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Correlation of early Paleogene global diversity patterns of large benthic foraminifera with Paleocene and Eocene climatic events

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ABSTRACT

Large benthic foraminifera (LBF) were major contributors to many Paleogene carbonate platforms around the world. These photosymbiotic foraminifera lived in warm, oligotrophic, shallow waters within the photic zone. Such Paleogene families as the nummulitids, alveolinids, and orthophragminids rose to prominence in the late Paleocene, thrived in the early and middle Eocene, and declined in the late Eocene and Oligocene. Diversity data from these three families were studied to understand better the controls on the rise of Paleogene LBFs. Analyzed data included total diversity (total number of species per biozone), number of first occurrences per biozone, and number of last occurrences per biozone. Results indicate that there were four intervals of increased total diversity, increased first occurrence, and increased last occurrence for all three families studied. These four intervals follow closely after important climatic events within the Paleogene: mid-Paleocene biotic event (MPBE), the Paleocene–Eocene thermal maximum (PETM, a hyperthermal event), the early Eocene Climatic Optimum (EECO) and the middle Eocene Climatic Optimum (MECO). The shallow marine biotic community, on a global scale, reacted to such climatic warming events as the MPBE, PETM, EECO, and MECO, based on these diversity trends. Our data also show a pattern of an increase in the number of last occurrences followed by an increase in the number of first occurrences, which suggests that the overall increase in species diversity is due to faunal turnover, as has been interpreted for the large benthic foraminiferal turnover that occurred at the PETM.