

90 MA OF OCEAN AND CLIMATE HISTORY: OCEAN DRILLING RETURNS TO THE CARIBBEAN

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ABSTRACT

Not since the early days of the Deep Sea Drilling Project (DSDP) has the Caribbean Sea been the focus of leg-length scientific drilling. DSDP Leg 15 (1970-71) demonstrated that the Caribbean stores an outstanding low latitude sedimentary record of ocean and climate change dating back to early Late Cretaceous time. The discovery of the Chicxulub impact crater on the Yucatan Peninsula and a Caribbean-wide Cretaceous/Tertiary boundary ejecta deposit has also heightened interest in the Caribbean sedimentary record. In addition, deep sea drilling and land-based research have provided compelling evidence that the Caribbean Plate formed in the eastern Pacific as a Large Igneous Province (LIP) about 88 Ma. In December 1995, Ocean Drilling Program Leg 165 will return to tap into this rich geological record of seven sites: Cayman Ridge, Pedro Channel and Walton Basin (northern Nicaragua Rise), lower Nicaragua Rise, Colombia Basin, Venezuela Basin, and Cariaco Basin.

Scientific drilling will focus on two major themes. The first is Caribbean ocean and climate history, with particular emphasis on the pre-Neogene record. Important elements of the Late Cretaceous and Cenozoic paleoceanographic objectives include 1) low latitude sea surface temperatures, meridional temperature gradients, and the role of the ocean in planetary heat transport; 2) sources and circulation of deep and intermediate water masses through time (including testing the hypothesis of warm, saline deep and intermediate water mass production); 3) timing and reorganization of Caribbean circulation as a consequence of regional oceanic gateway openings and closings during the late Neogene (namely, partial demise of the carbonate mega-bank of the northern Nicaragua Rise and the initiation of the Caribbean Current, and the closure of the Central American seaway); and 4) ultra high resolution record of Quaternary tropical climate change, trade wind strength and variability.

The second major theme is the Cretaceous/Tertiary boundary interval. New drilling at many of the proposed sites will provide important insights into the dispersal and depositional mechanisms of ejecta from the proposed K/T impact site at the Chicxulub crater, as well as environmental consequences, biotic extinctions, and post-impact recovery. In addition, basement rocks will be drilled at four sites which will enable the geochemical characterization and dating of the Caribbean crust and an evaluation of models for its formation as a LIP that was subsequently emplaced between North and South America. Drilling crustal rocks on the Cayman Ridge will also reveal the age and origin of this unknown feature, and the origin of the Yucatan Basin.