Neotectonic deformation and modified sediment fabrics of a late Pleistocene talus succession, Central Apennines

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Active normal faulting controls surface topography of the Central Apennines. Normal faulting post-dates Late Miocene foreland-directed stacking of the Apennines fold-and-thrust belt, and partly overlaps with Plio-Pleistocene exhumation and surface uplift. Studies on neotectonic deformation in the Apennines in many cases use talus deposits as deformation markers, but the deformed talus itself is rarely subject to investigation. We investigated an excellently exposed talus succession that underwent the hitherto last increments of activity of a normal fault.

Whereas the footwall of the studied fault consists of Meso-Cainozoic deep-water limestones, deformed talus deposits are confined to the fault hangingwall. The footwall displays a fault core of ultracataclasite that was subject to meteoric-diagenetic overprint (e.g., dissolution pores lined by cement, intrabrecciation); ripped-up calcite cements floating in ultracataclasite record fault reactivation during diagenetic overprint. The considered talus of pebbly scree-slope deposits accumulated mainly from grain flows and cohesive debris flows, and is intercalated with soil levels. Whereas the packages of scree represent relatively dry conditions, the soils record more humid interludes characterized by climb/densening of vegetation. Deformed strata and intercalated, radiocarbon-dated soils allowed to define three talus packages: (1) package A, ~30–25 ka in age, is paraconformably overlain by (2) package B younger than ~25 ka and that, in turn, is truncated along the base of the present topsoil. Along strike, the topsoil is locally underlain by (3) the youngest package C that perhaps accumulated during the Holocene. Together, package A and B are deformed into heteroaxial folds, (a) a syncline-anticline couple with axes at high angle to the normal fault plane, and (b) a recumbent fold with an axis roughly parallel to talus depositional strike. Field evidence indicates that faulting had ceased for a longer interval of time, but the time of cessation is difficult to constrain.

The talus is rich in clasts that were fractured while embedded in the sediment, giving rise to a specific, secondary sediment fabric. In addition, many clasts show planar contacts and are arranged into subvertical stacks (‚clast pillars'). Diagenesis records distinct phases of cementation, separated by fracture and/or intense dissolution of, each, matrix, cement and smaller lithoclasts. A speleothem flowstone along a fracture in talus package A shows successive precipitation, dissolution, and fracturation. The contrast between the ultracataclastic fault core, formed probably at 1-2 km in depth, and the overlying deformed talus indicates that the present fault/talus-ensemble records only the last increments of downfaulting. The complexity of the studied talus succession, including its deformation, stratigraphic architecture, sediment fabrics and diagenetic successions, provides an example for similar, less well-exposed talus subject to faulting.