Stratigraphy, nature and origin of the near KT breccia, relation with the Chicxulub impact

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Breccias with altered impact glass and located at or near the K-T boundary in Texas (USA), northern and southern Mexico, Belize, Guatemala, Haiti and Brazil are investigated to determine their age, stratigraphy and origin. Ages are variable. The oldest breccia deposit is within the uppermost Maastrichtian in the southern USA (Brazos, Texas), NE Mexico (e.g., Loma Cerca, El Penon) and in the Chicxulub impact crater cores on Yucatan (e.g., cores Yaxcopoil-1, Y6, C1). In all these sections, the geochemistry of glass within the breccias is identical and consistent with Chicxulub impact ejecta. The K-T boundary, Ir anomaly and mass extinction is located well above these impact breccia layers. This strongly supports a pre-K-T age for the Chicxulub impact, as also determined based on sedimentology, stratigraphy and paleontology. In NE Mexico and Texas the oldest Chicxulub impact spherule ejecta layer is interbedded in normal marine sedimentation in the upper Maastrichtian (base of CF1 Zone), about 300'000 year prior to the K-T boundary. All stratigraphically younger spherule ejecta layers represent repeated episodes of reworking and transport of the original layer during a sea-level regression and re- deposition in incised valleys in shallow environments (e.g., Brazos, Texas, La Popa Basin NE Mexico) and submarine canyons in deeper environments via mass flows and turbidites (e.g. Mimbral, Penon, Loma Cerca and many other section throughout NE Mexico). In southern Mexico, Belize and eastern Guatemala, the widespread thick microspherule and larger spheroid deposits are interbedded with breccia, microbreccias and conglomerates in the early Danian as a result of erosion in shallow carbonate platform sediments. The presence of early Danian planktic foraminifera in the matrix of the breccia, as well as within spherule clasts, indicate that redeposition occurred during the early Danian Parvularugoglobigerina eugubina (P1a) zone. In Haiti (Beloc sections), spherule deposits and microbreccias are also reworked together with late Maastrichtian microfossils and redeposited during the early Danian zone P1a. In NE Brazil (Poty Quarry) and Argentina (Neuquen Basin), the breccia layers identified as K-T age are also younger and deposited in the early Danian P1a and P1c zones, respectively. No extraterrestrial markers, such as glass, glass spherules or shocked quartz are present. These breccia and sandstone deposits thus represent normal sedimentary processes with deposition primarily linked to sea-level changes. However, an Ir anomaly is detected in the Early Danian P1a(1) subzone (100-200ky after the KT boundary) in southern Mexico (Coxquihui, Bochil), Guatemala (Actela), Haiti (Beloc) and Brasil (Poty). This suggests that the K-T transition was a time comet showers with current evidence of two large impacts, the pre-K-T Chicxulub impact and K-T impact, and smaller impacts in the early Danian and late Maastrichtian (Boltysh crater). The distribution of the K-T impact breccia is consistent with a multi-impact scenario.