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Integrated planktonic foraminiferal and calcareous nannofossil biostratigraphy and paleoenvironmental inferences for Turonian sediments from Tanzania

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Turonian marine claystone sediments recovered from 10 boreholes drilled during the Tanzania Drilling Project (TDP) in southeast Tanzania yield some of the best preserved microfossils in the world, providing valuable new insight on planktonic foraminiferal and calcareous nannofossil evolution, taxonomy, biostratigraphy, and biodiversity. Integration of species distribution data obtained from the studied sections with bulk sediment geochemical data, foraminiferal stable isotope data, and lithostratigraphy also enables new inferences on changes in the depositional environment.

The early-middle Turonian Tanzanian record reveals a prolonged period of species stasis with essentially no changes in species relative abundance, no species extinctions, and no evolutionary first occurrences for both calcareous plankton groups until the late middle Turonian. This is followed by two species turnover events in the late Turonian that have not been well documented previously. The older of these turnovers occurs at the top of the mid-Turonian *Helvetoglobotruncana helvetica* Zone, where last occurrences of four planktonic foraminiferal species are immediately followed, within several meters, by first occurrences of five foraminiferal species and an increase in the abundance of dwarfed planktonic forms. Changes in the calcareous nannofossil assemblages are less profound and marked by the extinction of one calcareous nannofossil species and an abrupt but temporary spike in the abundance of another species. There are no obvious changes in lithology, bulk sediment geochemistry, or stable isotope values across this first turnover event. The second species turnover occurs within the late Turonian middle *Marginotruncana schneegansi* Zone and is marked by extinction of three calcareous nannofossil species followed by first appearances of four calcareous nannofossil species. Corresponding with the nannofossil first occurrences are a dramatic increase in the relative abundance of biserial taxa,

first occurrences of two planktic foraminifer species, a strong diagenetic shift causing calcareous infilling of all foraminiferal tests in overlying samples, and an increase in sediment grain size.

Comparison between the TDP planktonic foraminiferal species distributions and those observed in Turonian core samples from Ocean Drilling Project Hole 762C (Exmouth Plateau, subtropical southeast Indian Ocean) reveals significant differences, including: (1) no evidence at Site 762 for evolutionary stasis during the early-middle Turonian; (2) several marginotruncanid planktonic foraminifera have older stratigraphic ranges at Site 762; and (3) the species changes associated with the turnover events in Tanzania are much less significant at Site 762. These differences are attributed to factors related to the different mesotrophic and oligotrophic environmental settings of the clastic margin vs. pelagic carbonate sequences. Taxonomic study and biostratigraphic comparisons between these sites result in an improved integrated biostratigraphic scheme that improves the temporal resolution for global correlation of calcareous nannofossil and planktonic foraminiferal bioevents.

