Geology and Emplacement Mechanism of Chicxulub Crater Deposits: An Analogue for Planetary Impact Ejecta

Ocampo, A.C.

2013

document version
Publisher's PDF, also known as Version of record

Summary

The 65 Ma Cretaceous-Paleogene mass extinction is clearly related to the Chicxulub impact in the Yucatan Peninsula, Mexico. Proximal impact ejecta deposits from the Chicxulub crater were first identified in Belize and these sites represent the type section for the Albion Formation. The Albion Formation dramatically outcrops at several sites in Northern Belize at 340-370 km radial distance from the crater (near Orange Walk), at 470km radial distance (Armenia) and at 580km (Santa Teresa). The ejecta originates from the outer portion of the Chicxulub crater as a continuous ejecta blanket, submerged in the Yucatan peninsula and spectacularly outcrops northwest, central southern Belize, and also along the Mexican Belize border near Chetumal. The target rock is rich in volatiles (with ~60% anhydride) and was during the Late Cretaceous overlain by a shallow ocean that at the time of impact provided the ideal conditions to form extensive flows that were preserved as a Spheroid Bed and produced multiple fluidized ejecta blanket deposits.

The Albion Formation Spheroid bed, which rest on the fractured and karstified Maastrichtian Barton Creek Dolomite, is a distinct unit and was for the first time identified and described in this work and associated to a large impact with a volatile rich target rock, such as the Chicxulub crater. This unique basal unit of the Albion Formation named the Spheroid Bed is ~1-m-thick and is composed of clay spherules and dolomite spheroids. At least four discrete flows with shear-planes can be distinguished within the Spheroid bed. The clay spherules are altered impact glass and the dolomite spheroids have formed as accretionary lapilli. The Spheroid Bed is overlain by a calcareous 15-m-thick unit of coarse diamictite containing altered glass, large accretionary blocks, striated, polished, and impacted cobbles, and rare grains of shocked quartz. The abundance of accretionary clasts in the diamictite bed indicates evidence for atmospheric drag sorting, and further, the presence of multiple flows in the Albion Formation shows that the atmosphere play an important role in the formation of the outer portions of the continuous ejecta blankets of large craters, such as Chicxulub. The Albion Formation's Spheroid bed is interpreted to be a Fluidized Ejecta Blanket (FEB) and is in this thesis proposed to be the best terrestrial analogue to the FEBs found and first identified on Mars, Ganymede and Venus by Carr et al. (1977). A stratigraphical definition of the Chicxulub FEB will provide a clear analogue to the impact cratering processes on Mars and other planets in our solar system and will facilitate identification of targets for investigation for future planetary rovers.