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Luminescence profiling of loess-dominated archaeological layers of a Chalcolithic site, Northern Negev Desert fringe, Israel

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This study applies a pulsed-photon Portable OSL Reader (PPSL) in investigating the palaeoenviroment and stages of development of a Chalcolithic site revealed during a salvage excavation. The (Shoqet Junction) site, within late Pleistocene loess-dominated sediment, is adjacent to the meandering and ephemeral Hebron Wadi in the Beer-Sheva Valley, at the fringe of the Northern Negev Desert (Israel). The site intermittently covers approximately 8 hectares and was exposed at 0.3 - 0.5 m depths beneath a plowed field. Five areas were excavated down to ∼4 meters. The site was dominated by an array of underground facilities: tunnels, (capped) shafts, walls, floors and infilled cavities were found within four main layers. The site includes a mixture of sediments: large amounts of organic material, weathered bricks, a powdery loess-like unit and thin Bk horizons. The artifact assemblage is associated with the Ghassulian culture.

The objectives of this multi-parameter study, which combines PPSL luminescence profiling with sedimentological and geomorphic analyses, are to (1) analyze the Chalcolithic palaeoenvironments, aeolian and fluvial processes and location and morphology of streambeds, (2) identify possible deterministic physical influences upon the occupations (3) decipher the natural stratigraphic archive and discriminate between human and natural (aeolian/fluvial) induced sedimentation (4) create relative age profiles based on portable OSL measurements and OSL ages, in order to minimize OSL dating.

Three main sections were profiled: a natural section – in order to identify the natural sedimentological regime and two walls of two excavation squares down to the sites' alluvial base. A small section above a prominent Bk horizon was also profiled. Altogether 58 samples were obtained for sediment and PPSL analyses.

Luminescence profiles in general fit the stratigraphic breaks and enable discrimination between layers. Plowed and surface loess give low reads. Inverse reads along the profile are partly understood to be due to anthropogenic intervention with the sediment. The study highlights the potential and some of the complexities involved with portable OSL profiling of multi-layer prehistoric sites.