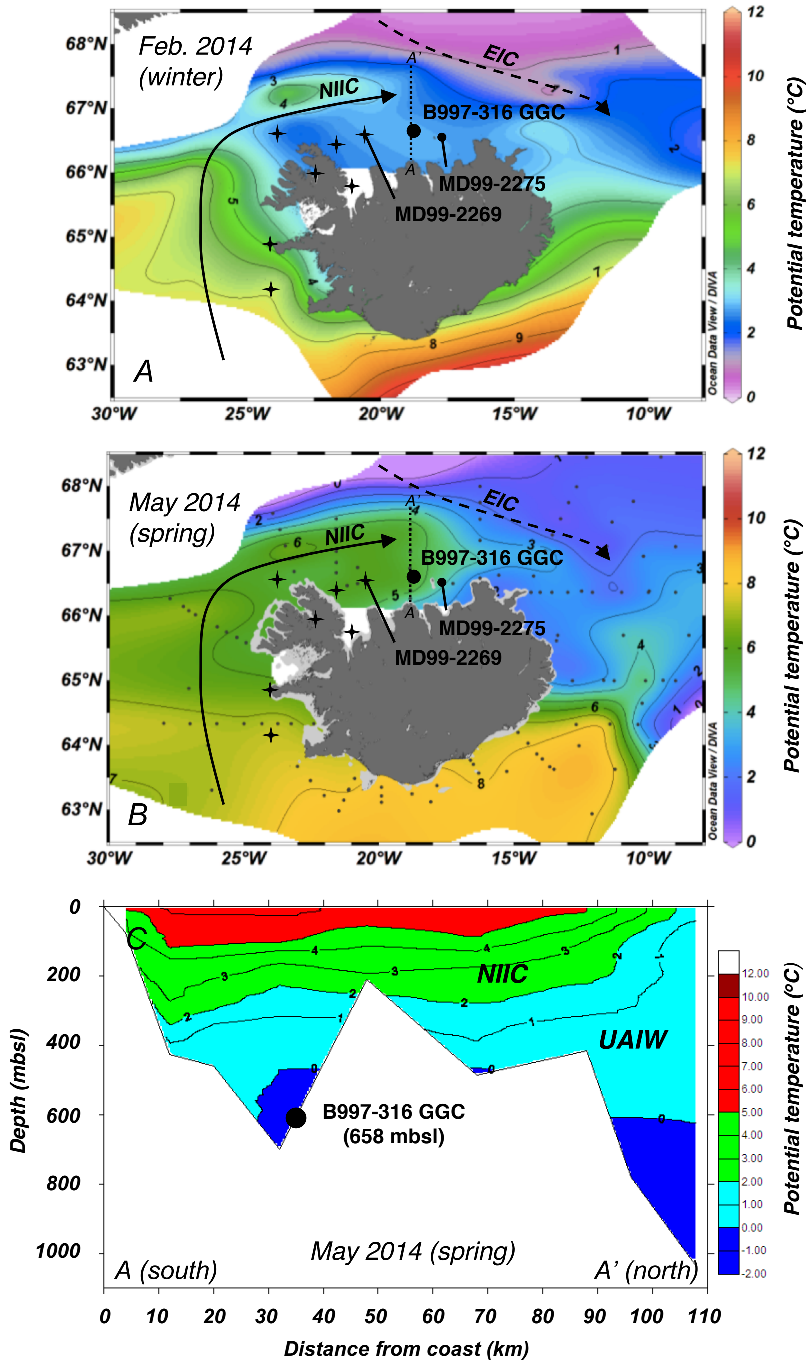


Fig. 1: A) Overview maps of modern Icelandic oceanography. A) February 2014 and B) May 2014 50 m depth potential temperature integrated from local CTD stations. Marine sediment cores (black dots) and surface sediment sample locations (black +) are marked. C) May 2014 S-N trending cross section of NIS bathymetry and vertical potential temperature structure along the Siglunes transect and through the B997-316 GGC marine sediment core site. Data from Hafrannsóknastofnun (Marine and Freshwater Research Institute, http://www.hafro.is/Sjora/).

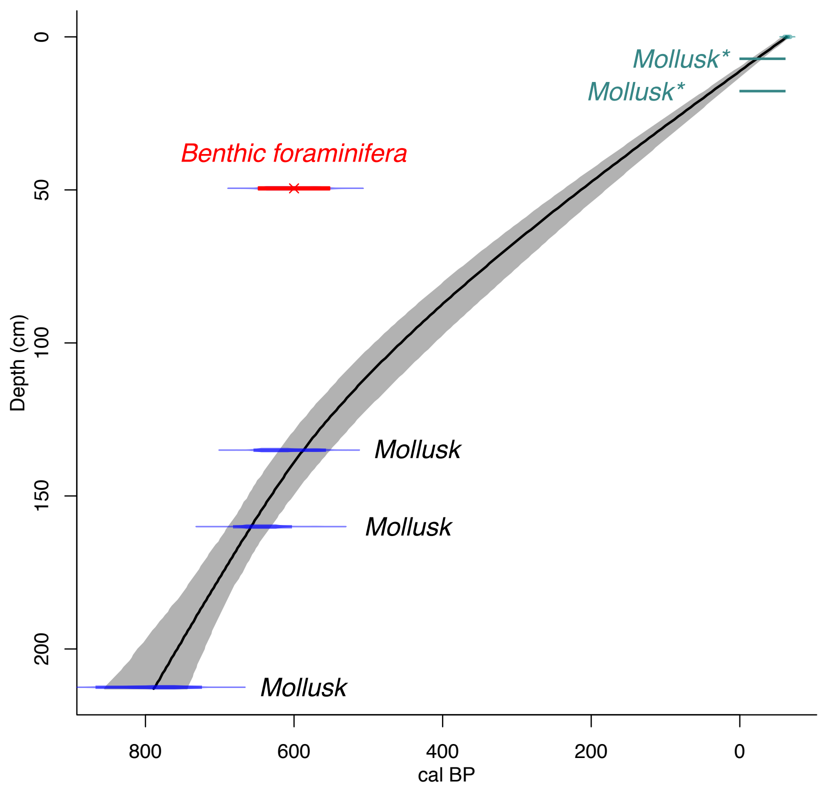


Fig 2: CLAM age model. Gray shaded area denotes the 95% confidence envelope (Blaauw, 2010). Teal and asterisked mollusk ages are from the adjacent short gravity core, B997-316 SGC, and not used as age control points in this model. Radiocarbon information provided in Table 1.

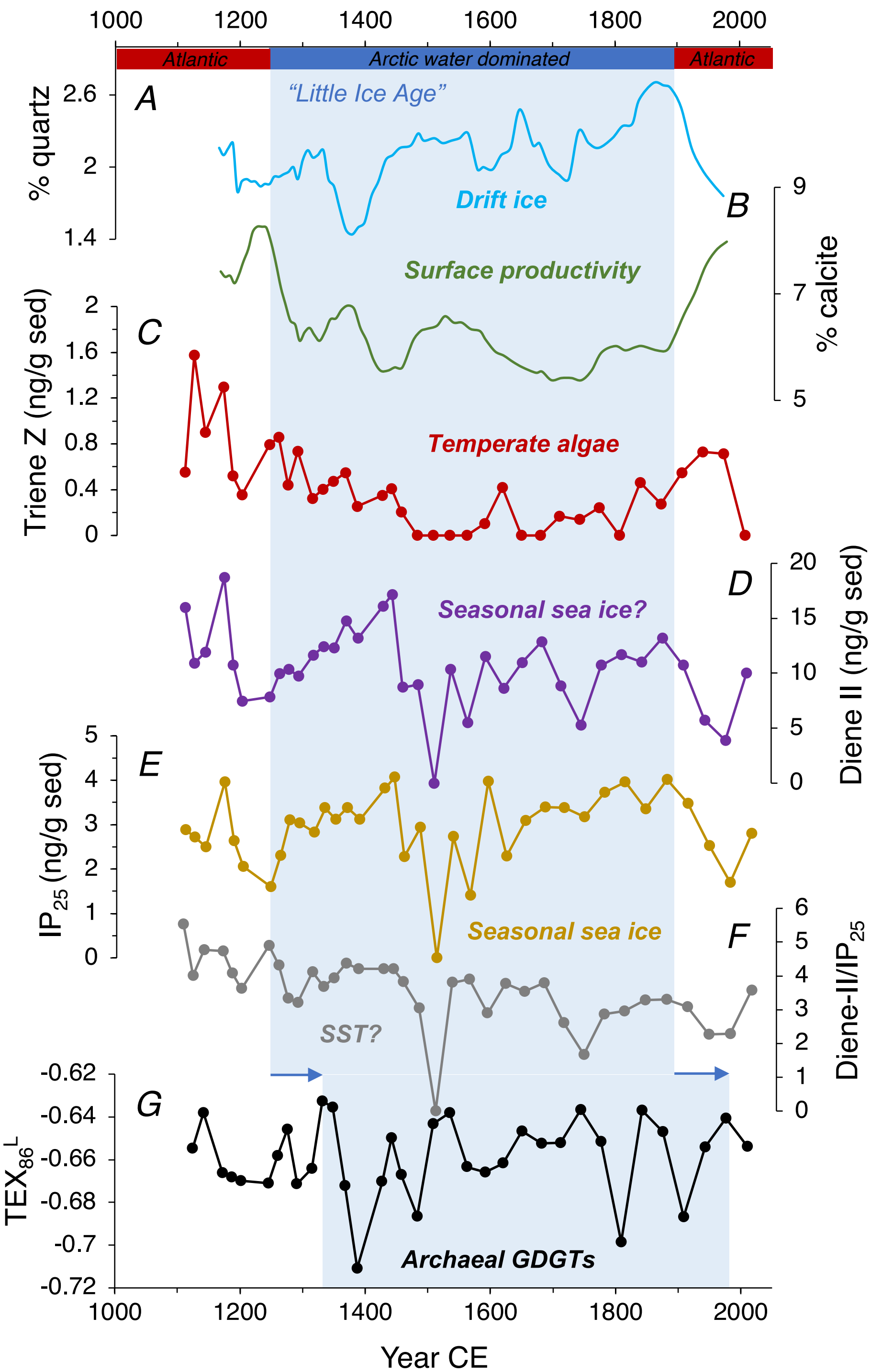


Fig. 3: B997-316 GGC marine sediment core climate proxies over the last millennium. A) % quartz, B) % calcite, C) triene Z concentrations, D) diene II concentrations, E) IP_{25} concentrations, F) diene-II/IP_{25} and G) TEX_{86}^{L}. Blue boxes highlight colder, LIA-like conditions reflected in the surface climate proxies (A-F) and the subsurface proxy (G).

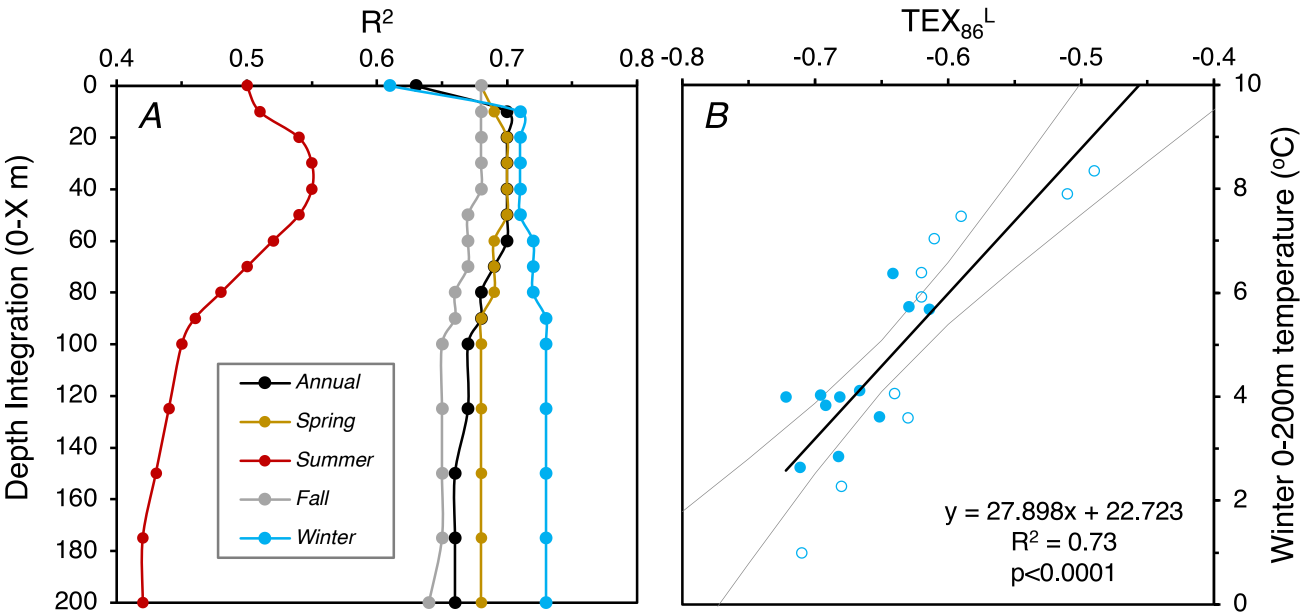


Fig. 4: Regression analysis summary of surface sediment GDGT calibration. A) Correlation coefficient (R^2) of the 21 surface sediment TEX_{86}^L values against seasonal and annual temperature depth integrations. B) Calibration of Icelandic marine surface sediment TEX_{86}^L values against winter 0-200m temperature, where gray lines denote the 95% confidence envelope. Surface sediment data shown as closed circles (this study) and open circles (Rodrigo-Gámiz et al., 2015).

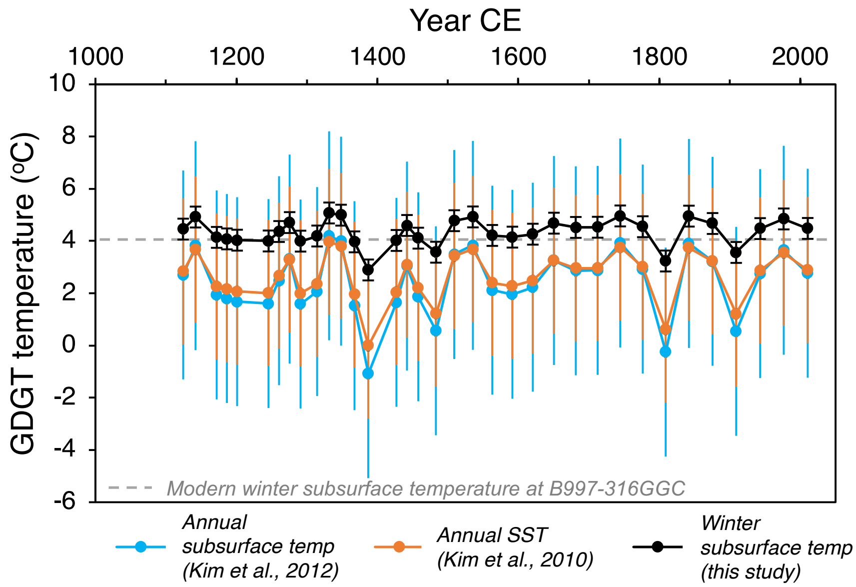


Fig. 5: Comparison of the available TEX_{86}^{L} temperature calibrations on the B997-316 GGC sediment record. Icelandic winter subsurface temperature (this study), annual SST (Kim et al., 2010) and annual subsurface temperature (Kim et al., 2012). Modern winter subsurface temperature at the B997-316 GGC site marked with gray dashed line.

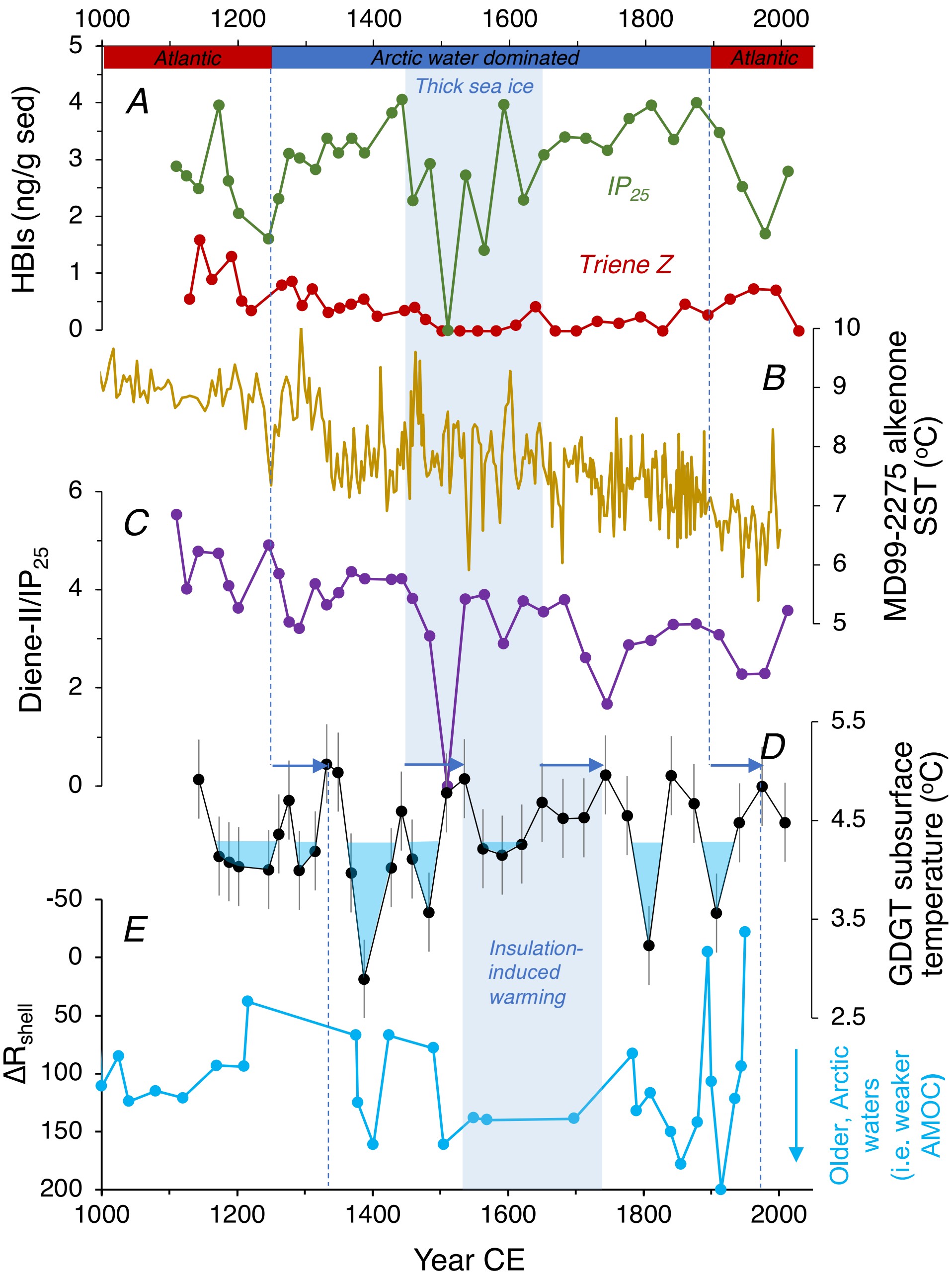
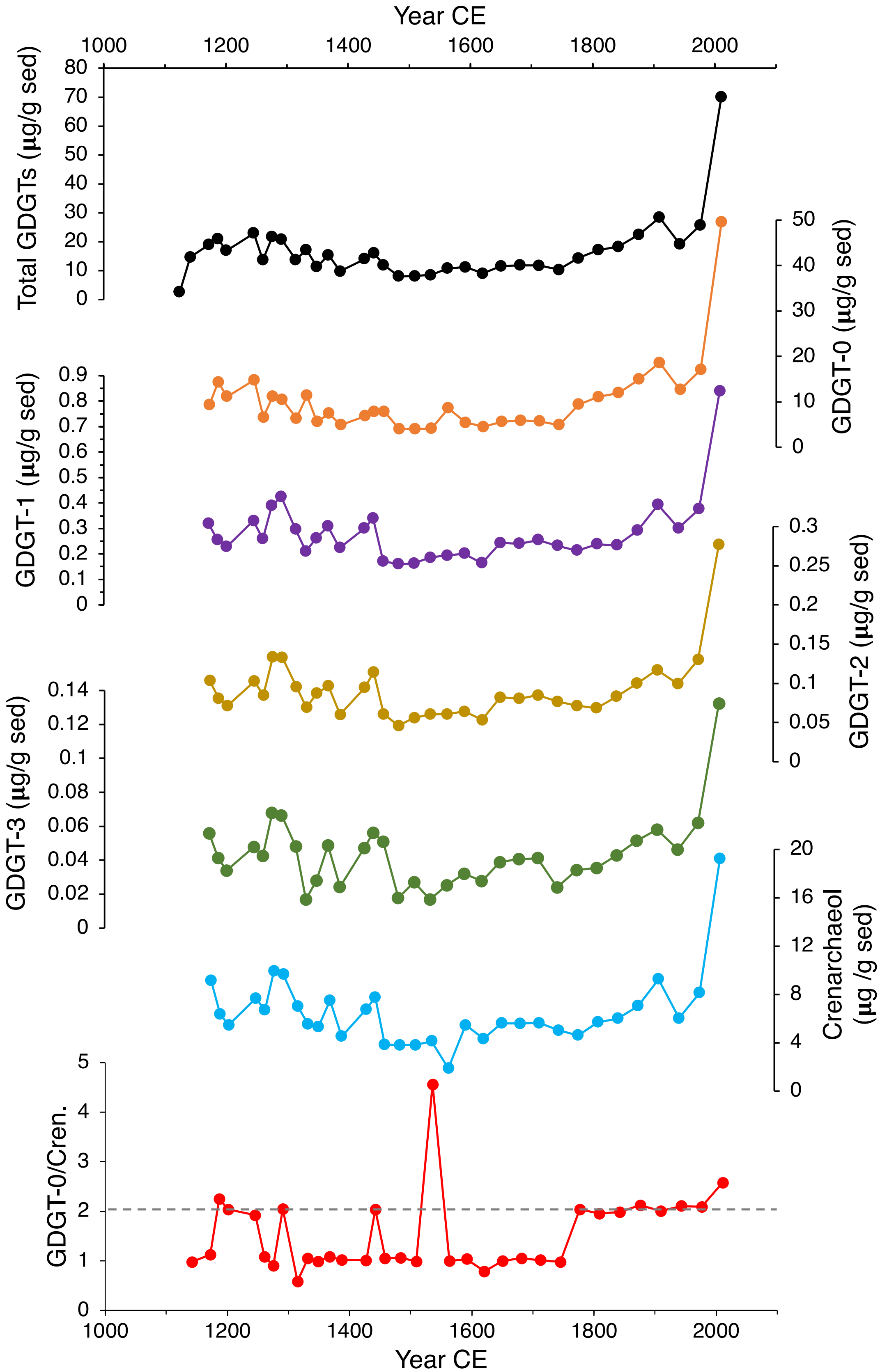
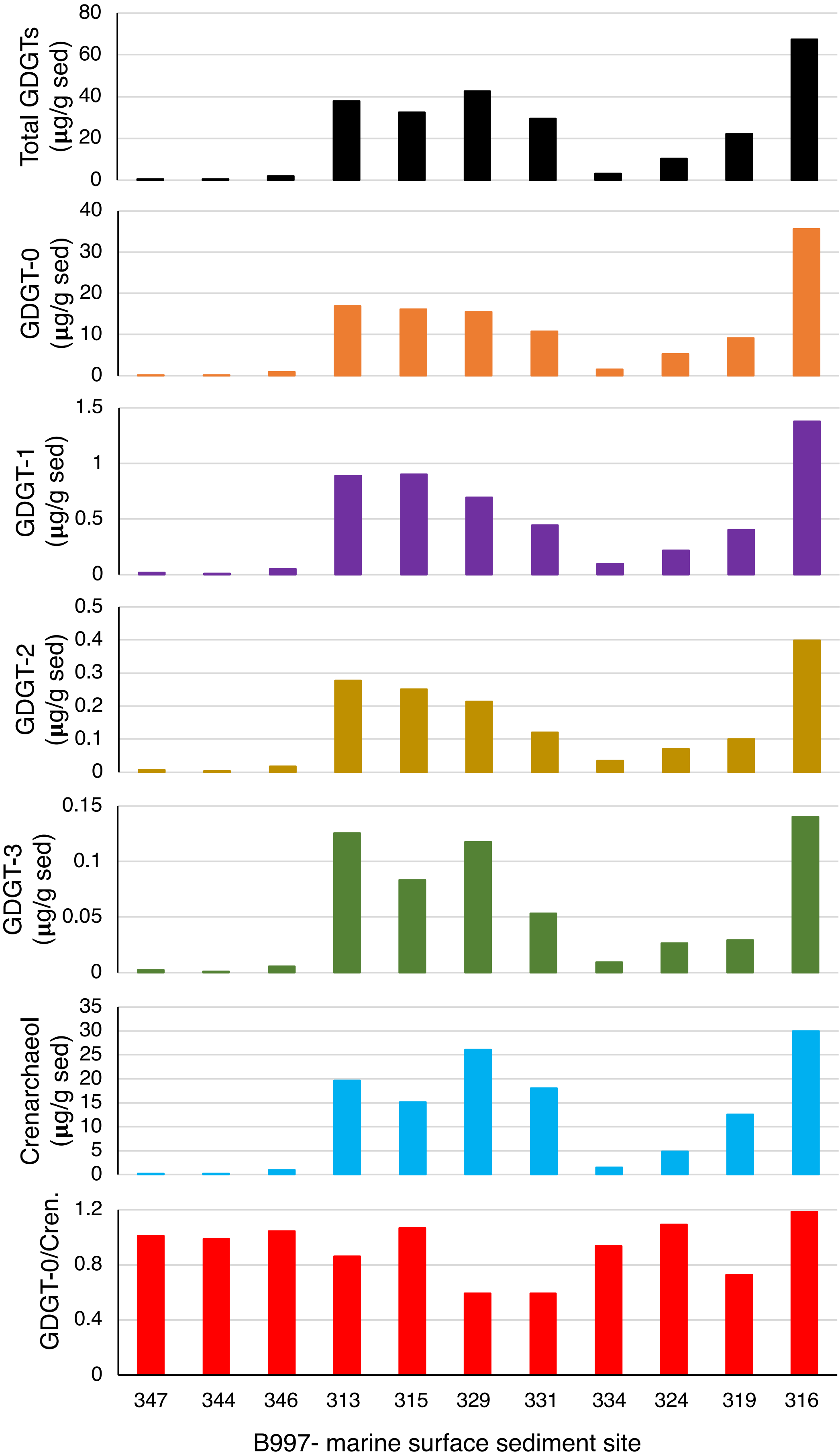


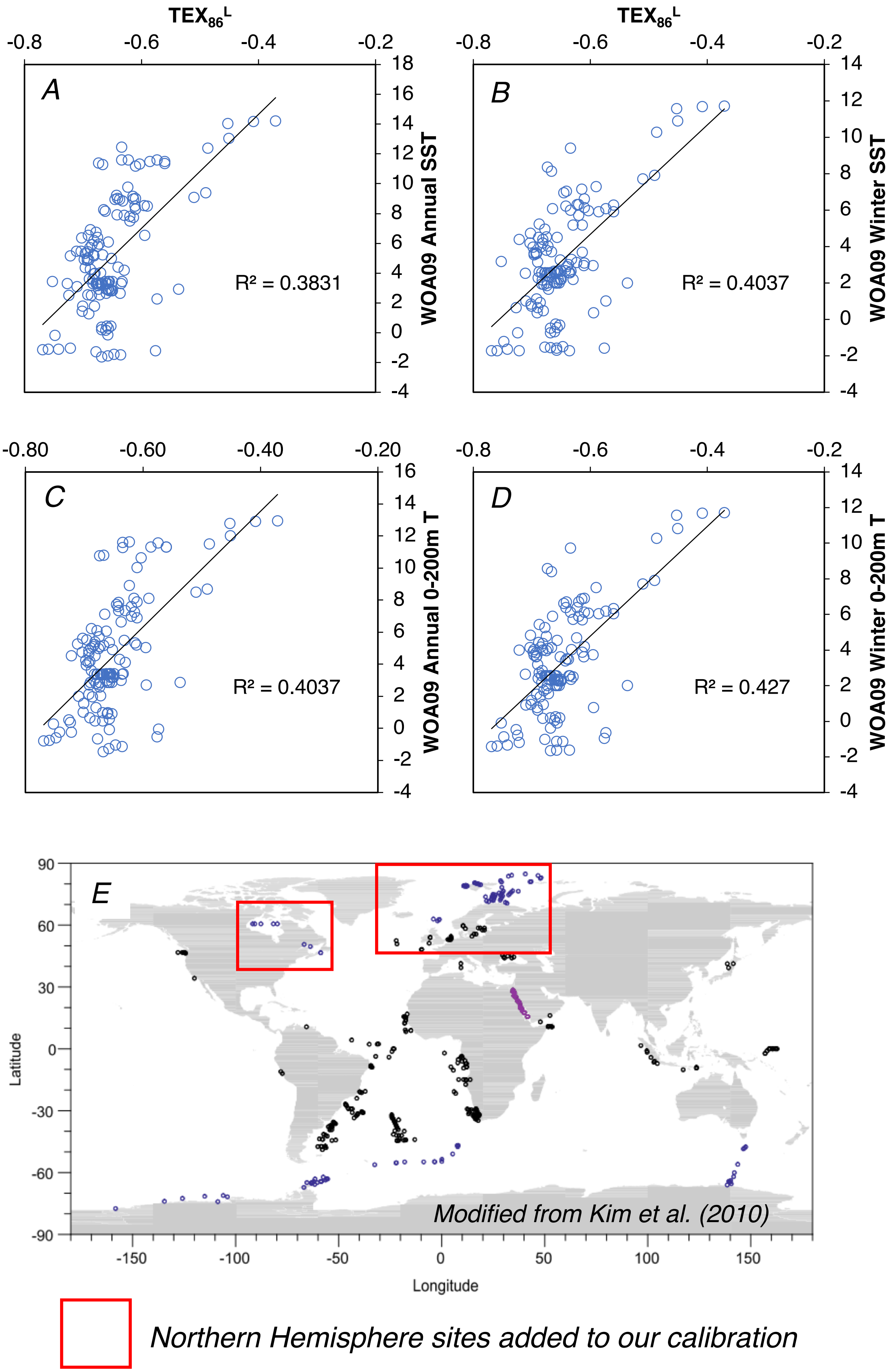
Fig. 6: Comparison of select B997-316 GGC marine climate proxies to other well-dated, high-resolution Icelandic NIS marine climate records. A) B997-316 GGC IP_{25} and Triene Z concentrations (this study), B) MD99-2275 alkenone-inferred SST (Sicre et al., 2011), C) B997-316 GGC diene-II/IP_{25} (this study), D) B997-316 GGC GDGT-inferred subsurface temperatures, with values below the record mean highlighted in blue (this study), and E) schlerochronological ΔR record, where increases in ΔR_{shell} values reflect the incursion of older, Arctic waters, and a weaker AMOC (Wanamaker et al., 2012). Vertical blue bars highlight the period of interpreted thick sea ice, and then the delayed associated insulation/warming of the subsurface. Dashed blue lines bound the inferred periods of LIA-like conditions for the surface (A-C) and subsurface (D).



Supplemental Fig S1: GDGT concentrations in B997-316 GGC marine sediment samples. GDGT-0/crenarchaeol ratios > 2 suggest the presence of methanogenic Eukaryotes, which produce the same GDGTs as marine Thaumarchaeota, but with different distributions (Blaga et al., 2009). Thus, when methanogenic Eukaryotes are present, take caution in the TEX86 ratios.



Supplemental Fig S2: GDGT concentrations in B997 marine surface sediment samples. Sample labels are abbreviated (i.e., 347 = B997-347) and ordered geographically from the southwestern-most (347) to the northeastern-most (316).



Supplemental Fig S3: Using samples selected from the global calibration of Kim et al. (2010) we tested whether we could improve the local calibration by extending the range of samples, and thus, the environmental gradient. A) Annual SST, B) Winter SST, C) Annual 0-200 m T, and D) 0-200m T. Panel E highlights the northern hemisphere samples included from the the global calibration of Kim et al. (2010).