FROM GUBBIO TO CHICXULUB: K-PG IRIDIUM ANOMALY COMES FULL CIRCLE

Abstract

More than forty years ago, the detection of a positive Iridium (Ir) anomaly of several parts per billion (ppb) at the Cretaceous-Paleogene (K-Pg) boundary in Gubbio (Italy) and Caravaca (Spain) triggered the theory that, 66 million years ago, a ± 10 km meteorite collided with Earth, inducing a major mass extinction, and the demise of the non-avian dinosaurs. The fine (mm to cm thick) boundary clay layer is also enriched in other platinum group elements (PGE) and shows a less radiogenic value of Os/Os, unmistakably supporting an extraterrestrial contribution. The PGE elemental ratio, together with Os and Cr isotope ratios constrain the nature of the impacting meteorite to a specific type of carbonaceous chondritic projectile (CM or CR). The Ir-PGE enrichment is reported at continental and marine K-Pg boundaries worldwide. Close to the Chicxulub crater (Yucatan-Mexico), identified as the impact site in 1990, Ir occurs at the very top of expanded K-Pg sequences. At the rim of the Gulf of Mexico, tsunami, seiches and huge debris flows induced to a higher influx of sediments that diluted and vertically spread the PGE anomaly.

In 2016, IODP-IDCP Exp. 364 recovered a ~830 m near-continuous core within the Chicxulub peak-ring containing a ~75 cm thick succession of post-impact sediments deposited on top of a ~130 m thick suevite, just below the appearance of the first Paleocene pelagic carbonates. This ‘transitional unit’, is composed of generally fining-upward, laminated dark brown to dark grayish brown carbonate-rich silty claystone to micrite. A clear positive Ir anomaly in excess of 1 ppb is measured towards its very top, comparable in magnitude and pattern to other K-Pg boundary sites in the Gulf of Mexico. It is associated with a marked drop in Os/Os values. Clearly, the ultrafine Ir-rich dust transported across the entire planet in the aftermath of the impact event also settled within the newly formed crater, placing strict and unprecedented time constraints (< 20 years) on the deposition of the transitional unit, and its underlying proximal impactite sequence. The identification of the now world-famous Ir anomaly on top of the impactite sequence deposited within the crater conclusively ties Chicxulub to the global Ir layer and to all the K-Pg boundary sections worldwide, unequivocally connecting the Yucatan impact event to all the sedimentary sections that record the K-Pg mass extinction.

Author

Philippe Claeys
Vrije Universiteit Brussel

Authors

Steven Goderis
Vrije Universiteit Brussel

Pim Kaskes
Vrije Universiteit Brussel

Sietze de Graaff
Vrije Universiteit Brussel

Thomas Dehais
Vrije Universiteit Brussel

Matthias Sinnesael
University of Durham

Niels De Winter
Vrije Universiteit Brussel
Session

44: T114. From the Guajira Desert to the Apennines, and from the Sardinia/Corsica Microplate to the Killer Asteroid: Honoring the Career of Walter Alvarez on the Occasion of His 80th Birthday

Christian Koeberl, Department of Lithospheric Research, University of Vienna, Vienna, Austria and Philippe Claeyts, Research Group of Analytical, Environmental, and Geo-Chemistry, Vrije Universiteit Brussel, Brussels, Belgium

Sunday, October 10, 2021
1:30 PM - 5:30 PM
Oregon Convention Center - Portland Ballroom 256 (Hybrid Room)