245-5 - SCIENTIFIC DRILLING INTO THE K-PG CHICXULUB IMPACT CRATER: DISCOVERIES FROM IODP-ICDP EXPEDITION 364

Abstract
IODP-ICDP Expedition 364: Drilling the K-Pg Chicxulub Crater occurred in 2016 as a mission specific platform operation conducted by ECORD aboard the Liftboat Myrtle. The DOSECC drilling rig was provided by ICDP and mounted on the bow of the Myrtle allowing a single site to be drilled into peak ring of the Chicxulub impact structure. The resultant 835 m of core, collected from 500-1335 meters below seafloor at ~100% recovery, represented the first offshore drilling into the crater and was completed in <20 m of water depth. The cores were analyzed at sea in April-May, CT scanned in Houston by Weatherford Labs in June, with the data processed by Enthought scientific computing, and underwent a complete IODP onshore science party analysis at Universität Bremen in September-October. The expedition was not just a resounding success scientifically, but a great example of partnership between IODP and ICDP.

From the bottom up, we recovered basement rocks that were uplifted 8-10 km during crater formation, impact melt rock capping the peak ring, >100 m of a melt bearing breccia (suevite) deposited within the first day of the Cenozoic, a transition unit showing colonization of the crater within years, and Paleocene and Eocene crater infill recording evolutionary and environmental changes from the K-Pg mass extinction and subsequent hyperthermals. These cores supply key findings that fully accomplished the goals of the expedition including: 1) confirmation that peak rings represent outcrops of deeply sourced materials, and that hypervelocity impacts resurface planets through significant vertical mixing and porosity generation, 2) cratering is able to move materials by 10s of kilometers within minutes through pervasive fracturing at all scales, temporary strength reduction and a recovery of shear strength over time, 3) key factors in the K-Pg mass extinction caused by the 60 degree angle, northeast-southwest oriented impact of a 12 kilometer asteroid into the carbonate and evaporite rich Yucatán shelf were volatile release (S, C02, H20) and energy and ejecta effects (wildfires, earthquakes, tsunami, and 4) the impact crater environment was flooded within hours of the impact, was subsequently colonized by survivor species within years, and produced a hydrothermal chemosynthetic habitat for a millions of years in the subsurface.

Geological Society of America Abstracts with Programs. Vol. 51, No. 5, ISSN 0016-7592
doi: 10.1130/abs/2019AM-338465

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