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A Late Pleistocene linear dune dam record of aeolian-fluvial dynamics at the fringes of the northwestern Negev dunefield

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The paper presents a late Pleistocene aeolian-fluvial record within a linear dune-like structure that partway served as a dune dam. Situated along the southern fringe of the northwestern Negev desert dunefield (Israel) the structure's morphology, orientation, and some of its stratigraphic units partly resemble adjacent west-east extending vegetated linear dunes. Uneven levels of light-colored, fine-grained fluvial deposits (LFFDs) extend to the north and south from the flanks of the studied structure. Abundant Epipalaeolithic sites line the fringes of the LFFDs. The LFFD microstructures of fine graded bedding and clay blocky peds indicate sorting and shrinking of saturated clays in transitional environments between low energy flows to shallow standing water formed by dunes damming a mid-sized drainage system.

The structure's architecture of interchanging units of sand with LFFDs indicates interchanging dominances between aeolian sand incursion and winter floods. Sand mobilization associated with powerful winds during the Heinrich 1 event led to dune damming downstream of the structure and within the structure to in-situ sand deposition, partial fluvial erosion, reworking of the sand, and LFFD deposition. Increased sand deposition led to structure growth and blockage of its drainage system that in turn accumulated LFFD units up stream of the structure. Extrapolation of current local fluvial sediment yields indicate that LFFD accretion up to the structure's brim occurred over a short period of several decades. Thin layers of Geometric Kebaran (c. 17.5-14.5 ka cal BP) to Harifian (12-11 ka BP) artifacts within the structure's surface indicates intermittent, repetitive, and short term camping utilizing adjacent water along a timespan of ~4-6 kyr.

The finds directly imply that the NW Negev LFFDs formed in dune-dammed water bodies which themselves were formed following events of vegetated linear dune elongation. LFFD accumulation persisted as a result of dune dam maintenance by smaller sand mobilization events. Wetter climates increased flood events boosting LFFD buildup rates but shortened dune dam longevity. The abundance and recurrence of water bodies in middle and large basins deteriorated after Harifian times when reduced wind power during the post-Younger Dryas constrained dune dam maintenance. Eventually, dune dam incision began as a result of overland flow after accommodation space dissipated due to LFFD accretion.

Altogether, fluctuating high wind power and precipitation during a glacial-interglacial time window and high availability of fine-grained fluvial sediment yield from eroded middle to late Pleistocene upstream highlands loess mantles, combined to create a trio of aeolian-fluvial forcing factors supporting short-term but amplified dune-dammed fluvial depositional conditions.