

Middle to Late Miocene calcareous nannofossil biostratigraphy and paleoecology at Broken Ridge, eastern Indian Ocean (ODP Site 752)

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The Middle to Late Miocene represents an important time interval in the Indian Ocean due to the reorganization of land masses and the occurrence of important climatic events, such as the establishment of a near-modern monsoonal wind system, the Middle Miocene Climatic Transition, and the subsequent northward shift of the westerlies during the Late Miocene. However, the effect of these forcing mechanisms on intermediate and surface ocean dynamics in the southern subtropical Indian Ocean remains poorly understood. Ocean Drilling Program (ODP) Site 752, located on the western flank of Broken Ridge (30°53.475'S, 93°34.652'E), represents a key location for understanding how oceanic currents may have been affected by the above-mentioned mechanisms in the eastern sector of the Indian Ocean during the studied Miocene interval.

During ODP Leg 121, an initial biostratigraphic framework for Site 752 was established. However, the limited biostratigraphic data, due to poor preservation of sediment material for the Middle to Upper Miocene, resulted in a low-resolution shipboard age-depth model. We present here a newly updated high-resolution biostratigraphic age-depth model based on fully quantitative nannofossil assemblage analyses and planktonic foraminiferal bioevents for the time interval between ~15 and ~8 Ma for Hole 752A. The biostratigraphic age-depth model was compared with a recently published astrochronologically tuned age-depth model (Lyu et al., 2023) for further validation. A high consistency between models was observed for the whole record, except for the interval between ~13 and 12 Ma, where the age difference is high. We link these discrepancies to the potential variance in age of the recorded bioevents for this interval between basins, as well as the error associated with the mathematical approach of the tuned age model.

Based on our quantitative nannofossil data, we further evaluated overall changes in the nannofossil assemblages at ODP Site 752. Unpaired pair group method with arithmetic mean (UPGMA) clustering analyses resulted in five major clusters. Cluster 1 is characterized by a high abundance of *Reticulofenestra minuta* (average = 49.25%) and low abundances of medium (>3 µm) and large (>5 µm) reticulofenestrads. Cluster 2 is defined by a high abundance of *Calcidiscus leptoporus* and a higher abundance of *Umbilicosphaera jafari* when compared with the other clusters (average values of 18.34% and 1.42%, respectively). Cluster 3 is characterized by a high abundance of medium-sized (3–5 µm) reticulofenestrads, whereas Cluster 4 is characterized by a high abundance of *Coccolithus pelagicus* and *Discoaster* spp. (average of 22.56% and 7.38%, respectively). Cluster 5 is defined by a high abundance of *Reticulofenestra producta* (24.61%) and large reticulofenestrads (>5 µm) such as *Reticulofenestra pseudoumbilicus*.

References:

Lyu, J., Auer, G., Bialik, O.M., Christensen, B., Yamaoka, R. & De Vleeschouwer, D. 2023. Astronomically-Paced Changes in Paleoproductivity, Winnowing, and Mineral Flux Over Broken Ridge (Indian Ocean) Since the Early Miocene. *Paleoceanography and Paleoclimatology*, **38**(12): e2023PA004761. <https://doi.org/10.1029/2023PA004761>