CHICXULUB

Chicxulub 2016 IODP-ICDP deep drilling: From cratering to mass extinction

DURATION
15/01/2017 - 15/04/2021

BUDGET
586 905 €

PROJECT DESCRIPTION

This project aims at gaining a holistic understanding of the succession of events that took place across the Cretaceous-Paleogene (K/Pg) boundary, 66 million years ago, exploiting on the new ~ 1500 m long core drilled by the joint International Ocean Discovery Program (IODP) – International Continental Scientific Drilling Project (ICDP) within the central part of the Chicxulub crater (~200 km) in Yucatan. The thick sequence of impactites, and the shocked basement lithologies recovered by this large-scale international endeavour will be examined in terms of petrography, geochemistry, shock metamorphism, etc. to gain knowledge of the crater formation process; with an emphasis on the rise of the still poorly understood central peak-ring structure, the distribution of melt, and the formation of ejecta, on a planet with thick atmosphere. The IODP-ICDP material will further document the proportion of carbonates and evaporates implicated in the cratering event in their respective behaviour under dynamic shock. By releasing huge volumes of CO2, SOx and H2Ov by shock vaporization the upper 3 km of CaCO3 and CaSO4 composing the Yucatan target rock at time of impact, played a key role in the resulting global perturbation of the atmosphere and ultimately the mass extinction, including the demise of the dinosaurs that marks the K/Pg boundary. Global climate models that simulate this perturbation critically need more constrains on the proportion of the different volatiles and silicate dust injected into the atmosphere by the crater excavation process.

The recently proposed connection between the Chicxulub event and the coeval Deccan volcanism occurring in India will be tested by defining a detailed chronology of the volcanic flows sampled by the ICDP Koyna core in central India. The hypothesise is that seismic shacking and dynamic stress generated by the cratering propagated worldwide and stimulated the deep magma chamber of the Deccan, leading to a major phase of eruption. The goal, jointly with UC Berkeley colleagues, is to obtain high-precision 40Ar-39Ar ages of the basal Wai Sub-group lava flows, which are likely the thickest of the Deccan sequence, and probably occur directly above the K/Pg boundary. If verified, this impact-volcanism link will shed light on mantle reaction to collisional events on planetary bodies.

In parallel, a detailed investigation will be carried on assessing the response of continental ecosystems from late Cretaceous to early Paleogene. As much data already exists in North America, the focus here lies on a west – east transect of paleontological sites across Eurasia, coupled with the information available from the Paleobiology database. Together with the simulation of the global earth system, comparison of the reaction pattern of vertebrate fauna, at sites located either close or distant to both Chicxulub and the Deccan, to the sequence of events will contribute to the ongoing discussions on the cause(s) of the biotic extinction.

Finally, obtaining ground-truth at Chicxulub contributes to better understand the formation of large craters on terrestrial planets, an important asset for planetary exploration, which can be used for several coming ESA missions to Mars or the asteroid belt, keeping in mind that impact cratering is the most common geological process in the solar system.

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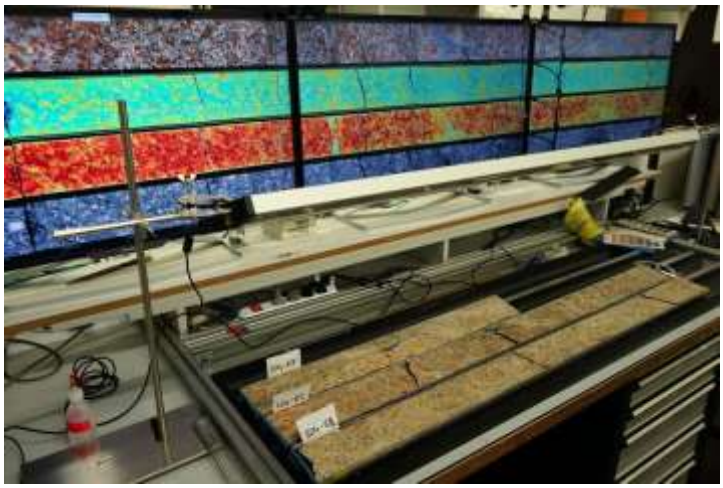

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LINKS

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http://www.ecord.org/expedition364/

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