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From the Yaxcopoil-1 drillhole to ODP Site 540/536: No evidence for pre-KT age of the Chicxulub crater

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The Yaxcopoil-1 (Yax-1) hole (20° 44' 37.72"N, 89°43' 07.11"W), was drilled about 70 km from the crater center (21° 21' 24.60"N, 89° 33' 31.50"W), 15 km from the crater rim. Yax-1 reached a depth of 1510m, and recovered 1106m of core. Fallback impact ejecta were encountered from 894.94-803.75m, overlain by current reworked suevite from 803.75-794.73m. The post impact crater fill has been recovered from 794.10-403m, and consists of fine-grained hemipelagic wackestones, rich in planktic foraminifers. The interval critical for the interpretation of the age of the Chicxulub crater is the transition from impact ejecta to basal Paleocene post-impact crater fill, a short core section of 65 cm from 794.73-794.10 cm. This interval consist -from bottom to top- of a dolomitic cross-bedded and parallel laminated interval of fine sandstone (54cm, 794.73-794.19m) overlain by an 8 cm thick strongly indurated burrowed hardground interval (794.19-794.11m). The hardground is topped by a dark 1cm thick clay layer, not enriched in iridium. Horse-tail laminations in- and adjacent to the clay demonstrate that the clay is an insoluble residue layer, marking a hiatus of several 100k years, consistent with the magnetostratigraphy (Rebolledo and Urrutia, 2004). The 54cm cross-bedded interval has been interpreted by Keller (2004) to contain abundant planktic foraminifers of latest Maastrichtian age. It has been labeled a pelagic micritic limestone (Keller (2007), and therefore these foraminifers were interpreted to be in situ, and not reworked. We have prepared from 12 samples of this interval (http://sheba.geo.vu.nl/˜smit/forums/yax_kt_section.html) a triplicate set of polished thin sections, in addition to the duplicate original set, to test the above hypothesis. The thin sections were analysed by transmitted light (TL) microscopy, ultraviolet (UV) and normal reflected light, Cathode Luminescence (CL) and SEM Backscatter microscopy in order to locate and determine foraminiferal remains. In none of these thin

sections were any recognizable foraminifers found, except benthic foraminifers embedded in a few rare limestone fragments. Abundant shapes were observed that, in transmitted light, superficially resemble chamberlets of foraminifers, and bear a striking resemblance to the shapes published by Keller (2004) as planktic foraminifers of Maastrichtian age. Invariably, when submitted to the TL, CV, UV and SEM methods, those shapes turn out to be dolomite fragments, idiomorphically overgrown by a thin rim of idiomorphic, zoned dolomite. This thin rim superficially resembles chamberwalls of foraminifers, but such walls should be formed of calcite, not dolomite. SEM analysis failed to demonstrate micrite (= <1micron, calcarous grains) in any of the thin sections. These findings effectively rule out the presence of indigenous, Maastrichtian foraminifers, overlying the suevitic impact ejecta, and therefore the evidence for a pre KT age of the Chicxulub impact. ODP sites 536 (2790m) and 540 (2926m) (Alvarez et al 1992), drilled at only 500km resp 590 km from the crater center, reveal a more lucid, unambiguous illustration of the relationship between the Chicxulub impact, iridium anomaly and foraminiferal distributions and the K/T boundary, and deserve to be redrilled by HPC/XPC. Hole 540 core 31 bears a striking resemblance to the succession in Yaxcopoil-1: A 150cm thick current reworked suevitic glass unit (as in Yax-1 altered to smectite) overlies a pebbly mudstone. It contains shocked quartz, and is moderately enriched in Ir (up to 200ppb in the top. This unit grades into a crossbedded interval similar in structure to the interval 794.73-794.19 of Yax-1. This interval contains clasts of smectite, some with remains of internal bubbles, identical to similar smectite clasts in Yax-1. Also this interval is moderately enriched in Ir. Due to a coring gap, the overlying record was not recovered. A similar cross-bedded interval occurs above a coring gap at the base of core 536-9-6, which yields anomalous Ir and identical bubbly smectite clasts as well. In both 536 and 540 this interval contains exclusively Cretaceous foraminifers of diverse ages (Cenomanian-Maastrichtian) and thus is clearly reworked. The iridium anomaly (667ppt) continues into the overlying ooze, which contains also exclusively Cretaceous foraminifers, but smaller in size. Taken together, the record of ODP sites 536/540 clearly shows the close relationship between the iridium anomaly and the glassy ejecta from the Chicxulub impact, which effectively rules out a different impact for the ejecta and iridium anomaly as posited by Keller (2007).

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