

NATURE OF CHICXULUB IMPACTOR – EVIDENCE FROM THE MELT-RICH BRECCIAS INSIDE THE CRATER. J. Urrutia-Fucugauchi¹, P. Vera-Sanchez¹, O. Morton-Bermea¹, A.M. Soler-Arechalde¹, C. Linares¹, M. Reyes², R. Lozano-Santamaria² and M. Rebolledo¹ Instituto de Geofísica, Universidad Nacional Autónoma de México, Coyoacán 04510 D.F., México ² Instituto de Geología, Universidad Nacional Autónoma de México, Coyoacán 04510 D.F., México

Synopsis: The nature of the bolide that excavated the Chicxulub crater in the Yucatan peninsula, Mexico is one of the standing-questions remaining. We describe centimeter-sized pieces and millimeter-sized fragments recovered within the melt-rich breccia sequence of the Chicxulub crater that show a siderophile component.

Introduction: Impactor identification in large terrestrial craters where no bolide pieces survive the high-energy events remains a notoriously difficult problem. Modeling of large impact events points to impactor vaporization with low probabilities for survival of bolide pieces. In the absence of direct evidence, nature of bolide is usually investigated from platinum group elements (PGEs), Cr, Ni and Co abundances and interelement ratios in melt rocks and ejecta layers. For the Cretaceous/Tertiary (K/T) boundary event, characteristics of the global ejecta layer at various sections have been interpreted in terms of a chondritic signature. There are however sites not showing chondritic signatures, and discrepancies are ascribed to PGE remobilization in differing depositional environments and the high-energy vaporization and condensation process.

Results: The K/T boundary impact site has been traced to the buried Chicxulub crater located in the Yucatan carbonate platform of southeastern Mexico, which has since been extensively studied and interpreted in terms of a ~200 km diameter multiring structure with an age of 65 Ma. Among the major long-standing questions are those related to the nature of the bolide and dynamics of the impact event, which are in general difficult to document in the absence of surviving bolide fragments. Here we describe both centimeter-sized pieces and millimeter-sized fragments recovered within the melt-rich breccia sequence of the Chicxulub crater that show a siderophile component. High-resolution magnetic susceptibility measurements in the drill cores permit a detailed simple inventory of melt fragments and basement clasts. The fragments examined here present high iron contents and strong ferrimagnetic signal. Whole-sample x-ray fluorescence measurements give some 26-30 % wt iron and 45-53 % wt silica. Individual fragments show higher iron contents up to 60 % wt. Rock-magnetic data indicate low coercivity iron-titanium oxide minerals. The fragments are relatively complex, mainly composed of iron and silica and show evidence of partial melting and alteration. We present macroscopic descriptions of the material and results of the petrographic and geochemical analyses (including detailed microprobe, ICP-MS, x-ray fluorescence, x-ray diffraction measurements). PGE determinations show enrichment of Ir, Ru, Ph, Pd and Pt, with higher values for Pd.