

Paleoenvironment across the Middle Eocene Climatic Optimum

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The Middle Eocene Climatic Optimum (MECO) is an abrupt short-term global warming event that occurred about 40 Ma. Although this event is now reported from all across the world, the environmental impacts and biotic responses accompanying the event are still poorly understood. Since we are now faced with the threat of global warming, deeper understanding of past global warming events like the MECO is critical.

We present bulk carbonate stable isotope data, coarse fraction accumulation rates (CFAR), and planktic foraminiferal assemblage data spanning the MECO interval from International Ocean Discovery Program (IODP) Site U1408 in the Northwest Atlantic to assess environmental changes and biotic responses across the event. A negative shift in bulk $\delta^{18}\text{O}$ was observed from 40.6 Ma (the MECO onset) to 40.0 Ma (the peak MECO), followed by a sudden return to the background level by 39.9 Ma (the termination). A significant decline of CFAR was observed near the peak of the MECO (40.3 Ma–40.0 Ma). This may reflect a decline in planktic foraminiferal production due to starving caused by elevated metabolism coupled by limited availability of nutrients. In contrast, a sudden increase in bulk $\delta^{13}\text{C}$, CFAR, and eutrophic planktic foraminiferal genus, *Pseudohastigerina*, was observed immediately after the peak of the MECO (40.0–39.9 Ma). This may indicate a sudden switch to the eutrophic environment and an increase in primary and planktic foraminiferal production. The termination of the warming might have caused continental aridification and resulted in an increased input of aeolian dust to the ocean. In addition, the relative abundance of photosymbiotic planktic foraminiferal genus, *Acarinina*, declined toward the peak of the MECO, while the relative abundance of another photosymbiotic genus, *Globigerinatheka* remained almost constant throughout the MECO. This may indicate the loss of photosymbiotic algae exclusively affected *Acarinina* during the event.

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