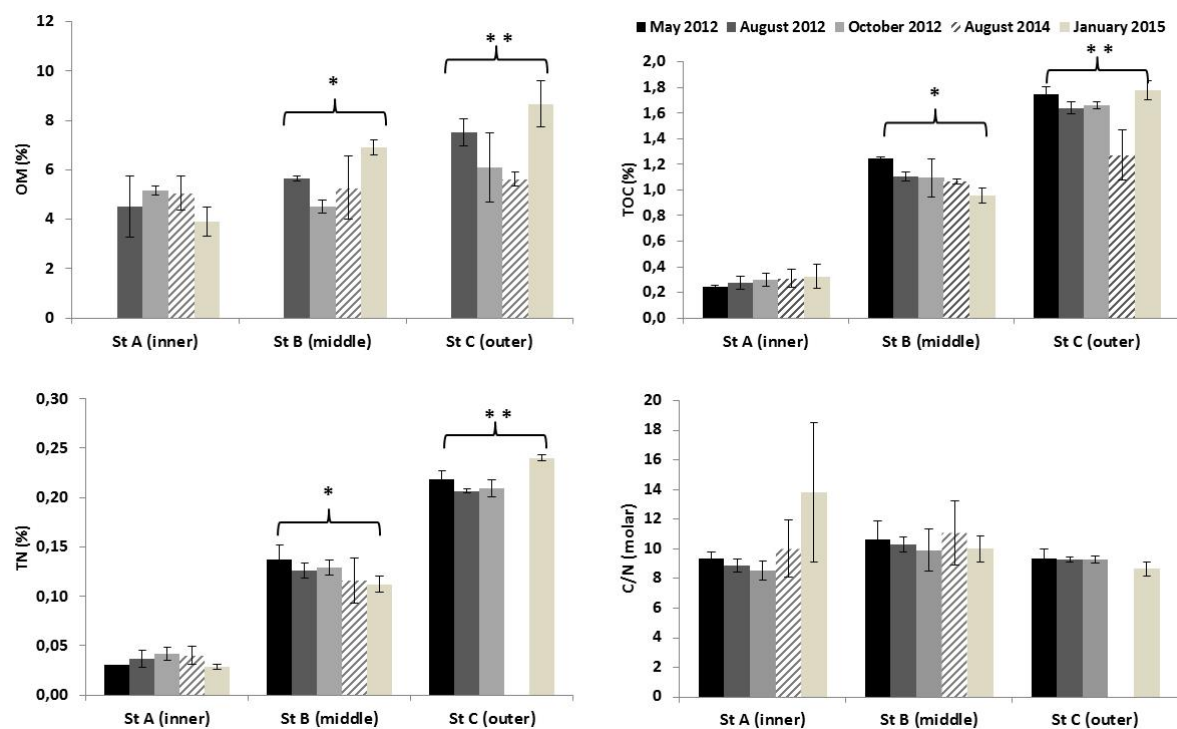
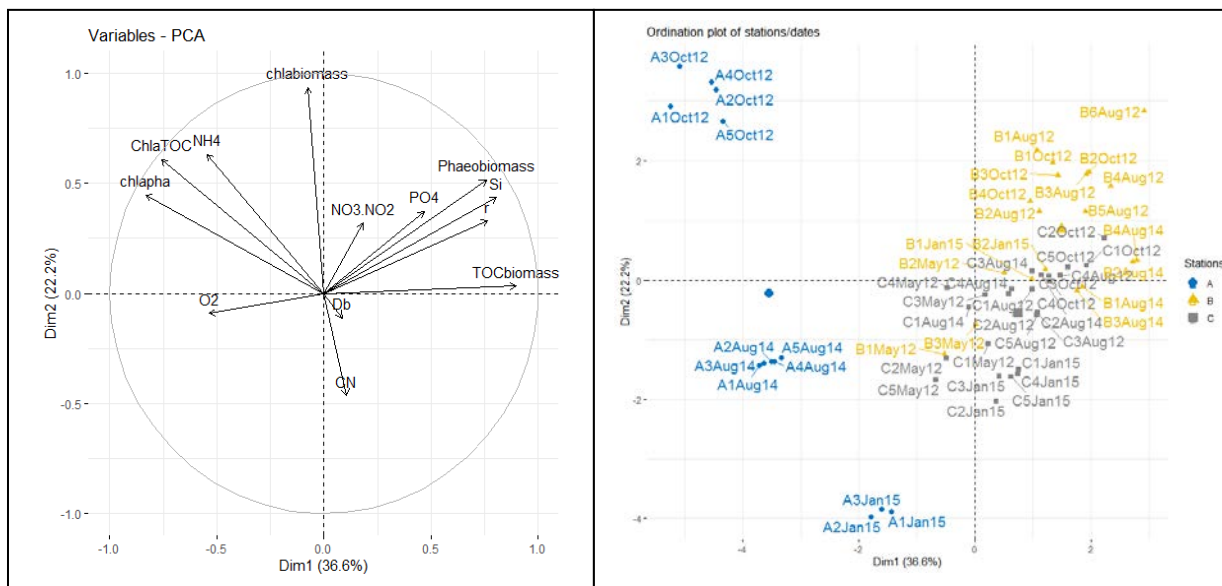


Climate change and diminishing seasonality in Arctic benthic processes



Supplementary Figure 1: Mean content (%) of organic matter (OM), Total organic carbon (TOC), Total Nitrogen (TN) and mean ratios of TOC/TN (mol:mol) over the 2 first cm of sediment ($\pm$ SD) at the three stations in Kongsfjorden, Svalbard (Inner (A), Middle (B), Outer (C)) in 2012 (May, August, October), 2014 (August) and 2015 (January). Significant differences among stations ($p < 0.05$) are indicated by asterisk (*).



Supplementary Figure 2: Principal component analysis based on the sediment variables (C:N, Chla:phaeo and C-Chla: TOC ratios, biomass of TOC, Chla and Phaeo pigments), benthic fluxes (oxygen, ammonium (NH_4^+), nitrate+nitrite ($\text{NO}_3^- + \text{NO}_2^-$), phosphate (PO_4^{3-}), silicate ($\text{Si}(\text{OH})_4$), and bioturbation coefficients (biodiffusion, Db and bioadvection, r) along the Kongsfjord area between 2012 and 2015. Loadings of environmental and biological/biogeochemical variables are shown in the left panel, and station/dates are shown on the ordination plot in the right panel.

sampling time	station	OM (%)	TOC (%)	TN (%)	TOC:TN	TOC biom (mg m ⁻²)	Chla biom (mg m ⁻²)	Phaeo biom (mg m ⁻²)	Chla:Phaeo	C-chla:TOC
May 2012	A	nd	0,23	0,03	9,04	136,58	71,06	103,56	0,68	4,96
May 2012	A	nd	0,25	0,03	9,65	nd	nd	nd	nd	nd
May 2012	B	nd	1,24	0,15	9,78	319,5	26,51	145,27	0,19	0,84
May 2012	B	nd	1,26	0,13	11,52	351,5	26,68	148,45	0,18	0,77
May 2012	C	nd	1,75	0,23	9,07	332,72	30,1	107,11	0,34	0,93
May 2012	C	nd	1,69	0,22	8,86	336,27	25,38	130,47	0,2	0,76
May 2012	C	nd	1,81	0,21	10,11	387,29	25,75	136,23	0,19	0,7
Aug 2012	A	5,86	0,27	0,04	8,77	68,62	55,34	76,09	0,46	6,57
Aug 2012	A	4,28	0,22	0,03	9,36	58,61	nd	nd	nd	nd
Aug 2012	A	3,42	0,32	0,05	8,45	87,86	66,47	98,07	0,6	6,63
Aug 2012	B	5,69	1,14	0,13	10,51	371,81	36,73	187,55	0,2	1
Aug 2012	B	5,7	1,07	0,12	10,65	333,06	35,88	160,81	0,22	1,11
Aug 2012	B	5,55	1,1	0,13	9,69	307,59	35,21	164,04	0,22	1,16
Aug 2012	C	7,31	1,65	0,21	9,26	336,9	20,84	116,6	0,18	0,63
Aug 2012	C	7,1	1,59	0,2	9,11	357,53	21,26	142,9	0,15	0,6
Aug 2012	C	8,15	1,68	0,21	9,45	365,65	22,35	112,84	0,2	0,61
octb 2012	A	5	0,29	0,04	7,99	77,82	5,94	48,41	0,12	0,86
octb 2012	A	5,09	0,35	0,05	8,4	96,83	83,56	132,45	0,47	6,75
octb 2012	A	5,35	0,25	0,03	9,22	67,25	45,23	79,69	0,51	5,96
octb 2012	B	4,28	0,97	0,12	9,21	294,23	32,5	156,97	0,21	1,11
octb 2012	B	4,45	1,06	0,14	8,99	319,31	38,69	162,87	0,24	1,21
octb 2012	B	4,8	1,26	0,13	11,54	360,29	31,6	152,31	0,21	0,9
octb 2012	C	7,08	1,68	0,22	9,13	326,43	24,76	123,75	0,2	0,75
octb 2013	C	5,11	1,64	0,2	9,43	375,37	23,61	137,47	0,17	0,63
Aug 2014	A	4,26	0,24	0,04	8,02	72,39	21,57	54,01	0,37	2,51
Aug 2014	A	5,31	0,37	0,05	10,15	90,67	11,01	30,55	0,34	1,16
Aug 2014	A	5,56	0,32	0,03	11,89	96,32	13,65	45,53	0,26	1,31
Aug 2014	B	6,01	1,05	0,09	13,58	326,46	27,36	138,6	0,2	0,86
Aug 2014	B	6,03	1,06	0,13	9,67	324,11	23,21	151,63	0,15	0,72
Aug 2014	B	3,81	1,09	0,13	9,96	435,12	26,8	180,43	0,15	0,62
Aug 2014	C	nan	1,48	0,21	8,45	392,78	27,64	139,05	0,2	0,71
Aug 2014	C	5,84	1,25	0,19	7,77	317,97	24,38	119,2	0,2	0,79
Aug 2014	C	5,43	1,09	nd	nd	298,47	24,3	130,86	0,18	0,8
Jan 2015	A	4,58	0,43	0,03	19,05	142,15	6,99	43,61	0,17	0,53
Jan 2015	A	3,57	0,24	0,03	9,85	81,63	5,81	39,14	0,16	0,71
Jan 2015	A	3,56	0,3	0,03	12,54	88,32	nd	nd	nd	nd
Jan 2015	B	6,57	0,97	0,1	10,95	215,74	22,01	108,06	0,2	1,01
Jan 2015	B	7,08	1,01	0,12	9,85	331,79	29,67	164,11	0,19	0,9
Jan 2015	B	7,1	0,89	0,11	9,23	247,78	nd	nd	nd	nd
Jan 2015	C	8,14	1,87	0,24	9,22	340,79	16,31	84,24	0,19	0,48
Jan 2015	C	9,75	1,72	0,24	8,31	313	10,29	77,57	0,13	0,31
Jan 2015	C	8,12	1,75	0,24	8,41	331,67	12,3	94,66	0,13	0,33

Dataset 1 : Data archive from bulk sediment variables that were used for the figures 2, 5, the tables 1, 2 and the supplementary figure 1. Sedimentary content (%) in organic matter (OM), total organic carbon (TOC), total Nitrogen (TN) and mean ratios of TOC:TN (mol:mol), biomass (mg m⁻²) of TOC, Chla, Phaeo, and mean ratios of chla:phaeo (d) and C-Chla:TOC (%) over the 2 first cm of sediment in each sampled core at the three stations in Kongsfjorden, Svalbard (Inner (A), Middle (B), Outer (C)) in 2012 (May, August, October), 2014 (August) and 2015 (January). (nd means no data).

Supplementary material for [N. Morata, E. Michaud, MA Poullaouec, J.Devesa, M. Le Goff, R Corvaisier, P.E. Renaud], [2020 submitted special issue – Arctic Change], [Climate change and diminishing seasonality in Arctic benthic processes], *Phil. Trans. R. Soc. A*. doi: 10.1098/rsta.[paper ID in form xxxx.xxxx e.g. 10.1098/rsta.2014.0049]

sampled time	station	Db	r	O ₂	NO ₃ ⁻ +NO ₂ ⁻	Si(OH) ₄	NH ₄ ⁺	PO ₄ ³⁻
		(cm ² y ⁻¹)	(y ⁻¹)	(mmol m ⁻² d ⁻¹)	(mmol m ⁻² d ⁻¹)	(mmol m ⁻² d ⁻¹)	(mmol m ⁻² d ⁻¹)	(mmol m ⁻² d ⁻¹)
May 2012	B	1,8	0	-8,63	-0,75	0,82	0,2	-0,01
May 2012	B	2,35	0	-8,88	-0,14	1,02	0,21	0,1
May 2012	B	nd	nd	-5,55	-0,01	0,4	0	-0,02
May 2012	C	4,35	0	-9,35	0,47	0,32	-0,29	-0,04
May 2012	C	2,05	0	-9,32	-0,07	0,08	-0,16	-0,04
May 2012	C	nd	nd	-10,87	0,03	0,45	-0,03	-0,02
May 2012	C	2,9	0	-8,14	-0,19	0,8	0,18	0,03
May 2012	C	2,5	0	-7,94	-0,15	-0,16	-0,21	-0,04
Aug 2012	B	0,15	8,8	-7,08	0,27	1,26	0,3	0,01
Aug 2012	B	nd	nd	-10,19	-0,03	1,95	0,12	-0,03
Aug 2012	B	0,02	5,56	-14,32	0,19	1,97	0,11	0,01
Aug 2012	B	0	6,5	-14,29	0,03	1,94	-0,01	0,05
Aug 2012	B	1,8	6,4	-12,15	0,14	2,45	0,01	-0,06
Aug 2012	B	nd	nd	-10,65	0,06	2,08	0,11	0,23
Aug 2012	C	0	4	-6,7	0,04	1,29	0,08	0
Aug 2012	C	0,05	4,8	-7,43	0,02	1,66	0,04	0
Aug 2012	C	0,1	5,6	-5,48	0,04	1,35	-0,12	0,01
Aug 2012	C	nd	nd	-11,73	-0,14	2,11	0,11	0,01
Aug 2012	C	nd	nd	-9,61	0,02	1,19	-0,06	0
octb 2012	A	0	0,3	-5,64	0,09	-0,48	0,4	-0,01
octb 2012	A	0,05	0,6	-9,82	0,05	0,39	0,4	-0,02
octb 2012	A	0	0,5	-6,21	0,02	0,4	0,59	-0,01
octb 2012	A	0	0,5	-9,11	0,03	0,46	0,44	-0,01
octb 2012	A	0	0,25	-5,7	0,22	0,34	0,12	-0,01
octb 2012	B	0,05	5,6	-8,01	0,17	2,24	0,16	0,05
octb 2012	B	0,1	6	-10,8	0,23	2,45	0,02	0,04
octb 2012	B	nd	nd	-6,79	0,36	2,03	0,03	0,05
octb 2012	B	0	3,75	-6,87	0,13	1,92	0,04	0,04
octb 2012	C	0,25	9,25	-7,77	0,03	1,61	-0,1	0,03
octb 2012	C	0	8,4	-11,81	0,11	2,17	0	0,01
octb 2012	C	0	5,4	-8,85	0,03	1,45	-0,03	0,02
octb 2012	C	nd	nd	-8,4	0,05	1,64	-0,06	0,02
octb 2012	C	nd	nd	-10,17	0,12	1,69	-0,05	0,03
Jan 2013	B	nd	nd	-5,91	nd	nd	nd	nd
Jan 2013	B	nd	nd	-9,44	nd	nd	nd	nd
Jan 2013	B	nd	nd	-7,22	nd	nd	nd	nd
Jan 2013	B	nd	nd	-10,37	nd	nd	nd	nd
Jan 2013	C	nd	nd	-8,48	nd	nd	nd	nd
Jan 2013	C	nd	nd	-8,65	nd	nd	nd	nd
Jan 2013	C	nd	nd	-9,1	nd	nd	nd	nd
Jan 2013	C	nd	nd	-7,43	nd	nd	nd	nd
Jan 2013	C	nd	nd	-9,45	nd	nd	nd	nd
Aug 2014	A	0	0,6	-6,19	nd	nd	nd	nd
Aug 2014	A	0	0,7	-7,69	nd	nd	nd	nd
Aug 2014	A	0	0,9	-6,35	nd	nd	nd	nd
Aug 2014	A	0	0,5	-8,42	nd	nd	nd	nd
Aug 2014	A	0	1	-8,65	nd	nd	nd	nd
Aug 2014	B	0	4	-11,84	nd	nd	nd	nd
Aug 2014	B	0	6,8	-14,8	nd	nd	nd	nd
Aug 2014	B	0,25	3,85	-11,2	nd	nd	nd	nd
Aug 2014	B	0	7	-15,1	nd	nd	nd	nd
Aug 2014	C	0	1,65	-5,4	nd	nd	nd	nd
Aug 2014	C	0	4,25	-11,67	nd	nd	nd	nd
Aug 2014	C	0,1	6,3	-7,53	nd	nd	nd	nd
Aug 2014	C	nd	nd	-7,83	nd	nd	nd	nd
Jan 2015	A	0	0,7	-8,8	-0,05	0,17	-0,05	-0,01
Jan 2015	A	0	0,7	-5,81	-0,02	0,13	-0,05	-0,02
Jan 2015	A	0	0,25	-7,59	0,02	0,14	-0,04	-0,01
Jan 2015	B	0,05	5	-13,41	0,03	0,93	0	0,01
Jan 2015	B	1,3	7,5	-11,96	0,03	1,28	0,04	-0,01
Jan 2015	C	0	3,65	-10,77	0,09	0,83	-0,07	-0,01
Jan 2015	C	0	2	-10,48	0,03	0,47	-0,14	-0,02
Jan 2015	C	0,1	5,2	-6,99	0,19	0,23	-0,1	-0,01
Jan 2015	C	0	1,75	-13,44	0,06	0,86	-0,06	-0,01
Jan 2015	C	0	2,5	-11,28	0,01	0,65	-0,07	0,01

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Dataset 2 : Data archive from sediment cores incubations that were used for the figures 3, 5, the tables 1, 2 and the supplementary figure 2. Biodiffusion (D_b in $\text{cm}^2 \text{y}^{-1}$) and non-local (r in y^{-1}) transports, oxygen and nutrients net fluxes ($\text{mmol m}^{-2} \text{d}^{-1}$) at the sediment-water interfaces in each sampled core at the three stations in Kongsfjorden, Svalbard (Inner (A), Middle (B), Outer (C)) between 2012 and 2015. (nd means no data).