Changes in ocean chemistry across the K/T boundary: A laser-ablation study of a marine Fe/Mn crust

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The Cretaceaous/Tertiary transition at 65 Ma marks one of the most extensive Phanerozoic mass extinctions, most likely caused by a giant bolide impact, the eruption of the Deccan flood basalts, or a combination of both.

In this study we analysed the major and minor element composition of a thick (106 mm) marine Fe/Mn crust (CD29-2 from the central Pacific ocean) at high resolution. Element concentrations were determined along continuous sections of the crust using a 193 nm Excimer laser ablation unit attached to a quadrupole ICP-MS. The crust was previously dated by Os-isotope stratigraphy, which revealed the presence of several hiatuses and a total age of 72 Myr at the base of the crust [1]. The section representing the period between 72 and 48 Ma is continuous and undisturbed. The K/T boundary was clearly identified in the crust by its pronounced Os isotope minimum.

We determined the concentrations of 35 elements. Particular attention was paid to hydrogenetic metals and platinum-group elements (Ir and Pt) in the section containing the K/T boundary, which has typically been identified by its anomalously high Ir concentrations in marine sedimentary sequences. In order to avoid disturbing effects of short term changes in growth rate or dilution effects, all concentrations were normalised to those of Co, which provides a reliable measure for the fluxes of elements into Fe/Mn crusts [e.g. 2].

Data were acquired for the entire crust and clearly reveal only one significant peak in Ir/Co, which coincides precisely with the K/T boundary and clearly documents an extraterrestrial contribution. The peak extends over 1 mm thickness and represents approximately 0.5 million years of crust growth. In contrast, the Pt/Co profile does not reveal such a clearly defined maximum. As an example of other hydrogenetic metals, Ni/Co also shows an increase near the K/T boundary but there is a clear time lag between the Ni/Co and Ir/Co peaks. The data from this unique archive will form the basis for a reconstruction of the sequence of changes in ocean chemistry across the K/T transition.

References

[1] Klemm V. et al. (2005) *E.P.S.L.* **238,** 42-48.
[2] Frank, M. et al. (1999) *GCA* **63**, 1698-1708.