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BIO-, MAGNETO- AND EVENT-STRATIGRAPHY ACROSS THE K/T BOUNDARY

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Determining the time and the time structure of rare events in geology can be accomplished by applying three different and independent stratigraphic methods: Bio-stratigraphy, magneto-stratigraphy and event-stratigraphy. The optimal time resolution of the two former methods is about 1000 years, while by means of event-stratigraphy a resolution of approximately one year can be achieved (1).

For biostratigraphy across the K/T boundary micro- and nannofossils have been found best suited. The biologic turnover manifested by the disappearence of the Late Cretaceous microfauna (large planktonic foraminifera) and nannoflora and the evolution from small surviving species in the lowermost Danian has been known for a long time and has been found to indicate the K/T event at preserved K/T boundary sites all over the globe. Since paleomagnetism is determined by forces within the core of the earth, the change of magnetic polarity is worldwide and synchronous. Taking the K/T boundary as an example, it can be shown that its relative position within Chron 29R is the same at each boundary site independent of the thickness of sediments (2).

The K/T event, 66.7 m. years ago, has left its distinct fingerprints mainly in deep sea sediments of that age. The qualitative and quantitative analyses of minerals and trace elements across the K/T boundary show anomalies on a millimeter scale and permit conclusions regarding the time structure of the K/T event itself.

The results of our analyses find a most consistent explanation by the assumption of an extraterrestrial impact. The main portion of the material rain from the atmosphere ("fall-out") evidently was deposited within a short time.

The long-time components consist of the finest portion of the material rain from the atmosphere and the transported and redeposited fall-out ("redeposition"). The cretaceous hemipelagic sediments contain about 70 % of biogenic calcium carbonate, and its $\delta^{13}C$ values indicate a microfauna living in warm surface waters. After the K/T event the $CaCO_3$ contents are diluted down to only 20 % and the $\delta^{13}C$ decreases to values corresponding to those of bottom waters (Fig.1). The phenomena in these sediments are direct consequences of the K/T event ("post event sequence").

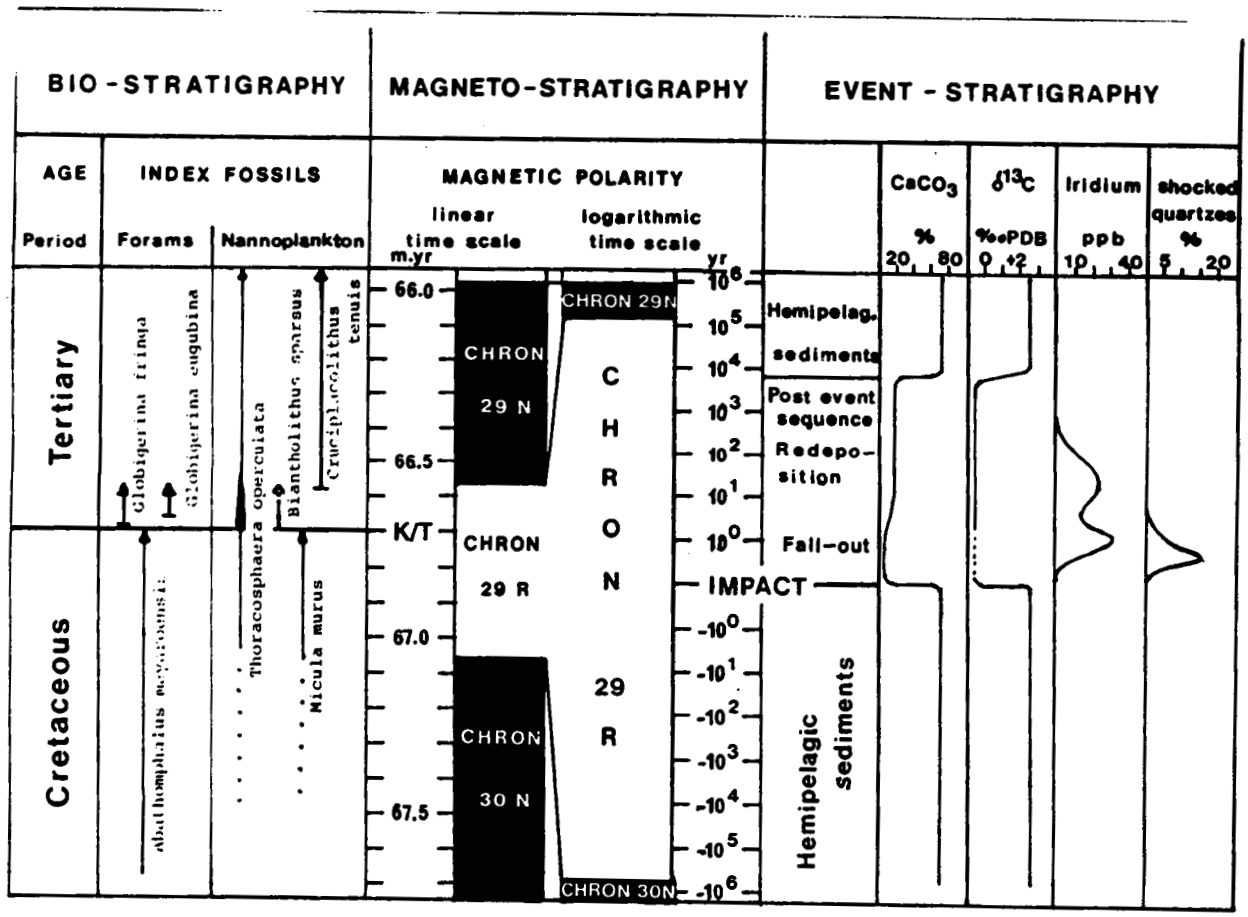

Fig.1
Characteristic features of hemipelagic sediments across the K/T boundary (Marine sediments from a paleodepth of about 1500 meters). Contents of Iridium and shocked quartzes are given in ppb and % respectively of decalcified samples.

References

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