0	4.7	4.1	0.56	0.51	36.59
C-3	45	15.5	14.0	16.0	3.5	0.93	5.1					0.51	36.61
C-4	60	15.7	13.5	15.5	3.5	0.91	5.1	5.9	4.8	4.2	0.57	0.41	36.62
C-7	105	14.9	12.1	15.5	3.5	0.94	5.3	5.9	4.8	4.1	0.56	0.38	36.61
C-11	200	15.4	10.8	15.9	3.5	0.88	5.3	5.9	4.7	4.1	0.56	0.33	36.56
C-12	255	15.5	11.1	16.8	4.2	0.90	5.8	5.8	4.8	4.1	0.56	0.33	36.54
C-13	340	15.3	9.6	16.2	4.0	0.87	5.6	5.6	4.6	4.0	0.53	0.29	36.45
C-14	440	15.4	8.2	15.2	3.3	0.88	4.8	5.5	4.6	4.0	0.55	0.25	36.53
C-15	550	16.9	6.3										35.98
C-17	750	20.5	5.1	16.0	3.3	0.00	7.3	5.1	4.4	4.2	0.52	0.13	35.31
C-19	1000	24.4	5.9	21.2	5.3	0.88	6.7	5.6	4.9	4.6	0.69	0.12	35.06
C-22	1500	26.0	6.8	21.4	5.4	0.89	6.8	5.7	5.1	4.8	0.70	0.13	34.98
C-20	2000	23.3	6.3	19.4	5.1	0.82	6.5	5.4	4.9	4.6	0.66	0.14	34.98
C-21	3000	24.8	5.8	20.8	5.3	0.87	6.8	5.8	5.0	4.7	0.69	0.12	35.08
C-23	4000	40.8	9.5	31.8	7.2	1.27	8.7	7.2	6.1	5.9	0.86	0.12	34.9

sarg_par.xls											
			Sargasso Sea Particles								
Sholkovitz et al. (1994)											
acetic acid digest (Ac); strong acid digest; HF bomb digest											
SAMPLE	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce
Depth/Digest				[fmol / Kg seawater]							Anom.

60/Ac	194	160	138	21.7	4.4	21.4	13.8	12.6	4.4	0.12	0.44
105/Ac	393	337	264	42.8	9.1	37.4	21.5	10.0	5.2	0.35	0.47
150/Ac	368	909	231	46.4	9.4		26.5	10.6	6.3	0.50	1.6
200/Ac	319	968	218	44.7	8.7	38.3	27.0	13.2	7.4	0.74	1.64
255/Ac	375	1083	233	44.9	11.2	44.5	30.0	14.3	8.1	0.57	1.60
255/Strong	61	244	69	18.6	4.7	19.0	16.9	8.8	7.6	0.97	1.83
255/Bomb	147	242	99	15.2	3.9	11.5	9.3	5.6	5.2	0.51	0.90
340/Ac	343	1123	267	52.5	12.1	52.8	36.9	17.3	10.1	1.01	1.70
340/Strong	117	395	111	27.6	6.3	26.1	22.4	11.1	10.1	1.21	1.65
340/Bomb	203	396	139	22.1	4.7	15.8	13.4	7.6	7.3	0.96	1.05
750/Ac	352	1183	308	61.9	12.5	59.3	42.5	20.0	11.8	1.22	1.68
750/Strong	142	609	183	42.2	9.7	38.7	33.1	17.2	15.6	2.03	1.86
750/Bomb	294	578	203	32.3	6.5	22.7	18.5	10.8	10.5	1.27	1.06
1000/Ac	395	1216	339	64.5	15.3	61.0	45.3	22.9	11.6		1.55
1000/Strong	178	585	195	43.6	9.6	45.4	34.6	17.8	16.0	2.01	1.52
1000/Bomb	348	620	229	36.8	7.5	29.0	23.4	13.6	13.7		0.97
1500/Ac	437	1306	400	80.0	17.6	74.4	53.6	25.3	16.5	1.75	1.48
1500/Strong	166	500	181	36.0	7.8	31.7	25.6	13.1			1.40
1500/Bomb	315	564	219	33.7	6.9	23.8	20.8	12.1	11.8	1.63	0.96
2000/Ac	336	995	321	64.0	13.8	60.3	42.5	21.2	13.6	1.44	1.44
2000/Strong	164	462	158	32.4		48.3	22.4	11.4	9.6	1.18	1.36
2000/Bomb	380	755	280	46.1			26.8	15.9	16.0	1.98	1.05
Blank/Ac	32	35	23	bd	bd	bd	0.6	0.3	bd	bd	
Blank/Strong	bd	33	16	bd	bd	bd	0.4	0.4	bd	bd	
Blank/Bomb	33	26	16	2	bd	bd	0.7	0.7	bd	bd	

Table A7: Handbook section 6.1. Pacific Ocean seawater

File name: PSW_CONC.XLS. Concentration of RE in Pacific Ocean seawater

Pacific Ocean Seawater

psw_conc.xls

CONC = pmol/kg

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu		Ce/Ce*
Piepgrass & Jacobsen (1992)					**Map #16**							
TPS 47 39-1												
3	22.6	8.0	15.9	2.88	0.75	4.01	4.65	4.22	3.52	0.61		0.19
195	36.3	6.4	22.2	4.09	1.06	5.84	6.72	6.13	6.00	1.07		0.10
364	40.2	6.1	22.9	4.12	1.12	5.94	7.05	6.86	6.80	1.22		0.09
600	42.0	7.7	24.4	4.52	1.17	6.62	7.89	7.57	7.84	1.42		0.10
800	43.1	6.2	25.3	4.70	1.24	6.90	8.16	8.08	8.38	1.53		0.08
1249	45.1	5.9	27.3	5.07	1.36	7.97	9.12	9.04	9.51	1.72		0.07
1795	48.4	6.2	29.8	5.54	1.47	8.56	10.2	9.88	10.8	1.96		0.07
2692	53.7	5.6	34.2	6.39	1.71	9.22	10.9	10.3	11.3	2.01		0.06
3592	57.8	5.6	38.7	7.31	1.92	10.5	11.8	10.6	11.3	2.03		0.05
4481	60.1	6.0	42.9	8.14	2.11	11.3	12.1	10.6	11.2	1.98		0.05
5408	61.6	8.4	44.4	8.60	2.20	11.7	12.4	10.5	11.1	1.97		0.07
TPS 47 80-1												
5174	79.5	13.0	62.8	12.6	3.2	15.8	16.8	13.5	14.0	2.44		0.08
TPS 24 76-1												
4621	68.4	5.5	51.7	10.2	2.5	13.7	13.9	11.7	12.3	2.13		0.04
TPS 24 271-1												
0	5.8	5.0	5.4	1.14	0.32	1.75	2.10	1.78	1.34	0.21		0.42
184	7.8	4.9	6.8	1.43	0.40	2.21	2.70	2.32	1.92	0.31		0.31
381	10.1	3.4	7.9	1.65	0.47	2.63	3.22	2.81	2.27			0.18
640	24.1	3.3	15.1	2.85	0.77	4.47	5.16	4.76	4.46	0.81		0.08
1046	35.3	4.1	20.0	3.65	0.99	5.77	6.78	6.66	6.88			0.07
1194	36.3	3.8	20.9	3.80	1.04	5.94	7.23	7.11	7.57	1.32		0.06
2000	46.9	4.0	28.2	5.13	1.40	7.75	9.41	9.21	9.97	1.84		0.05
2999	53.7	4.7	34.9	6.36	1.72	9.32	10.8	9.97	10.70	1.93		0.05
4195	54.8	5.0	37.0	6.84	1.80	9.52	10.8	9.73	10.50	2.05		0.05
5073	52.7	5.7	35.0	6.54	1.71	9.21	10.1	9.19	9.80	1.81		0.06
TPS 24 351-1												
5926	52.9	5.0	34.5	6.39	1.69	9.04	10.20	9.32	9.96	1.78		0.05
Klinkhammer, et. al. (1983)					**Map # 19**							
SE Pacific												
0	4.9	3.1	3.4	0.56	0.20	1.10	1.30	1.20	0.79			0.34
2500	30.0	3.5	16.0	2.70	0.80	5.00	6.30	7.00	7.50			0.07
NW Pacific												
0	8.3	10.0	5.1	1.00	0.33	1.60	2.00	1.70	1.10			0.67
2500	47.0	9.0	30.0	5.30	1.40	8.20	9.70	9.40	8.00			0.11

DeBaar et. al. (1985) **Map # 18** **Vertex II (18 N & 108 W)**

Depth	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Ho	Tm	Yb	Lu
15	19	11.0	3.2	13	2.7	0.70	4.0	0.54	0.97	0.35	2.2	0.35
45	22	10.0	3.5	16	2.8	0.69	3.7	0.56	0.71	0.40	1.9	0.30
100	32	10.0	3.3	15	2.6	0.76	4.0	0.58	0.83	0.52	2.8	0.44
150	47	25.0	4.3	24	4.0	1.23	6.3	0.91	1.50	0.86	5.8	0.96
200	17	17.0	2.5	13	2.6	0.71	3.7	0.55	1.11	0.57	3.5	0.60
300	19	18.0	3.0	15	2.6	0.77	4.3	0.61	1.02	0.57	3.7	0.63
400	22	13.0	2.3	14	2.6	0.71	4.0	0.54	1.20	0.62	4.0	0.68
500	20	13.0	3.1	15	2.5	0.75	4.2	0.58	1.50	0.66	4.0	0.71
750	34	8.4	4.2	17	3.1	0.82	4.1	0.70	1.40	0.78	5.5	0.98
1000	35	7.4	7.6	34	6.4	1.56	8.6	1.41	3.52	1.84	13.2	2.44
1250	33	4.2	4.5	25	4.5	1.25	7.1	1.13	2.36	1.50	9.1	1.63
1750	49	4.2	7.4	27	6.0	1.47	8.6	1.33	3.30	1.90	13.0	2.40
2000	46	5.3	5.6	24	5.2	1.30	7.2	1.12	2.80	1.50	11.0	2.00
2250	67	3.3	8.5	33	6.7	1.68	9.4	1.47	3.75	2.00	14.0	2.60
2750	63	2.9	8.9	42	9.0	2.32	13.0	2.01	4.40	2.50	17.0	3.10
3000	51	3.4	9.2	49	8.8	2.43	13.0	2.11	4.80	2.40	15.0	2.70
3250	67	2.9	7.0	41	7.7	2.15	12.0	1.81	4.00	1.95	13.0	2.30

Zhang, et. al. (1994)					Map # 12									
Depth	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
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0	4.72		1.25	4.99	1.16	0.32	1.76	0.33	2.45	0.64	2.03	0.27	1.59	0.23
25	3.28		0.78	3.70	1.11	0.30	1.58	0.32	2.33	0.62	1.99	0.26	1.45	0.22
99					1.43	0.30		0.38	2.26	0.62	2.05	0.28	1.61	0.25
199	4.65		0.90	3.57	1.10	0.30	1.66	0.32	2.45	0.66	2.09	0.29	1.55	0.24
397	5.95		1.46	5.81	1.35	0.37	2.05	0.38	2.91	0.79	2.63	0.36	2.13	0.34
695	15.98		3.75	16.1	2.72	0.70	4.13	0.73	5.42	1.49	4.92	0.71	4.58	0.75
993	21.94		3.71	15.7	3.39	0.93	5.10	0.96	7.04	1.98	6.70	1.00	6.58	1.15
1486	26.28		4.03	18.7	3.91	1.08	6.01	1.07	8.17	2.32	8.00	1.18	7.98	1.40
1980					4.52	1.18	7.74	1.24	9.26	2.60	9.07	1.38	9.47	1.64
2472	30.19		5.01	22.1	5.09	1.39	7.35	1.31	9.88	2.74	9.30	1.41	9.42	1.63
2963	33.53		6.13	25.7	5.41	1.43	7.81	1.42	10.6	2.94	10.0	1.52	10.3	1.79
3453	35.06		7.43	32.5	6.49	1.67	9.13	1.58	11.5	3.07	10.1	1.49	10.1	1.72

Esser, et. al. (1994)				Map # 15										
Depth	La	Ce		Nd	Sm	Eu	Gd				Er		Yb	
0	9.6	13.6		11.4	4	0.92	4.5				2.8		2.4	

Tanaka, et. al. (1990)					Map # 17						
	Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
FK	110	69.0	115	53.1	8.60	2.38	12.7	12.5	8.43	7.29	1.16
KT	bottom	5.4	20.9	6.0	1.23	0.36	3.64	2.37	2.47	2.27	0.40
KG 1 SW	0	65.0	67.1	50.5	9.08	2.41	13.4	12.5	9.97	8.06	1.34
KG 1 BW	40	68.0	159	55.6	10.0	2.58	16.5	12.2	8.64	7.51	1.25
SM 1 SW	0	112.3	134	75.7	9.37	2.70	18.1	15.3	11.07	8.86	1.49
SM 1 BW	60	87.6	138	65.3	10.1	2.49	19.8	12.4	8.47	7.71	1.24
SG 1 SW	0	86.4	99.7	55.8	7.27	1.95	12.9	11.1	8.26	7.20	1.17
SG 1 BW	40	62.5	140	52.0	9.78	2.56	16.0	11.0	7.46	6.46	1.04
SG 2 SW	0	49.7	74.3	39.8	7.66	1.86	19.0	11.0	8.34	7.53	1.24
SG 2 BW	40	69.6	138	57.3	10.0	2.43	12.1	11.4	7.64	6.94	1.08
SG 3 SW	0	57.7	94.2	50.4	9.48	2.35	16.6	13.3	9.97	8.62	1.37
SG 3 BW	75	37.8	91.9	42.8	7.97	2.09	17.4	9.81	6.97	6.64	1.06
SG 4 SW	0	57.5	84.5	45.7	7.87	1.93	14.8	11.8	9.39	8.53	1.43
SG 4 BW	70	59.8	126	50.0	9.08	2.30	13.0	11.00	7.64	6.66	1.12
HW-1	1675	27.43	7.93	19.6	3.85	1.10	5.25	4.70	3.43	3.04	0.47
S-2	4233	47.7	47.9	34.8	6.74	1.79	8.41	8.57	6.51	6.20	1.01
KS-3	5022	49.8	33.3	46.9	9.55	2.52	11.6	10.9	7.24	6.53	0.99
	Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
KS4(u)-1	3395	36.1	15.1	30.2	6.19	1.59	8.31	7.16	4.65	4.07	0.60
KS4(L)-1	3495	37.6	18.6	31.9	6.54	1.80	7.77	7.00	4.29	3.69	0.54
KS5(u)-1	4945	49.1	26.9	39.4	8.05	2.05	9.32	8.74	5.57	4.93	0.72
KS5(l)-1	5045	58.2	29.0	47.9	9.99	2.63	12.85	12.67	9.30	8.58	1.20

Shimizu, et. al. (1994)					Map # 14						
DE-4 (44 40' N & 177 00' W)											
	0	9.9	32.8	11.5			2.94	3.56	2.74	2.35	0.28
	50	12.4	31.3	12.6	2.29	0.64	3.21	3.44	3.00	3.01	0.46
	100	13.2	19.7	15.3	2.99	0.83	3.94	4.93	3.37	3.05	0.52
	200	20.7	26.1	23.5	4.89	1.51	5.69	7.50	6.08	6.04	1.05
	300	15.8	26.1	18.6	3.98		5.04	5.29	4.36	3.97	0.75
	498	13.4	9.3	11.6	2.39	0.67	3.69	4.14	3.52	3.56	0.66
	997	25.3	18.2	21.6	4.42	1.26	6.34	8.72	6.12	6.48	1.11
	1494	28.4	24.3	28.8	5.91	1.71	8.20	9.37	8.62	9.13	1.57
	1991	23.4		22.5	4.61	1.21	6.31	7.10	6.43	6.91	1.2
	2588	23.5	15.7	21.2	4.75	1.40	6.45		7.75	8.25	1.47
	3750	24.6	19.9	29.4	5.99	1.74	8.45	9.33	8.33	8.62	1.51
	4436	23.3	14.1	30.0	6.36	1.83	9.49	9.10	7.25	7.99	1.41
	5188	22.7	14.8	30.1	6.86	1.87	8.76	8.59	6.78	7.05	1.27
	5809	25.1	12.4	29.8	6.40	1.86			6.48	7.03	1.17

Moller et. al. (1994) Map # 13

filtered

	Depth	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
mean (6)	10m f.b	20.1	1.89	2.64	12.2	2.33	0.77	4.02	0.65	5.14	1.62	5.82	0.93	7.23
mean (9)	1m f.	29.6	2.41	3.20	14.3	2.71	1.35	5.72	0.82	6.10	1.83	6.37	1.05	8.32
	100	5.60	2.15	0.86	3.14	0.91	0.23	1.14	0.23	1.52	0.44	1.43	0.21	1.18
	200		2.58	0.83	4.67	1.36	0.36	1.82	0.29	2.03	0.50	1.63	0.26	1.31
	400	21.4	2.72	1.34	5.94	1.05	0.26	1.60	0.29	2.24	0.69	2.30	0.35	2.27
	500	23.7	3.18	2.08	9.27	1.67	0.40	2.53	0.44	3.45	1.07	3.49	0.61	3.79
	600	14.7	4.07	2.60	9.30	1.90	0.44	3.10	0.51	3.64	1.11	3.86	0.63	4.29
	700	18.8	2.18	1.89	8.19	1.56	0.41	2.59	0.43	3.70	1.10	3.93	0.61	4.40
	800	17.8	3.65	2.63	11	2.17	0.55	3.46	0.53	4.14	1.25	4.46	0.71	5.11
	800	10.1	2.54	1.71	7.92	1.57	0.72	2.79	0.54	3.78	1.11	3.92	0.68	5.25
	800	13.6	6.98	3.34	10.4	2.09	0.52	2.48	0.45	3.99	1.19	4.08	0.60	4.43
	1000	43.8	3.66	2.68	11.8	2.10	0.57	3.35	0.51	4.18	1.30	4.58	0.74	5.42
	1200	24.0	3.30	2.08	9.30	1.86	0.44	2.82	0.51	4.26	1.32	4.83	0.82	5.90
	1500	20.9	4.86	2.85	12.6	2.71	0.81	3.99	0.74	5.14	1.58	5.57	0.95	6.58
	1500	58.7	3.60	3.13	12.9	2.37	0.63	4.12	0.65	5.19	1.59	5.68	0.93	6.70
	1600	45.6	3.48	2.80	12.8	2.11	0.64	3.89	0.61	5.53	1.78	5.94	0.92	7.14
	1800	40.6	2.64	2.84	12.1	2.11	0.58	3.80	0.60	5.14	1.60	5.79	0.92	6.72
	2000	27.6	2.49	2.41	11.1	2.26	0.60	3.61	0.64	5.02	1.58	5.62	0.91	6.85
	2100	29.2	3.69	3.53	15.0	2.58	0.68	4.28	0.70	5.75	1.73	5.94	0.96	7.09
	2100	35.4	5.59	3.91	17.4	3.46	0.94	6.07	0.83	6.77	1.83	6.43	1.05	7.91
	2250	30.2	2.90	3.50	15.7	2.67	1.00	4.76	0.73	5.92	1.72	6.05	1.01	7.58
	2400	32.1	3.66	3.35	14.1	2.49	0.86	5.28	0.82	6.29	1.85	6.45	1.04	7.70
	2500	14.9	2.16	2.20	8.86	1.50	0.50	2.64	0.46	4.07	1.32	4.96	0.79	6.28
	2500	22.3	4.75	2.86	12.9	1.95	0.67	3.34	0.59	5.03	1.69	5.83	0.90	6.88
	2600	13.6	1.17	2.11	9.53	1.61	0.57	3.05	0.52	4.60	1.51	5.62	0.92	6.84
	2800	17.2	2.94	2.13	9.58	1.63	0.57	2.99	0.49	4.10	1.43	5.15	0.86	6.46
	2800	49.0	3.43	2.76	12.2	2.03	0.60	3.35	0.59	5.01	1.50	5.71	0.92	7.20

Moller et. al. (1994) Map # 13

unfiltered

	Depth	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
	100	21.8	21.5	3.20	9.10	1.55	0.31	1.77	0.25	1.80	0.49	1.57	0.24	1.50
	200	20.8	15.7	2.08	6.90	1.33	0.34	1.64	0.24	1.71	0.47	1.47	0.19	1.41
	200	45.3	24.50	3.11	8.80	0.78	0.20	1.02	0.19	1.45	0.39	1.22	0.14	1.11
	300	2.6	3.20	0.74	3.20	0.81	0.25	1.04	0.20	1.41	0.49	1.62	0.24	1.29
	400	8.2	4.60	1.59	6.20	1.13	0.26	1.45	0.29	2.34	0.67	2.26	0.37	2.32
	500	12.7	3.40	1.87	9.40	1.94	0.43	2.86	0.46	3.83	1.15	4.05	0.64	4.29
	500	17.7	7.20	2.52	10.5	1.84	0.43	3.00	0.46	3.64	1.13	4.00	0.60	4.07
	500		10.3	2.83	9.60	1.53	0.53	2.55	0.48	3.47	1.12	3.74	0.62	4.14
	700	27.6	29.6	5.53	19.9	2.64	0.61	3.17	0.60	4.23	1.25	4.27	0.62	5.04
	800	16.3	4.40	2.29	10.8	2.15	0.51	3.02	0.50	3.84	1.23	4.19	0.65	4.69
	800	38.6	29.4	4.85	17.7	2.27	0.60	3.12	0.57	4.54	1.33	4.72	0.72	5.29
	800	28.6	13.3	3.34	11.8	1.89	0.49	3.01	0.49	3.93	1.11	4.01	0.65	4.37
	900	17.0	7.80	3.20	11.8	2.13	0.59	3.33	0.55	4.45	1.28	4.46	0.68	5.30
	1000	73.8	38.1	6.39	22.4	2.57	0.68	3.51	0.55	4.97	1.43	4.85	0.81	6.01
	1200	36.4	20.7	4.86	19.2	3.70	0.90	4.59	0.83	6.01	1.83	6.19	1.05	7.45
	1600	82.2	34.4	7.22	26.1	3.39	1.02	4.58	0.84	7.16	2.10	7.02	1.10	8.18
	1800	37.1	17.1	9.29	18.9	3.35	0.87	4.86	0.81	6.61	1.96	6.91	1.09	8.48
	2100	44.6	24.0	5.15	21.8	3.76	0.91	5.36	0.85	6.69	2.07	6.15	1.02	7.35
	2100	57.5	36.4	8.28	28.7	3.69	0.97	5.94	0.89	7.16	2.14	6.85	1.07	8.02
	2500	38.4	5.90	4.45	19.9	3.71	1.20	5.90	0.94	7.30	2.05	7.47	1.20	8.44
	2600	52.9	27.8	6.85	26.0	3.36	1.08	5.27	0.86	6.61	1.95	6.43	1.05	8.38
	2800	31.1	7.80	4.75	18.3	3.44	1.13	4.63	0.92	6.81	2.04	7.20	1.18	8.18
	2800	78.6	24.2	6.18	19.9	3.24	1.07	5.89	0.88	6.83	2.02	7.02	1.05	8.40

Table A8: **Handbook section 6.1. Indian Ocean seawater**

File name: IND_CONC.XLS. Concentration of RE in Indian Ocean seawater

Indian Ocean

ind_conc.xls

CONC = pmol/kg

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu
-	-	-	-	-	-	-	-	-	-	-
1. Filtered Water Samples [0.4 um filtrates]										
Bertram & Elderfield (1993); German & Elderfield (1990)								**Map # 22**		
CD-1501 (05 14.9'S & 55 02.2'E)										
202	15.2	8.0	10.9	2.14	0.60	3.47	4.09	3.73	3.55	0.60
936	24.0	4.8	14.9	2.93	0.83	4.77	5.61	5.26	5.42	0.96
1500	27.3	5.5	17.1	3.29	0.90		6.48	6.05	6.25	1.57
1953	29.0	7.0	20.9	3.95	1.07	6.70	7.12	6.85	7.37	1.27
2499		4.9	23.3	4.25	1.17		7.74	7.19	7.67	
2878	39.7	6.0	24.7	4.43	1.18	7.59	7.25		8.54	1.51
2950			27.5	5.05	1.35	7.50	8.56	7.89	8.46	1.31
CD-1502 (12 17.8'S & 53 41.4'E)										
10	8.14	7.35	6.93	1.43	0.43	2.34	2.34	2.47	1.93	0.29
25	8.38	4	6.97	1.47	0.43	2.41	3.02	2.64	1.92	0.291
49	8.4	5.43	6.91	1.45	0.44	2.32	2.9	2.64	1.94	0.29
70		8.43	8.16	0	2.52	3.22	2.75	2.17	2.17	0.35
72	9.6	5.01	7.42	1.54	0.46	2.54	3.29	3	2.54	0.419
83	9.57	4.6	7.67	1.5	0.41	2.7	3.27	3.11	2.7	0.457
94	10.41	4.74	7.82	1.61	0.49	2.6	3.42	3.15	2.85	0.475
108		4.63	8	1.66	0.495	2.81	3.54	3.26	2.98	0.49
120	11.31	4.2	8.46	1.75	0.512	2.9	3.67	3.4	3.08	0.52
125		5.04		1.67				3.21		0.58
160	10.34	3.82	8.02	1.66	0.49	2.75	3.47	3.21	2.78	0.48
231	9.9		8.12	1.64	0.472	2.7	3.38	3.22	2.98	0.45
300	11.33	2.84	8.26	1.69	0.49		3.46	3.44	3.13	
500		2.71	9.69	1.93	0.55	3.25	3.92	3.9	3.8	
600	16.24	2.32	10.84	2.14	0.61	3.51	4.31	4.2	4.26	0.74
600		3.33	11.07	2.13	0.606		4.89		4.25	0.77
700	18.38	2.92	11.77	2.35		4.34	4.47	4.7	4.61	0.81
730		2.75	12.15	2.41	0.66			4.79	4.4	1.08
900	24		14.02	2.68	0.77	4.23	5.17	4.97	5.14	0.9
901	21.7	3.3	13.8	2.67	0.766		5.13	5.03	5.16	0.93
1151	24.26	4.1	15.21	2.93	0.826	4.67	5.54	5.64	5.76	1.03
1195			18.7	3.19			6.4			
1502	28.5	4.33	16.84	3.19	0.903	5.21	6.12	6.03	6.5	1.18
1750	30.63	4.38	18.93	3.42	0.912	5.44	6.72	6.38	6.81	1.35
2001	33.11	4.44	19.91	3.72	1.01	5.7	6.86	6.61	7.01	1.27
2500	38.05	5.2	23.34	4.22	1.17	6.4	7.59	7.19	7.71	1.38
2701	40.78		23.95	4.32	1.15	6.51	7.59	7.18	7.75	1.36
3000	41.64	5.99	25.88	4.73	1.28	6.79	8.1	7.54	8.1	1.49
3250	38.64	5.81	26.32	4.8	1.32	7.35	8.25	7.78	8.31	1.61
3500	44	5.94	27.16	4.94	1.27	6.97	8.14	7.49	7.9	1.45
3750	43.45	6.19	27.95	5.1	1.35	7.32	8.37	7.7	8.02	1.45
4002	43.1	5.18	28.13	5.11	1.35	7.11	8.31	7.63	8.14	1.43
4085			30.55	5.79	1.34			7.88		

				CONC = pmol/kg						
Depth	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
-	-	-	-	-	-	-	-	-	-	-
4105			29.04						3.57	
4250	39.35	5.14	27.39	5	1.31	6.98	7.89	7.17	7.61	1.33
4499	43.35	5.21	28.3	5.17		7.03	8.03	7.33		1.32
4730				5.99	1.05					1.00
CD-1503 (18 36.7'S & 55 36.2'E)										
6	9	4.87	8.43	1.87		1.95		2.57	2.35	0.31
50		5.31	7.48	1.58	0.48	2.64	3.54	2.59	1.86	0.28
90	9.27	5.58	8.32	1.63	0.492	2.69	3.34	2.34	2.24	0.35
115	9.39	5.24	7.75	1.64	0.51	2.7	3.48	3.08	2.58	0.42
225		4.57	7.41	1.47	0.466	2.47	3.06	2.89	2.34	0.36
250	8.68	5.17	7.23	1.5	0.44	2.87	3.15	2.83	2.3	0.34
323	10.94	4.29	8.13			2.5	3.34	3.38	2.85	0.47
393		4.28	7.96	1.6	0.463	2.61	3.33	3.17	2.86	0.48
520	11.18	3.46	8.08	1.53	0.433	2.6	3.37	3.28	3.03	0.51
650	12.22	2.64	8.48	1.62		2.75	3.58	3.33	3.41	0.59
799	18.08		11.49	2.13	0.59	3.51	4.3	4.28	4.4	0.77
825	17.71	2.69	10.72	2.07	0.585	3.42	4.31	4.39	4.5	0.83
1000		3.25	12.53	2.31		4.53	5.29		5.67	0.94
1392	25.7	3.47	15.17	2.82	0.803	4.62	5.67	5.63	6.02	1.08
1700		5.7	17.91	3.26	0.911	5.11	6.25	6.15	6.59	1.18
2200		5.11	21.67	3.99	1.09	6.1	7.3	6.97	7.44	1.32
2620	38.53	4.29	23.32	4.25	1.17	6.39	7.55	7.12	7.64	1.36
2700	39.94	4.28	23.93	4.32	1.19	6.6	7.76	7.25	7.82	1.35
4002	0	4.89	28.26	5.13	1.38	6.64	8.32	7.56	8.05	1.44
4380	45.99	8.9	29.2	5.36	1.4	7.52	8.46	7.54	8	1.33
4499			28.86	5.28	1.37	7.38	8.33	7.39	7.91	1.38
4577	43.1	6.91	29.48	5.4	1.39	7.1	8.73	7.87	8.04	1.44
4630	38.33	6.54	29.34	5.25	1.36	7.38	8.16	7.35	7.7	1.36
CD-1504 (27 00.5'S & 56 58.0'E)										
11	10.48	8.71	8.23	1.67	0.483	2.57	3.2	2.82	2.15	0.33
25	9.52	7.83	7.91	1.62	0.471	2.51	3.17	2.79	2.11	0.33
60	9.91	7.47								
77										
101	9.93	8.13	7.9	1.59	0.46	2.52	3.17	2.82	2.16	0.33
152	8.68	7.17	7.05	1.42	0.418	2.43	3.03	2.71	2.13	0.33
298	10.16	6.03	8.12	1.61	0.468	2.57	3.31	2.97	2.47	0.4
305		9.98	7.96	1.62			3.13	3.09		0.4
401	12	8.25	9.5	1.88	0.517	2.84	3.6	3.28	2.76	0.45
500		4.85	8.36	1.66	0.464	2.95	3.44	3.22	2.8	0.45
606	11.09	4.09	8.23	1.6	0.455	2.57	3.41	3.28	2.9	0.48
699	11.38	2.99	8.4	1.61	0.435			3.72	3.08	
799	12.33	2.85	8.61	1.67	0.478	2.69	3.51	3.47	3.27	0.55
900	13.37	2.25	9.1	1.74	0.485	2.85	3.69	3.72	3.56	0.64
1000	14.87	2.05	9.82	1.84	0.515	3.5	3.85	3.98	3.92	0.7
1250	17.27	2.92	10.37	1.93	0.543	3.26	4.15	4.25	4.42	0.81
1500		3.28	12.84	2.39	0.668	4.71	4.99	5.15	5.48	0.98
1750	26.31	3.88	15.34	2.78	0.757		6.03	5.69	5.95	1.11
1795	25.41		14.75	2.63	0.733		5.5	5.58	5.96	1.1
2000	30	4.36	16.48	3.01	0.834	4.89	5.98	6.05	6.16	1.14

					CONC = pmol/kg					
Depth	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
-	-	-	-	-	-	-	-	-	-	-
2005	29.12	4.5	17.64	3.15	0.877	5	6.14	6.01	6.41	1.15
2250	30.83	5.65	19.32	3.45	0.94	5.38	6.4	6.27	6.62	1.19
2451	33.56	4.33	20.52	3.71	0.977	6.32	6.9	6.51	7.01	1.25
2515		6.53	18.99	3.43	0.891	5.26	6.52	6.12	6.21	1.46
2625	39.3	6.67	22.13	4.05	1.1	5.9	7.26	6.82	7.36	1.31
3002			23.17	4.28	1.14	6.6	7.67	7.1	7.53	1.41
3100			24.91	4.62	0.978	6.44	0	7.16	6.55	1.43
3249	38.95	4.21	24.34	4.42	1.2	6.7	7.89	7.17	7.7	1.44
3499	40.81	4.34	25.28	4.59	1.24	6.79	7.97	7.23	7.69	1.37
3691		7.31	27.22	4.83		7	7.89	8.5	7.6	
4250	41.08	7.15	26.59	4.89	1.29	7.02	7.87	7.16	7.65	1.35
4505	42	5.49	27.34	5.02	1.25		9.83	7.07	7.18	1.44
4849	42.05	4.69	27.58	5.1	1.32	6.61	8.07	7.21	7.64	1.36
4876	42.68	6.13	28.13	5.16	1.33	7.2	8.04	7.2	7.68	1.34
5220		6.46	26.46	4.83	1.22	7.19	8.4	8.38	7.27	1.89
CD-1505 (24 36.5'S & 57 03.9'E)		**4950m**								
10	9.18	6.13	7.67	1.59	0.457	2.5	3.13	2.65	1.99	0.31
60	10.99	10.47	9.07	1.82	0.509	2.7	3.21	2.77	2.1	0.32
90	9.53	7.78	7.75	1.58	0.466	2.5	3.12	2.81	2.09	0.32
125	10.8	11.65	9.3	1.85	0.513	2.67	3.25	2.79	2.13	0.32
245	9.22	6.77	7.65	1.52	0.424	2.32	2.94	2.64	2.06	0.33
450	9.71	5.39	7.51	1.47	0.408	2.29	2.95	2.77	2.36	0.38
652	10.65	3.21	7.75	1.51	0.425	2.47	3.26	3.22	2.92	0.48
875	13.56		9.44	1.81	0.497	2.89	3.79	3.78	3.65	0.63
1150	16.87	2.43	10.28	1.95	0.545	3.23	4.07	4.25	4.31	0.8
CD-1506 (08 27.4'S & 52 43.9'E)		**5135m**								
93	12.7	3.23	9.74	2	0.588	3.24	4.08	3.73	3.6	0.7
100	14.4	2.63	10.41	2.14	0.656	3.34		3.88	3.84	0.67
395		2.06	10.1	2.06		3.23	4.12	3.95	3.91	0.69
695		3.08	11.93	2.35	0.681	3.84	5	4.44	4.52	0.89
957	20.9	4.57	13.43	2.6	0.745	4.06	4.88	4.68	4.87	0.86
1500	28.3	4.46	17.22	3.25	0.905	5.1	6.23	6.01	6.58	1.1
2300	32.4	4.56	19.94	3.66	1.01	5.86	6.71	6.38	6.88	1.23
3000		4.75	24.97	4.54	1.19	8.15	7.85	7.48	8.03	1.5
3398									9.92	
3500	46.85		29.67	5.4	1.41	7.5	8.35	7.73	8.31	1.48
4000		6.19	27.76		1.27	7.75	8.885	7.7	8.02	1.71
4251	47.47	5.06	28.32	5.22	1.38	7.42	8.46	7.61	8.1	1.45
5128	41.23	5.5	27.18	4.98	1.3	6.87	7.74	6.95	7.38	1.29
CD-1507 (06 09.2'S & 50 53.7'E)										
10	8.21	4.96	6.9	1.4	0.412	2.28	3	2.49	1.81	0.34
25	8.85	5.71	7.32	1.47	0.41	2.24	3.64	3.68	2.05	0.28
50	8.78		7.25	1.43	0.424	2.01	2.96	2.61	2	0.32
75	9.29	5.35	7.44	1.51	0.442	2.63	3.02	2.74	2.12	
80	10.79	4.69	7.68	1.57	0.47	2.66	3.38	3.22	2.85	0.49
85			7.91	1.61	0.5	2.7	3.4	3.15	2.8	0.54
125	12	3.64	8.6	1.74	0.5		3.58	3.5	3.28	0.56
151	12.1	3.68	9.26	2.17	0.531		3.6	3.61	3.39	
210	13.63	3.87	9.77	1.96	0.557	2.98	3.65	3.64	3.5	0.61

					CONC = pmol/kg					
Depth	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
-	-	-	-	-	-	-	-	-	-	-
278			9.85	1.96	0.559	3.22	3.92	3.8	3.67	0.64
345		4.11	10.13	2	0.456			3.83	4.5	0.65
370	14.45	2.89	10.05	1.99		3.17	3.69	3.88	3.78	0.67
370	14.61	3.22	9.74	1.89	0.54		3.87	3.8	3.76	0.7
448	15.48	2.67	10.6	2.09	0.602		4.29	4.04	4.05	
550	19.47	4.15	12.56	2.45	0.702	3.85	4.72	4.58	4.65	0.81
601		3.12	11.54	2.24	0.64		4.42	4.31	4.37	0.77
650		2.81	11.39	2.22	0.61			4.52		
785	18.06	3.91	12.95	2.5	0.71	4.4	4.77	4.63	4.71	0.83
880	22.84	4.33	14.84	3	0.81	4.41	5.24	5.02	5.09	0.92
965	23.85	3.8		2.93	0.839				5.38	
1137	25.01	5.3	15.82	3.06	0.87	5.23	5.74	5.48	5.65	1.03
1301	25.6	4.91	16.32	3.09	0.88	4.86	5.83	5.65	5.95	1.07
1506	25.62	5.25	18	3.46				6.13		
1805		4.79	18.03	3.37	0.94		6.41	6.29	6.56	1.22
2003	32.06	4.62	19.5	3.62	1.01	6.23	6.86	6.57	6.95	1.28
2305	35.4	4.68	21.1		1.08	6.93	7.38	6.88	7.41	1.38
2850		4.22	25.43	4.63	1.27	6.55	8.04	7.52	8.13	
3175	43	4.74	25.65	4.63	1.25	6.96	8.24	7.5	7.95	1.6
3451	44.86	6.34	28.07	5.1	1.38	7.36	8.58	7.87	8.38	1.5
4000	46.5	5.19	28.47	5.13	1.37		8.54	7.79	8.26	1.81
4050	44		28.41	5.13	1.36	7.32	8.31	7.51	7.99	1.4
4351	45.1	6.78	29.29	5.34	1.4	7.55	8.48	7.57	8.04	1.42
4813		7.06	29.47	5.39		7.5	8.93	7.47	8.1	1.4
4845	45.22	5.57	29.56	5.32	1.34	7.71	8.78	7.48	6.89	2.0
CD-1605 (14 25.6'N & 66 55.4'E)										
4	11.7	13.9	11.4	2.38			3.94	3.09	2.49	0.655
20	12.2	12.2	11.2	2.35	0.653			3.01	2.35	
40	11.2	11.1	11	2.34	0.642	3.41		2.97	2.49	0.416
60		12.1	10.9	2.26	0.631		3.65	3.01		0.443
79	12.8	12.2	11.5	2.41	0.673	3.43	3.79	3.09	2.48	0.386
100	12.3	9.8	11.3	2.4	0.644		3.41		2.64	0.451
100	10.4	9.8	11.1	2.32	0.598			3.39	3.05	
120	15.5	6.2	12.2	2.56	0.73	3.66	4.26	3.67	3.26	0.521
130		7.6	12.6	2.64	0.748	3.78	4.39	3.7	3.41	0.559
140	18	6.7	12.6	2.68	0.764	4.04	4.25	3.74	3.39	0.553
150	20.2	16.3	13	2.69	0.755	4.96	4.48	3.79	3.47	0.646
176	18.8		12.8	2.58	0.728			3.72	3.44	
201	19	15.6	12.6	2.5	0.699	4.53	4.28	3.68		0.646
300		12.7	12.3	2.47	0.67		4.09			0.649
399	15.6	10.2		2.41	0.578					
506	15.5	5.2	11.4	2.21						0.661
700	18.4		12.2	2.41	0.612	3.72		4.02	4.05	
1000		5.3	14.4	3.77	0.742	4.22	4.54		4.84	0.863
1490	24.4	4.1	16	3.09	0.862	4.85	5.61	5.42		1.142
1999		4.9	17.5	3.37	0.942	5.03	6.6	6.14	6.78	1.302
2500	31.2	5.4	19.2	3.58	1.006	5.62	6.89	6.66	7.35	1.33
2999		5.7	22.6	4.16	1.136	6.3	7.28	7.2	7.79	1.404
4001		6.7	24.6	4.44	1.247	6.71		7.52	8.08	1.462

					CONC = pmol/kg					
Depth	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
-	-	-	-	-	-	-	-	-	-	-
CD-1608 (22 29.5'N & 60 40.6'E)										
3	12	10.7	10.5	2.18	0.594		3.9	3.31		
15	11.1	9.3	10.5	2.21		2.98				0.388
30	10.4	6.9		1.88		2.9	3.76	3.2		
50		5.7	8.2	1.74	0.488	2.55	3.13	2.88	2.7	0.466
75	13.8	6.1	9	1.84	0.52	3.02	3.24	2.98	2.8	0.477
100	13.8	6.7	9.8	1.96	0.541	3.23	3.59	3.12	2.96	
125	16	7.4	10.8	2.12	0.593	3.28	3.56	3.26	3.11	0.527
176	15.3	6.5	10.5	2.12	0.597	3.19	3.66	3.36	3.26	0.549
200	15.7	6.5	10.6	2.15	0.605	3.19	3.66	3.55	3.27	0.553
203	14.5	7.3	10.7	2.14	0.605	3.28	3.46	3.58	3.4	0.569
240	15.6	7	10.8	2.19	0.618	3.44	3.59	3.27	3.21	0.557
400	15.4	7.2	10.4	2.09	0.598	3.15	3.75	3.46	3.45	0.594
600	14.8	6.8	9.9	2.03	0.58	3.49	3.6	3.5	3.59	0.676
799	15.7	6.8	10.9	2.19	0.623	3.49	4.02	3.87	4.06	0.827
1000	20	4.1	12.3	2.42	0.659	3.74	4.39	4.35	4.44	0.795
1200		3.6	13.5	2.95	0.743	3.99	4.67	4.52	4.74	0.862
1599	23.1	3.1	14.2	2.8	0.791	4.31	5.03	5.13		
2000	23.4	2.2	14.4	2.84			6.18	6.44	7.64	
CD-1609 (23 35.4'N & 58 59.9'E)										
4	13	11.8	12.9	2.89	0.793	3.66	4	2.5	1.77	0.623
15	12.7	9.7	11.3	2.37	0.645	3.19	2.99	2.16	1.49	0.224
20	11.4	9.2	11.3	2.3	0.61		3.09	2.02	1.47	
24		7.7	10.9	2.3	0.629	3.37	3.49	2.5	1.95	0.328
30	13.6	7.4	11.1	2.44	0.694	3.52	3.91	3.18	2.82	0.464
35	13	7.1	10.7	2.4	0.677	3.62	3.76	3.09	2.73	0.462
40		6.3	10.7	2.43	0.69	4.13	3.95	3.28	3.01	0.498
60		4.4	11	2.44	0.686	4.13	4.01	3.37	3.03	0.509
90	13.9	4.4	10.5	2.31	0.65	3.53	3.88	3.28	3.01	0.514
120		6.3	10.7	2.29	0.648	3.68	3.9	3.32	3.11	0.546
141	13.6	5.4	9.7	2.08	0.582	2.97	4.35	3.67	3	0.51
170	13.6	6.6	9.7	2.08	0.593	3.23	3.48	3.1	2.95	0.538
200		7.1	10.4	2.11	0.593	3.41			3.04	0.535
300		4	8.9	1.9	0.499	2.9	3.46	3.13	2.89	0.481
400	14.6	4.7	10	2.05	0.579	3.65	3.5	3.3	3.25	0.567
600	14.9	7.2	9.8	2.03	0.585	3.12			3.63	
800	17.1	6	11.1	2.24	0.631	3.43	4.03	3.83	3.93	0.699
1000	19.7	3.8	12.4	2.45	0.691	4.03	4.42	4.18	4.32	0.761
2000		2.4	14.8	2.89	0.818	4.53	5.25		6.36	1.13
2750		3.2	16	2.97		4.72	5.85	6.58	6.96	1.16

				CONC = pmol/kg						
Depth	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
-	-	-	-	-	-	-	-	-	-	-
Bertram & Elderfield (1993)				**2. Particle REE Data**						
				[pmol/kg of water]						
Madagascar Basin (Sta 1504)										
300		0.436	0.135	0.024	0.006	0.032	0.032	0.015	0.014	0.002
500		0.613	0.166	0.033	0.008	0.038	0.029	0.018	0.012	0.002
1180	0.199	0.727	0.146		0.008	0.036		0.019	0.015	0.003
2000		0.850	0.299		0.010	0.048	0.038	0.023	0.019	0.003
2515	0.315	1.140	0.362	0.059	0.012	0.053	0.045	0.026	0.021	0.003
3100	0.280	1.310	0.496		0.012	0.054			0.021	0.003
3691										0.002
4505	0.435	1.400	0.497	0.102	0.017			0.043		
5220	0.515	1.430	0.551	0.107	0.025	0.097	0.081	0.043	0.035	
Somali Basin (Sta 1597)										
75	0.285	0.123	0.154	0.025	0.001	0.031	0.037	0.026	0.025	0.005
125	0.309	0.504	0.220	0.046	0.010	0.056	0.066	0.041	0.037	0.006
365	0.438	0.969	0.352	0.070	0.010	0.056	0.066	0.041	0.037	0.006
785		1.005	0.473	0.081	0.010	0.080	0.075	0.042	0.037	0.006
1300	0.527	1.031	0.440	0.082	0.019	0.079	0.069	0.041	0.037	0.006
1805	0.384	1.058	0.399	0.068	0.017		0.070	0.036	0.033	0.006
2300		0.981	0.331	0.068	0.011	0.064	0.057	0.032	0.030	0.005
3175	0.383	0.881	0.336	0.066	0.016			0.029	0.027	
3999	0.531	1.211	0.692	0.091	0.021	0.117	0.084	0.043	0.032	0.005

Table A9: Handbook section 6.1. Pacific Ocean seawater

File names: HE1.XLS, HE2.XLS and HE3.XLS.

H. Elderfield's unpublished data on the concentration of RE in Pacific Ocean seawater

Pacific Ocean Seawater Data of Dr. H. Elderfield [in prep.]

HE1.XLS

	Map #21									[pmol/kg]					
ID	LAT		LON		**Depth**	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
VERTEX Project															
Sta.	33.00	N	139.00	W	8	5.78	7.95	4.16	0.76	0.21		1.51	1.43	0.88	0.12
TA					20		5.67	3.89	0.73	0.20	1.40	1.54	1.41	0.89	0.13
					60	4.94	3.47	3.75	0.70	0.19	1.20	1.52	1.40	0.87	0.14
					80	4.72	3.56	3.55	0.67	0.18	1.24	1.53	1.41	0.89	0.13
					100	4.39	2.89	3.53	0.67	0.19	1.15	1.59	1.50	0.97	0.15
					150	6.87	3.53	4.93	0.97	0.28	1.81	2.24	2.07	1.61	0.27
					290	12.1	4.85	8.04	1.60	0.44	2.80	3.46	3.24	2.77	0.45
					490	23.6	4.24	14.16	2.62		4.20	5.24	4.82	4.47	0.83
T5	39.60	N	140.77	W	8	7.53		5.08	0.87	0.20	1.37	1.55	1.41	0.82	0.13
					40	6.21	4.33	3.90	0.65	0.18	1.17	1.45	1.34	0.74	0.14
					80	9.11		5.98	1.06	0.22	1.62	1.82	1.65	1.08	0.14
					100	10.4	3.27	6.82	1.25	0.35	1.78	2.67	2.44	1.84	0.31
					150	14.3		9.40	1.85	0.46	2.50	3.44	3.21	2.63	0.44
					200	14.8	2.24	9.56	1.85	0.51	2.67	3.97	3.61	3.19	0.53
					290	17.0	4.18	10.9	2.10	0.59	3.45	4.37	3.99	3.44	0.63
					390	22.5	2.28	13.4	2.50	0.27	4.13	5.06	4.76	4.42	0.77
					490	27.5	4.90	15.8	2.90		4.72	5.63	5.19	4.98	0.87
					580	32.1	3.07	18.3	3.28	0.58	5.24	6.18	5.73	5.53	0.98
					685	33.1	6.27	19.2	3.47	0.72	8.36	6.46	6.07	5.93	1.04
					700		3.42	20.3	3.64	1.00	9.34		6.55	6.52	1.22
					890	37.6	3.94	21.2	3.81	1.03	6.16	7.21	6.81	6.89	1.24
					990	37.7	5.27	21.0	3.80	0.97	6.32	7.03	7.54	7.72	1.30
					1230	41.6	5.35	22.8	4.14	1.13		8.37	7.94	7.98	1.52
					1480	42.4	5.03	23.7	4.30	1.00	7.38	8.63	8.88	9.24	1.71
T6	45.00	N	142.87	W	8	12.1	3.32	7.46	1.34	0.36	2.10	2.67	2.41	1.70	0.33
					40	13.6	4.85	8.3	1.47	0.42	2.53	2.83	2.64	1.95	0.32
					100	16.8	2.94	11.1	2.14	0.58	3.36	4.33	3.82	3.19	
					150	18.5	2.21	12.2	2.35	0.64	3.79	4.62	4.15	3.75	0.64
					200	21.3	5.00	13.4	2.54	0.65	4.12	4.95	4.52	4.16	0.70
					290	23.6	2.27	14.3	2.69	0.74	5.21	5.60	4.59	4.55	0.77
					390	28.3	3.09	16.7	3.09	1.14	4.96	5.80	5.27	5.08	0.90
					400	32.0	2.70	18.5	3.40	0.93	5.40	6.31	5.71	5.55	0.98
					500	34.3	4.33	19.7	3.62	0.98	6.59	6.62	6.13	6.01	1.05
					690	37.7	4.10	20.5	3.71	1.00	6.06	6.90	6.52	6.41	1.16
					780	37.6	4.64		3.81	0.73	6.22	7.20	6.82	6.91	1.24
					875	37.3	3.38	20.9	3.80	1.04	6.29	7.24	6.93	6.96	1.27
					975	39.9	5.65	21.9	3.96	1.09	6.51	7.64	7.43	7.68	1.35
					1230		3.84	23.3	4.24		6.96	8.43	8.16	8.65	1.58
					1480	43.5	5.12	24.1	4.38	1.21	7.32	8.85	8.66	9.34	1.70

			Pacific Ocean Seawater Data of Dr. H. Elderfield [in prep.]												
HE1.XLS															
	Map #21										[pmol/kg]				
ID	LAT		LON		**Depth**	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
VERTEX Project															
T7	50.00	N	145.00	W	40	12.2	3.90	7.0	1.17	0.33	2.07	2.59	2.54	1.93	0.32
					80	16.8	3.52	9.9	1.74	0.51	2.99	3.49	3.23	2.66	0.45
					100	22.8	2.59	14.6	2.70	0.73	4.00	5.08	4.58	4.26	0.72
					150	27.7	2.97	16.7	3.07	0.84	4.81	5.75	5.09	4.83	0.84
					200			17.7	3.12	0.86	4.88	5.92	5.41	5.22	0.93
					250	32.9	2.79	18.2	3.32	0.90	5.30	6.10	5.56	5.35	0.96
					300	33.2	3.72	19.2	3.48	0.94	5.62	6.54	6.00	5.85	1.16
					480	35.0	3.11	20.0	3.64	1.00	5.93	6.64	6.36	6.26	1.15
					500	37.8	8.10	22.4	4.09	1.09			6.69	6.44	
					700	38.4	5.04	21.6	3.95	1.06	6.49	7.45	7.20	7.32	1.32
					800	38.9	3.60	21.5	3.92	1.07	5.63	8.39	7.33	6.48	
					900	40.2	4.07	22.2	4.05	1.12	6.72	8.35	7.65	6.33	1.57
					1000	42.3	4.12	23.5	4.28	1.18	7.06	8.67	8.20	8.74	2.72
					1250	43.5	4.89	24.7	4.50		7.49	8.99	8.77	9.47	1.74
T8	55.50	N	147.50	W	8	11.4	4.34	6.8	1.14	0.35	1.97	2.50	2.33	1.71	0.29
					40	13.3	2.87	7.7	1.35	0.38	2.31	2.87	2.72	2.15	0.37
					80	25.3	3.26	14.4	2.55	0.76	4.14	4.25		4.04	0.76
					100	28.9	4.09	16.1	2.86	0.79	4.43	5.26	4.98	4.68	0.81
					150	31.6	3.52	17.7	3.12	0.86	4.88	5.92	5.41	5.22	0.93
					200	33.2		18.8	3.31	0.91	5.41	6.37	5.59	5.54	0.99
					250	31.0	3.45	19.1	3.42	0.82	5.03	6.38	5.97	5.73	1.03
					300	34.6		19.9	3.62	0.86	5.85	6.86	6.22	6.25	1.10
					485	36.0	4.00	20.5	3.72		5.98	6.95	6.57	6.58	1.18
					500	37.6	5.26	21.8	3.93	1.13	6.35	7.33	6.87	7.00	1.29
					690	38.6	7.63	21.9	4.01	1.10	6.51	7.48	7.16	7.31	1.33
					780	39.4	7.15	22.8	4.18	1.06	7.46	7.92	7.76	7.29	1.43
					890	40.8	4.42	23.3	4.21	1.19	6.89	8.10	7.76	7.99	1.48
					990	41.4	5.23	23.4	4.35	1.19	7.38	8.06	7.93	8.38	1.74
					1240				4.67	1.30	8.21	8.99	8.68	9.18	1.66
					1480	45.3	4.49	26.9	4.92	1.37	8.06	9.59	9.28	9.90	1.81

he2.xls														
Map #21								[pmol/kg]						
ID	LAT		LON		**Depth**	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**
MARIANAS (RAMA)					[m]									
	18	N	145	E	15			6.39	1.13			2.09	1.80	
					28	8.32	9.91	5.12	1.01	0.33			1.66	1.66
					490		8.76		1.67					
					769			16.2			5.41	5.88	5.50	4.76
					775	26.0	9.10	13.3	2.44	0.70	4.37	4.96	5.07	5.09
					1236		8.63	19.0	3.19	0.88		7.40	7.46	
					1676	38.0		22.3	4.04	0.94			9.10	
					2077	43.7		25.8	4.67	1.28			9.14	
					2121		8.81	26.5	4.94	1.32	7.98		9.03	
					2350	45.4	5.17	28.1	4.88					
					2506			29.8	5.39					
					2554	47.8		30.6	5.34					
					2739		9.18	29.7	5.54	1.53	8.55	9.93	9.94	
					2749	49.0	10.00	28.3	5.42	1.28	8.39	9.88	9.50	
					3109		8.39	30.6	5.76		9.04	10.10		
					3168	51.0	3.64	31.1						
					3303		9.53	29.6	5.49	1.43		9.95	9.78	
					3604		8.62	30.0	5.77			10.40	9.75	
					3699		8.70	29.9	5.58	1.36	8.60	10.30	9.71	8.99
					3828	49.50		31.7	5.88			10.60	9.87	
					3864		3.41	32.0						
EAST PACIFIC RISE (VULCAN)														
Sta. 1	22 24.1	S	108 31.	W	1552		6.31	12.4	2.05	0.53		4.85	5.57	4.94
1					2898		7.48	18.3	3.15	0.89		6.73	7.28	7.37
2	22 15.0	S	114 29.	W	1099				1.46					
2					1259			9.41	1.52	0.42		4.29	4.99	4.51
2					1909			14.3	2.28	0.66		5.85	6.31	
2					2199			12.0	1.90		3.48	5.42	6.06	
2					2641			14.3	1.93					
2					2853			15.4	2.37			6.68	7.18	
3	21 22.0	S	114 15.	W	1986	28.60								
3					2118	28.10	7.82	13.9	2.16			5.78	6.34	
3					2789	28.00	3.88	15.7						
4	20 29.4	S	113 51.	W	1985		7.70	15.0	2.51			6.10	6.60	
4					2632		4.30	15.8	2.59		4.73	6.11	6.87	
4					2737		1.38		2.75		5.41	6.29	7.02	7.54
4					2785		3.10	15.4	2.69			6.44	7.18	
4					3074		12.7	19.8	2.82		6.18	6.40	7.26	8.08
5	20 09.0	S	113 44.	W	1975			15.2						

he2.xls														
Map #21								[pmol/kg]						
ID	LAT		LON		**Depth**	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**
5					2228		7.58	14.9	2.47		5.47	6.05	6.67	
5					2518		3.61	15.0	2.42		4.25	6.35		
5					2521	24.8								
5					2643			15.0						
5					2727			14.7	2.60		4.79	6.44	6.76	7.81
5					2802		6.27	15.9	2.82		5.60	6.84		
5					2804	28.3								
6	19 24.5	S	113 32.	W	2175		5.25	15.6	2.65	0.74	3.48	6.16	6.35	7.07
6					2350		3.21	16.3	2.77	0.75	4.21	6.33	6.97	7.84
6					2465		2.75	15.7	2.70	0.91	4.67	6.21	6.96	7.37
6					2656		5.80	16.7	2.82					
6					2756		5.99	17.4	2.85			6.70	7.33	
7	19 30.0	S	116 34.	W	1514	21.8	8.10	12.3	1.96			4.77	5.69	
9	19 29.1	S	123 31.	W	2351			12.0	2.05			5.60	6.53	
11	14 29.1	S	123 29.	W	1597	21.5	4.98	11.0	1.87	0.58	3.64	4.85	5.75	6.51
11					2502	29.7	2.56	13.3						
11					2749	24.7	1.26	12.7						
12	12 08.0	S	123 29.	W	2181			13.2	2.16	0.63		5.45	6.45	6.97
12					2484		3.64	13.0	2.12	0.63		5.54	6.60	
12					2536		2.67	13.4	2.07			5.41	6.31	7.31
12					2587		2.23	12.6	2.11			5.55		
12					2683		1.25	12.2	2.07		4.25	5.49	6.36	7.48
?					2685							5.83	6.97	

			Pacific Seawater Data of Dr. H. Elderfield [in prep.]									
HE3.XLS												
			Map # 21									
SURFACE WATER							[pmol/kg]					
STA	**LAT**	**LON**	**La**	**Ce**	**Nd**	**Sm**	**Eu**	**Gd**	**Dy**	**Er**	**Yb**	**Lu**
349	24.25	128.40	7.68		6.61	1.11	0.32	1.54		1.72	1.19	0.19
333	24.28	132.80	5.12	4.15	4.84	1.04	0.34	1.65	1.93	1.67	1.20	1.90
275	24.28	150.47			5.41	1.14						
227	24.27	167.97	5.36	3.96	4.56	0.97	0.28	1.43	2.03		1.12	0.18
189	24.24	183.25	4.85	3.80	4.42	0.91	0.27	1.42	1.71	1.48	1.01	0.15
181	24.24	186.37		4.45	4.64	0.92	0.26	1.51	1.70	1.52	1.03	0.16
173	23.40	189.26	5.26	3.76	4.61	0.89	0.26	1.32	1.69	1.47	0.97	0.14
157	24.10	192.83	4.59	2.88	4.15	0.85	0.29	1.38	1.65	1.46	0.94	0.15
150	24.50	193.27	4.55	2.70	3.94	0.80	0.27	1.37	1.63	1.46	0.97	0.16
140	25.48	194.27	4.92	3.03	4.29	0.86	0.25	1.39	1.66	1.46	0.95	0.14
128	24.89	198.75	5.38	4.02	5.02	0.98	0.28	1.54	1.71	1.52	1.00	0.18
116	24.24	203.27	5.14	3.73	4.71	0.96	0.29	1.50	1.74	1.49	0.98	0.16
100	24.25	208.69	5.81	3.52	4.87	0.97	0.24	1.27	1.78	1.54	1.00	0.15
88	24.23	213.07	5.86	3.39	4.71	0.96	0.27	1.53	1.75	1.52	1.00	0.16
81	24.23	215.97	7.10	5.07	5.82	1.13	0.32	1.75	2.00	1.69	1.08	0.17
62	24.25	224.38	7.05	4.00	5.24	1.00	0.29	1.20	1.85	1.62	1.06	0.17
56	24.25	226.76	8.43	4.76	6.41	1.26	0.33	1.88	2.07	1.74	1.12	0.18
46	25.20	231.20	11.5	5.94	7.63	1.36	0.36	2.11	2.16	1.84	1.20	0.18
31	29.05	236.13	12.6	6.18	8.69	1.60	0.43	2.20	2.48	2.04	1.28	0.19
28	30.04	237.41	14.1	7.24	10.3	1.88	0.52	2.55	2.72	2.17	1.40	0.21
26	30.49	237.98	12.4	5.89	8.34	1.47	0.40	2.25	3.06		1.21	0.21
24	30.89	238.76	12.3	5.85	8.16	1.51	0.41	2.28	2.44	1.98	1.24	0.19
22	31.24	239.45	15.7	8.54	10.3	1.83	0.50	2.53	2.90	2.52	1.65	0.29
18	31.67	240.29	14.3	6.69	9.75	1.76	0.47	2.58	2.76	2.22	1.47	0.22
16	31.77	240.47	21.9		13.8	2.11	0.52	2.69	2.74	2.21	1.42	0.22
T8	55.50	147.5	11.4	4.34	6.76	1.14	0.35	1.97	2.50	2.33	1.71	0.29
T7	50.00	145.0	12.2	3.90	7.00	1.17	0.33	2.07	2.59	2.52	1.93	0.32
T6	45.00	142.9	12.3	3.32	7.46	1.34	0.36	2.10	2.67	2.41	1.70	0.33
T5	39.60	140.8	7.53		5.08	0.87	0.20	1.37	1.55	1.41	0.82	0.13
T4	33.00	139.0	5.78		4.16	0.76	0.21		1.51	1.43	0.88	0.12

Table A10: Handbook section 6.1. Arctic Ocean seawater

File name: ARC_CONC.XLS. Concentration of RE in Arctic Ocean seawater (North Atlantic sector)

	Arctic Ocean (North Atlantic side)									
arc_conc.xls										
unfiltered samples				CONC = pmol/kg						
Depth	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Gd**	**Dy**	**Er**	**Yb**	**Ce/Ce***
-	-	-	-	-	-	-	-	-	-	-
Westerlund & Ohman (1992)										
Sta 296 (81 48.6'N & 31 35.6'E) 3011 m										
10	34.8	38.6	7.8	28.5	4.7	10.2	6.8	6.0	5.2	0.57
20	20.3	12.1	4.3	17.4	4.0	5.7	6.2	4.8	4.0	0.30
100	18.8	10.0	4.3	16.0	4.7	5.1	8.0	4.8	5.2	0.27
200	20.3	12.1	4.3	16.7	3.3	5.7	5.6	3.6	5.2	0.30
300	24.6	21.4	5.0	16.7	4.7	6.4	7.4	3.6	4.0	0.47
400	23.2	12.1	4.3	19.4	2.7	3.8	6.2	4.2	2.9	0.27
500	24.6	20.0	5.0	25.0	3.3	5.1	6.2	4.8	4.6	0.39
600	25.4	20.7	5.7	24.3	4.0	6.4	9.3	4.2	5.2	0.40
Sta 310 (82 08.1'N & 31 58.0'E) 3029 m										
600	22.5	12.9	4.3	22.9	4.7	7.0	5.6	4.8	5.2	0.27
1000	21.0	14.3	3.5	19.4	3.3	6.4	4.9	4.8	4.0	0.34
1500	21.0	12.1	5.0	20.1	3.3	5.7	6.8	4.2	5.8	0.28
2000	18.8	11.4	3.5	19.4	3.3	4.5	5.6	5.4	4.0	0.29
2500	22.5	8.6	5.0	20.1	4.0	4.5	6.2	4.8	4.0	0.19
2800	23.9	12.1	4.3	23.6	4.7	4.5	7.4	4.8	4.6	0.24
Sta 358 (84 01.5'N & 30 34.0'E) 4040 m										
10	37.0	16.4	6.4	30.6	5.3	8.9	8.0	6.6	5.2	0.23
20	40.6	15.7	7.8	29.2	4.7	11.5	9.3	6.0	4.6	0.21
300	21.0	10.0	4.3	18.1	2.7	5.1	6.2	4.8	4.0	0.24
800	21.0	10.0	3.5	19.4	2.7	4.5	3.7	4.8	3.5	0.23
1300	21.7	9.3	3.5	14.6	2.7	5.1	5.6	4.8	4.0	0.23
1800	23.2	8.6	3.5	16.0	4.0	5.7	4.9	4.8	4.6	0.20
2300	27.5	14.3	5.0	20.1	4.0	6.4	4.9	4.8	4.0	0.28
3000	23.9	5.7	4.3	17.4	3.3	5.1	5.6	5.4	4.0	0.13
3500	31.2	15.0	5.0	23.6	4.0	5.7	6.2	4.8	4.0	0.25
Sta 362 (85 04.0'N & 29 21.3'E) 4037 m										
10	30.4	15.0	5.7	27.1	4.7	8.3	8.6	7.2	6.4	0.25
20	34.1	16.4	5.7	26.4	5.3	7.6	8.6	7.2	6.4	0.25
50	26.1	14.3	5.0	27.8	4.7	5.7	7.4	6.0	5.2	0.26
100	31.2	12.1	5.0	26.4	4.0	7.0	8.6	7.2	6.4	0.20
200	21.0	9.3	3.5	16.7	3.3	5.1	6.2	5.4	4.0	0.23
400	23.9	10.0	4.3	18.8	3.3	7.0	6.8	5.4	4.6	0.22
700	18.8	9.3	3.5	16.0	3.3	4.5	5.6	3.6	3.5	0.25
Sta 370 (85 54.0'N & 22 46.4'E) 4552 m										
10	31.9	15.0	5.7	27.1	6.7	7.6	10.5	7.2	7.5	0.24
20	30.4	14.3	6.4	22.9	5.3	9.6	11.1	9.0	7.5	0.25
30	33.3	15.7	5.7	27.1	6.0	7.0	8.6	7.2	8.1	0.24
40	34.1	16.4	6.4	28.5	6.0	8.9	9.3	7.2	8.1	0.24
50	34.1	12.9	5.7	29.2	5.3	7.6	9.3	6.0	7.5	0.19
60	30.4	12.9	6.4	28.5	5.3	7.0	8.6	7.2	6.4	0.21
70	33.3	14.3	5.7	25.0	5.3	8.9	9.3	6.6	6.4	0.23
80	36.2	16.4	6.4	28.5	5.3	8.9	7.4	6.6	6.4	0.23
90	37.7	17.9	6.4	29.9	5.3	9.6	9.3	6.6	6.4	0.25
100	29.7	13.6	5.7	30.6	4.7	8.9	8.6	6.0	6.4	0.22
110	29.0	12.1	4.3	23.6	5.3	7.0	8.0	6.0	6.4	0.21

unfiltered samples				CONC = pmol/kg						
Depth	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Gd**	**Dy**	**Er**	**Yb**	**Ce/Ce***
-	-	-	-	-	-	-	-	-	-	-
120	28.3	13.6	5.0	21.5	4.7	6.4	6.8	5.4	5.2	0.25
130	26.1	11.4	5.0	23.6	4.7	8.3	7.4	5.4	5.8	0.22
140	28.3	13.6	5.0	20.8	4.7	7.0	9.3	6.0	5.8	0.25
150	42.0	61.4	9.9	39.6	4.7	13.4	9.9	5.4	6.9	0.71
160	24.6	10.7	4.3	25.0	4.7	8.3	8.0	6.0	5.8	0.21
180	27.5	12.1	5.0	22.9	4.0	6.4	8.6	6.0	5.2	0.22
190	30.4	12.9	5.7	22.2	4.7	5.1	8.6	4.8	4.6	0.23
250	23.9	11.4	4.3	18.8	3.3	7.6	7.4	5.4	4.6	0.25
300	22.5	10.0	4.3	18.8	3.3	5.1	5.6	4.8	4.6	0.23
400	25.4	12.1	5.0	21.5	4.7	6.4	8.0	6.0	5.8	0.24
500	23.2	10.0	4.3	16.7	4.0	6.4	6.2	6.0	4.6	0.23
800	23.9	14.3	4.3	21.5	4.0	5.7	6.2	4.2	4.6	0.30
1000	21.0	10.0	4.3	16.7	3.3	5.1	6.2	4.8	4.6	0.25
Sta 371 (86 04.3'N &21 59.2'E)			**3545 m**							
10	37.7	15.7	7.1	36.1	6.0	9.6	8.6	6.6	8.1	0.20
20	34.8	15.0	6.4	34.0	7.3	8.9	8.6	7.8	6.9	0.21
500	18.8	8.6	3.5	22.2	4.0	7.0	4.9	4.2	2.9	0.21
800	21.0	8.6	3.5	22.2	2.7	6.4	5.6	5.4	4.6	0.19
1000	24.6	9.3	4.3	19.4	3.3	7.0	6.2	4.2	4.0	0.20
1500	23.2	7.1	3.5	18.8	3.3	5.7	6.8	4.8	4.6	0.16
2100	26.1	8.6	4.3	18.8	3.3	5.1	4.3	4.2	4.6	0.18
2800	23.9	8.6	4.3	18.1	3.3	5.1	3.7	3.6	3.5	0.19
Sta 376 (85 22.4'N & 21 58.2'E)			**2900 m**							
10	37.0	14.3	7.1	40.3	6.7	9.6	12.3	8.4	6.4	0.18
20	34.1	13.6	5.7	27.8	5.3	7.6	10.5	9.6	6.4	0.20
50	31.2	13.6	5.7	28.5	4.0	8.3	9.3	4.8	5.8	0.22
100	31.2	13.6	5.7	27.1	4.7	9.6	8.6	6.6	5.8	0.22
200	23.2	18.6	5.0	21.5	2.7	6.4	7.4	6.0	3.5	0.39
300	23.9	10.7	3.5	18.1	4.7	5.1	7.4	4.8	4.6	0.23
400	23.9	10.0	4.3	21.5	4.7	7.6	7.4	5.4	4.0	0.21
600	19.6	7.9	1.4	15.3	3.3	3.8	4.3	4.8	2.9	0.21
700	19.6	9.3	2.1	19.4	3.3	4.5	5.6	4.8	4.0	0.23
Sta 393 (82 50.0'N & 17 14.5'E)			**3258 m**							
10	23.2	12.1	2.1	16.7	4.0	7.0	4.3	4.2	3.5	0.28
20	21.7	10.7	2.1	20.1	4.7	7.6	6.2	6.0	4.6	0.24
500	19.6	10.0	1.4	22.2	4.0	7.0	4.3	3.6	4.0	0.23
1000	22.5	8.6	1.4	19.4	2.7	5.7	4.9	6.0	3.5	0.19
1400	19.6	8.6	1.4	16.7	4.0	6.4	5.6	4.2	4.6	0.22
1800	21.7	7.9	4.3	20.8	3.3	3.8	4.9	4.8	5.2	0.18
2200	22.5	7.1	3.5	18.8	4.0	6.4	4.9	4.2	4.6	0.16
Sta 364 (85 22.0'N & 26 09.8'E)			**3668 m**							
10	41.3	22.9	7.8	36.8	7.3	9.6	9.9	9.0	6.4	0.28
20	40.6	25.0	7.1	38.9	7.3	9.6	8.6	7.8	8.1	0.30
Sta 365 (85 30.7'N & 25 14.8'E)			**3089 m**							
10	32.6	15.7	5.7	25.0	4.0	7.0	8.6	7.8	5.8	0.25
20	34.8	15.7	6.4	29.9	5.3	8.3	8.6	7.8	6.4	0.23

Table A11: **Handbook section 6.1 and 7.1. Mediterranean Sea.**

File name: MED_CONC.XLS. Concentration of RE in the Mediterranean Sea, including the anoxic brines of Bannock Basin

Mediterranean Sea

med-conc.xls

CONC = pmol/kg

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce/Ce*
-	-	-	-	-	-	-	-	-	-		-
Greaves et. al. (1991)				**Map #24 0.4 um filtered samples**							
Sta 10404 (34 22.0'N & 12 29.0'W)											
13	14.4	12.30	12.4	2.54	0.673	3.74	4.49	3.83	3.32	0.522	0.43
33							4.51	3.78	3.20	0.500	
58	14.2	12.10	12.6	2.60	0.692	3.63	4.67	3.98	3.39	0.535	0.43
108	14.1	12.10	12.8	2.66	0.698		4.68	3.93	3.47	0.538	0.43
208	16.3	9.39	14.0	2.88	0.720	3.72	4.98	4.22	3.67	0.603	0.29
505	21.4	9.95	17.2	3.32	0.823	4.17	5.13	4.35	4.03	0.642	0.24
708	20.3	6.54	16.1	3.28	0.830	3.76	5.37	4.59	4.21	0.706	0.17
807	24.0	7.33	17.2	3.40	0.875	4.70	5.52	4.66	4.46	0.701	0.16
827	19.8	4.29	15.3	3.14	0.837	4.62	5.58	4.75	4.45	0.719	0.11
869	20.4	5.49	15.9	3.27	0.866	4.46	5.66	4.84	4.48	0.737	0.14
913	20.3	5.54	16.3	3.38	0.901	4.90	5.76	4.91	4.57	0.765	0.14
1013	20.8		16.4	3.39	0.905	4.94	5.71	5.00		0.769	
1013	21.3	6.59	16.6	3.40	0.914		6.21	5.04	4.70	0.763	0.16
1111	20.2	5.53	16.4	3.45	0.916	5.26	5.95	5.07	4.65	0.785	0.14
1212		4.22	16.3	3.48	0.937	5.11	6.13	5.16	4.76	0.809	
1212	21.0	5.47	16.7	3.55			6.10	5.12	4.78	0.810	0.13
1307	20.5	4.76	16.6	3.52	0.944	5.10	6.16	5.17	4.69	0.813	0.12
1307			17.1	3.62		4.93	6.10	5.07	4.96	0.798	
1610	21.3	3.84	16.2	3.34	0.885		5.77	4.96	4.74	0.789	0.09
1812	21.8	4.58	16.2	3.25	0.860	4.82	5.78	4.85	4.70	0.786	0.11
2019			18.2	3.37	0.834	4.74	6.00	4.88	4.83	0.810	
Sta 10708 (40 15.0'N & 05 22.0'E)											
25	26.1	20.90	24.4	5.53	1.470	7.99	8.76	6.78	6.11	1.010	
100	28.1	15.90	25.8	5.86	1.570	8.33	9.50	7.50	6.86	1.090	
175	29.0	13.60	26.2	5.98	1.600	8.30		7.63	7.00	1.140	
175		14.90	26.3	6.03	1.610	8.50	9.77	7.59	7.03	1.160	
250	27.9	15.90	25.4	5.82	1.560	8.13	9.72	7.64	7.05	1.150	
400	25.2	8.14	23.5	5.46	1.480	7.92	8.96	7.40	6.98	1.070	
1200		7.27	22.8	5.26	1.440	7.71	8.86	7.00	6.58	1.070	
1550		6.17	21.9	5.14	1.420	7.42	8.68	6.83	6.45	1.050	
1950	22.6	6.44	20.7	4.95	1.360	7.08	8.43	6.74	6.36	1.050	
2350	22.9	6.60	22.0	5.05	1.390	7.38	8.26	6.87	6.57	1.050	
2750	22.0	8.78	20.9	4.91	1.330	7.03	8.37	6.80	6.47	1.050	

Spivak & Wasserburg (1988)				**Map # 24 0.4 um filtered samples**							
Med-15 (36 04.8'N & 05 59.8'			**Nd**								
75			14.1								
150			27.9								
250			28.0								
400			32.4								
450			30.3								
500			26.6								
Med-4 (36 04.81'N & 05 59.83'W)											
20			30.8								
Med-9 (35 37.2'N & 06 03.8'W)											
2			32.2								
ALB-I (35 55'N & 04 27'W)											
0			16.4								
EMED-I											
0			31.5								
TTO-TAS 80 (27 50.0'N & 30 32.0'W)											
0			13.8	Station Outside of Med. Sea in North Atlantic Map # 9							
389			13.9								
1152			17.9								
1260			16.3								
1990			17.1								
2984			20.2								
4724			26.3								
	Henry et al. (1994) western Mediterranean Sea,										
Sta. Villefranche				**unfiltered samples**							
M 40m			27.5								
80			30.2								
200			26.2								
500			29.5								
2000			37.7								
O40			54.1								
80			35.7								
1000			32.0								
Sta. BAOR, deep			26.4								

	Schijf et al. (1995):		**Anoxic brines of Brannock Basin**					**Map #25**			
			0.4 um filtered samples								
Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	
2998	24.3	10.1	21.2	4.79	1.31				6.78		
3300	26.9	12.0	23.4	5.43	1.48				7.25	1.02	
3306	24.9	10.2	21.9	4.92	1.40			7.32	7.07	1.06	
3310		10.8	23.0	5.19	1.44				7.14		
3315	25.5	10.1	23.0	5.10	1.43				7.09		
3323	1038	3750	970	179	42.9	197	144	94.3	75.9	9.27	
3329	416	1523	360	75.0	19.2			48.0	45.5	7.09	
3359	292	860	212	43.3	11.4			29.7		3.64	
3377	394	905	221	46.2	11.8	56.6	48.2	27.4		3.4	
3420	224	564	145	32.0	8.35				24.8	2.86	
3470	178	431	114	25.3				19.4	17.4	2.63	
3470	141	425	111	24.3	6.44						
3491	193	476	128	27.4	7.47			22.0	20.6	2.75	
3529	322	616	219	45.3	12.0			41.8	32.3		
3580	310	638	234	48.6	12.6			42.8	34.5	3.58	
3628	364	599	216	44.8	12.0			39.8	31.5	3.31	
3730	326	671	240	48.4	12.5						
3730	318	603	220	45.2	11.4	55.1		35.6		3.73	
3784	330	582	210	43.5	11.7			34.0	32.3	3.79	

Table A12: Handbook section 7.1. Anoxic Basins

File name: BLACKSEA.XLS. Concentration of RE in the Black Sea

File name: SAANICH.XLS. Dissolved and suspended concentrations of RE in Saanich Inlet, British Columbia, Canada

File name: CARIACO.XLS. Concentration of RE in the Cariaco Trench.

See also Chesapeake Bay data in Table A3 files

					Anoxic Basins						
blacksea.xls					**Black Sea**	**Map # 25**					
			CONC = pmol/kg								
Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce/Ce*
-------	-	-	-	-	-	-	-	-	-		-
Schijf, et. al. (1991)						**0.2 um filtered samples**					
Sta BSK2 (43 N & 34 E)											
0		30.8	23.2	5.52	1.45			13.2	9.70	1.48	
30	33.1	16.5	21.8	4.76		7.40	10.00	9.2		1.28	0.27
40		18.1	23.3	5.04	1.38			8.8		1.37	
40		18.7	23.6	5.03	1.36			9.0			
50		12.7	22.8	4.42	1.24			8.5	7.50	1.30	
60		5.36	16.9	3.56	1.04						
70	28.4	6.03	16.9	3.69					7.10		0.12
85	19.4	3.54	12.2	2.58	0.76	4.20	6.40	6.6		1.11	0.10
100		3.30	7.35	1.55	0.48			5.5	5.80	0.85	
107	16.8	3.95	7.23	1.44	0.45		4.20	5.3	5.50	0.95	0.14
110	17.3	8.66	10.7	2.31	0.71		5.80	6.2	6.40	1.06	0.28
115		19.2	15.7	3.29	0.96			8.1	8.30	1.21	
130		28.9	17.3	3.50		5.70	7.40			1.45	
160	56.4	109	45.0	9.16	2.56			12.7	12.2	1.67	1.00
175		136	54.6	11.1	3.10				14.1		
200	64.5	154	63.1	12.7	3.51				14.8	1.70	1.15
225		180	70.9	14.7	4.15				16.1		
250	90.3	197	77.5		4.16					2.06	1.10
300		205	80.5								
400	89.7	198	80.7	16.0	4.50			16.8	17.6	1.99	1.10
500	93.4	185	75.0	15.1	4.00			15.6	14.9	1.90	1.02
700		159	67.5	13.7	3.75				14.5		
1050		122	54.5	11.4	3.01				11.8		
1350	68.8	114	51.7	10.2	2.84			12.0		1.46	0.87
1600		110	51.4	10.2	2.77			11.8	11.2	1.44	
1800	69.0	100	48.4	9.86	2.69			11.1	10.9	1.41	0.78
2172	68.1	102	47.0	9.85	2.69			11.0	11.0	1.36	0.81
German et. al. (1991)				**0.4 um filtered samples**							
Sta BS3-6 (43 04' N & 34 00' E)											
6	18.9	22.2	18.6	4.25	1.27	7.29	10.1	9.23	9.15	1.56	0.57
15	19.0	18.4	18.6	4.23	1.26	7.15	10.1	9.19	9.01	1.55	0.47
31	19.4	16.8	19.1	4.30	1.27	7.90	9.62	8.86	8.59	1.47	0.42
50	21.5	5.8	18.6	4.09	1.19	7.05	8.60	8.22	8.48	1.45	0.14
65		2.6	14.4	3.10	0.94	5.60	6.98	7.03	7.23	1.29	
70	19.0	2.8	14.7	3.09		6.40	6.77	6.85	7.02	1.26	0.08
76	16.0	1.6	12.2	2.56	0.77	4.83	6.27	6.37	6.77	1.25	0.05
81	15.5	2.1	11.5	2.41		4.53	5.71	6.30	6.81	1.20	0.07
86	15.6	3.1	11.9	2.46	0.74	4.72	6.05	6.29	6.66	1.23	0.10
91	17.2	9.7	12.9	2.68		4.84	6.00	6.45	6.86	1.23	0.30
96	18.9	13.7	14.3	2.97	0.88	5.16	6.76	6.88	7.21	1.28	0.38
100	20.1	16.5	15.2	3.13	0.77	5.46	6.71	7.39	7.40	1.30	0.43
105	20.5	18.8	15.5	3.23	0.97		7.02	7.09	7.35	1.40	0.48
110	24.1	27.5	18.4	3.83	0.93		7.86	7.86	7.46	1.41	0.60
115	25.2	31.1	19.3	3.98	1.15	6.39	8.23	7.93	8.16	1.39	0.65

			CONC = pmol/kg								
Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce/Ce*
----------	-	-	-	-	-	-	-	-	-		-
120	35.0	55.1	27.1	5.56	1.60	8.39	10.7	9.57	9.51	1.62	0.82
125	39.3	63.1	29.9	6.13	1.43	9.08	11.2	10.3	10.0	1.74	0.84
130	37.0	57.4	29.2	6.02	1.72	8.85	11.0	10.0	10.0	1.69	0.80
150	59.6	106	47.8	9.75	2.26	13.0	15.2	12.9	11.7	2.03	0.92
180	76.0	145	59.3	11.9	3.32	16.1	19.3	14.8	13.9	2.26	0.99
500	96.1	181	76.6	15.4		20.3	21.1	16.1	14.3	2.33	0.97
800	83.0	142	64.1	13.0	3.54	17.6	16.0		12.7	2.03	0.89
1500	64.7	105	50.5	10.4		13.4	15.4	11.5	10.5	1.73	0.84
2153	62.1	96.3	48.1	9.88	2.74	12.2	14.6	11.3	10.1	1.66	0.81
2174	58.3	89.6	45.3	9.01	2.42	12.8	14.1	10.8	9.65	1.59	0.80
2185	62.8	52.9	47.6	9.67	2.74	11.8	14.5	11.2	9.30	1.72	0.44
	Schijf and De Baar (1995)			**Data from Bosporus**				**0.22 um filtration**			
Sta. HKS											
8		31.7	24.4	5.61	1.66				10.2	1.57	
30		16.9	23.5	5.47	1.56			10.6	9.37		
65		13.8	20.2	4.40	1.31				8.13	1.2	

Anoxic Basins

saanich.xls

Saanich Inlet

CONC = pmol/kg

Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce/Ce*
---------	-	-	-	-	-	-	-	-	-		-
German & Elderfield (1989)											
CSS Vector (48 36.6' N & 123 30.0' W)					**Map #26**						
A. Dissolved Samples [0.4 um filtered]											
0	44.5	73.3	28.4	5.59	1.60	7.38	8.06	6.52	6.01	0.97	0.91
10		20.8	29.1	5.61			7.60	6.61		1.05	
20		19.7	24.8	4.94							
50			20.6	4.04	1.18		6.10	5.37		1.11	
75		8.1	17.0								
100	31.4	6.8	16.1	2.95	0.86		4.33	3.87	3.90		0.12
125	39.4	6.4	13.2	2.25							0.10
140			14.3	2.48	0.69	4.55	3.71	3.34	3.48	0.73	
150		7.4	13.1	2.36	0.71		3.58	3.41	3.73		
155	33.1	8.0	13.4	2.43	0.70		4.21	3.38		0.57	0.15
160			19.2	3.53	0.87	5.62	4.66	3.87		0.67	
165	58.2	38.4	23.3	4.29	1.18	6.08	5.24	3.98	4.71	0.65	0.40
170			26.2	4.94	1.36		5.75	4.27		0.82	
175			26.9	4.95	1.38	6.69	5.78	4.31		0.75	
180			27.8	5.22	1.37	6.81	6.77	4.65		0.72	
190			29.2	5.38	1.49	7.55	6.12	4.51	5.57		
200			29.9	5.53	1.50		5.94	4.54			
205	53.3	58.2	31.7	5.87	1.58		6.81	4.79	4.31	0.70	0.61
210		60.2	31.8	5.90		7.48	7.41	5.63		0.91	
215	54.9	60.9	33.0	6.16	1.70	7.47	6.82	4.80	4.32	0.71	0.62
B. Suspended Particles [pmol/kg of water]											
0	6.8	10.9	5.2	1.1	0.3	1.1	0.9	0.4	0.3	0.07	
20		19.8	9.3	2.0		1.9	1.5	0.7	0.5	0.07	
50	24.4	18.7	10.2	2.2	0.6	2.0	1.8	0.9	0.7	0.10	
75		61.8	31.5	6.9	1.7	6.6	5.3	2.7	2.1	0.29	
100	39.0	86.0	45.6	9.9	2.5	9.3	7.6	3.8	3.0	0.41	
125		60.2	32.2	6.8	1.7	5.8	5.7	2.9	2.3	0.33	
140	30.2	51.0	27.4	5.9	1.5	6.0	5.1	2.7	2.1		
150	31.0	62.9	31.6	6.7	1.7	6.4	5.3	2.7	2.1	0.29	
160	23.9	44.9	22.9	4.6			4.3	2.0	1.8		
165		21.7	12.7	2.8	0.7	2.8	2.2	1.1	0.9		
180		7.9	4.3	0.9	0.2		0.9		0.7	0.05	
205	4.9	9.2	4.4	0.9	0.2	0.9	0.7	0.3	0.3	0.04	

				Anoxic Basins								
cariaco.xls												
Cariaco Trench (10 40'N & 65 35'W)					Map # 27							
DeBarr et. al. (1988)			1.0 um filtered samples									
Depth	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce/Ce*
----------	-	-	-	-	-	-	-	-	-	-	-
5	19.4	17.8	19.6	4.78	1.41	5.60	6.85	5.44	4.31	0.62	0.44
50	15.5	12.1	14.8	3.27	0.88	4.15	5.36	4.05	3.51		0.38
119		10.3	13.6	3.06	0.79		4.96	4.01	4.13		
150	15.7	9.5	14.0	3.02	0.79	3.80	4.59				0.30
256	11.7	4.0	9.5	1.78	0.49	2.77	3.44	2.80	2.53	0.43	0.18
278	11.6	4.4	8.4	1.68	0.46	2.45	3.15	2.63	2.48	0.40	0.20
288	12.8	20.7	10.2	2.05	0.56	3.05	3.18		2.54	0.41	0.84
292	15.3	30.4	11.6	2.41	0.63	3.14	3.64	2.93		0.44	1.04
302	15.1	29.9	11.6	2.39	0.63	3.09	3.50	2.94	2.65	0.40	1.03
322	16.3	36.5	12.8	2.62	0.70		3.83	3.09	2.72		1.16
327	16.3	33.3	11.7	2.48	0.66	3.18	3.84	2.97			1.09
337	16.9	35.5	13.5	2.86	0.64	3.34					1.08
357	19.5	41.3	14.4	2.91	0.77			3.28	2.82		1.12
377	21.4	45.8	16.0	3.11	0.82		4.34	3.32	3.09		1.13
496	21.3	53.7	20.4	3.98	0.97	5.22	4.83	3.74	3.67	0.66	1.23
594		55.1	20.1	4.19		5.42	5.40	3.74			
697	23.7	57.7	21.2	4.44	1.17	5.79	6.12	4.61			1.21
994	23.2	48.8	18.9	3.98	1.04		5.24	3.49	2.94	0.45	1.08
1097		55.4	21.1	4.67	1.17	6.71	6.75	3.92	3.17	0.50	
1319	23.3	51.0	19.7	4.16	1.07	5.66	5.17	3.63	3.19		1.11

Table A13: **Handbook section 7.2. Marine Pore Waters**

File name: PW_REE.XLS. Concentration of RE in pore waters

pw_REE.xls			**Pore Water Concentrations**									
Sholkovitz et al. (1989), Buzzards Bay, MA, USA												
					pmol/kg							
Sample		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce Anom.
1 m Water Column		49.3	95.3	75.3	7.35	1.72	8.02					0.78
5 m Water Column		48.6	81.5	45.2	7.73	1.71	10	11.2	8.85	8.69	1.42	0.82
14 m Water Column		74	106	76.9	11.7	2.58	14.5	14.8	11	10.5	1.71	0.68
Overlying Water		61.8	145	38.3	6.5	1.4	8.76	10.5	8.72		1.43	1.3
Pore Water* Depth (cm)												
0-3		117	428	93.1	19	3.87	20					1.89
3-6		269	693	266	51.9	9.6	49.1	46.4	27.3	25.1		1.24
6- 9		379	1248	306	55.8	14.5	51.4	47.4	27.7	27.3		1.7
9-12		631	1531	595	115	21	104					1.19
12-15		842	2070	788	152	27.7	140					1.21
18-21		950	2359	892	175	32.8	150	132	73.4	67.9	10.5	1.22
24-27		1095	2673	1041	204	37.7	190	155	85.4	77.8	12.3	1.19
30-33		1059	2448	1031	201	31.2	192	159	87	80	12.6	1.12
33-36		927	2263	895	176	32.9	159		80		12	1.18
36-39		1764	4104	1733	344	63.1	311					1.12
39-42		1216	2915	1214	245	45.5	229	194	109	104	16.2	1.14
42-45		1300	3308	1245	251	47.3	229	201	116	113	18	1.24
45-48		913	2271	888	178	33.7	169	151	91.4	91	14.9	1.21
51-54		1057	2508	1040	210	39.2	198	172	102	103	16.7	1.14
60-66		896	2361	830	167	32.4	160	152	97.1	103	17.5	1.29
66-72		551	1768	512	102	19.8	102	104	75.4	85.3		1.58
* 0.45 um filtered												
Elderfield and Sholkovitz (1987), Buzzards Bay, MA, USA												
		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	
Overlying seawater 1			91.9	27.2	4.7	1.04		6.83	5.71	6.26	1.07	
Overlying seawater 2		42.5	106	27.2	4.13	0.92		7.39	5.56	6.04		
Pore water* depth (cm)												
0-1**		51.8	130	65.2	15	3.38	19.5	26.9	19.7	22.7	3.7	
0-1**			320	62.9	14.8	3.2	20.3	25.1	21.2	23.7	4.0	
1-3			757	245	40	8.46		41.9	29.3	32.3	5.17	
3-5		106	227	107	23.4	4.97	26.5	29.2	21.9	23.2	3.97	
5-7		44.6	98.6	49	11	2.02		16.2	13.7	15.7	2.67	
7-9		151	264	121	24.7	5.06		26.3	18	18.8	3.07	
9-11		137	268	114	23.4	4.84	27.1	25.3	17.8	18.6		
11-13			608	274	52.5	10.4				28.6		
13-15			912	356	69.8	13.6	59.8	61.4	35.9	34.2	5.49	
17-19		444	898	358		13.2	66.2	62.2	36.1	32.1	5.5	
23-25			1162	486	98.1	19.7	87.3	83.4	48.8	48.5	7.77	
27-29			1910	815	164	30.8		127	73	68.6	10.8	
** replicates, * 0.45 um filtered												

German and Elderfield (1989) Saanich Inlet												
		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Ce-
Overlying seawater		55	61	33	6.2	1.7		6.8	4.8			Anom.
Pore water* depth (cm)												
0-3		1217	649	344	84.9							
3-6		479	193	127	40.3	12.3		96.9	82.3			
6-9			244	171	46.2			135	163			
9-12		533	168	113	35.7			119				
12-15		49	48	31	8.6	3.25			68.1			
15-18		28	18	13	3.4	1.25			11.7			
* 0.4 um filtered												
Sholkovitz et al. (1992)												
Chesapeake Bay 0-1 cm Pore Water*												
Time-Series												
Date												
10-Feb-88												
12-Apr-88		122	256	214	56.2	14.7	152	72.7	55.9	56	8.28	0.79
17-May-88		226	490	328	83.6	20.6	158					0.89
14-Jun-88		458	1032	599	148	34.5	434					0.97
6-Jul-88		815	1727	1154	293	69.2	350	288	173	145	18.5	0.88
26-Jul-88		962	3728	1221	294	68.9	339	299	177	148	19.4	1.69
16-Aug-88		1040	2382	1188	262	59.8	290					1.04
21-Sep-88		230	395	295	88	18.7	117	121	78.5	69.4		0.75
24-Oct-88		227	447	274	68	16.9	89.5	89.2	67.3	64.5	9.17	0.88
15-Nov-88												
20-Dec-88		152	333	223	55.2	13.9	76.5	73.1	56.2	53.9	7.73	0.90
15-Feb-89		147	284	164	39	10.0	54	47	37	36	5.10	0.89
*0.22 um filtered												
Ridout and Pagett (1984)												
Great Meteor East, North Atlantic Ocean												
Pore water*, dept		16.4	28.1	22.3	4.35	1.53		5.66	3.63	6.25		
*0.45 um filtered												Ce-
		La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	Anom.

Table A14: Handbook section 7.3. Marine hydrothermal vent waters

File name: VENTS.XLS. Concentration of RE in the hydrothermal waters of the Atlantic and Pacific Oceans.

VENTS.XLS				Hydrothermal Waters							
Klinkhammer et. al. (1994a)											
ID	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er
982 ICPMS	1280	2100	320	1440	280	3400	220	31	120	21	46
982 TIMS	1353	2161		1459	280	3352	244		122		47
1636-3 ICPMS	1200	2400	360	1720	330	2400	260	34	140	22	61
1636-3 TIMS	1218	2439		1632	329	1915	251		142		52
1637-3 ICPMS	800	1250	150	550	92	1070	105	15	68	16	30
1637-3 TIMS	754	1187		506	92	1047	96		67		29
1150-11 ICPMS	730	590	54	164	16	280	16	3	14	2	5
1150-11 TIMS	663	551		165	18	259	17		12		8
1683-14 ICPMS	2700	6800	980	2800	390	2600	450	70	240	35	60
1683-14 TIMS	2549	6606		2635	413	2391	418		239		64
1160-6 ICPMS	2100	3800	480	2100	470	1970	444	65	300	54	110
1160-6 TIMS	2196	3718		2108	439	1878	425		300		94
1635-3 ICPMS	1500	1000	98	340	40	380	42	6	32	5	13
1635-3 TIMS	1472	904		322	41	353	44		33		16
1158-16 ICPMS	1080	1600	167	588	100	1220	120	18	88	18	45
1158-16 TIMS	964	1483		592	85	1163	125		76		34
1160-16 ICPMS	2170	4330	550	1690	360	1870	370	50	270	40	90
1160-16 TIMS	2191	4188		2066	400	1802	397		265		87
1683-5 ICPMS	1610	3660	510	2300	480	2050	360	57	240	32	65
1683-5 TIMS	1689	3560		1888	405	2026	348		221		63
1152-7 ICPMS	1500	1610	190	680	132	1240	100	9	40	6	15
1152-7 TIMS	1163	1683		637	96	1128	155		85		41
1155-18 ICPMS	6900	14200	1420	4900	430	4500	450	61	220	32	88
1155-18 TIMS	6528	13640		4715	416	4404	459		213		74
1620-1 ICPMS	1440	1560	140	387	52	1500	30	5	17	4	11
1620-1 TIMS	1415	1468		345	49	1451	33		11		5

Comparion of two analytical methods:

ICPMS = inductively coupled plasma mass spectrometry

TIMS = thermal ionization mass spectrometry

Klinkhammer et. al (1994b)					Conc = pmol / Kg						
ID	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**
HG 1981	2100	3980	510	1980	450	1980	440	56	310	49	108
HG 1985	1656	2500	332	1440	340	1390	320	46	250	38	81
NGS 1981	2300	4490	650	2500	440	4600	360	45	200	34	78
OBS 1981	1080	1540	166	610	113	1250	126	18	94	18	46
OBS 1985	1310	1760	210	730	170	1190	140	20	94	16	40
SW 1981	750	600	56	169	16	270	17	3	14	2	5
SW 1985	1620	1270	123	414	46	416	48	8	33	7	17
13 N #1	3870	7800	1290	6120	1450	5650	1280	168	780	117	250
13 N #2	4510	11700	1760	7660	1700	4000	1120	168	750	121	340
13 N #3	10800	15800	1590	5730	1040	1990	920	120	700	116	290
11 N #4	6600	13100	1920	8550	1680	7300	1270	150	770	88	200
11 N #5	2600	4880	610	2500	500	3950	280	48	300	58	127
11 N #6	2870	3630	500	2240	580	1471	470	65	350	57	145
MARK I	2822	7110	1030	2930	410	2720	470	73	250	36	63
MARK II	1680	3820	530	2400	500	2140	375	59	250	33	68
E. HILL 1982	880	745	82	225	29	266	17	3	15	3	5
E. HILL 1985	670	620	63	216	31	228	24	4	15	3	5
S. FIELD 1985	1470	1590	143	390	53	1530	30	5	17	4	11
Marianas	1950	2140	200	770	155	2900	125	16	77	14	31
Escanaba	870	1020	122	490	112	165	93	13	80	26	36
Endeavor	3105	4221	397	1296	216	678	199	29	158	27	60
AVE. FLUID	2643	4491	585	2350	478	2194	387	53	262	41	96

German et. al. (1990): TAG Field in N. Atlantic							(pmol / Kg)			
ID	**La**	**Ce**	**Pr**	**Nd**	**Sm**	**Eu**	**Gd**	**Tb**	**Ho**	**Er**
TAG:14	1.90	1.83	0.465	1.87	0.474	0.111	0.383	0.065	0.072	0.194
TAG:18	2.68	2.02	0.683	2.81	0.668	0.168	0.559	0.101	0.113	0.301
TAG:19	2.13	1.69	0.528	2.16	0.509	0.130	0.446	0.077	0.087	0.226
TAG:22	3.96	2.26	1.009	4.09	0.893	0.265	0.753	0.150	0.179	0.469
TAG:32T	4.14	2.48	1.039	4.20	1.001	0.265	0.813	0.149	0.165	0.434
TAG:32B	1.99	1.97	0.522	2.02	0.456	0.119	0.387	0.069	0.074	0.184
TAG:35T	3.73	2.14	0.942	3.78	0.872	0.237	0.775	0.138	0.155	0.413
TAG:35B	1.69	1.78	0.437	1.71	0.377	0.090	0.315	0.060	0.067	0.174
TAG:39T	3.70	2.06	0.944	3.85	0.847	0.229	0.756	0.143	0.165	0.441
TAG:39B	1.49	1.68	0.390	1.62	0.364	0.092	0.308	0.055	0.062	0.160
TAG:43T	3.24	2.15	0.823	3.35	0.754	0.213	0.613	0.121	0.138	0.365
TAG:43B	0.98	1.61	0.253	1.02	0.224	0.057	0.194	0.035	0.035	0.093
TAG:48T	0.70	1.59	0.157	0.62	0.127	0.032	0.112	0.017	0.018	0.044
TAG:48B	0.65	1.46	0.148	0.59	0.122	0.026	0.111	0.017	0.017	0.046
TAG:53T	0.72	1.45	0.160	0.63	0.144	0.032	0.133	0.019	0.020	0.056
TAG:53B	3.55	2.34	0.932	3.98	0.884	0.263	0.733	0.145	0.170	0.445
Vent fluid	2700	5800	750	2700	470	2600	390	69	34	70
Sea water	29.35	7.26	4.87	20.66	4.13	1.047	5.12	0.795	1.554	4.97

Michard (1989): Mid-Atlantic Ridge

	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb
HS 88 5 1	2926	1692	399	1540	337	203	72	46
HS 88 10 1	2320	1213	259	1040	203	135	48	35

Michard & Albarede (1986): East Pacific Rise

	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb
13 N 14Ti2	13703	7765	2381	5265	1653	972	413	266
13 N 20Ti4	13989	7959	4084	5331	1717	997	395	289
13 N 20Ti4-D	13774	7709	3964	5166				
13 N 15Ti2	2212	984	213	737	140	111	59	
13 N 20Ti1	6959	3792	1264	2521	630	308	120	116
13 N Seawater	10	38	7	2	10	11	10	11
21 N SW 1149-2	3104.6	936	200	303	242	185	114	127
21 N SW 1157-2	1627.2	485	53	125	76	51	26	27
21 N HG 1160-2	11476	3397	891	1777	572	418	209	191
21 N OBS 1158-2	10135	1872	492	1270	509	332	179	191

Piepgras & Wasserburg (1985) — **21 N East Pacific Rise**

		Nd	Sm
1158-6a		528	100
1158-6b		540	
1156-11		420	81
1155-14a		2328	381
1155-14b		2328	
1155-18a		4567	
1155-18b		4567	396
1151-14a		1635	313
1151-14b			
1154-6		970	170
1160-11		1809	404
1149-11		139	17
1159-9		38	5

Michard et. al. (1983): East Pacific Rise (pmol / Kg)

	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb
24G2	15630	7765	1191	3475	954	542		156
22G2	22125	7696	1177	2553	865	443	161	150
24G0	1142	569	126	118	32	18	15	10
26G2	14131	7037	1363	2599	1030	720	293	283
28G0	6380	3959	791	2488	725	431	167	110
28G0-L	7144	3993	785	2442	655	449	167	116

Mitra et. al. (1994): Mid-Atlantic Ridge											
	La	Ce	Nd	Sm	Eu	Gd	Dy	Er	Yb	Lu	
Snakepit (23 N)											
1683-14 (1986)	2670	6900	2760	432	2500	437	250	67.0	33.5		
1683-5 (1986)	1760	3710	1970	422	2110	362	230	65.6	37.5	3.96	
1683-7 (1986)	2230	3740	1980	425	2120	397	241	73.0	43.0		
2194-1 (1990)	1410	3140	2080	556	2960	440	286	70.6	39.4	3.90	
2192-6 (1990)	1380	2970	1880	480	2850	402	240	63.3	31.7	3.12	
TAG (26 N)											
Black Smokers											
2186-3 (1990)	4240	10200	6740	1400	3690	1240	878	336	249	30.6	
2179-5 (1990)	4610	9960	6990	1450	3470	1330	907	325	229	25.8	
2179-9 (1990)	4130	9070	5250	1040	3390	895	635	253	169	21.4	
2191-5 (1990)	3710	8820	5570	1160	3610	938	685	281	196	22.4	
2191-7 (1990)	3760	9020	5550	1170	3680	988	691	282	196	26.0	
White Smokers											
2187-1 (1990)	2570	3460	1370	235	9540	159	96.4	43.7	35.5	3.59	
2187-3 (1990)	2650	3410	1370	214	9850	142	98.1	41.5	38.1	3.81	
2187-6 (1990)	2750	4170	2080	305	8740	229	176.0	75.3	58.6	7.52	
2191-1 (1990)	1820	2640	1120	198	6640	123	71.3	29.8	22.7	3.56	
Seawater											
S-pit (3400m)	31.8	2.70	21.9	4.20	1.08	5.74	6.34	5.50	5.34	0.87	
TAG (3300m)	29.0	5.44	21.4	4.13	1.06	6.25	6.36	5.47	5.42	0.88	
TAG (3500m)	36.0	6.62	25.5	5.12	1.32	7.13	8.04	7.15	7.17	1.18	

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16. Abstract (Limit: 200 words)

This technical report serves as an appendix to a recent article by Byrne and Sholkovitz (1996) in the Handbook on the Physics and Chemistry of Rare Earths (vol. 23, chapter 158, pg. 497-592) edited by K.A. Gschneidner Jr. and L. Eyring and published by Elsevier Science. This article, Marine Chemistry and Geochemistry of the Lanthanides, discusses the physical chemistry of the lanthanides in natural waters, describes the major features of the lanthanides in rivers, estuaries and oceans and discusses the chemical and biogeochemical processes controlling the speciation and distribution of the lanthanides in the ocean.

The article by Byrne and Sholkovitz (1996) refers to a large set of published and unplublished data on the rare earth (RE) composition of rivers, estuaries, seawater, marine pore waters and marine hydrothermal waters. In order to conserve space in the Handbook article, a compilation of concentration data for natural waters will be presented in this report. Publications through 1995 are cited.

17. Document Analysis a. Descriptors

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