The role of the Chicxulub Impact in the KT Mass Extinction

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The Chicxulub impact is the commonly accepted cause for the end-Cretaceous (KT) mass extinction whereas other catastrophes, such as volcanism and climate change, are considered at best secondary effects. However, this popular scenario can no longer be supported by the emerging database on the pre-KT age and biotic effects of the Chicxulub impact in Mexico and Texas. At these localities reworked impact spherule layers form the base of a sandstone complex, which has been erroneously interpreted as impact-generated mega-tsunami deposit. The KT boundary clay and Ir anomaly are well above the sandstone complex and never associated with impact spherules (Keller et al., 2007; Keller, 2008). The sandstone complex infills submarine channels that formed during the latest Maastrichtian sea level fall and cooling (100-150 ky) that followed the greenhouse warming between 400-150 ky before the KTB. The primary impact spherule deposit was discovered in undisturbed marls up to 8 m below the sandstone complex in NE Mexico sections (El Penon, Mesa Juan Perez, Loma Cerca) and in claystone below the sandstone complex in Texas. Chicxulub impact spherule deposition occurred near the base of zone CF1, predating the KTB by ~300 ky. The Chicxulub impact and K-T mass extinction are thus two separate and unrelated events.
Evaluations of the biotic effects across the primary Chicxulub impact layer in Mexico and Texas reveal that not a single species went extinct as a result of this impact. No significant changes occurred in species populations, climate, or sedimentary environments. This suggests that even a much larger impact at the KT boundary would likely have been insufficient to cause the KT mass extinction (Keller et al., 2009a, b). This result is surprising only because we assumed that the Chicxulub impact caused the mass extinction. No other large impacts are associated with mass extinctions. No species extinctions or significant environmental changes were caused by the late Eocene Popigai and Chesapeake impacts (craters of ~100 km in diameter). This suggests that environmental effects of impacts were short-lived. If not the Chicxulub impact, what caused the KT mass extinction? Deccan volcanism is the other major catastrophe near the end of the Cretaceous. Recent studies suggest that the main phase (80%) of Deccan eruptions may have been very rapid and ended near the KT boundary, suggesting volcanism as viable cause for the KT mass extinction.

Keller, G., et al. (2007): EPSL 255, 339-356.
Keller (2008): GSA Special Paper 437, 147-178.
Keller et al. (2009a): Paleo-3, 271, 52-68.
Keller et al. (2009b): JGL in press.