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Foraminiferal turnover at the Eocene-Oligocene boundary in Tanzania and Java

Paul N. Pearson¹; Ian K. Mcmillan¹; Bridget S. Wade² & Helen K. Coxall¹

¹*School of Earth, Ocean and Planetary Sciences, Cardiff University,
Main Building, Park Place, Cardiff CF10 3YE, U.K.
pearsonp@Cardiff.ac.uk*

²*Department of Geological Sciences, Rutgers University, New Brunswick, New Jersey 08903, U.S.A.*

The Eocene-Oligocene stage boundary (as currently defined) is marked by the disappearance of the Hantkeninidae, a distinctive group of tubulospinose planktonic foraminifera. The boundary is generally accepted to pre-date the well-known phase of rapid ice accumulation on Antarctica and associated climate and sea-level change (which occurred in the early Oligocene). There has been little detailed study of foraminifer turnover at the Eocene-Oligocene boundary proper, because good expanded sections with abundant and well-preserved foraminifera are rare.

We have obtained three new drill-cores through the Eocene-Oligocene boundary in Tanzania and (at the time of writing) one new drill-core from Java, Indonesia. Both were deposited in shelf-slope settings and are now exposed on land. These sites are important in recording tropical events through the boundary interval in mudstone facies with exceptionally well-preserved foraminifera. The presence of common allochthonous shallow-water debris in the sites also permits correlation with large benthic foraminifer extinction events as well as nannofossil biostratigraphy.

The Tanzanian sites are highly expanded (with sedimentation rates higher than 10cm / kyr). Five morphospecies of Hantkeninidae are recognized, all of which disappear simultaneously in an interval of less than 30cm. There is no evidence of a hiatus at this level. The hantkeninid morphospecies (*Hantkenina alabamensis*, *H. nanggulanensis*, *H. primitiva*, *H. compressa* and *Cribrohantkenina inflata*) are too dissimilar to realistically belong to a single biospecies, hence the extinction appears to have been a coordinated event involving several closely related species. To date we have been unable to identify a probable cause for the extinction.

The Eocene-Oligocene boundary extinction is distinctly preceded by a similar coordinated extinction within the genus *Turborotalia*. Several

morphospecies belonging to the *T. cerroazulensis* group disappear in the top 10m of the Eocene in Tanzania (*Turborotalia cerroazulensis*, *T. cocoaensis* and *T. cunialensis*). A similar short interval between the extinctions of these two groups has also been observed at the GSSP in Massignano, Italy (where the estimated interval between the events is about 60 kyr), and other Tethyan sections.

An interesting feature of the new sections is the record of smaller and larger benthic foraminifera. The Eocene-Oligocene boundary is associated with the extinction of several important groups of larger foraminifera. Our data indicate that the turnover event(s) at or very near the stage boundary were significant and affected very widely distributed taxa (particularly among the larger foraminifera), implying a severe global perturbation that preceded the major climate shift in the early Oligocene.