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A new sea-surface temperature perspective on MIS 11 from multi-species planktonic foraminiferal Mg/Ca ratios at North Atlantic IODP Site U1313

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Marine Isotope Stage (MIS) 11 is widely regarded as a potential analog for future warming due to its similar orbital configuration and greenhouse gas concentrations. Yet the magnitude of North Atlantic sea-surface warming and the influence of seasonal and habitat biases on planktonic foraminiferal proxies remain unresolved. We present paired $\delta^{18}O$ and Mg/Ca measurements from *Globigerina bulloides*, *Neogloboquadrina incompta*, and *Globigerinoides ruber* (white) across MIS 11–12 at IODP Site U1313 to reconstruct upper-ocean structure and sea-surface temperature (SST) variability.

Convergent $\delta^{18}O$ values among mixed-layer and thermocline dwellers during major ice-rafted detritus (IRD) events indicate substantial homogenization of the upper water column, implying reduced stratification and similar calcification temperatures across taxa. This pattern mirrors upper-ocean conditions documented during the last glacial cycle. Mg/Ca-derived SSTs from *G. bulloides* reveal a pronounced thermal maximum between 411–400 ka, contrasting with earlier interpretations of MIS 11 as a uniformly warm and stable interval (425–386 ka). Instead, our results align with deuterium-based temperature reconstructions from the EPICA Dome C ice core, suggesting strong interhemispheric climate coupling between the North Atlantic and Antarctic during this period. These findings refine the thermal evolution of MIS 11 and highlight the importance of multi-species geochemical approaches for resolving past upper-ocean dynamics and their relevance to future climate analogs.