Supplementary Material for

Holocene Temperature Variations in Semi-Arid Central Mongolia - A Chronological and Sedimentological Perspective From a 7400-year Lake Sediment Record From the Khangai Mountains

SI 1 Lake Bathymetry

A bathymetric map of the lake's floor of Shireet Naiman was created using an Innomar SES 2000 light parametric echo sounder (Innomar®, Rostock, Germany) operating with a frequency of 100 kHz resulting in ~7200 depth-measurements. The respective drivelines are shown Figure SI 1. The data were processed using the ISE 2.91 software (Innomar® Rostock, Germany) and the bathymetric map was created using the software Esri ArcGIS 10.5 applying the 'spline with barriers' interpolation tool.

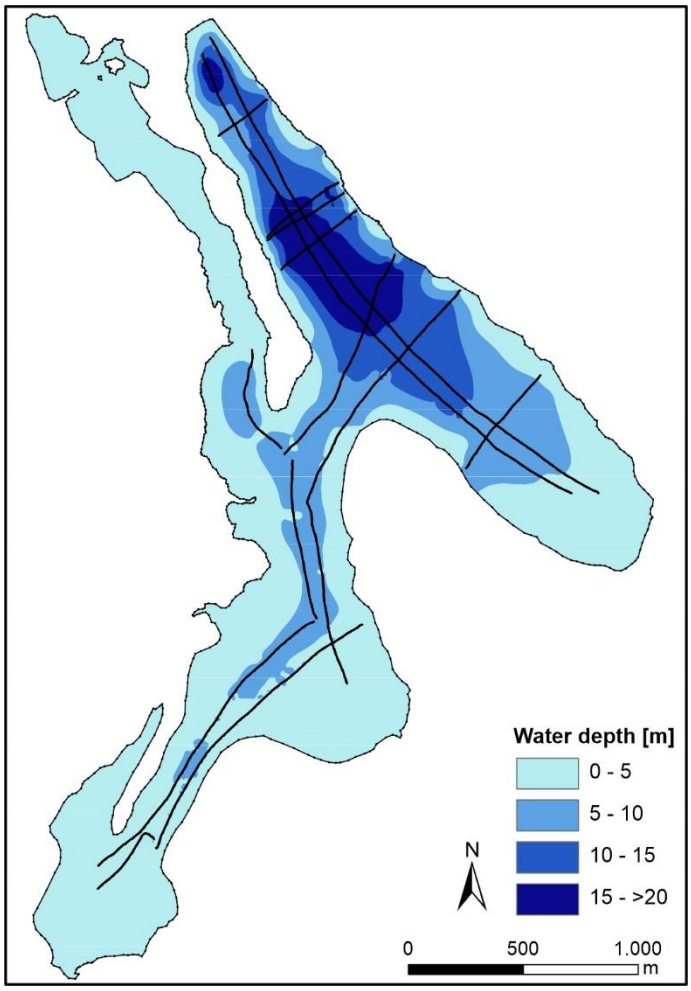

Figure SI 1. Bathymetric map of Shireet Naiman Nuur, including the drivelines (black lines) used for creating the map.

SI 2 Grain size analyses and results

Grain size analyses were carried out at the Friedrich Schiller University Jena. Sample aliquots were treated with hydrogen peroxide (H2O2; 10%) and hydrochloric acid (10%) to remove organic mater and carbonates, respectively. Before measurement, sodium-pyrophosphate was added as a dispersant to each sample, which was subsequently shaken for ~2h. Grain size distribution was measured with a laser diffraction particle size analyzer (LS 13320, Beckman Coulter). Samples were measured with the aqueous liquid module in several 60 s cycles until the signal was reproducible. Data analyses was carried out with the Gradistat 4.2 software (Blott and Pye, 2001).

Grain size analyses show that the layered sediments from Shireet Naiman Nuur consist of fine- to medium-grained silty material. Silt contents vary between 70 and 80 % and the median grain size only shows minor changes between ~5 to 10 µm (Fig. SI 2).

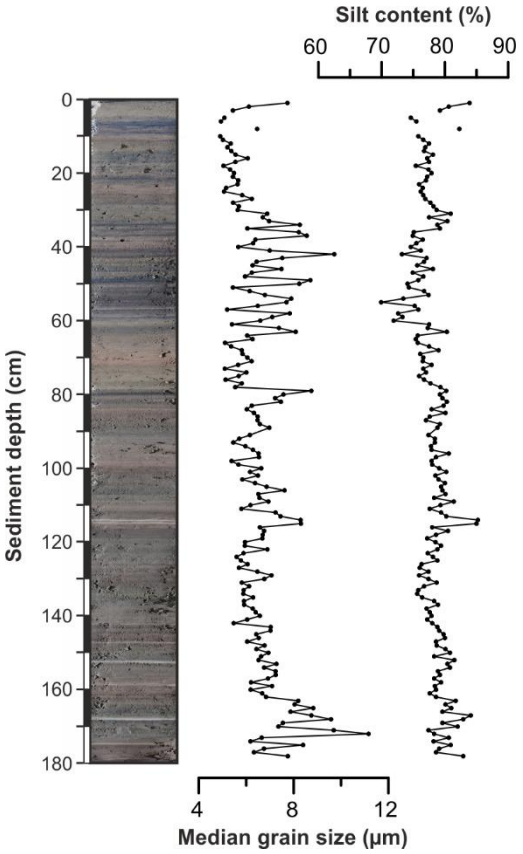

Figure SI 2. Depth profiles of median grain size and silt contents from the Shireet Naiman Nuur sediments.

SI 3 ^{14}C-dating results

Table SI 1. ^{14}C-dating results of bulk organic carbon and terrestrial macrofossil samples from Shireet Naiman Nuur. Samples were calibrated with the IntCal20 calibration curve (Reimer et al., 2020) except the samples SNN19_3 M and SNN19_11 M that were calibrated with the bomb peak NH1 calibration curve (Hua et al., 2013). For the bulk organic carbon ^{14}C-ages, we additionally report reservoir corrected calibrated median ages. Reservoir correction is based on the uppermost uncalibrated bulk organic carbon sample SNN19_1 and was carried out with OxCal (Ramsey, 2009) using the IntCal20 calibration curve (Reimer et al., 2020).

Lab code	Sample label	Depth (cm)	$F^{14}C \pm u$	Uncalibrated ages	Calibrated age ranges (cal. BP)	Calibrated median ages (cal. BP)	Reservoir corrected calibrated median ages (cal. BP)
BE-13606.1.1	SNN19_1[1]	1	0.9243±0.0116	632±101	492-770	608	93
BE-16522.1.1	SNN19_3 M[2]	3	0.9802±0.0079	161±65	-4-294	154	
BE-16523.1.1	SNN19_11 M[2]	11	0.9723±0.0073	226±61	-4-445	206	
BE-13605.1.1	SNN19_20[1]	20	0.8450±0.0112	1353±106	995-1514	1254	664
BE-17019.1.1	SNN19_26 M[2]	26	0.8906±0.0102	931±92	676-1051	838	
BE-16525.1.1	SNN19_29 M[2]	29	0.7314±0.0170	2513±187	2120-3060	2577	
BE-16526.1.1	SNN19_41 M[2]	41	0.8693±0.0129	1125±120	793-1286	1045	
BE-13604.1.1	SNN19_50[1]	50	0.7577±0.0111	2229±117	1896-2697	2222	1606
BE-16527.1.1	SNN19_50 M[2]	50	0.8417±0.0082	1384±79	1075-1469	1295	
BE-16528.1.1	SNN19_59 M[2]	59	0.7900±0.0065	1894±66	1628-1989	1808	
BE-16529.1.1	SNN19_68 M[2]	68	0.7677±0.0063	2123±66	1940-2310	2100	
BE-16530.1.1	SNN19_79 M[2]	79	0.7004±0.0077	2860±89	2770-3222	2994	
BE-12036.1.1	SNN19_80[1]	80	0.6539±0.0127	3413±157	3275-4141	3679	3066
BE-17020.1.1	SNN19_83 M[2]	83	0.7025±0.0058	2837±67	2782-3150	2954	
BE-16531.1.1	SNN19_89 M[2]	89	0.7025±0.0068	2837±78	2775-3166	2959	
BE-16532.1.1	SNN19_95 M[2]	95	0.6704±0.0056	3212±67	3248-3578	3430	
BE-13603.1.1	SNN19_104[1]	104	0.5977±0.0095	4134±128	4256-4974	4653	4003
BE-16533.1.1	SNN19_104 M[2]	104	0.6512±0.0058	3445±72	3492-3886	3703	

BE-16534.1.1	SNN19_113 M[2]	113	0.6218±0.0052	3816±67	3990-4415	4216	
BE-16535.1.1	SNN19_119 M[2]	119	0.6162±0.0058	3890±76	4091-4522	4311	
BE-13602.1.1	SNN19_124[1]	124	0.5467±0.0089	4850±131	5319-5895	5584	4926
BE-16536.1.1	SNN19_125 M[2]	125	0.5979±0.0052	4132±71	4444-4838	4665	
BE-16537.1.1	SNN19_131 M[2]	131	0.5686±0.0057	4535±81	4883-5460	5172	
BE-16538.1.1	SNN19_137 M[2]	137	0.5719±0.0062	4489±88	4866-5437	5133	
BE-13601.1.1	SNN19_140[1]	140	0.5046±0.0083	5494±133	5943-6599	6285	5655
BE-16539.1.1	SNN19_143 M[2]	143	0.5312±0.0064	5082±97	5595-6108	5816	
BE-16540.1.1	SNN19_152 M[2]	152	0.5039±0.0052	5506±82	6016-6489	6304	
BE-16541.1.1	SNN19_158 M[2]	158	0.4870±0.0058	5780±95	6320-6795	6580	
BE-13600.1.1	SNN19_160[1]	160	0.4467±0.0077	6474±139	7023-7616	7373	6711
BE-16542.1.1	SNN19_168 M[2]	168	0.4743±0.0059	5991±99	6629-7158	6838	
BE-12035.1.1	SNN19_177[1]	177	0.3952±0.0081	7458±165	7963-8589	8259	7686
BE-16102.1.1	SNN19_177 M[2]	177	0.4520±0.0063	6380±112	7007-7553	7295	

[1]bulk organic carbon [2]terrestrial macrofossil

References

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