DRILLING THE K-PG IMPACT CRATER: IODP-ICDP EXPEDITION 364 RESULTS.

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Introduction: Joint IODP-ICDP Expedition 364 drilled into the peak ring of the Chicxulub impact crater in 2016 at Site M0077. The goals of the expedition included improving our understanding of: 1) The nature and formation of topographic peak rings and large crater formation in general; 2) The mechanism by which rocks are weakened to allow complex craters to collapse and form relatively wide, flat craters; 3) The nature and extent of post-impact hydrothermal circulation; 4) Habitability within the crater rocks; 5) Recovery of life at the impact site; and 6) The climatic effects of this impact. The expedition also included investigations into the nature of the Eocene hyperthermals and the Paleocene/Eocene Thermal Maximum (PETM) transition, the nature and composition of the impact breccias, impact melt rocks, and peak-ring rocks, the sedimentology and stratigraphy of the Paleocene–Eocene Chicxulub impact basin infill, the chronology of the peak-ring rocks and impact lithologies, petrophysical properties measured on cores and downhole to calibrate geophysical models and integrate with seismic velocity data. Site M0077 was drilled on the outer edge of the peak ring in a small topographic valley where the uppermost peak-ring rocks are formed from a relatively thick (100-150 m) sequence of material with an unusally low seismic velocity [1]. This site was selected for drilling in order to maximize the chance of recovering the earliest Paleocene, obtain a thick section of the the low-velocity material that was thought to be impact breccia, and sample several hundred meters of rocks that form the upper peak ring at the Chicxulub impact crater [2].

Results: Coring started at ~500 m depth, and ~100-m of Eocene and ~10-m of Paleocene sedimentary rocks were recovered before encountering the top of the peak ring, where an unusual 80-cm thick transitional unit lies above a ~130-m thick sequence of suevite and impact melt rocks. Granitoid basement rocks with pre- and post-impact dykes and suevitic intercalations were encountered from ~748 m to the bottom of the hole at 1335-m depth. A suite of standard IODP measurements were performed by the Expedition Science Party at the Marum core repository in Bremen, and these can now be viewed online in the IODP Proceedings [3]. Core from Expedition 364 will be archived at the Gulf Coast Repository at Texas A & M University, and samples can be requested from [4].

Data from Expedition 364 have led to publications on the dynamic collapse model for peak-ring formation [1, 5] and new calculations on the release of climatic gases by the Chicxulub impact [6], and there are papers in press on the extraordinary petrophysical properties of the peak-ring rocks [7], and surprisingly rapid recovery of life at the impact site [8]. Progress has been made on all of the goals listed above, and many other papers are submitted and in preparation. The presentation will provide an overview of the drilling expedition, and a summary of the most recent and upcoming results.

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References: [1] Morgan J. V. et al. (2018) *Science* 354:878–882. [2] Gulick S. P. S. et al. (2016) International Ocean Discovery Program Expedition 364 Preliminary Report http://publications.iodp.org/preliminary_report/364. [3] Morgan J. V. et al. (2017) http://publications.iodp.org/proceedings/364/364title.html. [4] http://web.iodp.tamu.edu/sdrm/ [5] Kring D. A. et al. (2017) *GSA Today* 27:4–8. [6] Artemieva N. et al. (2017) *Geophysical Research Letters* 44:10180–10188. [7] Christeson G. L. et al. (2018) *Earth & Planetary Science Letters*, in press. [8] Lowery C. M. et al. (2018) *Nature*, in press.