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Nitrogen isotopes: Did climate change affect low latitude Paleogene plankton?

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Between the towns of Kilwa and Lindi, on the southern coastal margin of Tanzania, an expanded Paleogene succession has been continuously cored by the Tanzanian Drilling Project (TDP). The Paleogene (65-24Ma) contains two of the most significant global climate change events from the past 65Ma: The global-warming event; the Palaeocene-Eocene Thermal Maximum (PETM); and the global-cooling event; Early Oligocene Climate Event (EOCE). Both have been cored in this region by TDP, along with many of the smaller climate events of the Paleogene. The succession itself is a mid- to outer-shelf passive margin sequence dominated by organic-rich clays and claystones with occasional ribbon limestones and more carbonate-rich intervals.

The organic-rich clays lend themselves to use of nitrogen isotope chemostratigraphy. In addition to use in ecosystem studies, nitrogen isotopes record changes in the nutrient supply and planktonic biomass providing a proxy for past changes in climate and ocean circulation patterns. Preliminary nitrogen isotope results suggest a significant decrease in delta^{15}N at the onset of the PETM. This negative shift in delta^{15}N coincides with an extinction of benthic foraminifera at this site and may indicate a broader ecosystem collapse. Productivity collapse is a likely result of switching off the nutrient supply to the planktonic biomass. There are many ways to switch off nutrient supply, but this may indicate stratification of the water column - much like that seen during El Niño events, but over a longer timescale. Current refinement of the technique will allow results from this succession as a whole to provide a clearer picture and context of the East African climate through the Paleogene.