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Coarse-grained, clastic sandstone complex at the K/T boundary around the Gulf of Mexico: Deposition by tsunami waves induced by the Chicxulub impact?

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ABSTRACT

The K/T boundary in marine deposits in and around the Gulf of Mexico at a distance of <800 km from the Chicxulub impact structure is marked by a series of unusual sandstone beds in almost any outcrop. These sandstone beds have a complex architecture, varying with depth of deposition. At neritic to upper-bathyal depths (100 to 500 m) the sandstone beds can consistently be subdivided into three (sometimes four) successive lithological units. From bottom to top, the units decrease in grain size and change in composition and texture. The first unit (I) is characterized by millimeter-sized particles: spherules and other splash-form particles with internal filled vesicles and limestone clasts; both are interpreted as altered impact ejecta. Those ejecta, mixed with clay/marl rip-up clasts from underlying formations, washed-out foraminifers, and various material scavenged from the seafloor, fill shallow channel-like depressions. The second unit (II) consists of a sequence of several lenticular sandstone layers made up of a mixture of foraminifers, bioclasts, plant remains, and terrigenous material. The sandstones may be massive, graded, or parallel- or current-ripple laminated. Some rare spherules and limestone clasts infrequently occur at the base of each layer. The Unit II sands are deposited in very shallow, stacked channels or erosional depression infillings and display a variety of sedimentary features containing evidence for repeated up-section changes in current direction and current strength. The third unit (III) consists of strings of fine sand ripples alternating with thin silt layers. Only Unit III and the overlying unit (IV) contain anomalous iridium and Ni-rich spinels, concentrated in the silt layers. Unit IV is a graded silt-mudstone, representing a quiet depositional phase of fine material, settling—over at least a few days—together with the fine iridium-rich dust.

The coarser basal units in particular show internal unconformable stratigraphic relationships, but all the units and beds are amalgamated on top of each other, with-

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