245-6 - HABITAT OF THE NASCENT CHICXULUB CRATER

Abstract

Drilling on the peak ring of the Chicxulub Crater at Site M0077 during International Ocean Discovery Program-Continental Scientific Drilling Program Expedition 364 recovered possibly the most complete record of the immediate aftermath of the impact at the Cretaceous-Paleogene boundary. This record is contained within deposits formed by initial resurge into the crater followed by those laid down by tsunami and seiche waves. Charcoal layers at the top of the tsunami and seiche deposits derived from impact-induced wildfires suggest deposition within hours to decades after the impact. Seiche deposits are composed of calcite formed by decarbonation of the target limestone during impact followed by carbonation at the sea floor. Deep-sea temperatures in the crater recorded by clumped isotopes of these carbonates ranged between 50 and 90ºC indicative of impact-induced hydrothermal activity. Strontium isotope values and alteration of charcoal to pyrite and petrified wood supports this interpretation. Veins with chlorite and sphalerite suggest conduits with higher temperature fluids in the carbonate section.

The crater became a habitat for life soon after impact with an earliest Danian nannoplankton and dinocyst assemblage appearing at the top of the tsunami bed. Diversity dropped at the top of the seiche deposits where a monogeneric calcareous dinoflagellate resting cyst assemblage is found without other nannoplankton or dinocysts, suggesting deteriorating environmental conditions. Microbial fossils made of apatite and calcite at the top of the seiche deposits suggest a thriving bacterial community in the surface ocean and at the seafloor, which we postulate was supported by energy and nutrients supplied by hydrothermal activity.

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