



Environmental Significance of Holocene Dust Accumulation in Archaeological Hilltop Ruins in the Southern Levant

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Pleistocene primary and secondary loess remains cover large parts of the landscape in the Negev in Israel and have been postulated in southern Jordan, but Holocene deposits are absent. We hypothesized that archaeological structures might represent effective dust traps which preserve Holocene dust, and investigated soils developed on archaeological hilltop ruins. These were compared them with local soils, paleosols, geological outcrops, and current dust. Statistically modeled grain size end-members were identified and demonstrate that the ruin soils in both regions consist of mixtures of local and remote sediment sources that differ from dust compositions deposited during current storms. This discrepancy is attributed to fixation processes connected with sediment-fixing agents such as vegetation, biocrusts, and/or clast pavements associated with vesicular layers (similar to desert pavements). It suggests that dust deposition depends not only on supply, but that sedimentation processes play a major role. Precipitation may have contributed to dust accretion, as a snowstorm in the Petra region delivered a significantly higher amount of sediment than rain or dry deposition. Snowfall dust had a unique particle size distribution relatively similar to the ruin soils. Wet deposition and snow might catalyze dust deposition and enhance fixation by fostering vegetation and crust formation, which suggests that more frequent snowfall during the Pleistocene may have been an important mechanism of primary loess deposition in the southern Levant.

How to cite: Roskin, J., Lucke, B., Vanselow, K. A., Bruins, H. J., Abu-Jaber, N., Porat, N., and Bäuml, R.: Environmental Significance of Holocene Dust Accumulation in Archaeological Hilltop Ruins in the Southern Levant, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-862, <https://doi.org/10.5194/egusphere-egu2020-862>, 2019