THE K/PG TRANSITION ON THE PEAK-RING OF THE CHICXULUB IMPACT STRUCTURE IN CORE M0077 OF IODP-ICDP EXPEDITION 364. Ph Claeys[1], S. Goderis[1], N. J. de Winter[1], A. Wittmann[2], M. Whalen[3] and the IODP-ICDP Expedition 364 Scientists. [1]Analytical-, Environmental- and Geo-Chemistry, Vrije Universiteit Brussel, B-1050 Brussels, Belgium (phclaeys@vub.ac.be), [2]Arizona State University, Tempe, AZ 85287, [3]Department of Geoscience, University of Alaska Fairbanks, Fairbanks, AK 99775.

Introduction: The ~66 Ma old, ~200 km diameter Chicxulub impact structure coincides with the K/Pg boundary and is one of the few terrestrial craters with a well identified and preserved peak-ring. In 2016, the International Ocean Discovery Program (IODP) and the International Continental Scientific Drilling Program (ICDP) jointly drilled 1335 m deep core M007A into the peak ring of Chicxulub offshore the Yucatán Peninsula. Coring started at 505 mbsf (meters below sea floor). Drill core M0077A recovered three main lithological units: 1) Paleogene sedimentary rocks (Post-Impact section), 2) suevite and impact melt rock (Upper Peak ring section), and 3) granitic peak ring rocks intruded by pre-impact dikes and intercalated with suevites and impact melt rocks (Lower Peak Ring section) [1]. They were described and sampled in detail during the Onshore Science Party at the University of Bremen in September-October 2016.

This project already led to new discoveries regarding the formation process of peak-rings and their evolution during the cratering event [2]. Our study reports preliminary chemical data for the part of the core that marks the transition between the impactites deposited on the peak ring to the overlying Paleogene sediments, and likely contains a well-preserved, continuous K/Pg boundary sequence.

Samples: The Post-Impact section from 506−617 mbsf comprises the post-impact carbonate Paleogene sequence dominated by marlstones. Below ~616.6 mbsf, this section grades into dark organic-rich siltstone (Unit 1G). A complex layer at ~617.33 mbsf marks the transition to the Upper Peak Ring section that also includes impact melt rocks. From 747−1335 mbsf, the core is mainly composed of highly deformed and shock metamorphosed granite that is intruded by granitoid and subvolcanic dikes and intercalations of up to decameter thick impact melt rock and suevite [1].

We analyzed four samples from the Paleogene sediment transition to suevite in order to chemically characterize the K/Pg boundary section (*Core 40R Section 1*) of core M0077A and better constrain the final phases of impact crater formation. These samples are (1) from the lithological boundary between the carbonate-rich siltstone (Unit 1G) and marlstone (Unit 1F) at 616.54 to 616.60 mbsf; (2) from a carbonate-rich siltstone (616.62 to 616.68 mbsf); (3) from the lithological boundary between siltstone and uppermost suevite (617.30-617.34 mbsf); and (4) from a size-sorted suevite (617.35-617.37 mbsf).

Methods: We subjected the 4 samples to micro-X-ray fluorescence (µXRF) analysis at the VUB using a M4 Bruker Tornado instrument (Bruker Nano GmbH, Berlin). We used this non-destructive µXRF technique to produce 2D maps as well as higher-precision line scans from the core samples for high-resolution (25 µm) elemental analysis down to ppm concentrations for all elements heavier than Na. These XRF scans serve as a base to carry out high-resolution laser ablation - inductively coupled plasma - mass spectrometry (LA-ICP-MS) to obtain fully quantified data for a set of ~50 major and trace elements [3], including the highly siderophile elements Ir and Pt that can mark contributions from the inferred carbonaceous chondritic impactor [4,5].

Results: At its base, *Core 40R-section 1* shows the transition from a fine-grained, sorted suevite (Unit 2A), which top at 617.34 mbsf into laminated carbonate-rich clay to siltstone (Unit 1G top at 616.58 mbsf) that could contain at its base the K/Pg boundary (Fig. 1). The contact with the underlying suevite is rather sharp. The uppermost part of the sorted suevite (617.34-617.5 mbsf) appears finer grained than the sorted suevite at the base of the core (below 617.51 mbsf). It is silicate-rich and contains carbonates, both as fine clasts (mm) and in the matrix. Just above the sharp contact, the lowermost part of the laminated carbonate siltstone unit (617.30-617.34 mbsf) contains multiple mm-thick layers, clearly enriched in Ni, over a thickness of ~ 1 cm (Fig. 1). Directly over the layers that are enriched in Ni, the sediment is composed of alternating dark brown/gray fine carbonate layers. Locally, pyrite nodules disrupt this fine bedding. Although the Ni concentration is also elevated compared to average upper continental crustal values in laminae of this siltstone and individual pyrites, the enrichment at the top of the suevite is significantly higher and does not correlate with S enrichment (Fig. 1). Siltstone Unit 1G is described in detail by [6]. Another sharp contact separates siltstone Unit 1G from the overlying Unit 1F, which at its base is composed of gray/green claystone that may represent stylolites [6]. Fig. 1 shows the presence of pyrite layers at the base of this unit.

Ongoing work: Core 40R section 1 (616.24–617.68 mbsf) of IODP-ICDP Expedition 364 represents a crucial interval on the peak-ring of the Chicxulub impact structure. A well-preserved, continuous K/Pg boundary sequence appears to have been recovered. µXRF imaging and line scans have proven highly useful to preliminarily identify intervals with elevated siderophile element enrichment (e.g., Cr, Ni). These intervals will be the target for more precise chemical and isotopic analyses, including spatially resolved LA-ICP-MS. The latter will be used to further characterize chemical variations throughout this layer to constrain its source material and deposition, while the enrichment of highly siderophile Ir will unravel the deposition of vaporized impactor components during the final stages of the Chicxulub structure formation.

Acknowledgements: The IODP-ICDP Expedition 364 Science Party is composed of S. Gulick (US), J. V. Morgan (UK), E. Chenot (France), G. Christeson (US), Ph. Claeys (Belgium), C. Cockell (UK), M. J. L. Coolen (Australia), L Ferrière (Austria), C. Gebhardt (Germany), K. Goto (Japan), H. Jones (US), D. A. Kring (US), J. Lofi (France), C. Lowery (US), C. Mellett (UK), R. Ocampo-Torres (France), L. Perez-Cruz (Mexico), A. Pickersgill (UK), M. Poelchau (Germany), A. Rae (UK), C. Rasmussen (US), M. Rebolledo-Vieyra (Mexico), U. Riller (Germany), H. Sato (Japan), J. Smit (Netherlands), S. Tikoo-Schantz (US), N. Tomioka (Japan), M. Whalen (US), A. Wittmann (US), J. Urrutia-Fucugauchi (Mexico), L. Xiao (China), K. E. Yamaguchi (Japan), and W. Zylberman (France).

The Chicxulub drilling expedition was funded by the International Ocean Discovery Program as Expedition 364 with co-funding from the International Continental scientific Drilling Project. The European Consortium for Ocean Drilling implemented Expedition 364, with contributions and logistical support from Yucatán state government and Universidad Nacional Autónoma de México. This work is also supported by the Research Foundation Flanders and BELSPO project Chicxulub.

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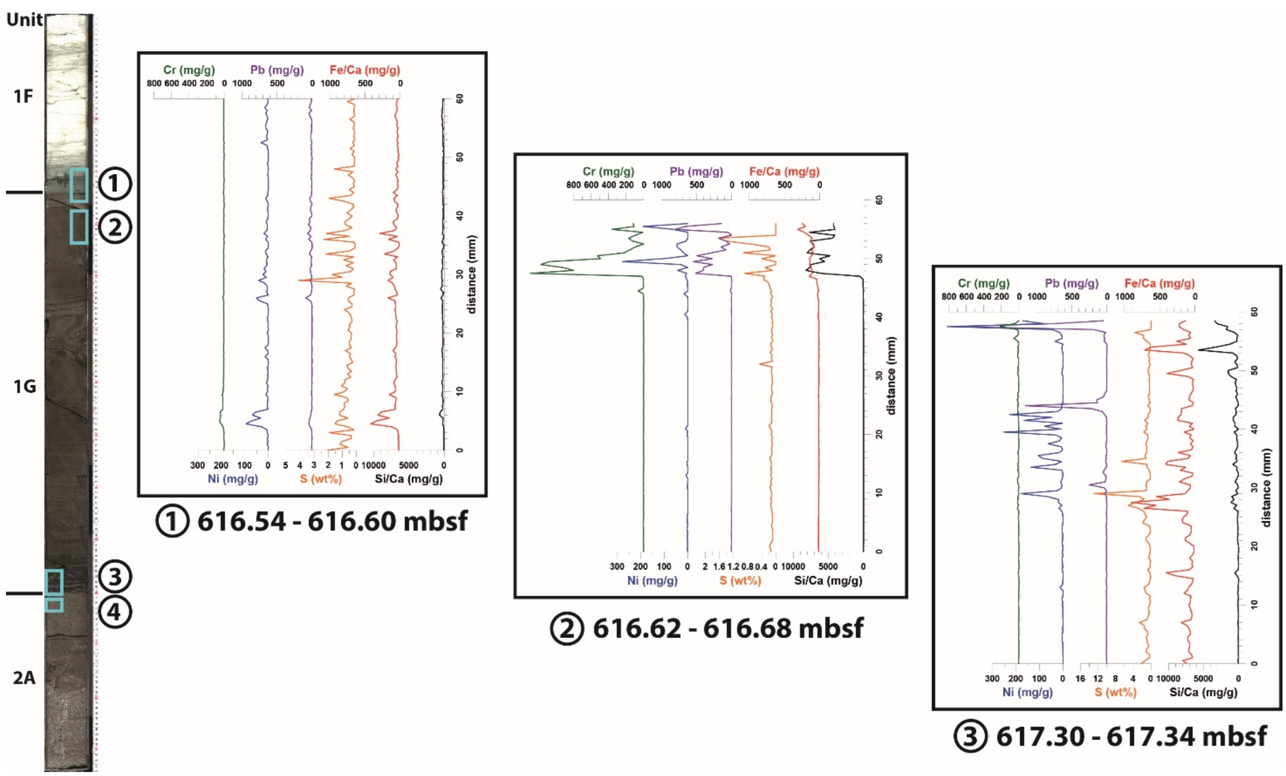

Figure 1: µXRF linescan results of segments 1 to 3 with their positions indicated on an image of Core 40R section 1. The results for section 4 from the upper suevite are not shown here.