Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.23998

High resolution reconstruction of the hydro-climate regime in the last glacial southern Levant from chemical compositions of interstitial soluble salts in Lake Lisan sediments

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Temporal variations in the Na/Cl, Mg/Cl, Br/Cl, Br/Mg ratios of the deep and the overlying brines that filled the Dead Sea Basin between ~100-13 ka period were retrieved from soluble salts within the lake's sediments. The soluble salts were extracted from cores drilled in the Dead Sea floor and sediments of the last glacial from the high margins of the Dead Sea. The variations in these elemental ratios (e.g., declining/rising Na/Cl ratios) reflect processes of halite precipitation/dissolution during arid/wet periods in the drainage basin, respectively, and exchanges between the epilimnion and hypolimnion brine. Ions of Na^+ and Cl^- were mainly supplied to the brines by the dissolution of the Mount Sedom salt diapir and halite deposits at the lake's margins (e.g., halite which precipitated during arid periods of the last interglacial). The main observations are: (1) Between ~100-30 ka the deep lake's hypolimnion evolved through a steady "enrichment" by Na^+ and Cl^- ions, due to continuous dissolution of marginal halite and/or from the Mt. Sedom salt diapir. Towards the end of this period, between ~43-30 ka, the Amiaz plain, a marginal basin, that comprised a semi-isolated water body, witnessed frequent episodes of halite precipitation/dissolution with temporal patterns that resemble millennial temperature ($\delta^{18}O$) variations in the Greenland ice core; (2) Between ~30-18 ka (MIS 2), when Lake Lisan reached its highest stands and maximum spatial expansion, the soluble salts indicate on frequent changes in the composition of the hypolimnion, reflecting centennial dissolution cycles of the Mt. Sedom salt diapir; (3) Between ~18-13 ka, when the lake declined to low levels, the variations in the elemental ratios reveal several episodes of enhanced supply of freshwater to the shrinking lake, causing massive halite dissolution and supply of Na^+ and Cl^- to the hypolimnion. The long-term (~100-13 ka) pattern in the elemental ratios of the hypolimnion resembles global CO_2 concentrations and sea temperature trends, while the short-term fluctuations in these ratios are correlated with short warm/cold cycles in the Greenland ice core $\delta^{18}O$ data, indicating a strong impact of the global climate engines on the regional hydro-climate in long and short time scales