Validation data set compiled from Baltic Environmental Database

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Bo G. Gustafsson
Miguel Rodriguez Medina

Baltic Nest Institute
Stockholm Resilience Centre
Stockholm University
SE-106 91 Stockholm, Sweden

Baltic Nest Institute

Contents

1 Introduction

The evolution of coupled physical-biogeochemical models of the Baltic Sea has reach the point where the models are capable of rather accurate reproduction of the conditions in the Baltic Sea. With increased accuracy follows an increased demand for high-quality validation data sets. The Baltic Environmental Database (BED) at the Baltic Nest Institute contains probably the most complete collection of hydrographic and hydrochemical data from the Baltic Sea. The data base is built up from voluntary data contributions from a large number of institutes and individuals throughout the past two decades. Highly sophisticated graphical and statistical tools are available, and continuously developed, for accessing the data base through the Internet and retrieve various data products, i.e., the Nest and the DAS systems, both available from http://nest.su.se. However, there is a demand from modelers to get access to time-series that are closer to the raw data and still quality assured and relatively homogeneous. Therefore, we made an effort to produce a data set that is quality controlled and compiled in a consistent manner, yet keeping a high resolution vertically and temporally.

The data set contains of monthly average time-series from 1970-2008, at some 16 selected monitoring stations around the Baltic Sea (see Table 1.1). Some statistics from each station are also computed and available in the data set.

Table 1.1: Station names and positions.
All stations within a bounding box around each station are selected. The sizes of the bounding boxes are: [1]+/- 5 nm, [2]+/- 10 nm, [3]+/- 8 nm, [4]+/- 2 nm and [5]+/- 3 nm

Station number	Station name	Latitude	Longitude
1	Anholt E[1]	5640	1207
2	Bornholm deep BY5[2]	5515	1559
3	Gotland deep BY15[2]	5720	2003
4	Gulf of Finland LL7[1]	5951	2450
5	Bothnian Sea SR5[2]	6103	1934
6	Bothnian Bay[2]	6444	2204
7	Arkona BY2[1]	5500	1405
8	Landsort Deep BY31[1]	5835	1814
9	Gulf of Finland F1[1]	6008	2620
10	Gulf of Riga[2]	5735	2335
11	Gdansk Deep[3]	5450	1919
12	Bothnian Sea US3[2]	6245	1912
13	Landskrona W[4]	5552	1245
14	Fehmarn Belt[5]	5434	1120
15	Great Belt[5]	5531	1052
16	SE Gotland basin[1]	5533	1824

Table 1.2: Parameters in the data set.

No.	Parameter	Unit
1	Temperature	degC
2	Salinity	
3	Total oxygen	ml/l
4	PO4-P	μmol/l
5	TP	μmol/l
6	SiO4-Si	μmol/l
7	NO3-N	μmol/l
8	NO2-N	μmol/l
9	NO2-N+NO3-N	μmol/l
10	NH4-N	μmol/l
11	TN	μmol/l
12	Chlorophyll-a	mg/m^3

2 Data treatment

2.1 Data preprocessing

Raw data were extracted for a quadratic area around the standard position of each station. The reason being that the position of sampling could vary somewhat, especially before common use of GPS. The positions and sizes of the quadratic regions are given in Table 1.1. Based on the sampling frequency, a number of standard depths are selected for each station (see Table 2.1, and data within a meter distance from that depth is used. Surface values (0 m depth) are selected if the observation depth of the uppermost measurement of the profile is less than or equal to 2 meters.

Initial quality control was done during inclusion of data into BED. The assigned quality codes are listed in Table 2.2. Observations with quality codes 1, 3, 4, 5, 7 and 8 were used.

Still, after initial quality control, there are erroneous records in the data set. These can only be found if the values are in some respect unrealistic. Since the purpose of the data set is model validation and not data analysis as such, we can be less rigorous when eliminating questionable data because individual extreme events manifested by single observations of high/low values are most probably not caught by the models anyway. Vertical profile plots of the maximum and minimum values at each depth, together with average, median and quantiles; and time series plots for all depths and parameters were produced. By browsing these figures the most extreme values was found. The process was repeated until all values that could subjectively be considered extreme were eliminated. The whole profile for the questionable parameter was eliminated from the data set. Still, after this process there are questionable data, which the user of this data set should be aware of.

In the BED oxygen concentration and hydrogen sulfide is stored in the same variable, (hydrogen sulfide being converted into negative oxygen according to the demand of oxygen needed to oxidize hydrogen sulfide to sulfate). Occasionally, during sulfidic conditions hydrogen sulfide is not measured but zero oxygen is reported. Thus, time series of negative oxygen during anoxic conditions are inter-

rupted by zero's. To eliminate these we disregard any records within the range $0 \leq$ [O2] < 0.01 ml/l. In addition, we compute from raw data average O2 and H2S (in form of negative O2) concentrations since this may in some instances be valuable to have these separately.

The number of observations used for each parameter, depth and station are presented in Tables (B.1 - B.16) in the Appendix.

2.2 Construction of time series

The data are utterly unequally spaced in time, some periods may be frequently sampled with long gaps in-between. Therefore, we make make monthly averaged time-series. Not only the monthly average value of each parameter but also the average time of observations since they may be quite off centered from the mid of the month. Thus, the average of a property, say $\bar{c_m}$, at year y and month m is given by

$$\bar{c}_{y,m} = \frac{1}{N_{y,m}} \sum_{n=1}^{N_{y,m}} c_{n,y,m} \tag{2.1}$$

$$\overline{c^2}_{y,m} = \frac{1}{N_{y,m}} \sum_{n=1}^{N_{y,m}} c^2_{n,y,m} \tag{2.2}$$

where $N_{y,m}$ is the number of observations during year y and month m. Standard deviation time-series are calculated as

$$\sigma(c_{y,m}) = \sqrt{\overline{c^2}_{y,m} - \bar{c}^2_{y,m}} \tag{2.3}$$

The average annual cycle is computed with monthly resolution. Mean values of the parameters and time of observations are computed from the monthly averaged time-series, i.e.,

$$\overline{cm}_m = \frac{1}{Y_m} \sum_{y=Y_{min}}^{Y_{max}} \bar{c}_{y,m} \tag{2.4}$$

The annual cycle of standard deviation is computed as the sum of the variance from all individual measurements.

$$\sigma(cm_m) = \sqrt{\frac{1}{Y_m} \sum_{y=Y_{min}}^{Y_{max}} ((\bar{c}_{y,m} - \overline{cm}_m)^2 + \sigma(c_{y,m})^2)} =$$

$$= \sqrt{\frac{1}{Y_m} \sum_{y=Y_{min}}^{Y_{max}} \overline{c^2}_{y,m} - \overline{cm}^2_m} \tag{2.5}$$

Long-term mean values are computed from the annual cycle since this would lead to least bias.

$$\overline{ca} = \frac{1}{12} \sum_{m=1}^{12} \overline{cm}_m \tag{2.6}$$

and the overall standard deviation is computed from

$$\sigma(ca) = \sqrt{\frac{1}{12} \sum_{m=1} 12 \left[\frac{1}{Y_m} \sum_{y=Y_{min}}^{Y_{max}} \overline{c^2}_{y,m} \right] - ca^2} \tag{2.7}$$

Table 2.1: Selected standard depths for the stations.

Depth	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
15	x	x	x	x	x	x	x	x	x	-	x	x	x	x	x	x
20	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
25	x	-	-	-	-	-	-	-	-	-	-	-	x	-	-	-
26	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-	-
30	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	x
33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	x	-
40	x	x	x	x	x	x	x	x	x	x	x	x	x	-	-	x
50	x	x	x	x	x	x	-	x	x	x	x	x	x	-	-	x
60	-	x	x	x	x	x	-	x	x	-	x	x	-	-	-	x
70	-	x	x	x	x	x	-	x	-	-	x	x	-	-	-	x
80	-	x	x	-	x	x	-	x	-	-	x	x	-	-	-	x
85	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	-	-	x	-	x	x	-	x	-	-	x	x	-	-	-	-
100	-	-	x	-	x	x	-	x	-	-	x	x	-	-	-	-
110	-	-	-	-	-	x	-	-	-	-	-	-	-	-	-	-
125	-	-	x	-	-	-	-	x	-	-	-	x	-	-	-	-
150	-	-	x	-	-	-	-	x	-	-	-	x	-	-	-	-
175	-	-	x	-	-	-	-	x	-	-	-	x	-	-	-	-
200	-	-	x	-	-	-	-	x	-	-	-	-	-	-	-	-
225	-	-	x	-	-	-	-	x	-	-	-	-	-	-	-	-
240	-	-	x	-	-	-	-	-	-	-	-	-	-	-	-	-
250	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-
300	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-
440	-	-	-	-	-	-	-	x	-	-	-	-	-	-	-	-

Table 2.2: Quality codes in the BED data base.

Quality code	explanation
0	missing
1	ok
2	will be changed
3	modified
4	manually interpolated
5	traces
6	>
7	<
8	NO2-N+NO3-N is calculated from the sum of measurements of NO2-N and NO3-N
9	questionable
40	ship 40, sweden ,bad chemdata

3 Data files

All data is stored in simple ASCII files.

3.1 Monthly time-series

One file for each station, parameter and depth. The filenames are constructed as, for example: GotlanddeepBY15SALINmonth000.dat which contain salinity data from 0 m depth at BY15. The columns in the files are, Day no, Year, Month, Day, Average value, Standard deviation, Minimal value, Maximal value and Number of observations. A header line gives information of the columns. Day numbers are julian days since 1850-01-01.

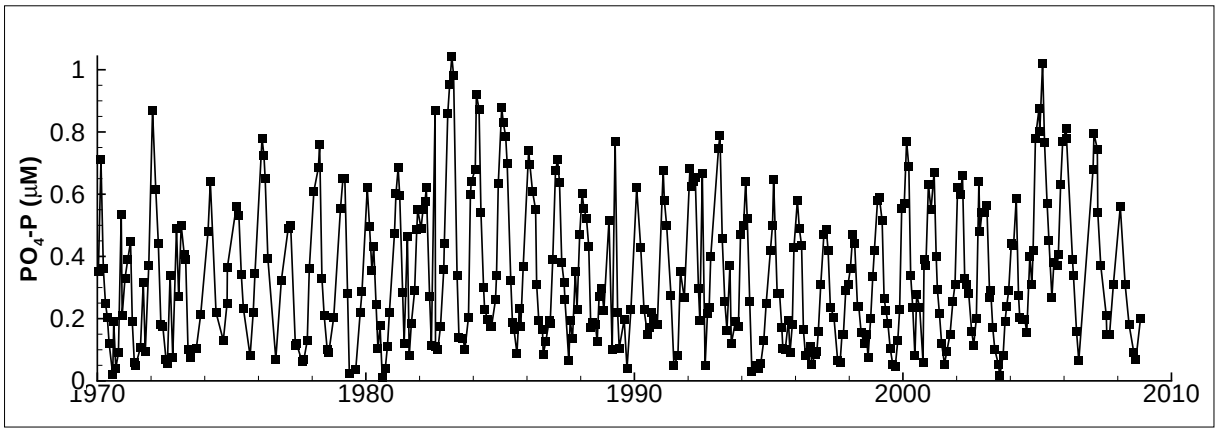

Figure 3.1: Example of monthly time-series of PO4-P from 0 m depth at BY5 (Bornholm basin)

3.2 Seasonal cycles

One file for each station and month. Filenames are constructed as for example: GotlanddeepBY15SeasonM01.dat for profiles in January. The columns are: Depth, Temp, Temp standard deviation, Salinity, Salinity standard deviation, etc... A header line gives the information of the columns.

3.3 Average profiles

One file for each station, format the same as for seasonal cycles.

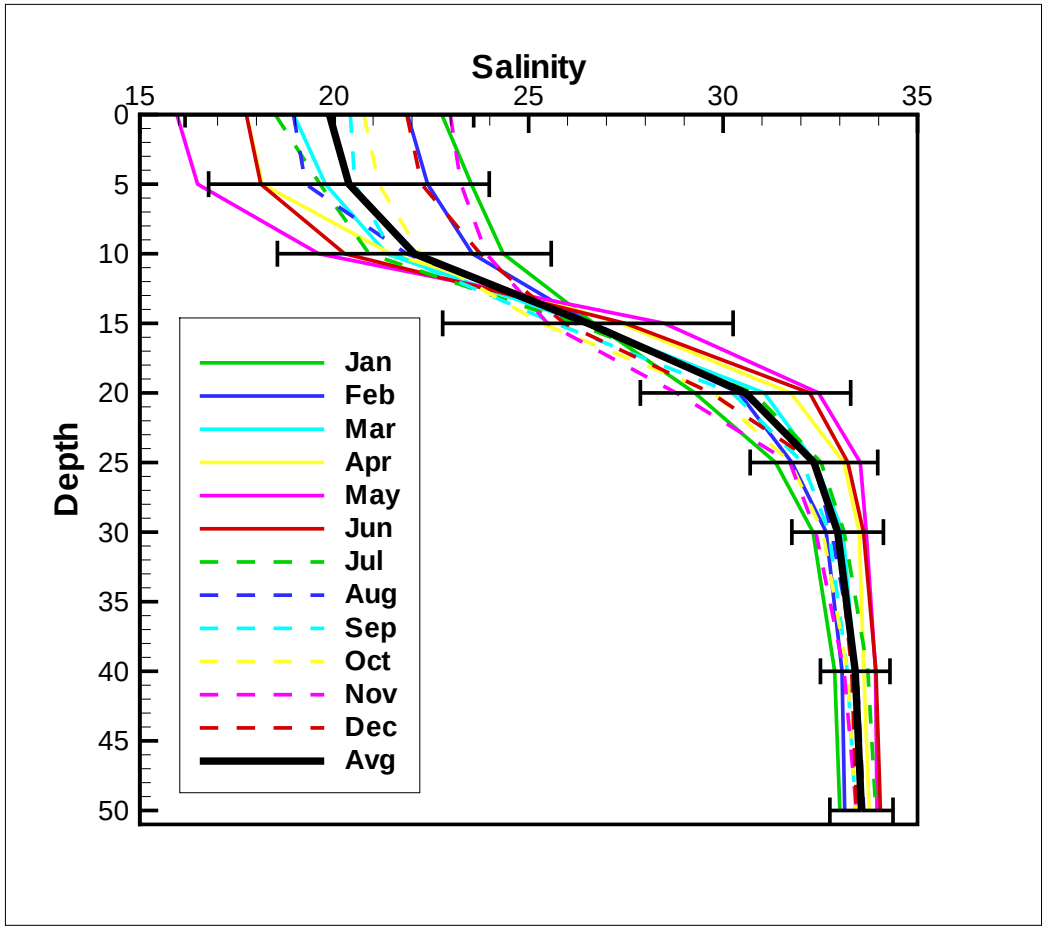

Figure 3.2: Example of monthly and long-term average profiles of salinity from Anholt E. Errorbars indicate the standard deviation around the long-term average.

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A Data contributers

The following institutes have contributed to the BED with marine data. We give the complete list and not only the contributors to the data used for this compilation.

A.1 Denmark

National Environmental Research Institute

Fyns Amt Teknik og Miljøforvaltning

International Council for the Exploration of the Sea, ICES

Marine Biological Laboratory Helsingr. Univ. Copenhagen

A.2 Estonia

Estonian Marine Institute, Tallinn

Estonian Meteorological and Hydrological Institute

A.3 Finland

Finnish Environment Institute, Helsinki (coastal water and river loads data)

The Finnish Environment Institute also provided data from the City of Helsinki, Environment Centre; Lapland

Regional Environment Centre, Finland; Middle Ostrobothnia Regional Environment Centre, Finland; North Ostrobothnia Regional Environment Centre, Finland; Southwest Finland Regional Environment Centre, Finland; Southeast Finland Regional Environment Centre, Finland; University of Turku, Finland; Uusimaa Regional Environment Centre; Finland; West Finland Regional Environment Centre, Finland.

Finnish Institute of Marine Research, Helsinki

Helsinki Commission, Helcom

Husö biologiska station. Åbo Akademi

A.4 Germany

Baltic Sea Research Institute, Warnemuende

Federal Maritime and Hydrographic Agency

German Oceanographic Data Center, Hamburg

Institut für Meereskunde der Universität Hamburg, Hamburg

Institut für Mereeskunde, Kiel

Landesamt für Natur und Umwelt des Landes Schleswig-Holstein

Landesamt für Umwelt, Naturschutz und Geologie. Mecklenburg-Vorpommern

A.5 Latvia

Balt. Fish. Res. Inst. Riga, Latvia

Hydromet in Latvia

Latvian Institute of Aquatic Ecology, Riga

A.6 Lithuania

Klaipeda Hydrometeorological Observatory (In 1992, this observatory became an institution that was first called Lithuanian Laboratory of Marine Research. After the reorganisation of the Environmental Protection Department to Ministry in Lithuania, it was renamed as Centre of Marine Research.)

Coastal Research and Planning Institute, Klaipeda University

A.7 Poland

Gdansk University

Institute of Meteorology and Water Management, Gdynia

Morski Instytut Rybacki / Sea Fisheries Institute

A.8 Russia

Atlantic Scientific Research Institute of Marine Fisheries and Oceanography, AtlantNIRO

Arctic and Antarctic Research Institute in St. Petersburg

Institute of Oceanology of the Russian Academy of Science, Atlantic Branch

North-Western Board of the Hydrometeorological Service of Russia

Russian State Hydrometeorological University, St. Petersburg.

St.-Petersburg branch of State Oceanographic Institute

A.9 Sweden

Department of Systems Ecology and Stockholm Marine Research Centre, University of Stockholm
Gothenburg Marine Sciences Centre
HavsFiskeLaboratoriet (Fiskeriverket)*
Kristinebergs Marina Forskningsstation*
KustLaboratoriet (Fiskeriverket)*
Ljusnan-Voxnans Vattenvårdsförbund in Sandarne
Lunds Universitet
Länstyrelse i Gävleborg
Länstyrelse i Norrbotten
Länstyrelse i Västernorrlands län *
Miljölaboratoriet i Gävle
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SMHI, Gothenburg *
Stockholm Water
former Svelab AB
Swedish CoastGuard *
Tjärnö Marine Biological Laboratory*
Toxicon AB *
UmeåMarine Sciences Centre, UmeåUniversity *
VBB Consult i Malmö (refer Öresunds Vattenförbund)
Öresunds Vattenförbund*

* These data were provided via the SMHI which is the national data host for hydrophysical/chemical marine data from the Swedish national monitoring programmes.

The coastal control programs that collaborated with data to this database via SMHI are:

Bohuskusten, Gullmarn, Halland, Öresund, Sydkusten, Västra Hanöbukten, Blekingekusten, Kalmar, Gavikfjärden, Råneåfjärden.

B Number of measurements

Table B.1: Number of observations from Anholt E

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	757	738	519	685	648	592	533	618	588	582	496	344
5	631	625	448	567	540	537	423	557	525	527	431	342
10	759	755	712	695	652	599	539	625	596	594	498	344
15	664	658	635	625	590	584	481	615	589	579	440	335
20	759	751	721	643	592	601	501	626	613	590	444	281
25	486	479	476	468	419	453	343	469	462	444	298	73
30	751	745	710	681	623	592	544	621	618	574	490	69
40	713	707	679	595	527	563	471	590	588	553	416	67
50	569	566	551	500	446	435	395	454	453	422	362	19

Table B.2: Number of observations from Arkona BY2

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	1468	1464	1244	964	580	373	567	549	503	452	389	174
5	1013	1001	843	431	345	339	335	397	350	383	256	178
10	1712	1702	1379	947	544	393	558	534	480	484	396	177
15	1275	1266	895	504	347	337	332	393	347	379	253	176
20	1695	1692	1419	899	471	391	496	560	510	484	307	173
30	1707	1693	1395	959	520	387	563	539	503	473	375	37
40	1729	1696	1398	901	450	389	515	567	550	475	295	35

Table B.3: Number of observations from Bornholm Deep BY5

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	3962	3932	2806	1816	1305	612	1321	1442	1248	666	506	235
5	2235	2203	1253	647	441	535	560	610	535	519	389	196
10	4868	4852	2727	1646	1160	679	1241	1349	1145	701	497	237
15	4166	4134	1555	970	716	536	815	912	786	514	360	187
20	4849	4828	3159	1739	1166	675	1319	1420	1222	706	491	223
30	4810	4774	2538	1463	975	632	1160	1240	1087	670	457	39
40	4873	4845	2819	1587	1026	656	1263	1342	1218	692	506	38
50	4867	4825	3058	1728	1171	622	1254	1380	1241	656	445	37
60	4964	4927	3084	1714	1150	653	1320	1426	1320	679	471	2
70	4057	4009	2653	1314	778	585	952	1048	945	613	426	1
80	4474	4441	2955	1704	1147	641	1295	1410	1269	653	464	0
85	2965	2942	1905	951	785	115	634	715	613	110	88	1

Table B.4: Number of observations from Bothnian Bay F9

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	488	495	202	257	299	179	244	180	155	181	287	28
5	335	343	58	267	307	257	257	261	219	257	305	26
10	388	393	193	254	294	180	242	182	159	184	280	13
15	194	198	54	163	171	155	154	157	137	155	167	16
20	335	337	194	176	182	163	163	168	149	166	168	3
30	182	180	57	141	137	130	131	137	120	135	135	0
40	399	400	199	202	242	180	185	184	157	184	233	19
50	184	184	60	144	139	132	132	139	119	137	138	0
60	393	393	201	253	289	179	239	179	148	183	280	12
70	204	204	59	166	158	154	156	156	135	157	156	0
80	392	393	203	197	234	181	182	178	149	185	225	12
90	171	171	59	145	137	132	133	134	114	133	135	0
100	345	347	213	232	232	162	221	165	143	166	227	12
110	157	160	148	116	117	114	115	109	89	114	114	12

Table B.5: Number of observations from Bothnian Sea SR5

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	410	398	247	227	220	208	166	192	177	195	217	12
5	367	361	172	169	165	160	120	157	140	156	163	11
10	393	389	238	226	218	206	160	187	173	196	210	11
15	326	323	164	129	128	125	88	122	114	121	126	11
20	395	385	238	210	204	195	143	186	170	186	198	12
30	357	354	179	150	141	144	97	144	130	138	138	0
40	391	385	238	222	213	207	158	192	178	200	207	0
50	360	356	190	157	149	150	100	146	134	142	143	0
60	390	384	244	217	213	202	152	195	182	193	204	0
70	357	354	181	158	149	153	105	151	141	146	146	0
80	387	383	254	222	210	209	153	197	187	202	203	0
90	289	288	137	124	116	117	87	117	109	115	109	0
100	352	350	240	198	198	187	134	183	178	176	188	0

Table B.6: Number of observations from Bothnian Sea US3

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	502	495	337	280	314	176	224	158	141	160	303	27
5	302	298	96	119	163	112	92	111	92	109	155	26
10	500	494	329	273	302	173	219	155	137	163	303	14
15	251	250	100	85	97	78	61	83	75	74	85	14
20	447	439	323	155	148	144	97	141	130	135	148	3
30	283	276	139	130	119	124	84	124	114	118	119	0
40	503	497	335	181	217	173	129	158	148	166	205	15
50	282	277	157	131	121	126	86	127	124	121	124	0
60	492	488	335	257	295	160	207	153	141	152	282	12
70	279	274	151	127	117	121	84	118	115	118	117	0
80	493	488	335	169	202	163	121	156	144	159	192	12
90	229	223	109	104	96	99	77	101	98	95	96	0
100	475	467	332	150	146	142	96	136	135	131	147	12
125	261	257	168	144	133	132	91	133	133	126	136	0
150	427	425	323	242	275	144	201	143	134	134	264	12
175	151	148	126	97	97	95	67	96	93	93	95	0

Table B.7: Number of observations from Fehmarn Belt

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	461	441	243	397	310	334	403	393	366	339	161	81
5	458	439	268	305	231	271	316	309	281	242	108	74
10	519	495	486	398	312	343	410	404	379	333	144	81
15	500	477	465	383	292	331	389	381	365	310	129	76
20	493	469	459	390	295	327	396	394	391	317	133	16
26	628	616	610	533	405	464	543	538	540	437	180	4

Table B.8: Number of observations from Gdansk Deep

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	1844	1816	1388	797	226	337	472	470	435	361	217	166
5	843	833	592	347	197	279	290	302	268	239	189	51
10	1752	1731	1329	733	225	337	476	473	440	367	213	152
15	812	805	577	310	182	257	264	275	241	214	173	43
20	1760	1744	1342	737	224	339	477	476	444	365	210	108
30	1736	1726	1328	701	192	307	441	440	411	341	184	19
40	1668	1654	1238	726	217	336	471	471	446	365	212	4
50	1714	1696	1279	710	190	306	442	438	418	337	186	10
60	1722	1698	1283	752	209	331	457	459	438	354	202	2
70	1724	1697	1300	723	186	298	435	433	416	329	177	3
80	1729	1693	1308	751	217	328	456	451	433	349	205	9
90	1651	1634	1225	703	172	285	402	416	386	313	171	0
100	1582	1558	1124	713	202	316	414	441	402	329	192	1

Table B.9: Number of observations from Gotland Deep BY15

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	1230	1225	1065	840	527	497	595	630	566	541	410	163
5	809	807	657	439	303	372	310	411	359	381	262	164
10	1403	1400	1200	796	523	499	544	578	508	506	404	163
15	986	986	772	499	301	387	336	425	380	400	262	162
20	1391	1386	1209	721	464	482	511	615	557	539	333	164
30	1178	1176	988	629	363	409	399	495	457	459	297	38
40	1384	1373	1184	705	450	487	508	609	558	542	334	34
50	1200	1194	1004	655	385	422	417	518	484	467	304	34
60	1354	1352	1183	791	489	521	593	636	618	571	384	0
70	1016	1017	881	572	333	400	382	474	463	435	284	0
80	1327	1318	1158	697	438	522	520	609	594	545	335	0
90	876	874	747	481	287	376	358	430	421	418	245	0
100	1389	1382	1233	773	449	566	547	650	624	580	337	0
125	1052	1056	896	638	350	483	437	547	522	475	316	0
150	1284	1276	1068	764	421	575	517	625	567	558	333	0
175	894	895	722	566	332	440	388	477	419	458	303	0
200	1194	1191	948	735	441	562	488	620	528	549	349	0
225	891	896	712	600	403	429	411	459	388	431	358	0
240	360	357	341	333	216	270	185	270	238	252	204	0

Table B.10: Number of observations from Great Belt

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	2465	2449	2178	1128	1150	191	13	13	1077	1152	1103	1092
5	3802	3785	2945	308	331	107	10	11	265	331	287	285
10	3543	3526	2838	323	346	117	15	16	282	347	305	313
15	3514	3498	2814	309	332	115	12	13	267	333	291	326
20	3498	3483	2810	329	353	115	13	14	286	354	310	313
33	2719	2706	2355	685	695	78	1	1	666	695	678	2

Table B.11: Number of observations from Gulf of Finland LL7

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	729	714	498	401	314	319	277	330	337	358	306	18
5	600	584	296	231	192	212	158	196	215	215	187	19
10	726	717	458	392	305	319	271	324	336	356	293	19
15	613	593	250	169	134	145	124	158	154	151	130	8
20	718	710	407	318	244	258	221	281	276	277	234	6
30	681	671	344	242	173	188	154	215	213	208	165	3
40	707	696	418	336	262	278	239	297	289	292	251	3
50	659	651	365	246	178	198	159	224	220	215	163	3
60	612	604	390	284	234	247	194	256	248	248	224	3
70	439	438	278	195	149	166	119	169	164	169	144	3

Table B.12: Number of observations from Gulf of Finland F1

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	309	316	241	177	168	161	117	153	151	164	161	3
5	245	245	145	110	104	101	69	99	97	99	99	3
10	286	292	216	185	168	169	115	159	157	172	161	3
15	227	228	131	91	91	89	57	84	84	83	91	3
20	276	280	194	167	157	156	105	150	148	152	153	3
30	253	258	162	112	96	107	52	99	99	105	94	0
40	269	273	201	173	163	160	113	147	145	155	160	0
50	253	255	173	107	100	101	58	101	99	105	97	0
60	204	205	157	122	118	117	74	109	109	110	114	0

Table B.13: Number of observations from Gulf of Riga

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	427	424	382	372	366	199	233	316	339	330	187	33
5	259	233	170	196	185	152	119	176	178	183	133	36
10	430	422	385	372	364	196	236	313	337	335	183	40
20	425	419	377	359	349	185	232	308	328	317	176	9
30	414	408	371	348	341	177	226	301	310	314	165	5
40	399	391	375	351	340	180	227	304	322	315	170	3
50	273	269	260	240	239	128	155	207	222	209	126	1

Table B.14: Number of observations from Landskrona W

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	1566	1547	1264	936	895	652	546	604	855	856	726	588
5	2940	2937	2550	766	748	544	423	487	682	710	622	524
10	2964	2955	2792	873	840	639	546	602	820	810	666	537
15	2982	2974	2813	878	817	638	543	597	841	809	666	531
20	2983	2976	2824	907	844	661	568	616	881	827	684	470
25	2755	2747	2611	697	649	497	371	434	701	643	512	53
30	2918	2909	2766	792	733	546	552	597	763	713	567	39
40	2770	2766	2612	791	742	566	462	511	772	727	605	37
50	2134	2149	2138	254	247	190	163	162	246	240	178	2

Table B.15: Number of observations from Landsort Deep BY31

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	963	966	828	694	630	610	418	411	595	600	602	347
5	877	839	371	588	521	571	321	370	547	564	490	344
10	956	953	594	706	629	627	425	418	599	620	591	350
15	722	720	360	581	523	568	316	364	550	564	497	345
20	952	955	901	655	576	606	372	424	609	624	540	347
30	772	775	423	641	545	595	361	413	597	613	513	273
40	939	946	886	649	579	598	374	420	614	615	529	213
50	772	779	423	646	564	596	368	417	620	612	517	208
60	910	919	870	646	561	601	371	418	623	617	524	260
70	723	731	480	621	542	586	354	404	602	600	513	0
80	900	905	860	694	616	620	419	415	607	606	576	259
90	459	461	404	356	329	331	158	185	338	341	305	0
100	900	906	846	636	573	594	361	416	596	609	531	0
125	537	540	484	436	362	404	232	263	384	419	329	0
150	713	723	644	618	541	585	349	393	564	591	509	0
175	447	449	376	364	291	337	166	204	329	359	285	0
200	865	873	772	613	554	579	341	392	566	590	525	0
225	215	215	166	137	124	124	91	131	129	123	120	0
250	554	561	486	479	463	471	215	268	472	468	462	0
300	858	865	759	604	539	574	337	387	561	583	505	0
400	823	809	737	647	585	597	385	379	551	579	557	0
440	513	530	471	486	481	481	248	280	481	475	466	0

Table B.16: Number of observations from SE Gotland basin

Depth	T	S	O_2	PO_4	TP	SiO_4	NO_3	NO_2	NO_x	NH_4	TN	Chl
0	759	755	619	556	416	473	454	530	471	452	385	217
5	712	711	604	522	379	458	447	521	462	450	369	183
10	800	796	697	577	430	492	482	556	495	476	400	217
15	701	699	586	511	376	450	442	514	457	450	370	180
20	795	796	698	579	416	497	485	558	496	484	383	180
30	779	779	678	571	399	486	479	550	502	473	375	37
40	799	799	687	575	423	489	480	554	510	480	398	36
50	794	793	675	574	408	487	477	551	515	473	382	36
60	792	795	692	580	401	488	482	551	520	478	378	0
70	734	733	640	525	375	456	437	508	484	441	371	0
80	776	773	675	560	395	483	464	536	519	458	373	0