Anuário do Instituto de Geociências - UFRJ
ISSN 0101-9759 Vol. 29 - 1 / 2006

FORAMS 2006

The Micropaleontology of Critical Boundaries

Chaired by Ellen Thomas and Robert Speijer

Overall, the Earth's biosphere has shown a strong increase in diversity over the Phanerozoic, although the pattern of this increasing diversity is being debated: did diversity increase logarithmically (although interrupted by mass extinctions), or were there periods of stability? Microfossils offer an unrivaled opportunity to study the patterns of change in diversity and assemblage composition at times of major faunal turnover throughout the Phanerozoic, including periods of mass extinction and recovery, and intervals of major climate change. We call such intervals 'critical boundaries'; they include the Frasnian-Famennian, Permo-Triassic, Triassic-Jurassic, Cretaceous-Paleogene, Paleocene-Eocene, Eocene-Oligocene boundaries as well as Oceanic Anoxic Events. In microfossil studies, large populations can be sampled across such events, and possible relations between evolutionary and environmental change can be evaluated statistically. The study of microfossils also offers the opportunity to compare patterns of extinction in planktic and benthic forms, and in shallow and deep water forms. Contributions present information on short-term or long-term patterns of change in diversity and assemblage composition across periods of rapid (*e.g.*, K/P) or more gradual (*e.g,* E/O) environmental change, including comparisons between variations in faunal and geochemical (including isotope) proxies.

Anuário do Instituto de Geociências - UFRJ
ISSN 0101-9759 Vol. 29 - 1 / 2006 p. 165

FORAMS 2006

The Cretaceous/Paleogene boundary event in the deep sea: Inferences from the Caribbean and the Gulf of Mexico

Laia Alegret & Alfonso Meléndez

Dept. Ciencias de la Tierra, Universidad de Zaragoza, Zaragoza, España
laia@unizar.es

The impact of an asteroid at Chicxulub (Yucatan Peninsula, Mexico) in coincidence with the Cretaceous/Paleogene (K/Pg) boundary is the most plausible hypothesis to account for the mass extinctions recorded worldwide, and the deposition of the so called "K/Pg boundary cocktail unit" in the Gulf of Mexico, Caribbean and North Atlantic. In these areas, the Chicxulub impact caused mass wasting processes, submarine landslides and extensive slumps related to the destabilization of the continental margins, leading to the deposition of a mixture of impact-derived materials, heterogeneous lithic fragments and reworked fossils. Nevertheless, there is still some controversy as to this single catastrophic scenario, and the origin and model of deposition of the K/Pg boundary deposits from the Gulf Coast and Caribbean need more research. The study of K/Pg boundary deposits from Cuba, which was located relatively close to the impact site, is of great importance to investigate the K/Pg boundary event.

At the Loma Capiro section (central Cuba; Alegret *et al.*, 2005. *Geology*, 33: 721-724), the K/Pg boundary is located within the Santa Clara Formation, at the base of a 9.6m-thick, fining-upward clastic complex that overlies the uppermost Maastrichtian marls and underlies the lower Paleogene silty sediments. In addition to the sedimentological analysis, the study of the abundant microfossils that are present through the whole section may provide some additional information on the origin and deposition of the clastic complex, and on its relationship with the K/Pg boundary event.

Analysis of benthic foraminiferal assemblages from Loma Capiro shows a close similarity to Upper Maastrichtian and lower Paleogene assemblages from bathyal sections in Mexico. They contain abundant representatives of the bathyal and abyssal Velasco-type fauna, such as *Aragonia velascoensis, Gyroidinoides globosus, Nuttallides truempyi, Stensioeina beccariiformis*. At Loma Capiro, upper Maastrichtian and lower Danian sediments below and above the clastic complex contain benthic foraminiferal species typical from bathyal settings. The clastic complex itself, in contrast, contains a mixture of

benthic foraminifera and other fossils from different ages and different environments, including taxa typical from shallow and deep-water settings. Assemblages from the clastic complex at Loma Capiro probably resulted from reworking and down-slope transport triggered by the K/Pg boundary impact. A similar scenario was reported from the Mexican sections, where the K/Pg clastic complex contains mixed neritic-bathyal faunas that indicate redeposition in the deep basin by mass-wasting processes resulting from the K/Pg boundary impact in the Gulf of Mexico (Alegret *et al.*, 2001. *Geology*, *29*: 891-894).

Moreover, the comparison of the benthic foraminiferal turnover in sections from Cuba and Mexico constitutes an important tool to reconstruct paleoenvironmental changes across the K/Pg boundary. At Loma Capiro, as in the Mexican sections, lowermost Paleogene sediments immediately above the clastic complex contain assemblages dominated by oligotrophic taxa such as *Cibicidoides hyphalus*, *N. truempyi*, and *S. beccariiformis*, with low percentages of infaunal taxa. These data indicate a decrease in food supply to the seafloor in this area, probably related to the collapse of surface primary productivity that occurred immediately after the K/Pg boundary impact event.

L.A. holds a Ramón y Cajal contract from the Spanish Ministerio de Educación y Ciencia. This research was funded by project CGL2004-00738/BTE.

Anuário do Instituto de Geociências - UFRJ
ISSN 0101-9759 - Vol. 29 - 1 / 2006 p. 475-476