

Paleolimnological and redox conditions over the Last Glacial Dead Sea from pore fluids

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The late Quaternary Dead Sea is a terminal lake whose geochemical and physical characteristics reflect the regional hydroclimatic conditions in the Levant basin. Across the Last Glacial Maximum, the lake (Lake Lisan) was characterized by high water level, lake stratification, and gypsum precipitation. Pore fluids extracted from two long cores from the International Continental Drilling Program (ICDP) in the Dead Sea, one at the centre of the lake (Core 5017-1-A) and one along the perimeter of the lake (5017-3-C), were used to reconstruct the limnological and redox conditions across that period. Pore fluid concentrations and isotope profiles of sulfate and dissolved inorganic carbon were analyzed from both cores and compared to each other and to the sulfate isotopes of the gypsum in Lake Lisan. The results suggest significant microbial sulfate reduction in the hypolimnion of the lake with partial oxidation of reduced sulfur species back into a heterogeneous lake sulfate reservoir. Based on the results, we develop the traditional paleolimnological mechanisms for Lake Lisan (e.g. the 'sulfur pump'), to one which explains robustly the evolution of the gypsum records and addresses the pore fluid anomalies.