Late Glacial Dust Patterns during the Mystery Interval: A Study of Dead Sea Sediments

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What can dust patterns reveal about the climatic structure of the Mystery Interval (17.5-14.5 ka)? This study analyzed the grain-size distribution of Lake Lisan (paleo-Dead Sea) samples from Massada to develop a broad picture of dust input into the Dead Sea Basin region during a time of oscillating climate conditions. Aeolian dust flux in a region reflects atmospheric processes that control dust mobilization and transport from source to sink regions, allowing interpretations of global climate patterns. Dead Sea samples were separated into 3 grain-sizes, greater than 20 microns (> 20 um), between 5 and 20 microns ([5,20] um), and less than 5 microns (< 5 um). We assumed the < 5 um fraction as the dust fraction and the other fractions to be fluvial in nature. Lake Lisan deposited large units of gypsum, namely the Upper Gypsum Unit (UGU), evidence for the extreme aridity during that time period. The chaotic wet-dry oscillations of this time interval were reflected by the alternating aragonite (high lake stands) and gypsum (low lake stands) layers present within the UGU. These oscillations correlated with fluctuations in sediment fraction yields during this time interval. The extreme aridity present in the Dead Sea Basin was also present in the Saharan-Arabian regions, where an increased output of dust was evident through past multi-proxy studies. In addition, this study looked at the effect of three acid leaches, 1N HCl, 1.7N acetic acid, and buffered acetic acid, in the removal of carbonates, gypsum, and salts from the samples. Of the three acids used, 1N HCl produced the highest yield while buffered acetic acid had the lowest sediment yield. However, buffered acetic acid yielded the greatest < 5 um fraction of the three acid leaches. This aspect of our study contradicted past studies that found acetic acid to be the leaching acid of choice since HCl is a strong acid and prone to attacking clays as well as removing unwanted carbonates and salts.