

1 Medieval warmth confirmed at the Norse Eastern Settlement in
2 Greenland

3 **G. Everett Lasher¹ and Yarrow Axford¹**

4 ¹*Department of Earth and Planetary Sciences, Northwestern University, 2145 Sheridan Road, Evanston,*
5 *IL 60208 USA*

6 **APPENDIX**

7 *Figure DR1.* Comparative North Atlantic Oscillation reconstructions.

8 *Figure DR2.* Age-depth model and scanned image for SL core 16-LOW-U2.

9 *Figure DR3.* Isotopes of precipitation and lake water in South Greenland.

10 *Table DR1.* Radiocarbon ages from Scoop Lake.

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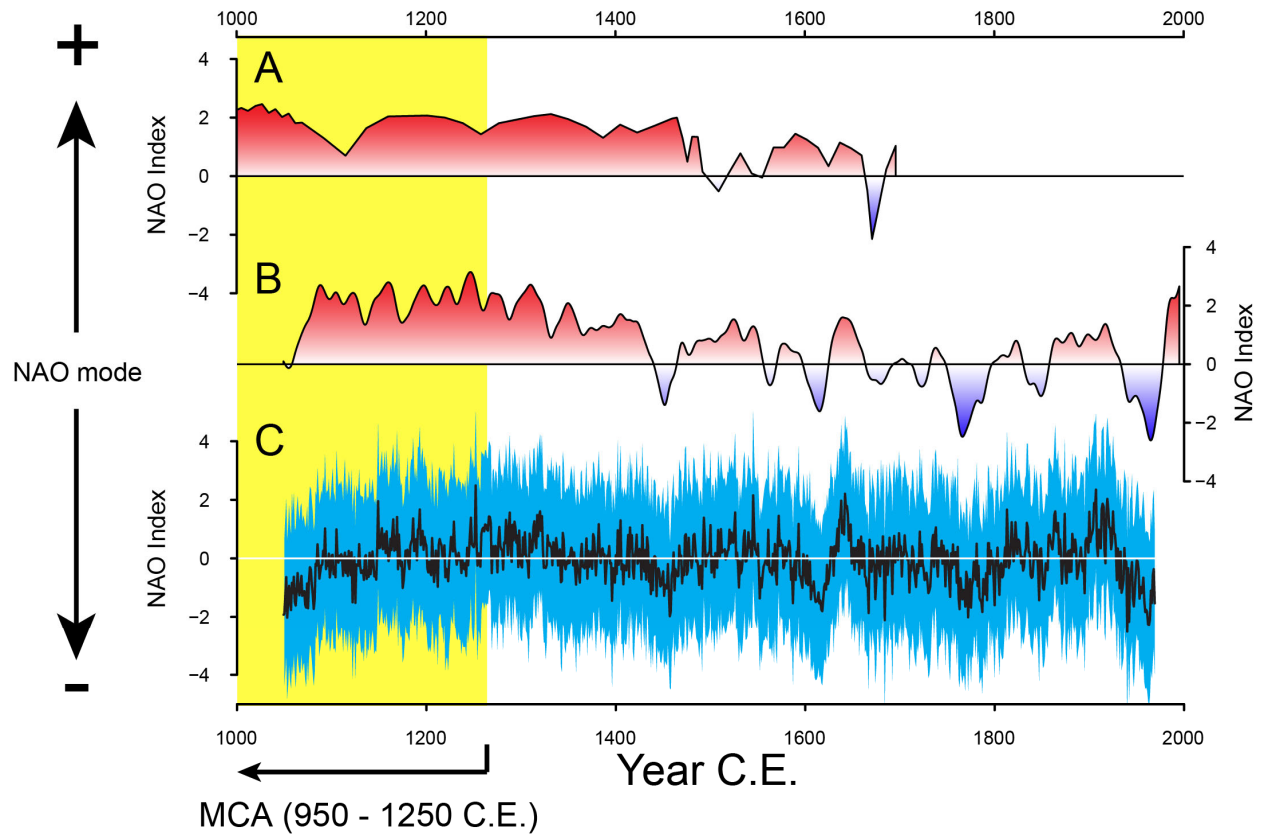
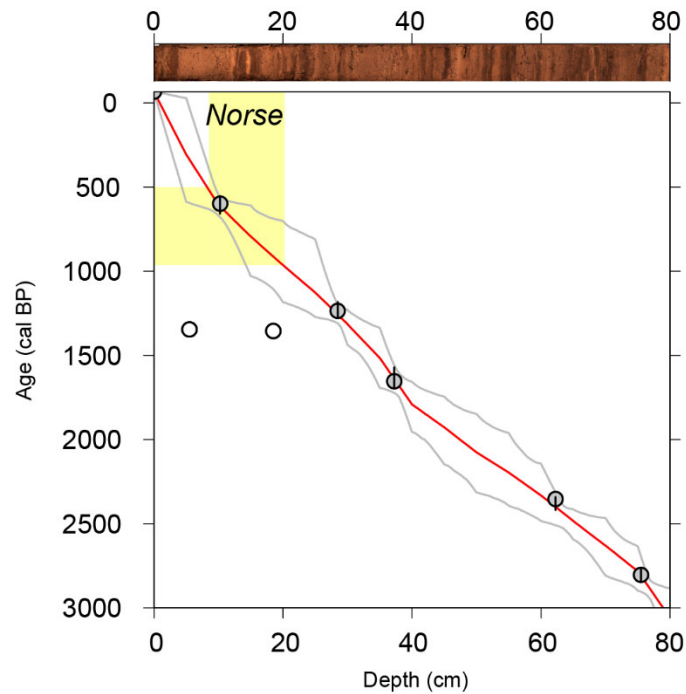
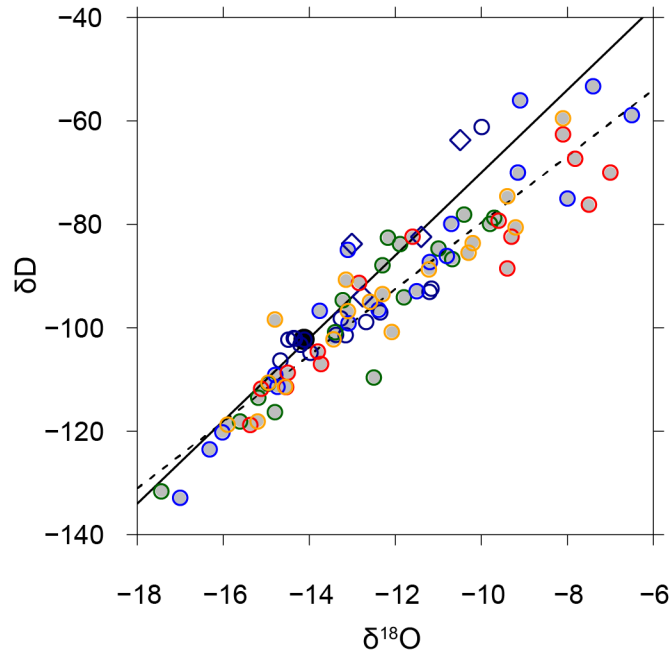


Figure DR1: Examples of North Atlantic Oscillation (NAO) reconstructions. Some records support the dominant positive NAO anomaly during the Medieval Climate Anomaly, while some do not. A: West Greenland lake-record-inferred NAO index (Olsen et al., 2012). B: A bi-proxy analysis using NAO sensitive climate archives (Trouet et al., 2009). C: A multi-proxy informed annual NAO simulation (Ortega et al., 2015).



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20 **Figure DR2:** Age depth model and GEO-TEK scanned image of the top 80 cm of core 16-LOW-
 21 U2 from Scoop Lake, generated using the rbacon package in R (Blaauw and Christen, 2018). The
 22 top-most age is an inferred surface dating to August 2016. All other ages were calibrated using
 23 the IntCal13 curve, and plotted as the midpoint $\pm \frac{1}{2}$ of the 2σ range (Reimer et al., 2013). Ages
 24 in white were considered outliers after they fell outside the 95% confidence intervals of an initial
 25 model containing all ages. Thus, they were not included when running the final rbacon model.
 26 The red line is the mean of over 6 million iterations of the model and bounded in gray by 95%
 27 confidence intervals.



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29 **Figure DR3:** Isotopes of precipitation from South Greenland. Closed gray circles are historical
 30 precipitation values collected at Kangilinnguit, Greenland (150 km NW of Scoop Lake) between
 31 1961 and 1974 (IAEA/WMO, 2017). Colors correspond to season: June, July August (JJA) – red.
 32 September, October, November (SOM) – orange. December, January, February (DJF) – green.
 33 March, April, May (MAM) – blue. Open diamonds represent precipitation collected in August,
 34 2016 near Narsaq, Greenland. Open circles are lakes sampled during August, 2016. The black
 35 closed circle is lake water from Scoop Lake, collected in August, 2016. The solid black line is
 36 the Global Meteoric Water Line, and the dashed line is the “Local” Meteoric Water Line for the
 37 historic Kangilinnguit samples.

Table A1: Radiocarbon results from Scoop Lake

Core ID	Depth (top cm)	Depth (bottom cm)	¹⁴ C Age	¹⁴ C_error	Age (cal yr BP)	2σ lower	2σ upper	Material	Lab ID	Fraction Modern	δ ¹³ C
Surface	0	1			-66						
16-LOW-U2	10	10.5	625	25	599	553	659	Aquatic Moss	OS-134547	0.9253	-28.7
16_LOW-U2	28	29	1280	15	1235	1182	1275	Leaf fragments	OS-139687	0.8528	-26
16-LOW-U2	37	37.5	1730	15	1654	1570	1699	Aquatic Moss	OS-134601	0.8066	-29
16-LOW-U2	62	62.5	2360	15	2354	2341	2420	Aquatic Moss	OS-134602	0.7458	-26
16_LOW-U2	75	76	2710	15	2805	2768	2848	Leaf and wood fragments	OS-139688	0.7136	-25.66
Ages not included in age-depth model											
*16_LOW-U2	5	6	1460	13	1345	1311	1376	Aquatic and terrestrial material			
16_LOW-U2	18	19	1470	15	1355	1314	1387	Plant/Wood	OS-139686	0.8325	-26
*Ages combined in OxCal											
16_LOW-U2	5	6	1380	15	1298	1284	1310	Aquatic Moss	OS-139684	0.8422	-29.13
16_LOW-U2	5	6	1670	25	1573	1528	1686	Leaf and wood fragments	OS-139685	0.8127	-25.68

*2 ages from the same depth combined using the R_combine function in OxCal v.4.3 (Ramsey, 2009).

REFERENCES CITED

- Blaauw, M., and Christen, A. J., 2018, rbacon: Age-Depth Modelling using Bayesian Statistics. R package version 2.3.3. <https://CRAN.R-project.org/package=rbacon>.
- IAEA/WMO, 2017, Global Network of Isotopes in Precipitation. The GNIP Database. Accessible at: <http://www.iaea.org/water>.
- Olsen, J., Anderson, N. J., and Knudsen, M. F., 2012, Variability of the North Atlantic Oscillation over the past 5,200 years: *Nature Geoscience*, v. 5, no. 11, p. 808-812.
- Ortega, P., Lehner, F., Swingedouw, D., Masson-Delmotte, V., Raible, C. C., Casado, M., and Yiou, P., 2015, A model-tested North Atlantic Oscillation reconstruction for the past millennium: *Nature*, v. 523, no. 7558, p. 71-74.
- Ramsey, C. B., 2009, Bayesian analysis of radiocarbon dates: *Radiocarbon*, v. 51, no. 1, p. 337-360.
- Reimer, P. J., Bard, E., Bayliss, A., Beck, J. W., Blackwell, P. G., Ramsey, C. B., Buck, C. E., Cheng, H., Edwards, R. L., and Friedrich, M., 2013, IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP: *Radiocarbon*, v. 55, no. 4, p. 1869-1887.
- Trouet, V., Esper, J., Graham, N. E., Baker, A., Scourse, J. D., and Frank, D. C., 2009, Persistent positive North Atlantic oscillation mode dominated the Medieval Climate Anomaly: *Science*, v. 324, no. 5923, p. 78-80.