

Concurrent PGE anomaly, negative carbon isotope shift, and Chicxulub ejecta at the K-T boundary in ODP Leg 207: No evidence for multiple- impact scenario

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An up to 2-cm-thick Chicxulub ejecta deposit was recovered in 6 holes drilled during ODP Leg 207 (Demerara Rise, about 380 km north of Suriname and ~4500 km off the Chicxulub crater); no other ejecta or volcanic ash layers have been reported from any of these drill sites. The ejecta deposit occurs precisely at (and only at) the biostratigraphic boundary; it also correlates with a sharp negative $\delta^{13}\text{C}$ excursion of -2.5% , a sharp drop of the carbonate productivity from >80 wt% to <20 wt%, and a drastic decline in the abundance of calcareous microfossils. This spherule deposit is the first dual-layer K/T boundary found in marine settings. The most exciting discovery is the presence of calcite and dolomite clasts next to shocked tectosilicates in its topmost millimetre. These carbonate clasts show very distinct, in part exotic features that are obviously related to shock metamorphism. Due to the total lack of bioturbation in this deposit, it is an ideal sample to dissect the “iridium anomaly”, and other geochemical peculiarities. We have performed a detailed survey on the distribution of 40 trace elements in five, up to 7200- μm -long profiles across the K-T boundary using La-ICP-MS with a very high spatial resolution. The most important results are (i) the PGE show particularly high concentrations (e.g., up to 0.095 ppm Pt, and 0.02 ppm Ir) only in the uppermost 1000 μm of the ejecta layer concomitant with the presence of shocked quartz and carbonate clasts; (ii) the low Ni/Cr ratios but also the rather flat distribution patterns of the rare earth elements (REE) point to mafic in addition to the known silicic materials as part of the Chicxulub ejecta; and (iii) the very low Zr/Hf and Nb/Ta ratios, occurring over the whole analysed part of K-T boundary layer (i.e., ~ 6000 μm) but neither below nor higher up in the section, indicate that – contemporaneous with ejecta deposition – supracrustal material was washed off the Guyana Craton into the Atlantic.

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