



Supplement of

Sea-ice conditions from 1880 to 2017 on the Northeast Greenland continental shelf: a biomarker and observational record comparison

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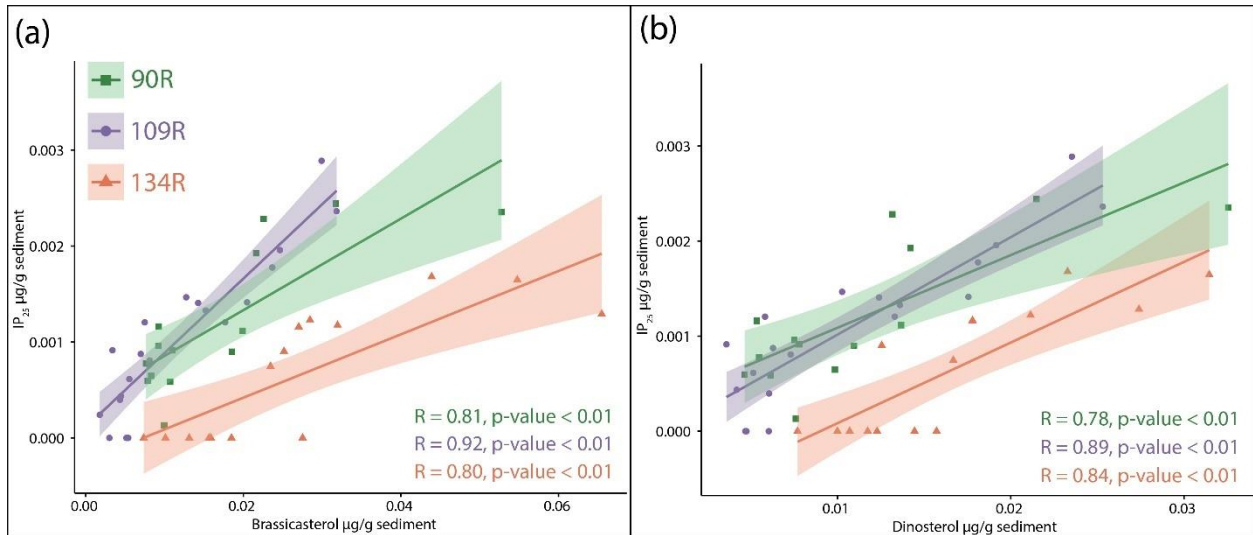


Figure S1: Pearson correlations of biomarkers: brassicasterol plotted against IP₂₅ (a) and dinosterol plotted against IP₂₅ (b) for all sediment cores: 90R (green), 109R (purple) and 134R (orange). The R values are listed for each core (bottom right) together with the p values.

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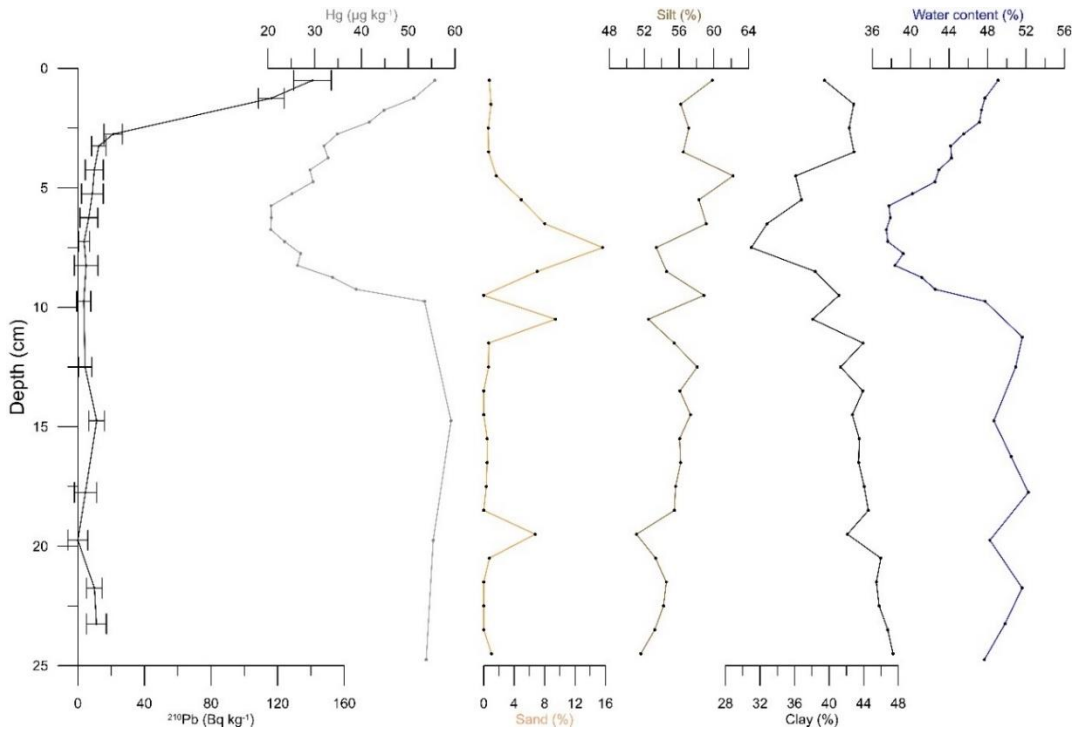
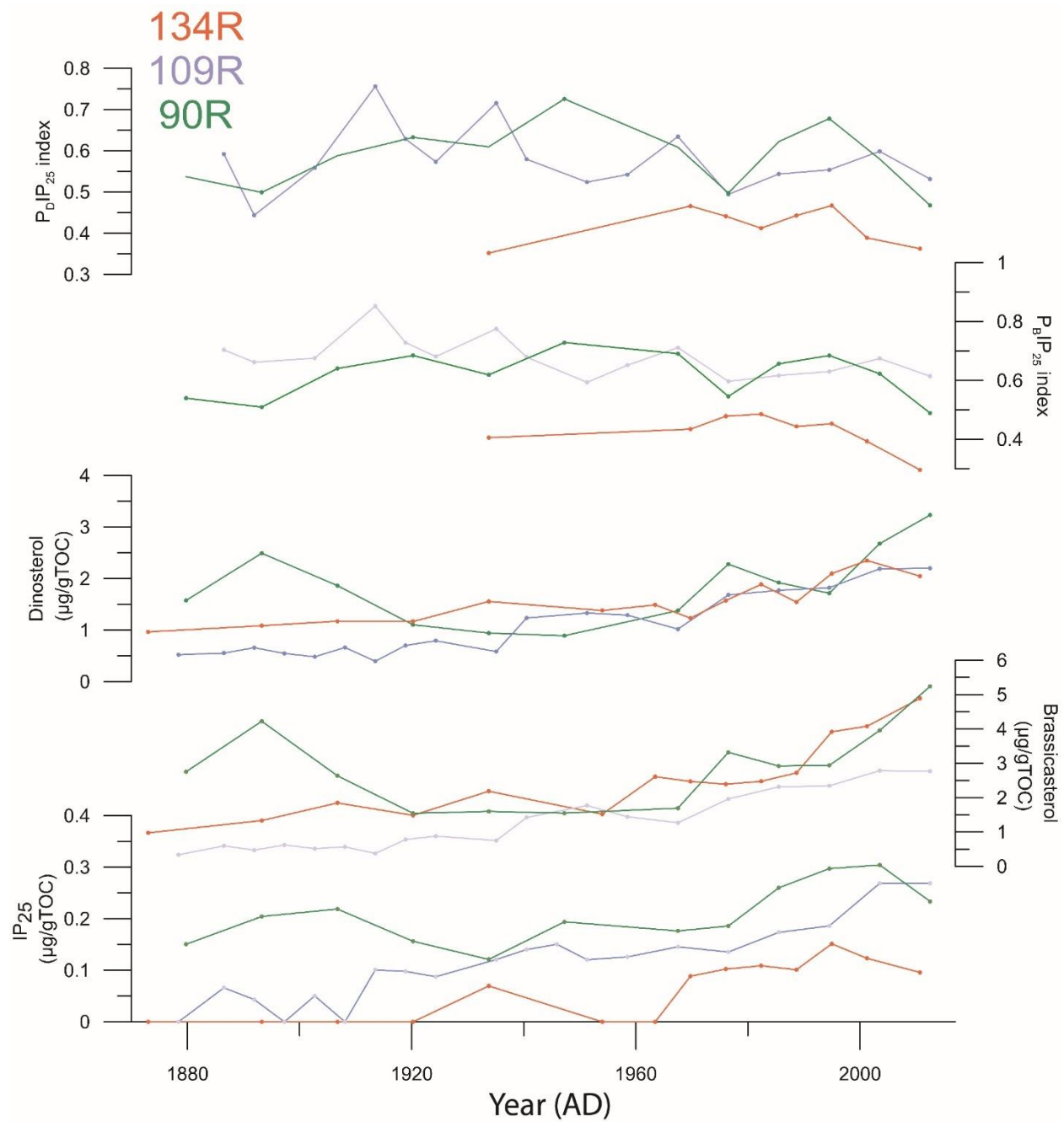


Figure S2: ²¹⁰Pb, Hg, grain size data (sand, silt and clay) and water content data for core 90R shown on depth.



10 **Figure S3:** Comparison between the PIP₂₅ index calculated using dinosterol (P_DIP₂₅) and brassicasterol (P_BIP₂₅) values.

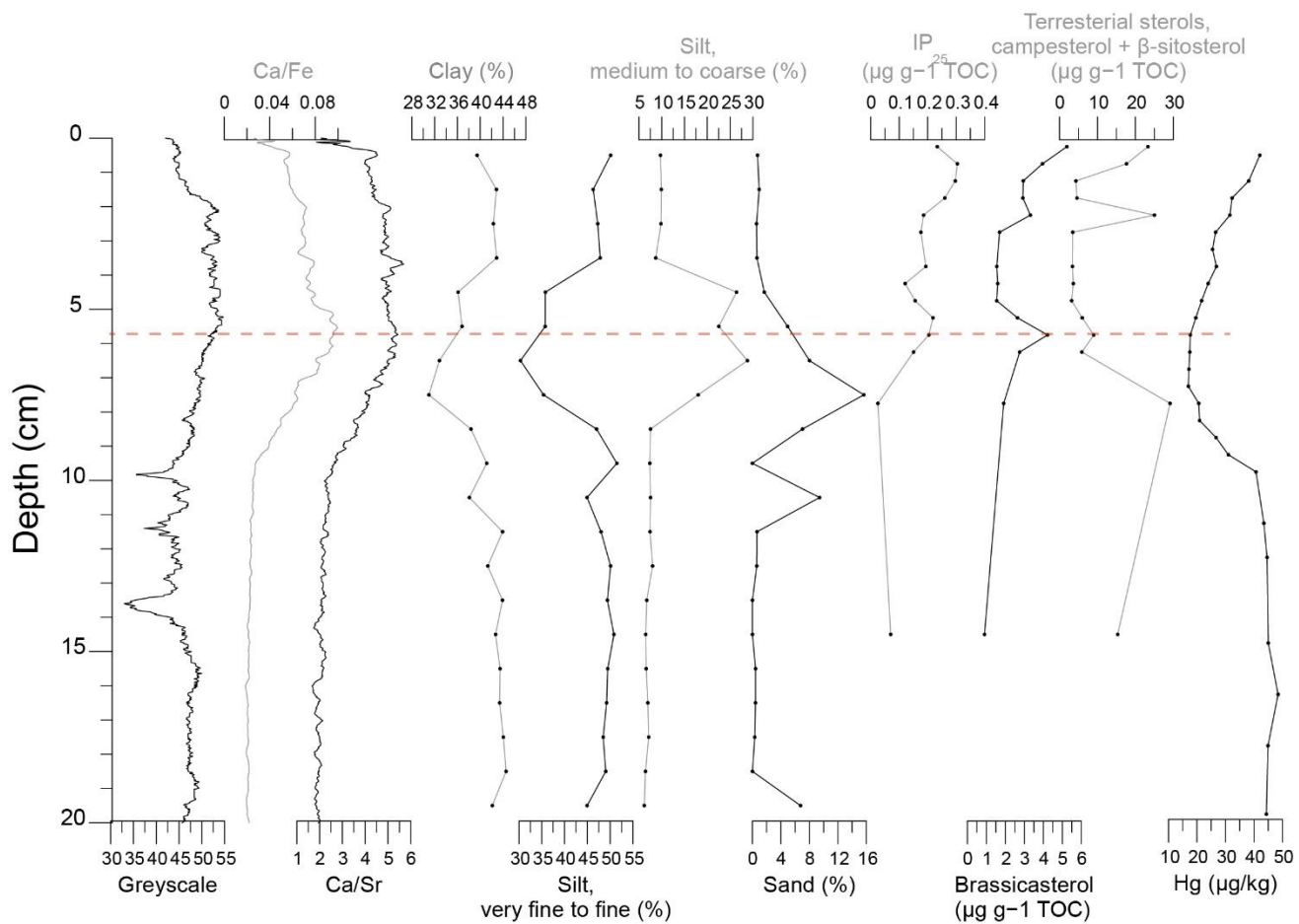


Figure S4: Sedimentological properties (greyscale, Ca/Fe, Ca/Sr, grain size), biomarker (IP₂₅, brassicasterol and terrestrial sterols) and Hg measurements for core 90R. The peak in sterols at 5.75 cm is shown (red dashed line).

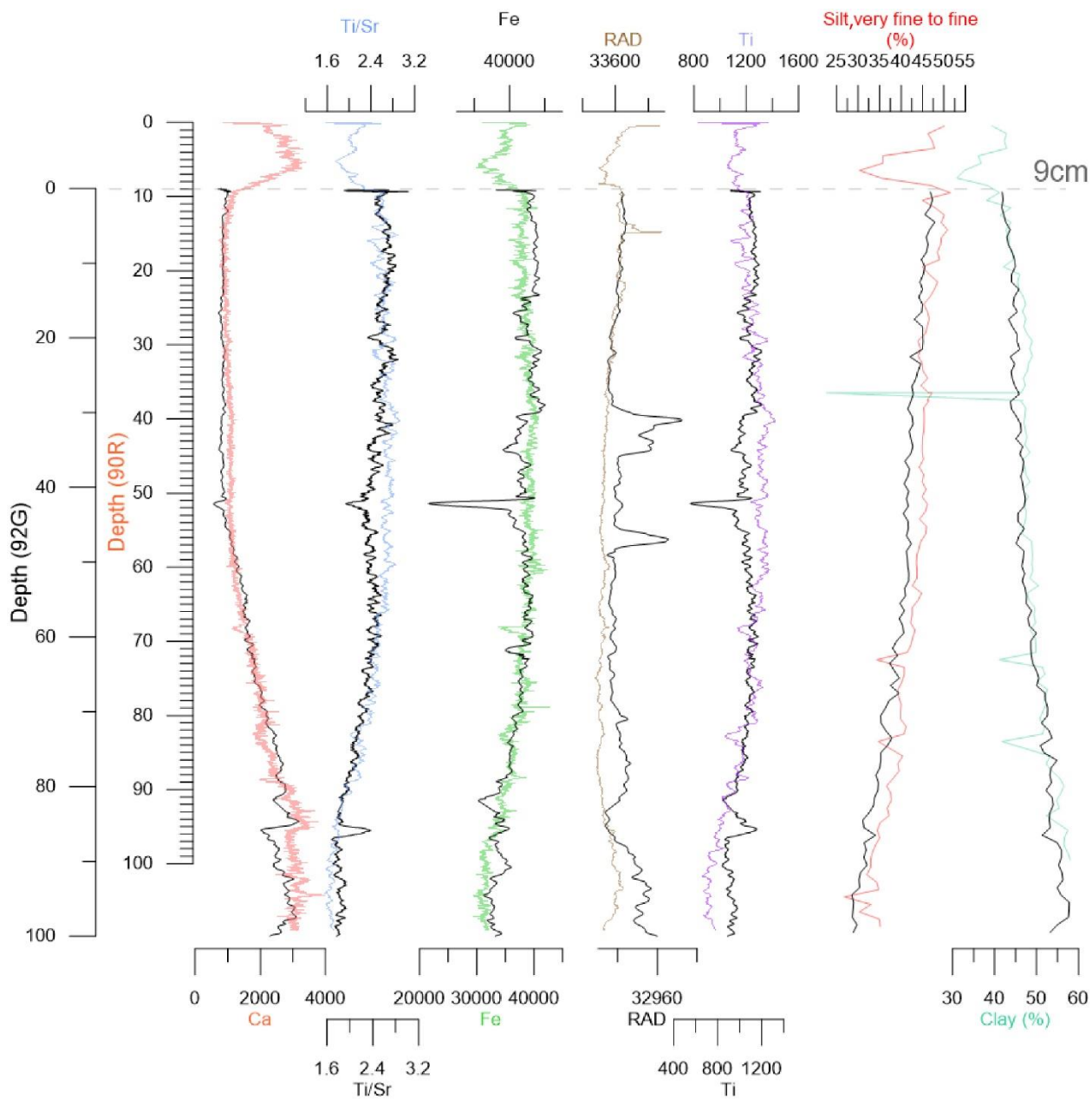


Figure S5: Selected elements (Ca, Fe, Ti), elemental ratios (Ti/Sr), RAD (X-ray intensity), and grain size (silt, clay) data used to align sediment cores DA17-NG-ST08-090R (90R) and DA17-NG-ST08-092G (92G). The amount of sediment lost from 92G is marked with a dashed line.

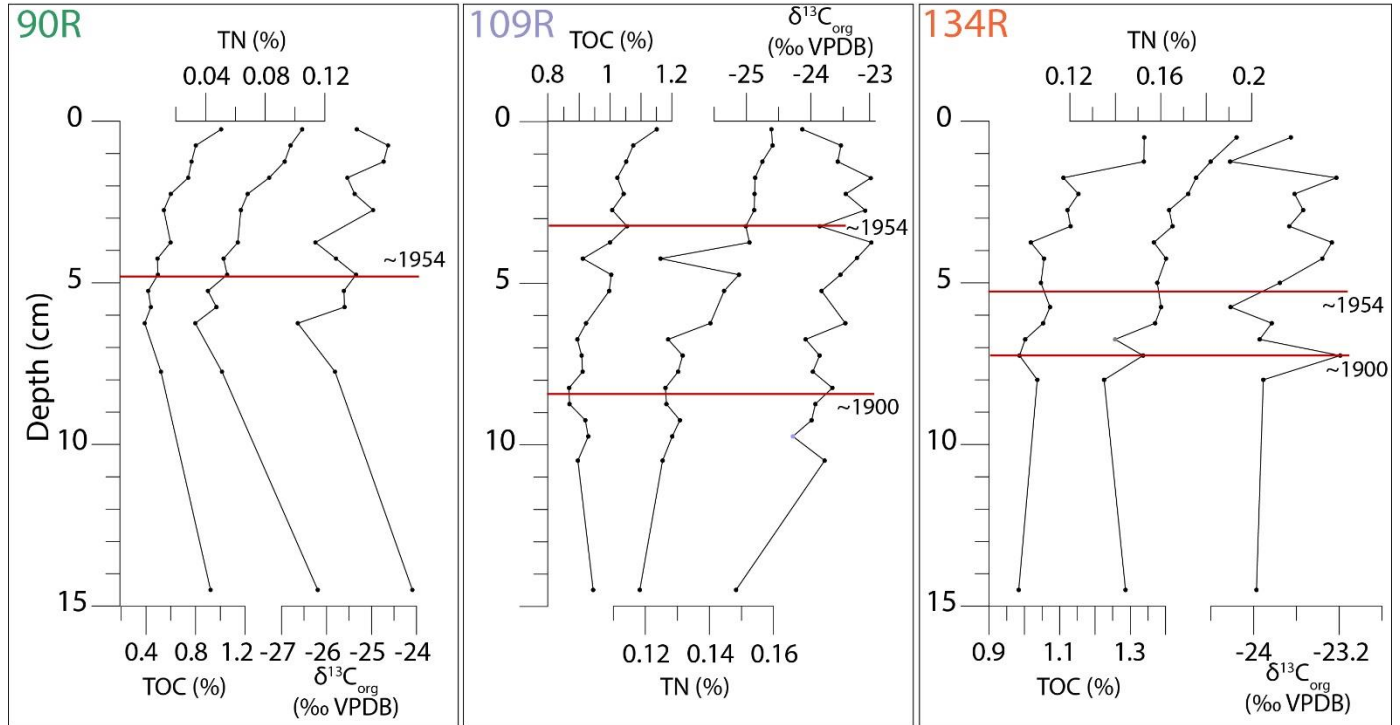


Figure S6: Total Organic Carbon (TOC), Total Nitrogen (TN) and $\delta^{13}C_{org}$ for 90R (left), 109R (middle) and 134R (right). The age markers (1900 and 1954) are shown for each core (red line).

Table S1: Biomarker data for sediment core DA17-NG-ST08-090R

DA17-NG-ST08-090R												
Depth (cm)	Age	TOC (%)	Brassicasterol (µg/g sed)	Brassicasterol (µg/gTOC)	Campesterol (µg/g sed)	Campesterol (µg/gTOC)	Sitosterol (µg/g sed)	Sitosterol (µg/gTOC)	Dinosterol (µg/g sed)	Dinosterol (µg/gTOC)	IP ₂₅ (µg/g sed)	IP ₂₅ (µg/gTOC)
0.25	2014	1.007	0.05277	5.23907	0.02488	2.47058	0.20993	20.84401	0.03256	3.23246	0.00235	0.23367
0.75	2007	0.803	0.03173	3.95381	0.01525	1.90022	0.12644	15.75344	0.02148	2.67680	0.00244	0.30425
1.25	2000	0.768	0.02257	2.93937	0.00907	1.18071	0.02418	3.14937	0.01317	1.71469	0.00228	0.29714
1.75	1994	0.741	0.02163	2.92013	0.00948	1.27995	0.02461	3.32220	0.01422	1.91914	0.00193	0.26005
2.25	1987	0.600	0.02104	3.50747	0.01122	1.87048	0.13885	23.14287	0.01367	2.27909	0.00112	0.18586
2.75	1981	0.544	0.00922	1.69338	0.00475	0.87227	0.01433	2.63207	0.00750	1.37787	0.00096	0.17637
3.75	1967	0.598	0.00927	1.54949	0.00480	0.80189	0.01572	2.62674	0.00533	0.89081	0.00116	0.19394
4.25	1961	0.493	0.00787	1.59704	0.00424	0.86010	0.01373	2.78499	0.00464	0.94102	0.00060	0.12096
4.75	1954	0.496	0.00767	1.54507	0.00444	0.89463	0.01148	2.31324	0.00548	1.10317	0.00078	0.15625
5.25	1918	0.418	0.01102	2.63592	0.00573	1.37029	0.01929	4.61580	0.00778	1.86230	0.00091	0.21874
5.75	1882	0.439	0.01856	4.22258	0.00939	2.13724	0.03027	6.88832	0.01095	2.49132	0.00090	0.20433
6.25	1846	0.390	0.01073	2.75286	0.00521	1.33769	0.01777	4.56029	0.00614	1.57474	0.00059	0.15045
7.75	1738	0.521	0.00996	1.91111	0.00833	1.59876	0.14340	27.52066	0.00759	1.45704	0.00013	0.02515
14.5	1252	0.921	0.00831	0.90153	0.00815	0.88501	0.13305	14.44040	0.00985	1.06889	0.00065	0.07019

25 **Table S2: Biomarker data for sediment core DA17-NG-ST10-109R**

DA17-NG-ST10-109R												
Depth (cm)	Age	TOC (%)	Brassicasterol (µg/g sed)	Brassicasterol (µg/gTOC)	Campesterol (µg/g sed)	Campesterol (µg/gTOC)	Sitosterol (µg/g sed)	Sitosterol (µg/gTOC)	Dinosterol (µg/g sed)	Dinosterol (µg/gTOC)	IP ₂₅ (µg/g sed)	IP ₂₅ (µg/gTOC)
0.25	2012	1.151	0.03183	2.76596	0.01567	1.36187	0.04571	3.97208	0.02531	2.19932	0.00236	0.20528
0.75	2002	1.075	0.02993	2.78450	0.01576	1.46574	0.03929	3.65524	0.02353	2.18877	0.00289	0.26868
1.25	1993	1.052	0.02465	2.34300	0.01217	1.15660	0.03296	3.13258	0.01916	1.82165	0.00196	0.18606
1.75	1983	1.023	0.02369	2.31448	0.01111	1.08524	0.03277	3.20247	0.01811	1.76979	0.00178	0.17356
2.25	1973	1.044	0.02048	1.96223	0.01192	1.14197	0.02953	2.82916	0.01756	1.68198	0.00141	0.13535
2.75	1964	1.007	0.01275	1.26683	0.00756	0.75050	0.01784	1.77228	0.01026	1.01958	0.00147	0.14559
3.25	1954	1.055	0.01523	1.44367	0.00958	0.90817	0.02635	2.49867	0.01361	1.29012	0.00133	0.12582
3.75	1949	1.000	0.01770	1.77093	0.00977	0.97738	0.02731	2.73192	0.01330	1.33077	0.00121	0.12056
4.25	1944	0.912	0.01630	1.78858							0.00137	0.15039
4.75	1939	1.004	0.01427	1.42222	0.00868	0.86487	0.02328	2.31932	0.01240	1.23519	0.00141	0.14016
5.25	1933	0.997	0.00847	0.84911	0.00589	0.59095	0.01431	1.43574	0.00582	0.58344	0.00120	0.12083
6.25	1923	0.922	0.00812	0.88058	0.00565	0.61239	0.01709	1.85381	0.00730	0.79140	0.00081	0.08752
6.75	1918	0.894	0.00699	0.78184	0.00549	0.61452	0.01523	1.70447	0.00628	0.70234	0.00087	0.09786
7.25	1913	0.908	0.00340	0.37442	0.00312	0.34341	0.01047	1.15396	0.00359	0.39547	0.00091	0.10069
7.75	1908	0.911	0.00517	0.56765	0.00424	0.46541	0.01128	1.23822	0.00603	0.66244	0.00000	0.00000
8.25	1903	0.867	0.00449	0.51774	0.00290	0.33477	0.00979	1.12938	0.00418	0.48238	0.00044	0.05024
8.75	1897	0.868	0.00540	0.62212	0.00388	0.44730	0.01193	1.37345	0.00475	0.54686	0.00000	0.00000
9.25	1892	0.919	0.00436	0.47365	0.00378	0.41077	0.01290	1.40269	0.00605	0.65811	0.00040	0.04320
9.75	1887	0.929	0.00554	0.59654	0.00340	0.36569	0.01115	1.19997	0.00514	0.55303	0.00061	0.06602
10.5	1879	0.895	0.00301	0.33587	0.00329	0.36752	0.00868	0.96985	0.00468	0.52257	0.00000	0.00000
14.5	1838	0.945	0.00179	0.18908	0.00153	0.16199	0.00477	0.50482		0.00000	0.00024	0.02552

Table S3: Biomarker data for sediment core DA17-NG-ST12-134R

DA17-NG-ST12-134R												
Depth (cm)	Age	TOC (%)	Brassicasterol (µg/g sed)	Brassicasterol (µg/gTOC)	Campesterol (µg/g sed)	Campesterol (µg/gTOC)	Sitosterol (µg/g sed)	Sitosterol (µg/gTOC)	Dinosterol (µg/g sed)	Dinosterol (µg/gTOC)	IP ₂₅ (µg/g sed)	IP ₂₅ (µg/gTOC)
0.5	2011	1.339	0.06546	4.88769	0.01978	1.47707	0.04743	3.54112	0.02740	2.04570	0.00128	0.09586
1.25	2002	1.338	0.05457	4.07698	0.02133	1.59359	0.05197	3.88314	0.03145	2.35005	0.00165	0.12309
1.75	1996	1.110	0.04350	3.91683	0.01717	1.54609	0.04923	4.43302	0.02328	2.09648	0.00168	0.15126
2.25	1990	1.153	0.03134	2.71855	0.01266	1.09813	0.03091	2.68092	0.01779	1.54328	0.00117	0.10107
2.75	1984	1.122	0.02778	2.47571	0.01202	1.07088	0.03668	3.26867	0.02114	1.88450	0.00122	0.10880
3.25	1978	1.131	0.02704	2.39104	0.01523	1.34654	0.06291	5.56291	0.01780	1.57416	0.00116	0.10231
3.75	1972	1.018	0.02517	2.47193	0.01034	1.01604	0.03920	3.85084	0.01255	1.23297	0.00090	0.08856
4.25	1966	1.056	0.02753	2.60807	0.01893	1.79315	0.08783	8.32031	0.01572	1.48915	0.00000	0.00000
5	1957	1.047	0.01589	1.51838	0.00792	0.75666	0.02344	2.23963	0.01445	1.38025	0.00000	0.00000
5.75	1941	1.072	0.02346	2.18714	0.01026	0.95633	0.03093	2.88421	0.01668	1.55558	0.00075	0.06959
6.25	1927	1.053	0.01565	1.48563	0.00749	0.71144	0.02088	1.98224	0.01228	1.16638	0.00000	0.00000
6.75	1914	1.002	0.01850	1.84625	0.00963	0.96090	0.03167	3.15990	0.01174	1.17164	0.00000	0.00000
7.25	1900	0.986	0.01314	1.33221	0.00864	0.87610	0.02294	2.32679	0.01070	1.08528	0.00000	0.00000
8	1880	1.036	0.01012	0.97653	0.00687	0.66286	0.01780	1.71703	0.01000	0.96435	0.00000	0.00000
14.5	1704	0.984	0.00737	0.74911	0.00496	0.50454	0.01437	1.46022	0.00770	0.78232	0.00000	0.00000