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*Supplement of*

## **Biogeochemical processes and buffering capacity concurrently affect acidification in a seasonally hypoxic coastal marine basin**

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Table S1. Measurements during the 2012 Den Osse sampling campaign. Wind speed refers to the daily-averaged wind speed at 10 m above the surface, which was obtained from the Royal Netherlands Meteorological Institute. The time of sampling is approximate within 15 minutes. For the other variables, see the original paper.

Date (dd-mm-yyyy)	Time of sampling (hh:mm, UTC+1)	Wind speed (m s <sup>-1</sup> )	Depth (m)	Temperature (°C)	Salinity (-)	Density anomaly (kg m <sup>-3</sup> )	Chl <i>a</i> (µg L <sup>-1</sup> )	O <sub>2</sub> (µmol L <sup>-1</sup> )
23-01-2012	12:25	5.6	1	5.36	30.01	23.58	-1.44	318.45
23-01-2012	12:12		3	5.36	30.00	23.58	-1.38	316.26
23-01-2012	12:00		6	5.42	30.05	23.63	-1.38	316.26
23-01-2012	11:47		10	5.40	30.04	23.64	-1.76	314.70
23-01-2012	11:30		15	5.56	30.14	23.72	-1.57	310.32
23-01-2012	11:15		20	5.86	30.45	23.95	-1.77	300.32
23-01-2012	11:00		25	6.11	30.85	24.26	-2.18	287.20
23-01-2012	10:50		32	6.46	31.37	24.66	-1.61	247.82
21-02-2012	09:20	6.1	1	1.99	30.43	24.20	2.01	355.95
21-02-2012	09:29		3	1.99	30.43	24.21	1.91	358.45
21-02-2012	09:37		6	1.98	30.43	24.23	2.84	357.20
21-02-2012	09:48		10	1.97	30.43	24.25	2.40	358.45
21-02-2012	09:59		15	1.93	30.49	24.32	1.92	356.26
21-02-2012	10:10		20	1.94	30.52	24.37	1.92	347.51
21-02-2012	10:21		25	1.29	31.10	24.90	1.11	343.45
21-02-2012	10:38		32	1.47	31.27	25.06	1.12	300.64
12-03-2012	09:15	2.8	1	7.18	30.08	23.42	5.23	365.95
12-03-2012	09:40		3	7.08	30.10	23.46	5.56	361.89
12-03-2012	09:50		6	6.31	30.80	24.12	5.85	351.26
12-03-2012	10:00		10	5.61	31.92	25.10	4.04	320.32
12-03-2012	10:15		15	5.36	32.07	25.27	2.46	315.01
12-03-2012	10:30		20	5.41	32.16	25.36	2.16	313.76
12-03-2012	10:45		25	5.42	32.22	25.42	2.44	310.95
12-03-2012	11:00		32	5.46	32.21	25.45	2.73	309.07

Table S1 (continued):

Date (dd-mm-yyyy)	Time of sampling (hh:mm, UTC+1)	Wind speed (m s <sup>-1</sup> )	Depth (m)	Temperature (°C)	Salinity (-)	Density anomaly (kg m <sup>-3</sup> )	Chl <i>a</i> (µg L <sup>-1</sup> )	O <sub>2</sub> (µmol L <sup>-1</sup> )
23-04-2012	08:40	6.4	1	9.78	30.57	23.43	3.79	296.26
23-04-2012	08:55		3	9.76	30.57	23.44	4.70	296.57
23-04-2012	09:05		6	9.55	30.59	23.50	5.09	296.26
23-04-2012	09:17		10	8.60	31.37	24.27	2.99	279.70
23-04-2012	09:27		15	8.30	31.45	24.40	2.68	264.70
23-04-2012	09:35		20	8.08	31.47	24.47	1.44	260.32
23-04-2012	09:45		25	8.04	31.47	24.50	1.74	249.07
23-04-2012	09:57		32	8.30	31.54	24.55	2.20	239.07
30-05-2012	08:55	2.3	1	19.10	30.20	21.23	2.45	274.39
30-05-2012	09:05		3	18.65	30.20	21.35	5.95	280.01
30-05-2012	09:19		6	17.81	30.22	21.59	13.90	293.45
30-05-2012	09:31		10	16.05	30.28	22.05	19.03	273.45
30-05-2012	09:44		15	12.28	30.63	23.10	5.36	189.69
30-05-2012	09:56		20	10.07	31.50	24.18	2.31	171.57
30-05-2012	10:11		25	9.90	31.55	24.27	1.08	165.63
30-05-2012	10:25		32	9.79	31.56	24.34	1.26	153.13
25-06-2012	08:25	4.2	1	16.97	30.16	21.71	6.30	236.57
25-06-2012	08:35		3	16.87	30.17	21.75	8.62	235.32
25-06-2012	08:50		6	16.85	30.38	21.93	8.83	235.01
25-06-2012	09:00		10	16.50	30.86	22.39	7.29	231.26
25-06-2012	09:15		15	15.57	31.21	22.89	2.10	187.19
25-06-2012	09:28		20	12.61	31.29	23.58	1.28	110.63
25-06-2012	09:40		25	11.18	31.36	23.91	1.16	82.50
25-06-2012	09:57		32	10.55	31.43	24.11	1.20	72.50

Table S1 (continued):

Date (dd-mm-yyyy)	Time of sampling (hh:mm, UTC+1)	Wind speed (m s <sup>-1</sup> )	Depth (m)	Temperature (°C)	Salinity (-)	Density anomaly (kg m <sup>-3</sup> )	Chl <i>a</i> (µg L <sup>-1</sup> )	O <sub>2</sub> (µmol L <sup>-1</sup> )
24-07-2012	08:55	2.3	1	20.01	30.36	21.13	27.33	361.58
24-07-2012	09:10		3	18.90	30.41	21.46	10.93	332.51
24-07-2012	09:18		6	18.98	30.70	21.66	10.68	292.51
24-07-2012	09:25		10	18.21	31.49	22.47	4.58	197.51
24-07-2012	09:35		15	17.40	32.09	23.15	4.72	149.38
24-07-2012	09:47		20	16.53	32.34	23.56	2.07	96.88
24-07-2012	10:05		25	15.79	32.24	23.67	1.41	74.07
24-07-2012	10:20		32	15.13	32.15	23.78	1.60	40.63
20-08-2012	08:50	3.4	1	21.03	30.74	21.15	12.86	294.07
20-08-2012	09:10		3	20.95	30.73	21.17	12.48	245.95
20-08-2012	09:15		6	20.44	31.54	21.93	6.82	139.69
20-08-2012	09:25		10	19.63	32.19	22.65	3.13	64.06
20-08-2012	09:47		15	18.77	32.38	23.03	2.32	39.06
20-08-2012	10:00		20	17.64	32.36	23.31	1.13	16.25
20-08-2012	10:20		25	17.19	32.31	23.41	0.85	5.31
20-08-2012	10:45		32	16.81	32.24	23.47	1.02	3.44
20-09-2012	08:15	3.7	1	16.41	31.57	22.91	7.10	224.35
20-09-2012	08:25		3	16.41	31.57	22.92	9.42	222.75
20-09-2012	08:40		6	16.87	31.98	23.14	4.56	214.70
20-09-2012	08:50		10	17.38	32.67	23.57	1.47	177.37
20-09-2012	09:00		15	17.14	32.67	23.65	2.78	181.87
20-09-2012	09:15		20	16.97	32.70	23.73	2.59	187.43
20-09-2012	09:30		25	16.93	32.73	23.79	2.69	191.24
20-09-2012	09:50		32	16.86	32.74	23.84	3.38	190.56

Table S1 (continued):

Date (dd-mm-yyyy)	Time of sampling (hh:mm, UTC+1)	Wind speed (m s <sup>-1</sup> )	Depth (m)	Temperature (°C)	Salinity (-)	Density anomaly (kg m <sup>-3</sup> )	Chl <i>a</i> (µg L <sup>-1</sup> )	O <sub>2</sub> (µmol L <sup>-1</sup> )
18-10-2012	08:29	2.8	1	12.10	30.92	23.30	2.99	260.01
18-10-2012	08:40		3	12.08	30.93	23.32	2.56	256.26
18-10-2012	08:55		6	12.76	31.79	23.87	1.46	238.76
18-10-2012	09:07		10	12.91	32.17	24.15	1.74	238.76
18-10-2012	09:15		15	12.78	32.19	24.21	2.05	232.82
18-10-2012	09:30		20	12.72	32.21	24.26	1.69	235.95
18-10-2012	09:45		25	12.67	32.22	24.30	1.75	238.45
18-10-2012	10:00		32	12.58	32.23	24.36	1.73	239.07
05-11-2012	08:55	3.8	1	10.04	31.21	23.88	1.71	275.37
05-11-2012	09:10		3	10.04	31.20	23.88	1.78	272.71
05-11-2012	09:22		6	10.05	31.20	23.90	1.94	266.70
05-11-2012	09:35		10	10.05	31.20	23.91	1.62	268.33
05-11-2012	09:50		15	10.09	31.22	23.94	1.82	245.76
05-11-2012	10:03		20	12.61	32.54	24.54	0.55	236.62
05-11-2012	10:18		25	12.73	32.64	24.62	0.93	232.13
05-11-2012	10:35		32	12.72	32.68	24.68	0.49	237.54
03-12-2012	09:28	5.2	1	6.75	31.33	24.45	1.94	289.59
03-12-2012	09:42		3	6.71	31.28	24.42	1.89	284.94
03-12-2012	09:57		6	6.97	31.19	24.34	1.42	279.36
03-12-2012	10:10		10	7.55	31.96	24.88	1.49	278.03
03-12-2012	10:23		15	7.94	32.21	25.04	1.55	276.36
03-12-2012	10:35		20	8.21	32.39	25.17	1.02	269.65
03-12-2012	10:48		25	8.34	32.44	25.21	1.23	266.69
03-12-2012	11:05		32	8.48	31.26	24.30	2.24	259.98

Table S1 (continued):

Date (dd-mm-yyyy)	Depth (m)	DIC ( $\mu\text{mol kg}^{-1}$ )	pH <sub>T</sub> (in situ)	TA <sub>FI</sub> ( $\mu\text{mol kg}^{-1}$ )	TA <sub>UF</sub> ( $\mu\text{mol kg}^{-1}$ )	pCO <sub>2</sub> (ppmv)	DOC ( $\mu\text{mol L}^{-1}$ )	NH <sub>4</sub> <sup>+</sup> ( $\mu\text{mol L}^{-1}$ )	NO <sub>3</sub> <sup>-</sup> ( $\mu\text{mol L}^{-1}$ )	Si(OH) <sub>4</sub> ( $\mu\text{mol L}^{-1}$ )	PO <sub>4</sub> <sup>3-</sup> ( $\mu\text{mol L}^{-1}$ )
23-01-2012	1	2246	8.077	2382	2390	452	180.66	8.89	30.08	18.94	0.84
23-01-2012	3	2257	8.041	2392	2386	454	179.28	8.87	29.93	18.95	0.83
23-01-2012	6	2258	8.058	2383	2381	451	176.56	8.80	29.87	18.94	0.82
23-01-2012	10	2250	8.076	2385	2386	461	164.63	8.77	29.94	19.45	0.86
23-01-2012	15	2253	8.074	2379	2388	457	166.30	8.81	30.24	19.95	0.90
23-01-2012	20	2250	8.069	2383	2389	463	162.61	8.87	30.29	19.96	0.88
23-01-2012	25	2259	8.065	2391	2402	444	149.69	9.92	29.19	21.70	1.02
23-01-2012	32	2306	8.060	2455	2443	466	147.67	13.42	23.18	22.43	1.12
21-02-2012	1	2266	8.195	2437	2495	373	164.30	3.64	32.05	9.41	0.52
21-02-2012	3	2259	8.157	2419	2440	366	156.94	3.58	31.10	9.42	0.51
21-02-2012	6	2254	8.146	2426	2436	359	155.78	3.47	30.96	9.32	0.48
21-02-2012	10	2261	8.134	2421	2547	357	171.20	3.51	30.94	9.33	0.49
21-02-2012	15	2260	8.139	2418	2437	359	162.55	3.44	30.91	9.36	0.49
21-02-2012	20	2264	8.121	2426	2429	385	155.99	4.17	31.70	11.25	0.70
21-02-2012	25	2260	8.086	2425	2456	394	141.80	4.57	32.85	12.90	0.75
21-02-2012	32	2297	8.069	2420	2433	435	134.13	7.82	33.00	17.20	0.95
12-03-2012	1	2190	8.295	2461	2473	277	170.21	0.76	20.61	0.00	0.02
12-03-2012	3	2196	8.306	2454	2466	277	170.21	0.71	20.68	0.00	0.03
12-03-2012	6	2205	8.285	2457	2457	296	166.62	0.91	21.91	0.21	0.03
12-03-2012	10	2219	8.142	2391	2444	381	132.78	2.51	27.26	5.26	0.33
12-03-2012	15	2220	8.121	2380	2390	401	121.00	3.10	27.66	5.90	0.46
12-03-2012	20	2223	8.135	2386	2387	405	118.91	2.81	27.70	6.14	0.47
12-03-2012	25	2228	8.122	2382	2396	411	119.36	2.97	27.94	6.53	0.48
12-03-2012	32	2226	8.117	2381	2391	416	118.62	3.19	28.15	6.92	0.49

Table S1 (continued):

Date (dd-mm-yyyy)	Depth (m)	DIC ( $\mu\text{mol kg}^{-1}$ )	pH <sub>T</sub> (in situ)	TA <sub>FI</sub> ( $\mu\text{mol kg}^{-1}$ )	TA <sub>UF</sub> ( $\mu\text{mol kg}^{-1}$ )	pCO <sub>2</sub> (ppmv)	DOC ( $\mu\text{mol L}^{-1}$ )	NH <sub>4</sub> <sup>+</sup> ( $\mu\text{mol L}^{-1}$ )	NO <sub>3</sub> <sup>-</sup> ( $\mu\text{mol L}^{-1}$ )	Si(OH) <sub>4</sub> ( $\mu\text{mol L}^{-1}$ )	PO <sub>4</sub> <sup>3-</sup> ( $\mu\text{mol L}^{-1}$ )
23-04-2012	1	2208	8.351	2495	2504	311	160.83	0.66	7.06	2.36	0.00
23-04-2012	3	2202	8.371	2492	2499	306	152.92	0.68	7.15	2.35	0.00
23-04-2012	6	2200	8.369	2499	2494	303	167.29	0.54	7.07	2.38	0.00
23-04-2012	10	2206	8.340	2477	2491	325	143.52	2.80	11.36	3.10	0.05
23-04-2012	15	2222	8.284	2462	2487	368	130.90	5.52	14.89	4.12	0.18
23-04-2012	20	2234	8.267	2471	2465	384	124.42	6.99	15.53	5.14	0.18
23-04-2012	25	2252	8.248	2471	2462	419	140.02	9.14	16.83	6.67	0.31
23-04-2012	32	2271	8.192	2475	2451	459	126.76	10.61	17.39	8.19	0.44
30-05-2012	1	2126	8.195	2481	2412	343	218.16	0.00	0.08	0.03	0.18
30-05-2012	3	2125	8.230	2468	2465	330	236.88	0.00	0.10	0.00	0.14
30-05-2012	6	2119	8.281	2467	2480	309	191.90	0.37	2.00	0.14	0.12
30-05-2012	10	2154	8.260	2440	2464	346	163.91	2.51	4.83	0.61	0.13
30-05-2012	15	2298	8.115	2492	2475	513	138.33	12.43	11.36	10.38	0.68
30-05-2012	20	2327	8.098	2516	2499	538	139.11	17.31	11.60	15.44	0.92
30-05-2012	25	2340	8.078	2515	2535	558	146.38	19.69	11.44	17.22	1.00
30-05-2012	32	2377	8.059	2585	2538	592	141.73	26.51	10.61	24.20	1.67
25-06-2012	1	2176	8.132	2425	2412	537	201.07	1.15	0.91	5.66	0.83
25-06-2012	3	2177	8.132	2418	2414	529	195.95	1.05	0.64	5.64	0.84
25-06-2012	6	2178	8.128	2423	2428	532	195.14	1.12	0.65	5.71	0.84
25-06-2012	10	2187	8.118	2430	2415	550	190.14	1.54	0.72	6.00	0.84
25-06-2012	15	2255	8.059	2444	2442	613	159.90	7.86	1.62	10.48	1.17
25-06-2012	20	2404	7.967	2537	2529	796	147.12	22.80	4.55	25.66	2.59
25-06-2012	25	2461	7.908	2575	2516	899	139.91	34.28	7.46	38.38	3.91
25-06-2012	32	2509	7.879	2608	2560	954	137.57	40.04	8.30	45.22	4.51

Table S1 (continued):

Date (dd-mm-yyyy)	Depth (m)	DIC ( $\mu\text{mol kg}^{-1}$ )	pH <sub>T</sub> (in situ)	TA <sub>FI</sub> ( $\mu\text{mol kg}^{-1}$ )	TA <sub>UF</sub> ( $\mu\text{mol kg}^{-1}$ )	pCO <sub>2</sub> (ppmv)	DOC ( $\mu\text{mol L}^{-1}$ )	NH <sub>4</sub> <sup>+</sup> ( $\mu\text{mol L}^{-1}$ )	NO <sub>3</sub> <sup>-</sup> ( $\mu\text{mol L}^{-1}$ )	Si(OH) <sub>4</sub> ( $\mu\text{mol L}^{-1}$ )	PO <sub>4</sub> <sup>3-</sup> ( $\mu\text{mol L}^{-1}$ )
24-07-2012	1	1966	8.251	2315	2329	337	217.66	0.14	0.21	2.21	1.18
24-07-2012	3	2007	8.221	2332	2333	369	216.70	0.19	0.00	2.77	1.11
24-07-2012	6	2100	8.131	2348	2358	452	199.78	0.19	0.08	4.57	0.93
24-07-2012	10	2218	7.981	2371	2385	703	170.00	1.76	2.87	12.18	1.42
24-07-2012	15	2283	7.855	2397	2426	847	155.59	5.72	8.04	17.71	2.37
24-07-2012	20	2343	7.760	2449	2443	1035	144.37	4.54	18.50	24.09	3.76
24-07-2012	25	2376	7.730	2459	2444	1130	151.49	4.28	22.09	27.25	4.38
24-07-2012	32	2428	7.672	2483	2458	1293	148.59	6.35	24.81	33.07	5.83
20-08-2012	1	1813	8.279	2169	2165	270	230.33	0.17	0.07	4.33	1.70
20-08-2012	3	1872	8.205	2190	2183	352	236.67	0.24	0.08	6.82	1.87
20-08-2012	6	2109	7.897	2273	2284	692	186.00	0.89	0.08	13.44	1.95
20-08-2012	10	2243	7.699	2324	2303	1121	159.12	0.21	0.10	19.29	2.36
20-08-2012	15	2298	7.623	2347	2343	1278	154.64	0.38	0.07	22.06	3.11
20-08-2012	20	2364	7.584	2409	2403	1355	153.18	2.48	10.55	28.39	4.94
20-08-2012	25	2390	7.585	2432	2414	1396	153.25	4.31	11.58	31.35	5.55
20-08-2012	32	2424	7.592	2453	2463	1379	163.40	11.46	1.70	38.37	6.82
20-09-2012	1	2035	7.946	2203	2197	650	208.52	1.83	0.60	7.29	2.57
20-09-2012	3	2059	7.949	2229	2266	655	190.52	2.45	0.67	7.90	2.48
20-09-2012	6	2110	7.918	2307	2273	690	174.61	4.27	0.84	9.53	2.29
20-09-2012	10	2172	7.896	2326	2331	766	152.44	8.65	0.88	13.86	1.95
20-09-2012	15	2177	7.886	2327	2366	763	145.31	8.66	0.93	13.50	1.86
20-09-2012	20	2160	7.911	2365	2350	747	149.64	8.52	0.99	13.12	1.79
20-09-2012	25	2158	7.915	2425	2355	741	142.59	8.19	0.98	12.77	1.75
20-09-2012	32	2179	7.904	2339	2387	783	149.37	8.52	0.98	12.82	1.77



Table S1 (continued):

Date (dd-mm-yyyy)	Depth (m)	DIC ( $\mu\text{mol kg}^{-1}$ )	pH <sub>T</sub> (in situ)	TA <sub>FI</sub> ( $\mu\text{mol kg}^{-1}$ )	TA <sub>UF</sub> ( $\mu\text{mol kg}^{-1}$ )	pCO <sub>2</sub> (ppmv)	DOC ( $\mu\text{mol L}^{-1}$ )	NH <sub>4</sub> <sup>+</sup> ( $\mu\text{mol L}^{-1}$ )	NO <sub>3</sub> <sup>-</sup> ( $\mu\text{mol L}^{-1}$ )	Si(OH) <sub>4</sub> ( $\mu\text{mol L}^{-1}$ )	PO <sub>4</sub> <sup>3-</sup> ( $\mu\text{mol L}^{-1}$ )
18-10-2012	1	2034	7.935	2208	2170	586	205.97	5.10	3.42	9.65	1.87
18-10-2012	3	2042	7.915	2223	2203	583	198.49	5.16	3.51	9.13	1.78
18-10-2012	6	2109	7.924	2279	2266	624	176.34	7.74	4.78	9.46	1.76
18-10-2012	10	2109	7.932	2275	2266	618	170.16	7.20	4.61	9.21	1.75
18-10-2012	15	2151	7.925	2308	2348	628	160.16	8.80	6.11	9.82	1.63
18-10-2012	20	2146	7.935	2327	2307	616	215.76	8.39	6.37	9.84	1.56
18-10-2012	25	2144	7.932	2325	2330	609	155.80	8.03	6.46	9.85	1.55
18-10-2012	32	2148	7.937	2311	2323	607	149.04	8.07	6.46	9.78	1.54
05-11-2012	1	2091	7.895	2229	2203	595	196.79	8.27	7.33	12.48	1.89
05-11-2012	3	2096	7.891	2241	2226	587	195.82	7.58	6.67	12.88	1.65
05-11-2012	6	2104	7.905	2243	2247	583	191.55	8.03	7.03	13.11	1.63
05-11-2012	10	2106	7.911	2251	2241	582	189.81	8.10	7.12	13.29	1.64
05-11-2012	15	2154	7.894	2282	2287	606	158.27	9.88	8.12	14.57	1.60
05-11-2012	20	2172	7.875	2301	2297	677	147.97	10.10	8.52	14.97	1.48
05-11-2012	25	2179	7.868	2295	2321	681	145.63	10.90	8.30	15.51	1.59
05-11-2012	32	2178	7.879	2320	2341	670	140.10	10.36	8.56	15.04	1.51
03-12-2012	1	2168	8.042	2293	2310	571	183.34	8.32	12.94	15.13	1.30
03-12-2012	3	2177	7.980	2295	2311	566	174.36	8.23	13.06	15.16	1.30
03-12-2012	6	2179	7.977	2280	2312	573	176.12	8.20	13.13	15.40	1.31
03-12-2012	10	2194	7.963	2332	2336	580	147.39	7.67	15.87	17.22	1.31
03-12-2012	15	2206	7.977	2343	2318	576	136.32	7.44	18.19	18.55	1.29
03-12-2012	20	2212	7.971	2338	2336	579	135.16	7.71	17.76	18.42	1.31
03-12-2012	25	2218	7.970	2330	2344	581	138.03	7.64	17.15	18.41	1.32
03-12-2012	32	2215	7.961	2365	2348	606	138.77	8.73	16.28	19.06	1.32

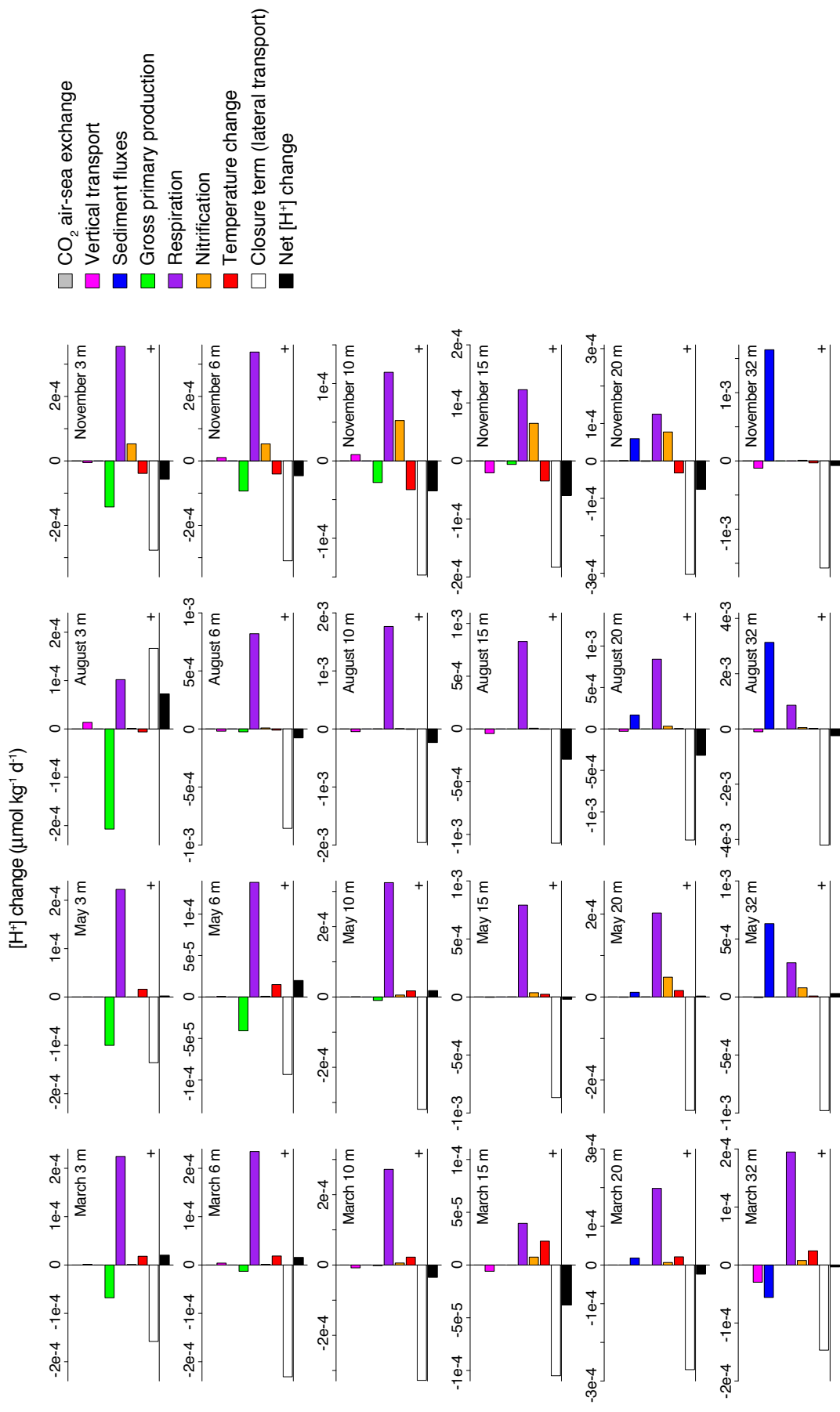


Figure S1. Proton budget for the Den Osse basin at 3, 6, 10, 15, 20 and 32 m depth for the months of March, May, August and November. The closure term is calculated as the difference between the calculated and measured net change in [H<sup>+</sup>].