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PP11B-1395

Centennial-Scale Nannoplankton Productivity Changes in the Mid-latitude North Atlantic During Marine Isotope Stages 11-12: Evidence From IODP Site 1313

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High-resolution nannoplankton records from sediment cores recovered at Integrated Ocean Drilling Program Site U1313 reveal past changes in surface water conditions during Marine Isotope Stages (MIS) 11-12. Samples were spiked with microbeads for collection of quantitative assemblage data and calculation of coccoliths per gram of sediment, which is an estimate of nannoplankton productivity. These data are compared to oxygen and carbon isotopes, total lithics (>315 μm), and high-resolution X-ray fluorescence measurements. Nannoplankton productivity correlates well with the $\delta^{18}\text{O}$ and calcium data, showing a gradual decrease in productivity during MIS 12, followed by a relatively rapid increase during Termination V, with generally higher levels in MIS 11. Gephyrocapsids dominate the assemblage throughout the studied interval. *Gephyrocapsa oceanica*, typically considered a warm-water species, is abundant during MIS 12. Some intervals of higher abundance are associated with lithic peaks, and could relate to decreased salinity from melting ice. *Gephyrocapsa caribbeanica*, typically a cold-water species, is also abundant during the studied interval, but only loosely correlated to inferred temperature. A transition from abundant large gephyrocapsids (>4 μm) during MIS 12 to small forms (<2.5 μm) occurs during Termination V. Small gephyrocapsids have been linked to both upwelling conditions and warmer temperatures. High abundance of the lower photic zone species *Florisphaera profunda* is typically interpreted as evidence for increased surface water stratification. The abundance of *F. profunda* fluctuates significantly during MIS 12, with the highest abundance (~4%) occurring just before the onset of Termination V. The studied interval also includes the biostratigraphically important last (common) occurrence of *Pseudoemiliania lacunosa* at 20.76 c-mcd (451.93 ka) during MIS 12. These results correlate well with other published nannoplankton data for the Atlantic basin, suggesting a change from cool, intermittently stratified surface waters during MIS 12 to warmer surface waters in MIS 11.

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