

A linear dune dam – a unique late Pleistocene aeolian-fluvial archive bordering the northwestern Negev Desert dunefield, Israel

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Interactions between aeolian and fluvial processes, known as aeolian-fluvial (A-F) interactions, play a fundamental role in shaping the surface of the Earth especially in arid zones. The blocking of wadis by dunes (dune-damming) is an A-F interaction that is perceived to be an archive of periods of aeolian 'superiority' on fluvial transport power and has had a strong impact on arid landscapes and prehistoric man since the late Quaternary.

The southern fringes of the northwestern Negev dunefield are lined with discontinuous surfaces of light-colored, playa-like, low-energy, fine-grained fluvial deposits (LFFDs). Abundant Epipalaeolithic camp sites mainly border the LFFDs. The LFFDs are understood to be reworked loess-like sediment deposited in short-lived shallow water bodies during the late Pleistocene. These developed adjacently upstream of hypothesized dune dams of wadis that drain the Negev highlands. However, no dune dam structures by the LFFDs have been explicitly identified or analyzed. This paper presents for the first time the morphology, stratigraphy and sedimentology of a hypothesized dune dam.

The studied linear-like dune dam structure extends west-east for several hundred meters, has an asymmetric cross-section and is comprised of two segments. In the west, the structure is 3-5 m high, 80 m wide, with a steep southern slope, and is covered by pebbles. Here, its morphology and orientation resembles the prevailing vegetated linear dunes (VLDs) of the adjacent dunefield though its slope angles differ from VLDs. To the south of the structure extends a thick LFFD sequence. In the east the structure flattens and is covered by nebkhas with its southern edge overlapped by LFFD units.

The structures' stratigraphy is found to be comprised of a thick LFFD base, overlaid by aeolian and fluvially reworked sand, a thin middle LFFD unit, and a crest comprised of LFFDs, fluvial sand and pebbles. Carbonate contents and particle size distributions of the sediments easily discriminate between sand, different LFFD units and surface sediments. Micromorphological analysis of the middle LFFD reveals clay with strial birefringence fabric, sub-angular blocky peds and several cycles of graded bedding, indicating shrinking of saturated clays and sorting in shallow standing water bodies or very low energy wadis.

The structure seems to be unique aeolian-fluvial archive of several phases/cycles of aeolian and fluvial deposition and erosion that preserved the dune-like morphology. Harifian and Natufian remains upon the structure indicate that the structure served as a convenient dwelling site by water bodies that developed to the north and south, probably at different times, and for short durations. The structure probably accreted during the two main episodes of Negev dune encroachment; around 15 ka, and then around 12 ka (Roskin et al., 2011) when it reached its mature state shortly prior to the Natufian encampment.