

Abstract title

TILLITES VERSUS IMPACT EJECTA: A COMPARISON FROM THE ORDOVICIAN-SILURIAN (S-BOLIVIA) AND CRETACEOUS-TERTIARY (SE-MEXICO) BOUNDARIES.

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Abstract

Successions of diamictites often record extraordinary events in Earth history and are sometimes even related to mass extinctions (e.g. O/S and K/T boundaries). It was proposed that some diamictites attributed to glaciations might be a product of large meteorite impact events. Direct comparison is difficult, since clearly impact induced diamictites are poorly known. The proximal ejecta blanket from only one crater has been well studied (Ries, Germany, Ø 25 km).

Diamictites from the distal part of the continuous ejecta blanket of the K/T age Chicxulub crater (Ø 180 km, Albion Fm.) could be identified and mapped on the southeastern Yucatán Peninsula (Mexico). To obtain diagnostic criteria for the recognition of these deposits, the Chicxulub ejecta blanket is compared to a thick, massive tillite succession of the Cancañiri Fm. at the O/S boundary in southern Bolivia.

Both diamictites show a very poor sorting. No grading and only faint and irregular bedding structures are present. The Cancañiri Fm. is polymict, containing abundant basement clasts. The Albion diamictite is oligomict, since most of the material was eroded from the Yucatan carbonate platform. This is a regional characteristic and not diagnostic. The deposits contain faceted and striated clasts. Striations on Cancañiri clasts are related to glacial abrasion. Particle abrasion of the Albion diamictite is related to internal friction during the secondary flow and rises from proximal to distal parts. Both diamictites rest with an erosional unconformity on previously exposed sedimentary rocks. Basal deformational breccias are present in each case. Differences are the threefolded succession of the Cancañiri Fm. recording three glacial advances and the presence of intercalated well sorted outwash deposits. In the Albion Fm. shear planes and shear zones are abundant in the distal parts, but in general it is more chaotic.

There are no unambiguous, ad-hoc field criteria for the distinction between both types of deposits. Since grooved or striated pavements as well as faceted and striated clasts can be produced within the secondary flow of ejecta material, they are not diagnostic for tillites. However, a detailed facies analysis, considering regional variations, does provide facies criteria for their recognition. Together with the proof of impact origin for suspect diamictite successions by the presence of shock metamorphosed minerals, it does allow to distinguish between tillites and impact ejecta.

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