

A SEDIMENTOLOGICAL RECORD OF MIS 5e IN THE NEGEV DESERT, ISRAEL: COUPLING DATA FROM HEAVY MINERALS WITH OPTICALLY STIMULATION LUMINESCENCE SENSITIVITY AND HYPERSPECTRAL CATHODOLUMINESCENCE OF QUARTZ GRAINS

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ABSTRACT

A previous study using OSL dating and tephra chronology showed that the peak of human occupation at the Nahal Aqev site in the Negev Desert was during the Marine Isotope Stage (MIS) 5e period. To appraise changes in boundary conditions at this location that could favor human settlements, this present study focuses on sedimentological and luminescence analyses of 11 samples from an 8-m section encompassing artifact-rich archeological and non-archeological layers dated within the range of MIS 5e–3. Quartz is the predominant siliciclastic mineral throughout the section, followed by feldspar, clays, and heavy minerals. The heavy mineral assemblage and ratios confirm a Nilotic origin of these sediments. When converting our hyperspectral cathodoluminescence data into a chromaticity diagram, we find a shared cluster of data present in all samples, suggesting that the sources of quartz have remained unchanged during MIS 5e–3. Statistical parameters of optically stimulated luminescence (OSL) of quartz grain data show that the samples from the archeological layers present a lower average and dispersion of data than the others, indicating fewer cycles of burial and bleaching. Moreover, the grain-size distribution data and grain texture analyses show that the archeological samples are confined to the moderately well-sorted, very-fine sand category comprised mostly of angular grains. In turn, the non-archeological layers show moderately sorted fine sand dominated by rounded grains. Our data suggest a fast-track transportation of sediments from the Nile Basin to the Negev Desert during MIS 5e that agrees with recent studies showing a significant increase of rains in northern Africa that triggered a nine-fold discharge increase in the flow of the Nile River. The effect of these changes is also reflected by additional analyses in the sediments from Nahal Aqev, showing higher magnetic susceptibility and concentration of Fe, Th, and SiO₂ and a decrease in U. Also, celestine is found only in sediments deposited during MIS 5e, suggesting an above-normal presence of water in the Levant.