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Effects of fluctuating hypoxia on benthic oxygen consumption in the Black Sea (Crimean Shelf)

A. Lichtschlag et al.

Correspondence to: A. Lichtschlag (alic@noc.ac.uk)

Supplement Figures and Tables

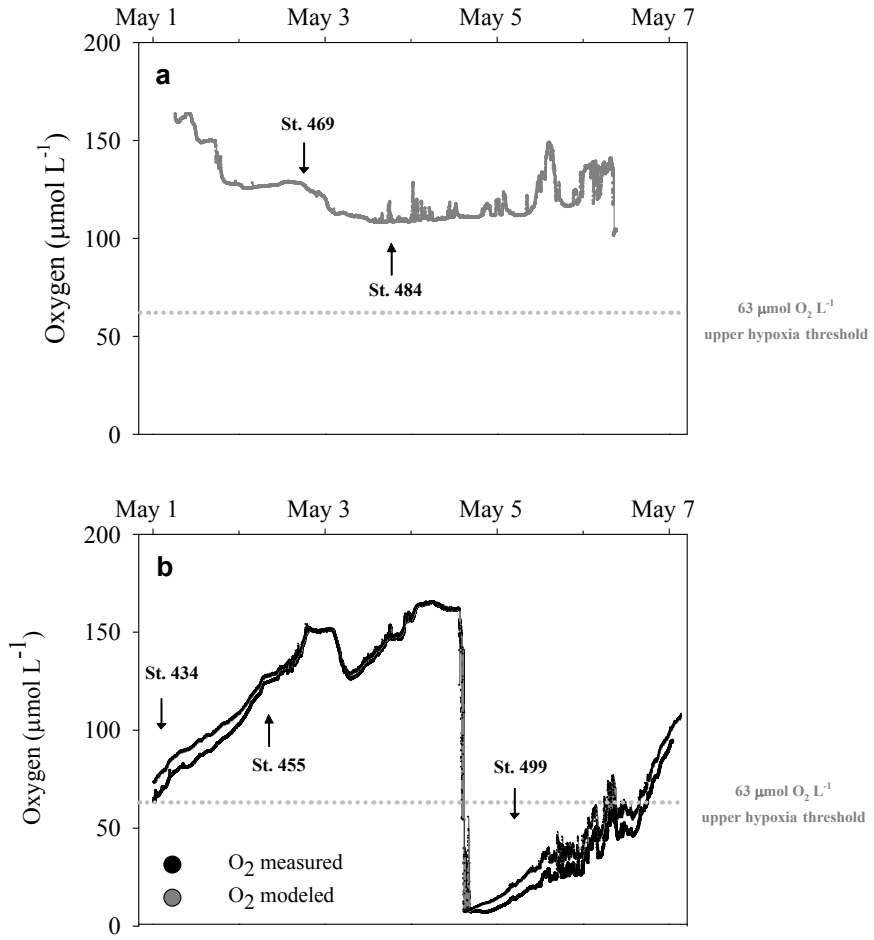

Fig. S1: Stationary moorings with sensors measuring one meter above the sediment over a time period of 7 days; a) the oxygen concentration from the mooring at 100 m was modeled from recorded density data; bottom water was always oxic during the measurements, still strong variations (up to 60 µmol O_2 L^{-1}) were visible during the deployment time; b) at the mooring at 135 m water depth, measuring 1.5 m above the sediment, the water column oxygen concentration strongly varied between oxic and hypoxic conditions, dropping to nearly anoxic conditions on May 5th. Time points where oxygen consumption was measured at these two water depths are indicated. The horizontal line indicates the conventional hypoxia threshold concentration of 63 µmol O_2 L^{-1}.

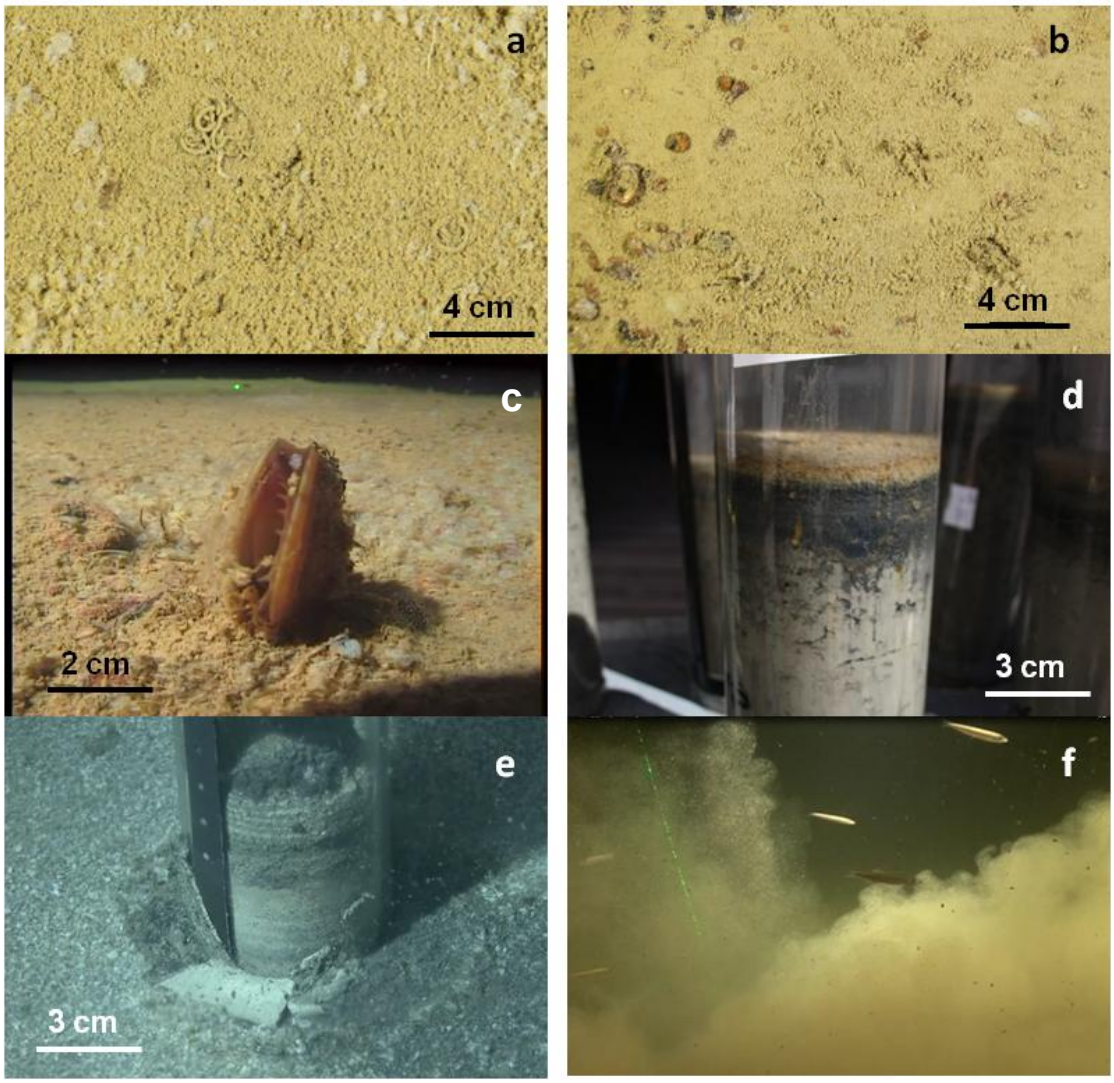

Fig. S2: Images of seafloor and sediments; a) fecal structures on top of the sediment in the oxic zone, b) brown iron-encrusted shells in the oxic zone, c) living bivalve on top of the sediment in the oxic zone; d) vertical layering of the sediment with oxygenated sediment on top in the oxic zone; e) vertical layering of the sediment during coring, f) fish at >153 m and O_2 concentrations below 25 µmol L^{-1}; photographs are copyright JAGO-Team GEOMAR.

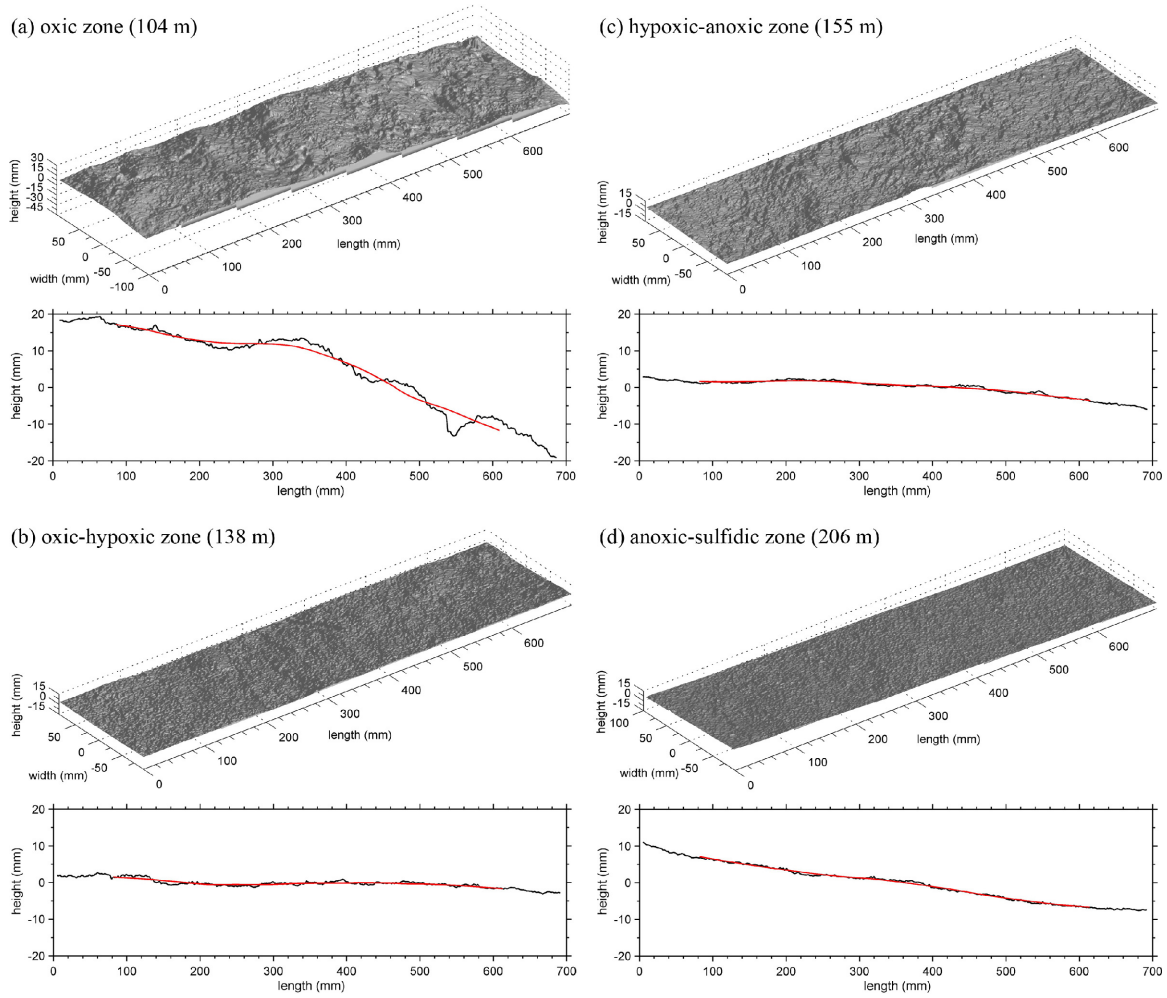

Fig. S3: Shaded 3D surfaces showing examples of micro-topography measurements obtained at (a) 104, (b) 138, (c) 155, and (d) 206 m water depth. The 2D plots show topography profiles extracted along the center line of the respective surfaces (black line). The red line shows the running average of the same profile (155 mm averaging window). Deviations of the profile from profiles smoothed at different window sizes were used to compare roughness between stations (see section 2.3 and 3.5)

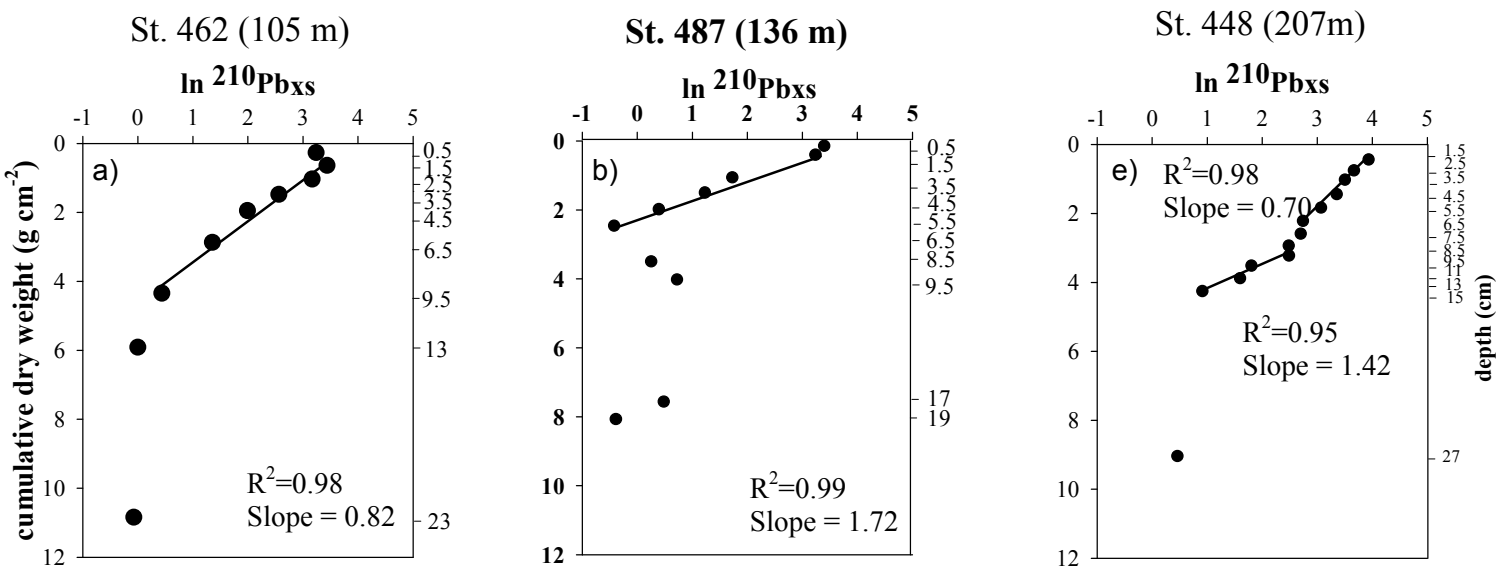

Fig. S4: Profiles of excess ^{210}Pb activity, cumulative dry weight (left y-axis) and depth (right y-axis). Regression lines are plotted for data that was included in calculations of sedimentation rates.

Table S1: Macrofauna composition and abundance per sampling depth (m) at the outer Western Crimean Shelf. Results were grouped according to bottom water oxygenation zones and integrated over the upper 5 cm. Apostrophe denotes replicate station within the same depth.

Taxa	**101**	**104**	**105**	**117**	**120**	**129**	**138**	**138'**	**145**	**151**	**155**	**162**	**163**
Ascidiacea	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Bivalvia	0.1	0.4	0	0	0	0	0	0	0	0	0	0	0
Cnidaria	2.1	0.4	1.4	7.5	50.1	53.1	35.4	23.4	1.7	0	1.4	1	0
Gastropoda	0	0.4	0	0	0	0	0	0	0	0	0	0.2	0
Nemertini	0	0	0.5	0	0	0	0	0	0	0	0	0	0
Oligochaeta	0.8	0.3	3.1	1.6	0.6	0.7	14.3	2.6	0.7	0	0	0	0.1
Polychaeta	1.6	0.8	1.7	0.7	0.1	0	1.7	0.3	0	0	0	0	0
Porifera	0.2	0	0	0	0	0	0	0	0	0	0	0	0
Σ	5	1.9	6.7	9.8	50.8	53.8	51.4	26.3	2.4	0	1.4	1.2	0.1
x10^3 individuals m^{-2} (average ±SD)				**21.3 ±24.1 oxic**			**38.9 ±17 oxic-hypoxic**		**1 ±1 hypoxic-anoxic**				

Table S2: Meiofauna composition and abundance (x10^4 individuals m^{-2}) per sampling depths (m) at the outer Western Crimean Shelf. Results were grouped according to bottom water oxygenation zones and integrated over the upper 5 cm. Apostrophe denotes replicate station within the same depth.

Taxa	**101**	**104**	**105**	**117**	**120**	**129**	**138**	**138'**	**145**	**151**	**155**	**162**	**163**
Acari	0	0.26	0	0	0.01	0.04	0.05	0	0	0	0	0	0
Amphipoda	0	0	0	0.02	0	0	0	0	0	0	0	0	0
Bivalvia	0.45	0.2	0.74	0.17	0.16	0.08	0.29	0.23	0.88	0	0.04	0.31	0.06
Ciliophora	1.52	0.16	3.08	0.81	1.52	4.91	0.79	3.55	3.49	12.41	1.02	3.32	0.97
Cnidaria	0.59	0.03	0.29	0.07	1.14	0.63	0.02	3.8	0.98	0.14	0	1.36	0.04
Forams hard shelled	0.25	0.09	0.05	0.05	0.16	7.39	13.39	15.42	2.49	0.24	0.23	1.05	0.01
Forams soft shelled	1.05	0.37	2.8	2.22	3.56	7.17	13.27	7.68	17.88	10.45	1.28	3.83	0.19
Gastropoda	0.01	0.03	0	0.02	0.01	0.04	0	0.01	0	0	0.01	0	0
Gromia	1.13	0.66	0.53	2.36	3.32	2.01	4.57	2.28	0.6	1.24	1.41	0.81	0
Harpacticoida	1.7	1.3	3.99	0.66	0.76	1.45	7.91	3.46	0.14	0	0.27	0.02	0.19
Kinorhyncha	0.41	0.12	0.62	0.11	0.32	0.05	0.17	0.01	0	0	0	0	0
Nauplia Decapoda	0.93	0.26	0.12	0	0	0.02	0	0.43	0	0	0	0	0
Nematoda	221.5	128.75	248.78	91.98	183.06	131.62	183.82	134.44	82.78	30.66	25.03	31.23	3.36
Nemertini	0	0.01	0	0	0	0	0	0.01	0	0	0	0	0
Oligochaeta juvenile	0.02	0.32	0	0	0.01	0.38	0.98	0.04	0	0	0	0	0
Ostracoda	2.88	2.8	6.74	0.05	0	0	0.14	0.01	0	0	0	0	0
Polychaeta	1.12	0.66	1.86	0.23	0.58	0.92	0.74	0.42	0.22	0.12	0.16	0.19	0.18
Tardigrada	1.11	0.57	1.55	0	0	0	0	0	0	0	0	0	0
Turbellaria	0.69	1.38	2.18	1.66	4.33	0.07	0.12	0.33	0.02	0.02	0.04	0	0
Others	0.65	0	0.05	0	0.51	0	0	0.04	0.02	0	0.03	0	0
Σ	**236.0**	**138.0**	**273.4**	**100.4**	**199.5**	**156.8**	**226.3**	**172.2**	**109.5**	**55.3**	**29.5**	**42.1**	**5.0**
x10^4 individuals m^{-2} (average ±SD)						**184 ±65**		**199 ±38**					**48 ±39**
				oxic			**oxic-hypoxic**		**hypoxic-anoxic**				

Table S3: Meiofauna community dissimilarity per sampling depths. Upper triangle: dissimilarity (based on Bray-Curtis), values closer to 1 represent high dissimilarity. Lower triangle: percentage of shared taxa. Colors depict oxygenation regimes, oxic (blue), oxic-hypoxic (pink), hypoxic-anoxic (red). Apostrophe denotes station within the same depth.

	101	104	105	117	120	129	138	138'	145	151	155	162	163
101		0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.2	0.3	0.4
104	89		0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.5	0.3	0.4	0.4
105	88	78		0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.2	0.3	0.3
117	76	68	75		0.1	0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.3
120	76	78	65	75		0.2	0.2	0.2	0.3	0.3	0.2	0.3	0.3
129	82	83	71	71	93		0.1	0.1	0.2	0.3	0.1	0.2	0.3
138	76	78	75	75	87	81		0.1	0.2	0.3	0.2	0.2	0.3
138'	88	89	76	76	76	82	76		0.2	0.3	0.2	0.2	0.3
145	62	56	71	71	71	67	71	62		0.2	0.2	0.1	0.3
151	50	44	57	57	57	53	57	50	80		0.3	0.2	0.3
155	62	56	60	71	71	67	60	62	82	64		0.2	0.3
162	56	50	64	64	64	60	64	56	90	70	73		0.2
163	50	44	57	57	57	53	57	50	80	60	64	89	