



Late Holocene dune mobilizations in the northwestern Negev dunefield, Israel: A response to combined anthropogenic activity and short-term intensified windiness

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The study of the effects of past climates on ancient cultures is usually based on geologic records pertaining to rainfall and temperature fluctuations and shifts. This study proposes a paradigm of anthropogenic activity and windiness fluctuations to explain aeolian sedimentation and dune mobilization in the northwestern (NW) Negev Desert dunefield (Israel). The proposed paradigm contributes a different approach to estimating the effect of climate changes on the unprecedented agricultural and urban settlement expansion during the late Roman to Early Islamic period in the northern and central Negev Desert. This study builds upon the late Holocene cluster of luminescence ages of Roskin et al. (Age, origin and climatic controls on vegetated linear dunes in the northwestern Negev Desert (Israel), Quaternary Science Reviews 30 (2011), 1649-1674) coupled with analysis of archaeological finds and historical texts. We suggest that whereas the NW Negev dunefield was generally stable during the Holocene, intermittent dune mobilization during the late Holocene, at ~ 1.8 ka and mostly 1.4–1.1 ka (~ 600 –900 CE), are linked to periods of human occupation. The idea that the last glacial dune encroachments alone that formed the NW Negev dunefield is connected to cold-event windy climates that may have intensified East Mediterranean cyclonic winter storms, cannot explain the late Holocene dune mobilizations. We conceptually model a connection between late Holocene dune mobilization, widespread anthropogenic occupation and activity, and windiness. We maintain that historic grazing and uprooting shrubs for fuel in the past by nomads and sedentary populations led to decimation of dune stabilizers, biogenic soil crusts and vegetation, causing dune erodibility and low-grade activity. Short-term events of amplified wind power in conjunction with periods of augmented anthropogenic activity that triggered major events of dune mobilization (elongation) and accretion have been preserved in the dune chronostigraphy. Because they were short lived, the dune mobilization events, corresponding windiness, and probable dustiness which were examined affected the northern Negev landscape differentially. However, they cannot be proved to have affected the environment sufficiently to influence the decline of the late Byzantine and Early Islam agricultural establishment. This study demonstrates the sensitivity of dunes in arid and semi-arid regions to a combination of local and short-term fluctuations in windiness at times of widespread grazing (anthropogenic activity). The results remind us that in similar future scenarios, sand mobilization may be similarly retriggered to varying degrees.