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Mass Wasting during the Cretaceous/Tertiary Transition in the North Atlantic: Relationship to the Chicxulub Impact?

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Deep-sea sections in the North Atlantic are claimed to contain the most complete sedimentary records and ultimate proof that the Chicxulub impact is Cretaceous-Tertiary boundary (KTB) in age and caused the mass extinction. A multi-disciplinary study of North Atlantic DSDP Sites 384, 386 and 398, based on high-resolution planktonic foraminiferal biostratigraphy, carbon and oxygen stable isotopes, clay and whole-rock mineralogy and granulometry, reveals the age, stratigraphic completeness and nature of sedimentary disturbances. Results show a major KTB hiatus at Site 384 with zones CF1, P0 and P1a missing, spanning at least ~540 ky, similar to other North Atlantic and Caribbean localities associated with tectonic activity and Gulf Stream erosion. At Sites 386 and 398, discrete intervals of disturbed sediments with mm-to-cm-thick spherule layers have previously been interpreted as KTB age impact-generated earthquakes destabilizing continental margins prior to settling of impact spherules. However, improved age control based on planktonic foraminifera indicates deposition in the early Danian zone P1a(2) (upper Parvularugoglobigerina eugubina zone) more than 100 ky after the KTB. At Site 386, two intervals of white chalk contain very small (<63 μm) early Danian zone P1a(2) (65%) and common reworked Cretaceous (35%) species, in contrast to the in situ red-brown and green abyssal clays that are devoid of carbonate. In addition, high calcite, mica and kaolinite and upward-fining are observed in the chalks, indicating downslope transport from shallow waters and sediment winnowing via distal turbidites. At Site 398, convoluted red to tan sediments with early Danian and reworked Cretaceous species represent slumping of shallow water sediments as suggested by dominance of mica and low smectite compared to in situ deposition. We conclude that mass wasting was likely the result of earthquakes associated with increased tectonic activity in the Caribbean and the Iberian Peninsula during the early Danian well after the Chicxulub impact.