

Supplementary information for

Carbon isotopes and lipid biomarker investigation of sources, transport and degradation of terrestrial organic matter in the Buor-Khaya Bay – the primary recipient of input from Lena River and coastal erosion in the Laptev Sea

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Comparison of normal and log-normal representations of the end-member values

For the present MC strategy the ($\Delta^{14}\text{C}$ and $\delta^{13}\text{C}$) end-member values were represented using normal distributions. The argument for using normal distributions is that this is the least biased representation if an unknown distribution. However, for many environmental and geosciences applications another common distribution is the log-normal distribution. The log-normal distribution represents the distribution of the product, rather than the sum, of several independent random variables.

To compare the effects of using a normal vs. log-normal distributions, the MC calculations were repeated using log-normal representations of the end-member values. The results from using log-normal distribution display systematic differences compared to the normal distribution values, Fig S1. In general, the fractional influence by (μ) from plankton OC sources increases by $\sim 8\%$ ($R^2=0.9956$), whereas the yedoma/mineral soil OC contribution decreases by $\sim 2\%$ ($R^2=0.9998$) when log-normal distributions are used instead of normal. Interestingly, the change in surface soil OC contributions is $\sim 0\%$ ($R^2=0.9999$), reflecting the similarity of fit for the normal and log-normal distributions to the end-member data. However, it should be noted that these differences lies well within the uncertainty range of both distributions. Thus, for the current data set the choice between normal and log-normal distributions does not have a big influence on the biogeochemical interpretations.

Figure S1 Results of three end-member mixing model (Monte Carlo simulation) analysis of relative contributions from marine plankton (f_{plankton} ; blue circles), surface soil (f_{surfsoil} ; green triangles) and old yedoma/mineral soil ($f_{\text{yedoma/mineral soil}}$; black squares) to **A**: surface water particulate organic carbon (POC) and **B**: surface sediment organic carbon (SOC) in Buor-Khaya Bay in August 2008. Fractions plotted versus distance to northernmost point of coastal erosion site Muostakh Island.

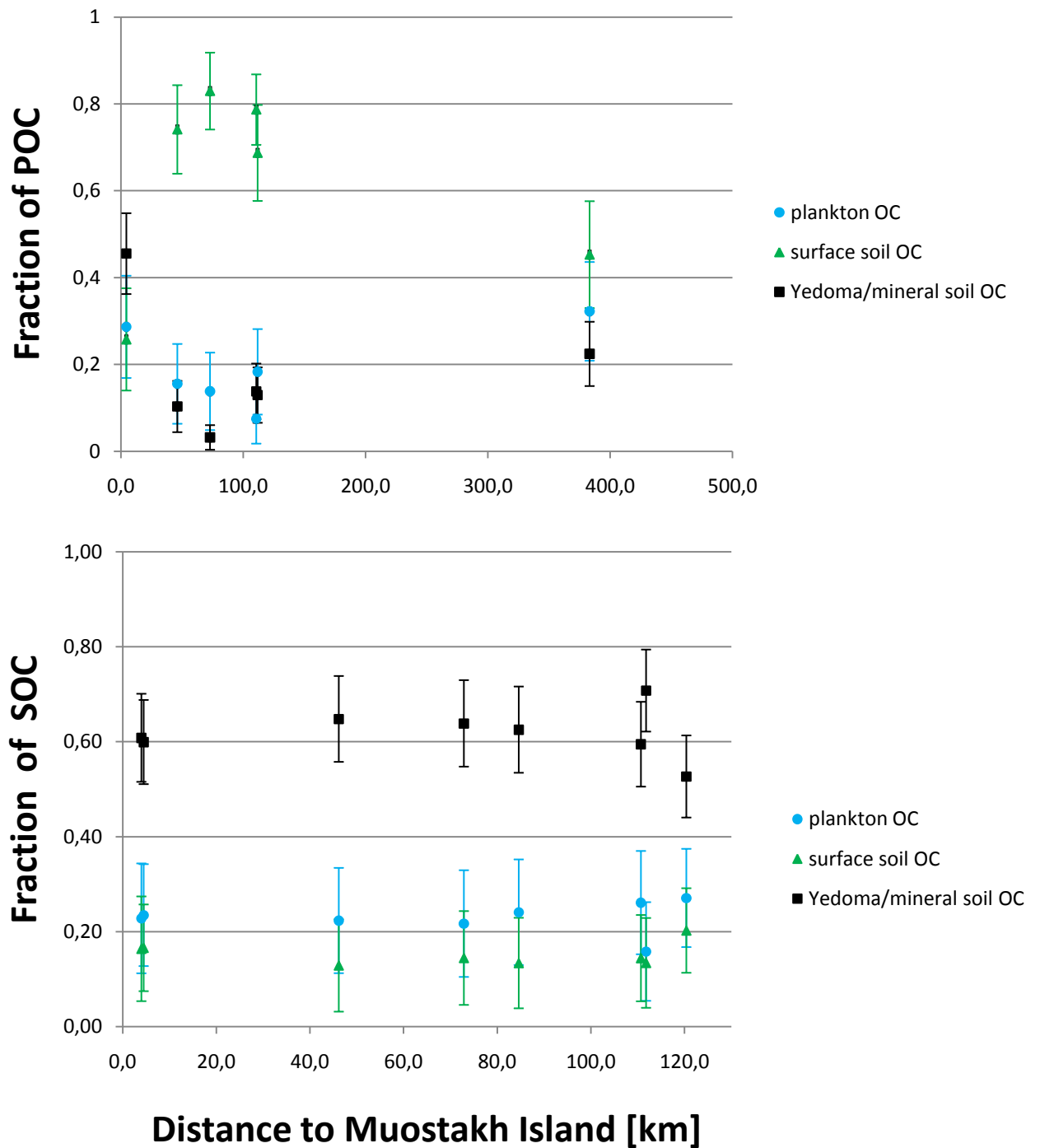


Figure S2. Results of three end-member mixing model (Monte Carlo simulation) analysis of relative contributions from marine plankton (f_{plankton} ; blue circles), surface soil (f_{surfsoil} ; green triangles) and old yedoma/mineral soil ($f_{\text{yedoma/mineral soil}}$; black squares) to **A:** surface water particulate organic carbon (POC) and **B:** surface sediment organic carbon (SOC) in Buor-Khaya Bay in August 2008. Fractions plotted versus distance to River Mouth, in the Lena prodelta near the Sardakhsaya delta river channel outlet (Fig. 1).

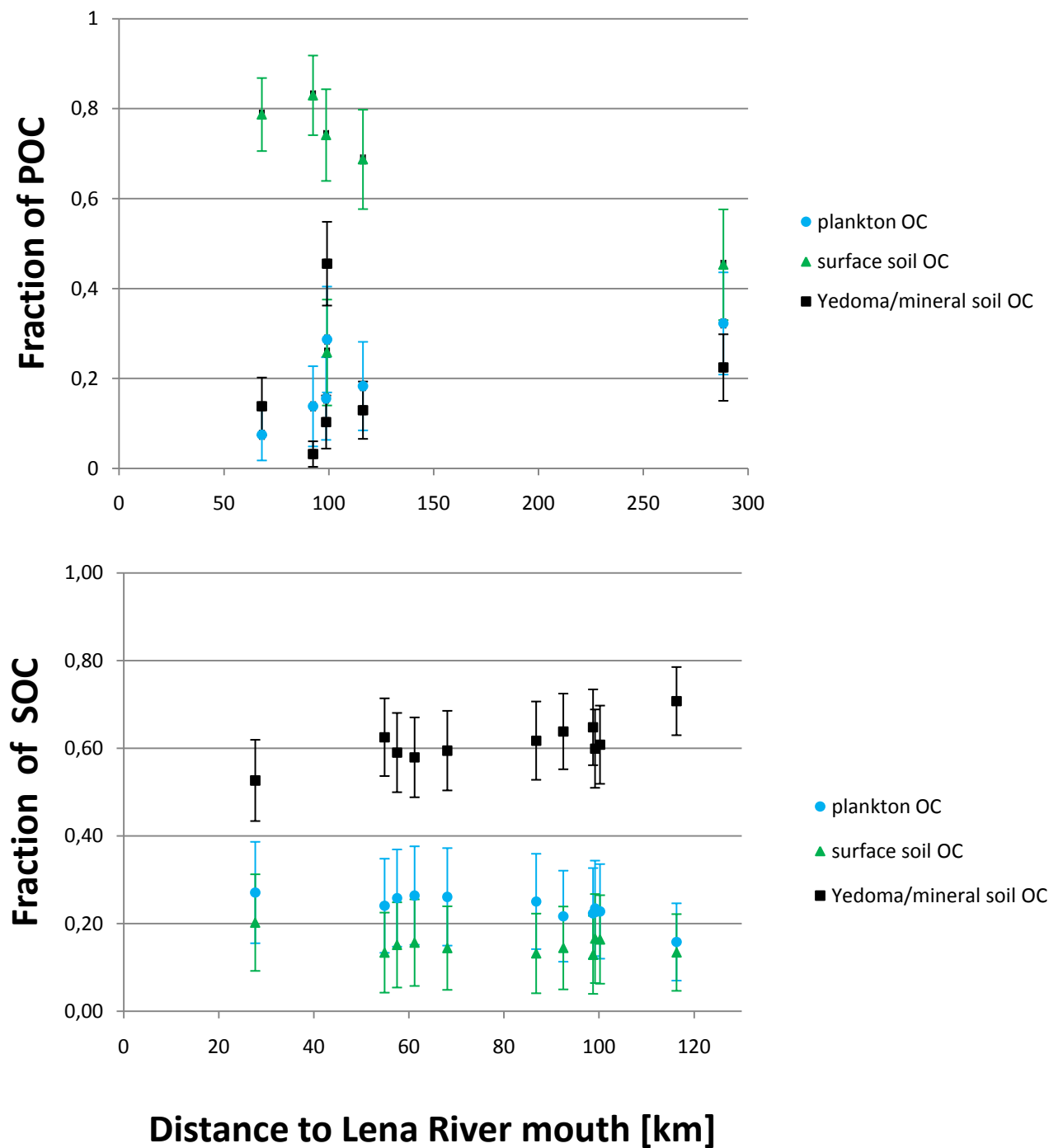


Figure S3. Probability density functions illustrating the variability in the calculated fractions of **A:** plankton, **B:** surface soil and **C:** yedoma/mineral soil contributions to organic carbon at station 14 (Fig. 1). Red curves represent normal distributions of the end-member data and blue curves represent log-normal distributions of the end-members.

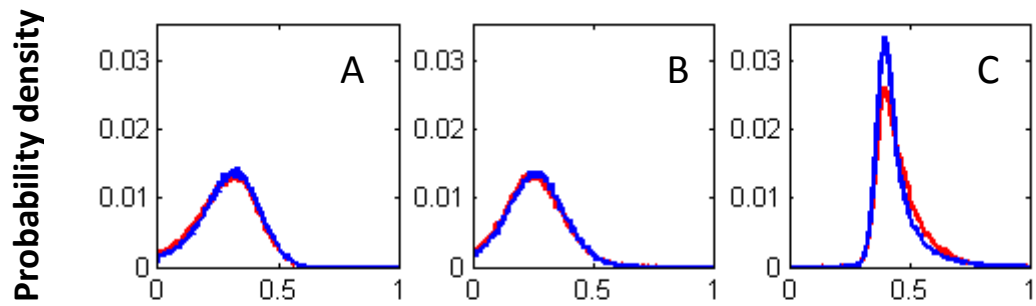


Table S1. Lipid biomarker concentrations of individual *n*-alkanes in POC [$\mu\text{g/g dw}$]

$\mu\text{g/g dw}$	15	19	20	22	24	26	28	35	40	44	47
C14	0.591	2.65	0.613	0.576	14.6	-	0.353	0.368	0.283	-	1.59
C15	0.429	7.26	4.93	1.28	23.3	4.82	0.741	7.32	3.99	0.954	1.14
C16	5.13	67.7	26.8	13.0	69.7	28.3	10.7	34.0	6.36	17.4	9.57
C17	4.21	513	184	39.8	232	131	61.8	17.5	24.0	14.2	12.8
C18	47.7	368	281	26.8	56.9	216	85.9	125	40.6	109	78.5
C19	11.3	258	90.5	30.7	74.1	99.9	24.6	-	13.3	59.2	30.8
C20	103	207	95.0	53.7	145	85.0	29.4	292	153	495	144
C21	27.9	99.0	42.1	22.8	47.2	25.7	9.79	31.2	20.8	56.5	34.3
C22	132	107	75.4	64.2	103	37.9	23.1	208	160	442	309
C23	35.3	55.9	67.0	27.4	50.2	20.0	13.5	33.4	31.0	50.9	43.0
D-C24	2420	1080	449	547	1060	462	326	3400	1390	4080	2370
C24	210	105	81.1	44.9	52.0	28.0	16.3	253	126	159	204
C25	34.1	87.8	58.0	23.5	3.4	15.4	10.5	51.1	12.4	27.9	18.3
C26	87.1	117	44.4	32.5	37.2	16.4	13.1	150	93.1	229	106
C27	51.7	98.1	35.3	24.3	29.9	14.4	12.5	44.0	39.9	99.9	54.3
C28	77.1	106	41.2	28.4	28.1	13.8	11.1	202	89.7	207	107
C29	145	115	42.2	30.2	32.3	14.5	11.9	60.1	45.5	121	76.6
C30	66.4	105	46.1	31.5	19.0	15.3	10.0	78.0	17.4	140	65.5
C31	65.9	130	70.1	40.2	33.2	19.8	11.4	94.8	38.5	151	69.9
C32	57.0	99.9	67.8	32.0	16.5	17.2	5.70	79.2	11.8	129	65.4
C33	43.8	97.7	27.0	25.7	21.7	24.2	6.79	19.3	4.22	0.0	19.8
C34	23.2	109	-	20.8	4.01	33.3	4.67	-	-	19.1	27.9
C35	-	79.9	60.2	29.3	12.3	19.8	5.52	-	-	-	7.56
C36	-	59.4	-	12.7	2.19	9.51	4.02	-	2.11	13.6	-

$\mu\text{g/g dw}$	50	53	54	59
C14	-	0.0173	0.200	-
C15	-	0.0812	0.209	-
C16	0.0239	0.207	0.463	0.0596
C17	0.0565	0.660	0.485	0.108
C18	0.0693	0.620	0.196	0.106
C19	0.0942	0.680	0.588	0.181
C20	0.156	0.709	1.21	0.182
C21	0.381	1.69	0.183	0.491
C22	0.349	1.28	1.11	0.412
C23	0.930	3.60	0.100	1.07
D-C24	0.484	0.554	0.944	0.475
C24	0.367	1.09	0.0396	0.386
C25	1.13	3.95	0.239	1.36
C26	0.363	0.996	0.0169	0.374
C27	2.23	7.91	0.0166	2.99
C28	0.312	0.951	-	0.353
C29	1.96	5.88	-	2.54
C30	0.164	0.333	-	0.195
C31	1.79	4.64	-	2.17
C32	0.554	0.159	0.880	0.0862
C33	0.603	1.36	-	0.640
C34	0.0201	0.186	8.80	0.0465
C35	0.00657	0.0894	-	-
C36	-	-	-	-

$\mu\text{g/g OC}$	50	53	54	59
C14	-	-	-	-
C15	-	0.000846	-	-
C16	0.00131	0.00215	0.00417	0.00319
C17	0.00310	0.00687	0.00512	0.00580
C18	0.00381	0.00646	0.00744	0.00567
C19	0.00518	0.00708	0.00820	0.00969
C20	0.00860	0.00739	0.0106	0.00973
C21	0.0209	0.0176	0.0227	0.0262
C22	0.0192	0.0133	0.0238	0.0220
C23	0.0511	0.0375	0.0526	0.0570
D-C24	0.0266	0.00577	0.0552	0.0254
C24	0.0202	0.0114	0.0223	0.0207
C25	0.0622	0.0411	0.0668	0.0727
C26	0.0200	0.0104	0.137	0.0200
C27	0.122	0.0824	0.0208	0.160
C28	0.0171	0.00990	0.126	0.0189
C29	0.108	0.0613	0.0113	0.136
C30	0.00903	0.00347	0.107	0.0104
C31	0.0985	0.0483	0.00450	0.116
C32	0.0304	0.00166	0.0272	0.00461
C33	0.0331	0.0142	0.00192	0.0342
C34	0.00110	0.00194	0.00189	0.00249
C35	-	0.000931	-	-
C36	-	-	-	-

Table S3. Lipid biomarker concentrations of individual *n*-alkanoic acids in POC [$\mu\text{g/g dw}$]

$\mu\text{g/g dw}$	15	19	20	22	24	26	28	35	40	47
C14	3930	2890	1690	725	1760	2100	1470	2270	1400	11700
C15	-	-	-	-	-	-	-	-	-	-
C16	3720	6400	8840	5330	8180	4170	2370	15600	11500	129000
C17	-	-	-	4870	-	-	-	-	-	-
C18	40900	4220	5450	36.1	6090	2920	1940	15900	12000	164000
C19	-	136	63.7	96.5	79.3	48.4	31.6	137	125	527
D-C20	9400	3480	1550	2090	1850	1570	1040	12100	4370	7580
C20	-	471	180	96.5	196	141	79	318	204	1410
C21	-	73.5	24.1	19.7	30.2	27.6	14.5	27.1	21.5	-
C22	-	398	142	-	173	141	79.8	81.6	96.7	-
C23	-	109	37.9	3.50	33.1	23.8	16.0	0.00	9.07	-
C24	-	534	176	23.85	155	97.5	67.4	38.2	39.6	-
C25	-	98.3	37.0	-	22.5	15.6	9.81	-	-	-
C26	-	178	78.3	7.69	70.3	40.4	28.6	19.02	12.2	-
C27	-	20.9	6.32	4.37	4.15	5.21	4.02	-	-	-
C28	-	74.8	48.0	18.1	29.5	21.9	17.6	10.09	19.1	-
C29	-	23.4	7.64	7.67	4.57	3.37	3.66	-	-	-
C30	-	-	18.7	-	25.7	14.6	7.29	-	-	-

$\mu\text{g/g dw}$	47	50	53	54	59
C14	7.16	2.39	9.46	2.83	3.24
C15	1.71	1.05	4.22	0.508	0.861
C16	11.0	9.92	16.3	11.0	9.93
C17	0.844	0.405	1.71	0.277	0.422
C18	6.91	4.82	9.69	3.08	3.49
C19	0.635	0.242	1.00	0.126	0.360
D-C20	0.988	1.03	1.24	1.07	1.06
C20	5.00	1.66	9.80	0.90	2.67
C21	2.30	1.09	4.80	0.476	1.59
C22	10.3	7.72	18.7	3.53	10.7
C23	6.45	4.37	13.48	1.92	5.70
C24	13.7	14.9	28.4	7.14	17.4
C25	3.59	3.00	9.73	1.41	3.84
C26	10.3	8.41	25.8	4.48	11.81
C27	1.36	1.37	4.00	0.739	2.23
C28	8.30	5.67	31.0	3.47	8.93
C29	0.614	0.796	3.56	0.415	1.61
C30	3.16	2.61	11.67	1.41	3.66

$\mu\text{g/g OC}$	47	50	53	54	59
C14	188	131	98.6	321	173
C15	44.9	57.5	44.0	57.7	46.0
C16	288	545	170	1256	531
C17	22.2	22.3	17.8	31.4	22.6
C18	181	265	101	350	187
C19	16.7	13.3	10.4	14.3	19.3
D-C20	25.9	56.5	12.9	122	56.9
C20	131	90.9	102	102	143
C21	60.5	59.6	50.0	54.1	84.9
C22	271	424	195	402	573
C23	169	240	140	218	305
C24	359	819	296	811	928
C25	94.1	165	101	161	205
C26	270	462	269	509	631
C27	35.7	75.5	41.6	83.9	119
C28	218	311	323	394	477
C29	16.1	43.7	37.1	47.1	86.2
C30	-	-	-	-	-