Transient symbiont bleaching of planktonic foraminifera during the Middle Eocene Climatic Optimum

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The short-term or permanent loss or inhibition of photosymbionts – '*bleaching*' – has recently been reported in many modern organisms including corals and benthic foraminifera in response to environmental stress. However, bleaching events in the fossil record and their impacts are relatively unknown. During the early and middle Eocene (~36-60 Ma), low and mid-latitude planktonic foraminiferal assemblages were dominated by surface-dwelling, symbiont-bearing genera including *Acarinina, Morozovelloides* and *Globigerinatheka.* A transient global warming event at ~40 Ma, the Middle Eocene Climatic Optimum (MECO), provides an opportunity to assess biotic impacts on these taxa in response to sea-surface temperatures and other transient environmental changes. We use size-restricted $\delta^{13}C$ analysis of planktonic foraminifera to investigate symbiont activity across the MECO event at Ocean Drilling Program (ODP) Sites 1051 and 748 (NW Atlantic and Southern Ocean, respectively). Our new records indicate large changes in the ecology of the surface-dwelling foraminiferal groups, specifically the acarininids and globigerinathekids, which experienced bleaching, during the MECO. Close coincidence between minimum $\delta^{18}O$ values and a loss or reduction in the test size- $\delta^{13}C$ gradient may imply a link between short-term loss of photosymbionts and increased sea surface temperatures (SSTs) during the MECO. We evaluate the viability of potential bleaching mechanisms including: 1) a direct impact from increased SSTs, 2) a shift to deeper in the water column in response to warming, 3) a restriction of depth habitat and 4) a response to pH decrease in surface waters. Following the MECO, photosymbiotic activity in surface-dwelling taxa at both study sites rapidly returned to pre-event levels.