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Sub-seismic scale folding and thrusting within an exposed mass transport deposit: A case study from NW Argentina.

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Abstract

While imaging of mass transport deposits (MTDs) by seismic reflection techniques commonly reveals thrusts and large blocks that affect entire deposits, associated systems of folds are generally less apparent as they are typically below the limits of seismic resolution. However, such sub-seismic scale structures are important as they permit the direction of emplacement, gross kinematics and internal strain within MTDs to be determined. Here we present a rigorous description of two outcrop-scale MTDs exposed in La Peña gorge, northwestern Argentina. These Carboniferous MTDs enable us to illustrate structural changes from a compressional domain, marked by sets of imbricated sandstone layers, into an extensional domain, characterized by sheared blocks of sandstone embedded in a finer matrix. Folds may be progressively modified during slump translation, resulting in asymmetric folds, which undergo subsequent deformation leading to sheared fold limbs together with detached and rotated fold hinges. In order to constrain transport directions within the MTDs, we measured fold hinges, mud clast alignment, and thrust planes as kinematic indicators. We propose emplacement models for both MTDs based on the overall deformational behaviour of sandstone beds