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Middle Eocene Regional Climate Instability and Palaeoceanography of the Western North Atlantic: Implications for the Position of the Proto Gulf Stream

High-resolution (3 k.y.) stable isotope analyses ($\delta^{18}O$, $\delta^{13}C$) were conducted on middle Eocene (ca. 40 – 37 Ma) planktonic foraminifera from the Ocean Drilling Program Leg 171B (Blake Nose, western North Atlantic). The analysis of mixed layer dwelling planktonic foraminifera permits the measurement of surface water conditions and provides significant insights into Eocene climate dynamics and how these differed from those of the present day. The study exposed a more complicated pattern of climate variability than was formerly anticipated, with large (>1‰) and rapid (<10 k.y.) variations in $\delta^{18}O$. The magnitude of change is greater than that seen in open-ocean Pleistocene records but could not have been caused by ice-volume and/or sea-level fluctuations. Instead, the oxygen isotope shifts resulted primarily from large oscillations in sea-surface temperatures with shifts of up to 12ºC. High frequency instability of sea-surface temperatures may have been attributable to deflections in the position of the Gulf Stream across the Blake Plateau. The results indicate that the regional oceanography of the middle Eocene western North Atlantic was not consistently warm or stable and that short-term regional climatic oscillations has been pervasive in time and space even during periods that lacked significant ice-volume fluctuations.