Responses of calcareous nannoplankton to mid-Pliocene dynamics between climate and the carbon cycle in the North Atlantic

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Calcareous nannoplankton, a vital component of marine ecosystems, serve as key players in the oceanic carbon cycle. Thus, exploration of their population dynamics, biomass variations, and calcite content will provide insights into past interactions between climate and the carbon cycle. Using sediment samples from mid-latitude North Atlantic Integrated Ocean Drilling Program (IODP) Site U1313, we assess the calcareous nannofossil assemblage and calcification response to major climate steps during a period of global warming under close-to-modern orbital and continental configurations (mid-Piacenzian Warm P eriod, ~3.3 to 2.9 Ma). Here, we present initial results from a total of 200 samples spanning Marine Isotopic Stage (MIS) M2 to KM5c, a period encompassing an anomalously cold glacial stage within the warm background climate of the Pliocene prior to the full-scale bipolar glaciation of the Pleistocene. This research seeks to improve our understanding of how calcifying phytoplankton responded to mid-Pliocene "glacial–interglacial" conditions and whether their productivity, calcite content, and/or morphology are linked to documented climate and pCO_2 changes at or above modern values.

We used quantitative coccolith slide preparation techniques and AI microscopy (SYstème de Reconnaissance Automatique de COccolithes [SYRACO]) at CEREGE (Aix-en-Provence, France) to quantify changes in absolute and relative abundances of nannofossil species, as well as coccolith morphology (size and mass). With these data, we calculated group-specific coccolith mass accumulation rates, as well as changes in morphological diversity index (MDI). In combination with existing records spanning this interval, including many from Site U1313, this new calcareous nannofossil dataset will help us to understand coccolithophore productivity, calcification, and carbonate export responses to climate and carbon cycle changes during the Pliocene, with implications for understanding the near future responses of marine calcifiers.