Goldschmidt 2025 Abstract
https://doi.org/10.7185/gold2025.26472

# Constraints on the Dead Sea levels based on $Mg^{2+}$ budget since the last deglaciation

**MS. JIE ZHAO** AND YAEL KIRO
Weizmann Institute of Science

The Levant region of the Eastern Mediterranean is projected to experience increased drought due to rising greenhouse gas emissions. Proxy-based paleoclimate reconstructions are crucial for understanding natural hydroclimate variability, which is essential for constraining future hydroclimate changes in response to a globally warmer climate. Here, we reconstruct the lake levels of the Dead Sea in the southern Levant based on conservative pore-fluid $Mg^{2+}$ concentrations from the Dead Sea Deep Drilling Project (DSDDP) since the last deglaciation. Our $Mg^{2+}$-deduced absolute lake levels are significantly higher (by 70–100 m) than the values from the lake level curve based on onshore records during ~16 to 8 ka, indicating a missing $Mg^{2+}$ inventory in the Dead Sea Basin, which currently consists of a deep north basin (~300 m) and a shallow south basin (~10 m). After reevaluating the conservative behavior of $Mg^{2+}$, a dual $Mg^{2+}$ inventory model is developed to address this discrepancy: the south basin was much deeper during ~16 to 8 ka and served as an important $Mg^{2+}$ reservoir. Considering this dual inventory scenario, the corrected $Mg^{2+}$-deduced lake levels are aligned with previous reconstructions, leading to the development of a comprehensive lake-level compilation since the last deglaciation (figure below). The new lake level curve identifies three major droughts, at ~13.7 ka, 11.7–11.3 ka, and ~8 ka, associated with weakened Mediterranean cyclones caused by the intensification of the North Atlantic latitudinal sea surface temperature (SST) gradient following meltwater release events. Based on modern comparisons, the total freshwater discharge during these low stands was ca. 700 million $m^3$/y, accounting for ~35–45% of the pre-1960s value (prior to human-induced diversion), with the Jerusalem average rainfall dropping below 300 mm/y. The findings highlight potential challenges and considerations for future water resource management in the populated southern Levant.